I Can See What You Are Feeling, but Can I Feel It? Physiological Linkage While Viewing Communication of Emotion via Touch

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Academic Abstract

Past research has demonstrated that emotions can accurately be communicated via touch (e.g., Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006). In stranger female dyads, physiological linkage plays a role in the mechanism whereby this successful communication occurs, as touch strengthens and lengthens linkage (Kissel, 2020). While touch has a direct impact on physiological processes, viewing touch may have similar effects. The current study explored this possibility in regard to physiological linkage. Hertenstein et al., 2006 demonstrated that participants can correctly decode emotions from observing videos of communication via touch to the forearm and hand. The current study replicated this finding with forty-seven female participants, while also determining the levels of physiological linkage between the "live" observers and the video-recorded participants from Kissel (2020) using dynamic linear time series modeling. Results showed that physiological linkage can occur between "live" and recorded participants. Participants demonstrated longer linkage times with the initial dyad they viewed, but linkage with videoed communicators whose communications were correctly perceived by their fellow videoed receiver had a larger influence on emotion word, valence, intensity, and quadrant detection accuracy. Based on these results, physiological linkage may influence empathic accuracy in virtual settings.

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General Audience Abstract

A common American English slang expression to state that you relate to someone on a deep personal level is “I feel you.” This is a verbal expression of empathy, but what if empathy goes deeper than our thoughts or memories of similar experiences? What if our bodies experience the same emotion as the person with whom we are interacting? This is possible through the phenomenon of “physiological linkage.” Physiological linkage occurs when physiological signals, such as heart rate, between interaction partners start to sync up—for example, when one person’s heart rate speeds up, so does the heart rate of the person with whom they are interacting. The author’s thesis study demonstrated that this linkage can occur when people communicate emotions solely through touch. But what happens if you are watching these emotion communications instead of experiencing them? The current study examined if physiological linkage occurs between people watching a video and the people emoting in the video. The results showed that linkage does occur while watching emotional touch interactions and that this can help the observer understand what these emotions are (even if the observer can see no faces and hear no voices). Touch has many health benefits, so the observation that watching recorded touch interactions can have a similar bodily effect has implications for increasing health and connectedness. This is particularly important given the limited face-to-face and touch interactions, as well as the increase in video call interactions, resulting from the COVID-19 pandemic.

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List of Abbreviations

Abbreviation	Definition
PL	Physiological linkage
IBI	Inter-beat interval
ECG	Electrocardiogram
ICG	Impedance cardiography
PEP	Pre-ejection period
LVET	Left ventricular ejection time
hfHRV	High frequency heart rate variability
RMSSD	Root mean squared successive differences of R-R intervals
RSA	Respiratory sinus arrhythmia
LSAS	Leibowitz Social Anxiety Scale
SHS	Sensory Hypersensitivity Scale
DASS	Depression Anxiety and Stress Scale
R-HHQ	Recent Health History Questionnaire
CP	"Correctly perceived"—refers to the videos in which the original receiver correctly detected all twelve emotions in Kissel (2020); "CP1" participants were randomly assigned to view this set of clips first
IP	"Incorrectly perceived"—refers to the videos in which the original receiver incorrectly detected all twelve emotions in Kissel (2020) ; "IP1" participants were randomly assigned to view this set of clips first
OLS	Ordinary Least Squares

1. Introduction

Compared to its sensory counterparts of vision, audition, olfaction, and gustation, touch has received far less research attention (Field, 2010). Recent research has further elucidated the physiological and neural mechanisms of touch, including those related to communication of distinct emotions and intentions (Kirsch et al., 2018). However, these analyses of the mechanisms of touch often neglect the dyadic aspect of interpersonal touch, and studies on observation of touch behaviors are rare.

The current study adds to the sparse literature on the observation of touch communications and provides additional insights in the realm of basic emotion and psychophysiological research. The literature reviewed below first documents the studies conducted demonstrating that touch can communicate distinct emotions, both when the touch is experienced and observed. The various physiological mechanisms of touch are also described to provide background into why physiological linkage may play a role in successful touch communications whether experienced or viewed, especially because physiological linkage has been observed across space and time.

Past studies of touch observations have focused on if communications can be successfully decoded, rather than the mechanism of successful decoding. The current study is the first to explore physiological linkage as a potential predictor of decoding observed touch-communicated emotions. The results of the current study expand basic emotion research through the examination of touch and dyadic influences and provide additional insights into the boundary conditions for the occurrence of physiological linkage. Furthermore, the results may have future implications for enhancing connectivity and empathy while using online and video platforms.

2. Literature Review

2.1. Communication of Emotion via Touch

Touch is the first sense to develop (Field, 2010) and plays a role in many cognitive (e.g. attention; Diego, Field, Sanders, & Hernandez-Reif, 2004) and interpersonal processes. For example, touch and physical affection increase overall relationship and partner satisfaction in romantic couples (Gueguen & Fischer-Lokou, 2003) and requests to strangers made simultaneously with a friendly touch are more likely to be fulfilled (Joule & Gueguen, 2007). Additionally, touch reduces stress in romantic couples (Ditzen et al., 2007, Holt-Lunstad, Birmingham, & Light, 2008) and decreases pain responses in cancer patients (Kutner et al., 2008) and in many types of chronic pain in adults (Field, Diego, & Hernandez-Reif, 2006) and adolescents (Suresh, Wang, Porfyris, Kamasinski-Sol, & Steinhorn, 2008). Touch can also alleviate symptoms of depression (Field, 2010) and reduce feelings of social exclusion (von Mohr, Kirsch, & Fotopoulou, 2017).

Several previous studies have demonstrated that touch can also be used to communicate a variety of emotions, similar to facial expressions and vocal tones (Elfenbein & Ambady, 2002; Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006; Hertenstein, Holmes, McCullough, & Keltner, 2009; Thompson & Hampton, 2011). This communicative aspect of touch begins in infancy as maternal touch aids in infant emotion regulation, guiding infants in their exploration of new objects (Hertenstein & Campos, 2001) and in the development of their bodily attunement and sense of self (Montirosso & McGlone, 2020). Despite gender and cultural differences in touching behavior (e.g., those in the U.S. touch less than those in Italy or the Czech Republic; Dibiase & Gunnoe, 2010), successful communication of emotion via touch persists into adulthood.

Hertenstein et al. (2006) were the first to demonstrate that touch communicates distinct emotions. In a series of three studies conducted in the U.S. and Spain, Hertenstein et al. (2006) demonstrated that participants could successfully communicate anger, fear, disgust, love, gratitude, and sympathy above chance levels using touch to the forearm and hand alone. The “self-focused” emotions of embarrassment, envy, and pride, as well as surprise, were also communicated, but were decoded below chance levels. The third study in this series also demonstrated that video observers of emotions communicated via touch can correctly detect anger, fear, happiness, disgust, love, and sympathy.

When extending touch beyond the forearm and hand to include any appropriate part of the body, Hertenstein et al. (2009) demonstrated even more success at communicating emotions via touch alone. Blind-folded receivers of the communications could correctly decode anger, fear, disgust, love, gratitude, and sympathy above chance levels, but also happiness and sadness. Thompson and Hampton’s 2011 replication and extension of Hertenstein et al. (2006) found that the relationship between the participants also plays a role in successful communication of emotion via touch. Thompson and Hampton’s participants included both romantic couples and unacquainted others. All the participants in Hertenstein et al. (2006) and Hertenstein et al. (2009) were strangers. When paired with their romantic partner, as opposed to a stranger, the participants in Thompson and Hampton (2011) could successfully detect Ekman’s universal emotions (anger, fear, happiness, sadness, disgust, and surprise), the three prosocial emotions used in the Hertenstein et al. studies (love, sympathy, and gratitude), as well as the three self-focused emotions (embarrassment, pride, and envy) above chance levels.

In a reanalysis of their 2006 study data, Hertenstein and Keltner (2011) found that sympathy was successfully decoded only when at least one member of a stranger dyad was female; happiness was successfully decoded only in all female dyads. This suggests a female advantage in communication of emotion via touch, which was also implied by Kissel (2020). The latter study included all unacquainted female dyads who communicated neutral, anger, fear, happiness, sadness, disgust, surprise, love, sympathy, and gratitude via touch to the forearm and hand of their fellow participant. The self-focused emotions of embarrassment, pride, and envy were not included due to the unsuccessful communication of these emotions via touch in stranger dyads in Hertenstein et al. (2006) and Thompson and Hampton (2011). The participants in Kissel (2020) communicated all ten included emotions above chance levels, including surprise, which was not successfully communicated in Hertenstein et al. (2006).

Outside of the laboratory, touch has been shown to contain an affective component. Jones and Yarbrough (1985) studied the meanings of touch in naturalistic daily interactions. They found twelve distinct meanings for touch during interactions, including support, appreciation, inclusion, sexual interest or intent, affection, playful affection, playful aggression, compliance, attention-getting, announcing a response, greetings, and departure. Some of these meanings correspond to emotions communicated via touch, such as support corresponding to sympathy and affection corresponding to love. In examining this affective component of touch, some data suggest that certain emotions are conveyed predominately through various nonverbal channels, with touch supporting intimate emotions in particular (App, McIntosh, Reed, and Hertenstein, 2011). Touch also serves similar communicative and affective functions in nonhuman primates and rats (see Hertenstein, Verkamp, Kerestes, & Holmes, 2010 for review).

2.2. Touch and Physiology

In order to achieve its various communicative and affective functions, touch utilizes numerous physiological mechanisms. These mechanisms do not duplicate those used by audition or vision for communicating emotion, though they do involve some partly nonoverlapping neuroanatomical systems (Schirmer & Adolphs, 2017). Physical touch stimulates dermal and subdermal pressure receptors that transmit signals to the vagus nerve (Field, 2010), reducing heart rate (Triscoli, Croy, Olausson, & Sailer, 2017) and enhancing heart rate variability (Triscoli, Croy, Steudte-Schmiedgen, Olausson, & Sailer, 2017). Touch also increases serotonin levels (Field, 2010) and results in the release of oxytocin (Shermer, 2004). Most recently studied is the impact of touch on C tactile nerve fibers and various brain areas. Stimulation of the C tactile nerve fibers in the skin results in activation of somatosensory brain areas and regions involved in social processing, such as the superior temporal gyrus, especially if stimulated by interpersonal touch (Strauss et al., 2019). These C tactile fibers react selectively to slow stroking of hairy skin (Löken, Wessberg, McGlone, & Olausson, 2009) at temperatures resembling skin-to-skin contact (Ackerley et al., 2014). Even when sub-optimally stimulating these fibers, touch results in deactivation of the default mode network, indicating arousal (Strauss et al., 2019). Additionally, stimulation of C tactile afferents promotes emotional processing in other modalities, such as vocal tones (Schirmer & Gunter, 2017).

The person performing, or perceived as doing the touching, affects these physiological mechanisms of touch. In an fMRI study of romantic partners who were told they were being touched by their partner or a stranger—but who were all touched by the same experimenter—increased responses occurred in the nucleus accumbens and anterior cingulate cortex to what was believed to be partner touch (Kreuder et al., 2017). The level of activation of C tactile fibers, whose effect on various somatosensory brain areas is described above, also plays a role in perception of touch communications. Different velocities of touches (optimal for C tactile fiber stimulation versus suboptimal) and touches to areas containing C tactile fibers (forearm) versus not (palm) result in differences in the perceived emotion or intention of a touch communication, even if the person touching is not conveying a specific intent (Kirsch et al., 2018). Specifically, optimal stimulation of skin areas containing C tactile fibers led participants to believe the communicator was communicating positive emotions (e.g. support) or sexual arousal.

2.3. Physiological Linkage

Interpersonal touch is inherently a dyadic activity. One cannot touch another with their body without receiving touch stimulation themselves. Hence, all the physiological mechanisms of touch described in the previous section apply to both individuals involved in interpersonal touch. Because of this, it is unsurprising that past studies have observed that touch increases autonomic coupling between romantic partners (Chatel-Goldman, Congedo, Jutten, & Schwartz, 2014). Regardless of emotional intensity and valence, touch increased linkage of electrodermal activity between participants. Similarly, Kissel (2020) found the greatest amount of linkage in cardiac interbeat intervals (IBIs) during neutral touch in stranger dyads. Kissel (2020) also found that who drives the linkage matters, with communicators of touch-expressed emotions having a larger influence on linkage and emotion detection accuracy. This has also been found in couples, with the man or woman who initiated a shared emotional experience (during a conversation) having a greater influence on their partner’s physiology (Chen et al., 2021).

Autonomic coupling and linkage of cardiac IBIs are forms of physiological linkage. Physiological linkage is the synchronization over time of physiological responses between interaction partners and is a form of biobehavioral synchrony (Scarpa et al., 2018). Physiological linkage (Scarpa et al., 2018) and other forms of non-verbal behavioral synchrony (Lozza et al., 2018) have been observed in same-sex stranger dyads. However, physiological linkage in particular has been most studied in groups that involve touching, such as parent and their children (Feldman et al., 2011), romantic partners (Levenson & Gottman, 1983), and teams (Henning, Boucsein, & Gil, 2001).

The physiological measures collected for physiological linkage analysis as well as the statistical techniques used to model it have varied widely. Early studies in physiological linkage, (e.g., Levenson & Gottman 1983), assessed physiological linkage in multiple channels, including cardiac IBIs, pulse transmission time to the finger, skin conductance levels, and general somatic activity, but used large time segments (10 second windows) in a time series analysis. Other studies have assessed linkage of respiration (Helm, Sbarra, & Ferrer, 2012) and cardiac pre-ejection period (PEP; Thorson & West, 2018). Many of these studies have used some form of dynamical systems modeling, usually a stability-influence (also called inertia-coordination) model or coupled oscillator model (Butler & Barnard, 2019). Helm et al. (2018) provides additional information on various measures and methods for assessing physiological linkage.

A pitfall of many of these modeling techniques is the size of the time window used for linkage analysis. Dynamic linear time series modeling, as used in Scarpa et al. (2018), allows for second-by-second analysis of changes in physiological linkage. This shorter time window (1 second versus 10) can better characterize linkage of faster changing physiological signals, such as cardiac IBIs, as most IBIs are less than one second long. Kissel (2020) assessed physiological linkage using dynamic linear time series modeling as described in Scarpa et al. (2018) and found that stronger and longer physiological linkage predicted successful communication of emotion via touch.

3. Present Study

The overall goal of the current study was to expand basic research on emotion and related physiological processes by exploring the boundary conditions of physiological linkage and the role of this phenomenon in understanding communication of emotion via touch alone. This study also sought to conceptually replicate and extend Study 3 of Hertenstein et al. (2006) by including physiological measures as potential predictors of successful decoding of emotion videos. To address this goal, healthy young adult female participants viewed twenty-four different 1-minute clips of two female dyads' hands and forearms communicating emotions via touch alone while their physiology was recorded via seven electrodes. The physiological linkage between the "live" video observers and the participants communicating and receiving emotions via touch within the video was then assessed using dynamic linear time series modeling.

The specific aims for the study were as follows:

1. The first aim was to examine if physiological linkage occurs between those viewing versus those performing communication of emotion via touch. In essence, can physiological linkage occur across time and space with only minimal stimulation? Or, is being face-to-face or having a more holistic emotional experience (including facial and vocal expressions of emotions) necessary for this physiological phenomenon to arise?

2. The second aim was to determine if physiological linkage between video observers and either the videoed communicator or receiver predicts successful decoding of the emotions communicated in the video by the observer.

Addressing Aim 1, it was hypothesized that physiological linkage can occur given minimal stimulation and interaction. This linkage should occur even if the original emotion communication was not understood by its recipient; what "matters" is the affective intent.

Additionally, the physiological linkage between the observer and videoed communicator was hypothesized to be greater than the linkage between the observer and videoed receiver given the potential increased focus on communicators as the main source of “action” or emotion in the video. The receiver was passive; it was the communicator’s touches that were trying to be understood. Regarding Aim 2, higher magnitude or length of linkage between the observer and either videoed participant was hypothesized to predict greater observer accuracy in decoding the communicated emotion, as this linkage could potentially provide information about the interaction not perceived otherwise. For example, video observers might empathize with the receiver and better understand the overall situation, or their linkage with the communicator might provide insights the receiver missed.

4. Method

4.1. Participants

Approval was obtained from the Virginia Tech Institutional Review Board (IRB# 21-478). Because physiological linkage has been shown to occur to a greater extent in women (Scarpa et al., 2018), and all videoed participants were female (Kissel, 2020), only female participants were recruited. Videoed participants were all female given this linkage advantage and because females show a higher sensitivity and discrimination accuracy to touch and have more positive responses to affective touch (Russo, Ottaviani, & Spitoni, 2020). This also reduced within-subject variance and optimized sample size. Women also have a greater autonomic nervous system response to tactile stimuli (Bertheaux et al., 2020). Participants were recruited from the current Virginia Tech female undergraduate and graduate student population over the age of 18. The target sample size was 150 participants for online prescreening, with 50 to be invited to participate in the in-lab portion of the study. A sample of 50 was selected to match the number of dyads in Kissel's thesis study (2020) and as a realistic number for the time frame of data collection (September-November 2021). Hertenstein et al. (2006) recruited 114 participants in their study examining observations of communication of emotion via touch in order to obtain adequate power for an ANOVA testing the influence of gender on emotion observation detection accuracy. However, the main analysis for this study involved dynamic linear times series regression analysis, which relies on length of time, rather than number of participants, for adequate power. Linkage has been demonstrated in interactions lasting 30 minutes (Thorson & West, 2018); the current study's paradigm exceeded this length at approximately 58 minutes. Recruitment occurred via flyers posted in Williams Hall and dorms, advertisement slides provided to Psychology instructors to present to their classes, an Instagram post shared by VT Scientistas, and through the Virginia Tech SONA participant management system.

Of the 251 people who completed at least some portion of the prescreen, 119 were invited to participate in the study. Overall, 47 signed up for the study, but only 43 had fully usable data, due to Mindware crashing during the experimental session (USB transfer error). The participants ranged in age from 18 to 29 (*M*=19.45, *SD*=1.82) and included 45 undergraduates and 2 graduate students (refer to Table 1 for participant characteristics). Exclusion criteria included the presence of any cardiovascular (e.g. atrial fibrillation) or neurological (e.g., stroke) conditions, or self-reported regular use of nicotine or drug abuse.

Prior to participation in the lab portion of the study, participants received instructions for study preparation. This email reminded them to wear loose clothing and abstain from alcohol and non-prescribed substances for twelve hours, from consumption of caffeine for six hours, and from food and vigorous exercise for two hours prior to arriving for the session.

Participants were compensated for participation in a pro-rated fashion. Full credit (0.5 points of extra credit to be applied to any applicable Virginia Tech Psychology class through SONA) was given for any level of completion of the online prescreen, but those who did not complete it fully or who met exclusion criteria were not invited to the lab session. Participants received 0.5 points for arriving at the lab, 0.5 for watching the first set of emotion communication videos, another 0.5 for watching the second set of emotion communication videos, and a final 0.5 for completing the entire study and as part of the extra incentive offered by the SONA administrator for in-lab versus survey studies (for a total of 2 extra credits points for the in-lab session and 2.5 points for the entire study).

4.2. Prescreen and Self-Report Measures

Students interested in participating completed an online prescreen via Qualtrics to gather demographic information and determine eligibility before coming to the lab. In addition to demographic and information about general physical and mental health, specific questionnaires assessing variables that could impact the physiological variables, linkage, or sensitivity to touch-related stimuli were administered to control for those variables or for exclusion purposes as described. These were the same prescreen questionnaires used for the videoed participants (Kissel, 2020) and were conducted to determine if the observers were similar to their videoed counterparts.

4.2.1. Demographic Information. The Virginia Tech SONA system includes an online prescreen which gathers demographic information from study participants including age, race/ethnicity, biological sex, gender identity, sexual orientation, substance use, and prescription medication. This prescreen information was used in addition to the Mind-Body Laboratory Health History Questionnaire (Appendix A) to determine study eligibility, specifically biological sex and gender identity, as only female participants were invited to participate in the study.

4.2.2. Mind-Body Laboratory Health History Questionnaire. When participants enrolled in Part 1 (the online portion) of the study on SONA, after completing the general demographic prescreen, they were asked to complete this questionnaire addressing history or current presence of significant medical or psychiatric conditions. Those endorsing the presence of any cardiovascular (e.g. atrial fibrillation) or neurological (e.g., stroke) conditions or the regular use of nicotine or drug abuse were excluded from the study. The physiological variables collected in this study focus on autonomic control of the heart, so it was necessary to exclude participants that did not demonstrate optimal cardiac health. Prescription medications and other physical and mental health conditions were planned to be addressed in the statistical analyses as necessary, rather than serving as exclusion criteria.

4.2.3. The Liebowits Social Anxiety Scale (LSAS; Fresco et al., 2001; Appendix B). The LSAS is the most commonly used self-report questionnaire used to assess social anxiety disorder and was included in Kissel (2020) to control for social anxiety. Participants exhibiting a range of social anxiety symptoms chose to participate in Kissel (2020) as evaluated using this measure. The LSAS has good internal consistency (coefficient alpha = .94) and validity in persons with and without social anxiety disorder (Fresco et al., 2001). The internal consistency in the current study's sample was also good, α=.97, and very close to that of Kissel (2020, α=.96). This measure consists of 24 scenarios, such as "telephoning in public," that respondents rate according to how much fear the scenario gives them (from none to severe on a 4-point scale) and how often they avoid such scenarios (from never to usually on a 4-point scale).

4.2.4. Sensory Hypersensitivity Scale (SHS; Dixon et al., 2016; Appendix C). The SHS is a 25-item self-report inventory addressing sensory sensitivity across 9 factors: allergies, heat, cold, light, pain, smell, hearing, taste, and touch (Dixon et al., 2016). Because the experiment in Kissel (2020) involved touch with another person, touch and general sensory sensitivity was assessed using the SHS. Extra focus was placed on the three touch sensitivity items; these were used as a potential statistical control variable in the current study as the electrodes placed on the skin can be mildly irritating and touch sensitivity may impact the processing of visualized touch stimuli. The original development and validation study of the SHS with 1,202 participants demonstrated adequate internal reliability, α=.81 (Dixon et al., 2016); internal consistency for the current study was moderate (α=.53) and higher than that of Kissel (2020, α=.31). Respondents rated how much they agreed with statements such as "I suffer from allergies" using a 5-point Likert scale from strongly disagree to strongly agree. Overall score on this scale (average of all the items) was used to control for general sensory sensitivity, with separate analyses focusing on the average of the three touch sensitivity items. The internal consistency for the touch items in the current study was similar to Kissel (2020), α=.88 as opposed to α=.89.

4.2.5. Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995b; Appendix D). Because chronic mood states like depression and extreme stress or anxiety impact the processing (e.g., "negativity bias," Williams et al., 2009) and expression (e.g. blunted affect; Loas et al., 1994) of emotion, as well as confer other social risk factors, (Kupferberg, Bicks, & Hassler, 2016) the DASS was included in the prescreen to control how these states and conditions might impact the results. Though these are state scales, they assess each given state for the past week. Participants were generally scheduled the same week as when they completed their prescreen and were likely in the same or similar state. Including this in the prescreen reduced time in the lab for the participant and aligned with the procedure of Kissel (2020). The DASS includes 42 items that assess three related negative emotional states: depression, anxiety, and tension/stress (Lovibond & Lovibond, 1995b). Each emotional state forms a subscale with 14 items. The items on the Depression scale assess anhedonia, devaluation of life, dysphoria, hopelessness, inertia, lack of interest or involvement in daily activities, and self-deprecation. Anxiety scale items index autonomic arousal, situational anxiety, skeletal muscle effects, and the subjective experience of anxious affect. The Stress scale assesses levels of chronic non-specific arousal including difficulty relaxing, irritability, impatience, and nervous arousal. Participants rate statements like "I found myself getting upset over quite trivial things over the past week" on a 4-point scale ranging from "did not apply to me at all" to "applied to me very much or most of the time." In a sample of 717 participants, confirmatory factor analyses demonstrated satisfactory internal consistency for each scale in addition to discriminant validity among the three constructs (Lovibond & Lovibond, 1995a). The internal consistency of each scale was good in the current study and in Kissel (2020), α=.97 (current)/.96 for Depression, α=.92 (current)/.93 for Stress, and α=.90 (current)/.90 for Anxiety.

4.2.6. The Mind-Body Laboratory Recent Health History Questionnaire (R-HHQ; Appendix E). This questionnaire assessed whether participants complied with the request to abstain from non-prescribed substances, caffeine, alcohol, food, and vigorous exercise before the study for the time periods in the email reminder as described in section 4.1. If a participant reported using such substances within the allotted time, a note was made on the files with their participant code. It was originally planned that these participants would be dropped from the study, but only one participant failed to comply with one of the requests and was allowed to proceed as finding a time to reschedule was unsuccessful. This questionnaire additionally asked about other variables to control for, such as sleep the night before and most recent menstrual cycle.

4.3. Physiological Measures

Physiological signals were collected using the same MindWare Technologies Ltd. software and hardware (MindWare Technologies Ltd., Gahanna, OH) as in Kissel (2020). The signals from the MindWare Mobile PDAs were amplified and integrated as analog data by the mobiles before reaching a laptop computer in the control room next to the experimental room via Wi-Fi. The ECG signal and ICG dz/dt and Zo signals were amplified and digitally sampled at 1000 Hz using MindWare BioLab 3.3.0 software (MindWare Technologies Ltd., Gahanna, OH). The "x-axis" movement channel was also selected within the BioLab software to detect and control for movement artifact. Both ECG and ICG were collected with MindWare conductive Ag/AgCl adhesive pre-gelled electrodes (refer to Appendix F for a diagram of the electrode placement). All physiological measures were collected in real time and then visually examined and exported from MindWare HRV Analysis 3.1 and IMP Analysis 3.1 software in five-minute intervals to prepare for statistical analyses.

4.3.1. Electrocardiogram (ECG). ECG was measured using a Lead II electrode configuration in which electrodes were placed on the thorax: one below the right collar bone and one on the bottom of the left rib cage; a ground was also placed on the bottom of the right rib cage. Distances between the peaks of the QRS complex in the ECG signal (R-spikes) were detected using MindWare HRV Analysis 3.1 software in order to derive inter-beat interval (IBI) values, or the distance between two consecutive R-spikes. The HRV Analysis 3.1 software also computed mean heart rate and heart rate variability (HRV) measures. Values for very low, low, and high frequency heart rate variability were obtained using spectral analysis of the ECG signal and yielded variability in various frequency bands (0.003-0.040 for very low frequency, 0.040-0.120 for low frequency, and 0.120-0.400 Hz for high frequency) using a Fast-Fourier Transform function to derive power (ms2).

High frequency heart rate variability (hfHRV) and RMSSD, a time-based proxy for hfHRV, were regarded as indexes of vagal activity. These were calculated and extracted in addition to the IBI series for the entire experiment (used in linkage analyses) in case baseline vagal activity predicted emotion detection accuracy from videos, despite having no effect on in vivo touch interactions (Kissel, 2020). Just as hfHRV and RMSSD were extracted for exploratory analyses examining the potential impact of baseline vagal activity, low (LF) and very low frequency (VLF) HRV were calculated and extracted to determine the potential impact of baroreflex activity and the renin-angiotensin system respectively. However, LF and VLF HRV power are not pure indexes of either baroreceptor or renin-angiotensin system activity (Shaffer & Ginsberg, 2017). LF HRV is produced by both sympathetic and parasympathetic influences in addition to blood pressure regulation via baroreceptors, while VLF HRV power stems from yet-to-be determined physiological mechanisms that include the renin-angiotensin system, thermoregulatory and endothelial effects, and others (Shaffer & Ginsberg, 2017).

4.3.2. Impedance cardiography (ICG). Noninvasive thoracic impedance measurements were taken using a standard tetrapolar electrode configuration with two electrodes placed on the chest (at the top and bottom of the sternum) and two on the spine (1.5 inches above and below the electrodes on the sternum). The impedance waveform (delta Z) and dz/dt waveforms were derived in real time by BioLab 3.3.0. The dZ/dt waveform, as analyzed by the IMP Analysis 3.1 software, provided average PEP, LVET, cardiac output, and stroke volume values. Average values were extracted in 5-minute intervals (corresponding to the time period of each baseline). The IMP Analysis 3.1 software used the ECG signal in conjunction with the dZ/dt signal derived in real time to form an ensemble average of all the R-spikes (starting 200 ms before each R-spike and lasting a total 750 ms) and used this along with a portion of the dZ/dt signal to locate the B, Z (also known as C), and X landmarks. The B-point was located using the percent of dZ/dt Time+C option, while the X point was estimated using the Framingham LVET windowing option. The distance between the front electrodes was also entered into the analysis.

4.4. Laboratory Procedure

Participants invited to the lab study were asked to refrain from consuming any non-prescribed medications and alcohol for 12 hours, caffeine for 6 hours, and food and vigorous exercise for 2 hours prior to the study in an email reminder sent at 8:00am the day before their scheduled session. Upon arriving to the experimental room, the participant was greeted and received a scripted verbal description of the informed consent; she was allowed to ask any questions at this time. Following this Q&A period, she received a paper copy of the informed consent to read over and sign. A research assistant then administered the Mind-Body Laboratory Recent Health History Questionnaire (R-HHQ) on a laptop.

Following the administration of this questionnaire, the research assistant provided the participant with a sheet outlining the dictionary definition of the emotions communicated in the videos to ensure she knew what each of these emotions were and could distinguish verbally between them. The emotions listed included anger, fear, happiness, sadness, disgust, surprise, love, gratitude, sympathy, neutral, and “none of these choices is correct,” following Hertenstein et al. (2006) and Kissel (2020). Hertenstein et al. (2006) also included embarrassment, pride, and envy, but obtained null results, so those emotions were excluded in Kissel (2020) and from the current study. In Kissel (2020), “neutral” appeared three times on the randomized list of emotions that communicators received. Participants viewing the videos were also told some emotions appeared in multiple video clips; these were the additional neutral clips from the videoed dyads.

After presenting the emotion list, the research assistant attached seven electrodes to the participant’s torso. One was placed on the collarbone, one on the bottom of each rib (three total for electrocardiogram), one on the top and bottom of sternum, and two on the spine (four total for impedance cardiography). Leads from each electrode were attached to a Mindware Mobile device that the participant could clip to a belt loop or put in her pocket. Before each electrode was attached, the area for attachment was abraded with an electrode prep pad. The research assistant then checked the signals on a laptop containing Biolab 3.3.0 software in the next room to ensure proper attachment. Once proper attachment was ensured, the participant was asked to sit quietly for a five-minute baseline. Following the baseline, the research assistant instructed the participant via intercom to press the next arrow on the laptop. Pressing next started the first video of the first round of emotion communication videos. This first video played for one minute, after which the screen displayed a set of questions. Once the participant answered the questions, a one-minute recovery period began. The screen was white during this time with text indicating this was a “1-minute Recovery Period.” As soon as one minute passed, the next video in the sequence would begin playing automatically.

This cycle of 1-minute videos followed by questions and 1-minute recovery periods continued for twelve videos. After the twelfth cycle, there was a second 5-minute baseline before another set of twelve videos and corresponding questions and recovery periods. Each of the twenty-four 1-minute videos contained video clips of emotion communications captured from participants in Kissel (2020). These clips do not show any identifying features of the participants (i.e., their faces are not visible). The videos are zoomed in on the hands and forearms and participants were instructed to remove any bracelets, rings, watches, etc. In the direct center of the video’s view, there is an opaque black curtain separating the communicator and receiver. The communicator’s (role as described in Kissel, 2020) hand is placed through a small opening in this curtain, while the receiver’s hand and forearm is resting on the arm of her chair. The communicator would then manipulate the receiver’s forearm and hand as she felt best communicated the target emotion; no instructions were given about how to communicate the emotions via touch alone by the research team. For example, in a video clip depicting “love,” an observer might see the communicator’s fingers interlocking with the receiver’s and then stroking the receiver's thumb with her own, with only these two hands (one from each videoed participant) in view.

Clips from each twelve-clip round were all of one "type," and the type that participants viewed first was counterbalanced. One set of clips contained videos of a dyad from Kissel (2020) in which the receiver correctly perceived (detected, CP) all twelve of the emotions communicated to them. The other set of twelve videos came from a dyad from Kissel (2020) in which the receiver incorrectly perceived (detected, IP) all twelve of the emotions communicated by their communicator. If participants were randomly assigned to view the videos in which the videoed receiver "correctly perceived" all emotions first, they were referred to as "CP1" participants. If participants were randomly assigned to view the videos where the receiver "incorrectly perceived" all emotions first, they were called "IP1" participants. "Perceived" was used in place of "detected" here in order to avoid confusion with common acronyms (e.g., CD and ID). These two types of videos were chosen to assess if linkage occurs regardless of the original actors' perceptions (Aim 1) and if even incorrectly perceived touches can be decoded (as some were in Hertenstein et al., 2006).

The first question on the list that appeared in between each clip and recovery period asked participants to select which emotion was communicated in the clip from a list containing all possible choices (the same as those from the definition sheet she was provided). The participant was also prompted to rate the emotion communicated in the video using two 7-point Likert scales asking about valence (very unpleasant to very pleasant as scale anchors) and intensity (not at all intense to very intense as scale anchors). These Likert scale questions allowed for comparison of emotion decoding accuracy based on discrete labels and the relevant axes of the circumplex model (pleasantness and activation/degree of arousal; Russell, 1980), as was done in Kissel (2020).

The video format mirrors the procedure of Kissel (2020), where communicators were instructed to communicate each emotion from a list of 12, one at a time, for 1-minute each. The list of emotions included anger, fear, happiness, sadness, disgust, surprise, love, gratitude, sympathy, and neutral three times in a randomized order. Added instructions stating "Some emotions will be presented more than once," were given to the receiver to minimize use of the process of elimination while selecting emotions. Following the 1-minute emotion communication, the receiver indicated the emotion that was communicated and rated the communication's valence and intensity before a 1-minute recovery period commenced. Once all 12 emotions were communicated, there was an additional 5-minute baseline, after which the communicator and receiver switched roles. The initial receiver received a new randomized list of 12 emotions and communicated these to the initial communicator. Mirroring the procedure of Kissel (2020) in the videos ensured that the experimental procedure for the current study was the same length as Kissel (2020). This facilitated physiological linkage analyses because the event markers for baseline, emotion communication, and recovery periods exactly aligned.

4.5. Data Analyses

4.5.1. Emotion detection accuracy. Accuracy of emotion decoding by the observer/participant was calculated per each round by summing the number of times the participant accurately chose the emotion communicated in the video over all emotions (specifically, number of correct emotions detected over 12 and multiplied by 100). Before proceeding with the physiological linkage analyses, the detection accuracy percentages for each twelve-clip round were examined to determine if detection occurred above chance levels. Chance level was set at 25% for these binomial tests as suggested by Frank and Stennett (2001) and used by the prior studies of communication via touch. Setting the chance level at 25% rather than 1/10 for the options given resulted in a more conservative test but accounted for the fact that some emotion words are so similar that participants were not truly choosing from the whole list at any time. Furthermore, as demonstrated by the circumplex model of emotion (Russell, 1980), most emotions can be placed within the four quadrants formed by the axes pleasant-unpleasant and aroused-unaroused. Because of this, emotion detection accuracy was also assessed based on the accurate placing of the emotions along each of these axes and into the quadrants created by them as was done in Kissel (2020). To receive a correct score for quadrant, both valence and intensity had to be rated correctly. These accuracy scores were also converted into percentages, with chance level set to 25%.

4.5.2. Physiological linkage analyses. Even if emotions were not decoded by observers above chance levels, assessment of physiological linkage was still conducted to determine if physiological linkage occurs in response to viewing communication of emotions via touch (Aim 1). Dynamic time series modeling as described by Scarpa et al. (2018) and Kissel (2020) was used to assess physiological linkage. The first step of this modeling procedure was to transform the "quasi time series" of IBIs into an equi-spaced, second-by-second time series. If a heartbeat of length x milliseconds started at or before the beginning of second t and ended at or after the end of second t, then the IBI(i,t) was equated to x. However, if a heartbeat of length x ms ended during second t and a heartbeat of length y ms began (but did not end) during this second, then the IBI(i,t) was equated to $\alpha x + (1-\alpha)y$, where α was the fraction of second t which was prior to the end of the heartbeat with length x. Because the time-series data were not normally distributed as necessary, it was log-transformed to normalize it.

Once the IBIs of the observers and videoed participants were converted into an appropriate equi-spaced time series, two sets of four equations were computed (one set for CP1 participants and one set for IP1 participants). Each participant was part of four dyads—two observer-videoed communicators (CP and IP) dyads (OC) and two observer-videoed receivers (CP and IP) dyads (OR). Each type of dyad the participants experienced (OC and OR, round 1 and round 2) was expressed in the four equations which assessed the following: 1) their linkage with the communicator in the first round of videos through the second baseline, 2) their linkage with the receiver in the first round of videos through the second baseline, 3) their linkage with the communicator in the second round of videos from the second baseline to the end, and 4) their linkage with the receiver in the second round of videos from the second baseline to the end.

These two sets (one for each order of videos, CP1 versus IP1) of four equations were model regression equations estimated using OLS procedures in the form $IBI_1(i,t) = \Phi_{11}(B)IBI_1(i,t) + \Phi_{12}(B)IBI_2(i,t) + \alpha_{1,I} + \beta_{1,it} + \sum \gamma_{1j}D_{1j}(i,t) + u(i, t)$. This example demonstrates the prediction of the average IBI of participant 1 of a given pairing/dyad based on their own past IBI length (“own-effect” lag structure: $\Phi_{11}(B)$) and partner’s (videoed receiver’s or communicator’s) past IBI length ($\Phi_{12}(B)$). Terms of the type $\Phi_{11}(B)$ represent a distributed lag structure going back *p* periods as a *p*th degree polynomial in the lag operator (B). These equations also include participant-specific (fixed-effects-style) intercepts ($\alpha_{1,}$i), linear time trends ($\beta_{1,it}$), and dummy variables ($D_{1j}(i,t)$) for each portion of the experiment (e.g., emotion communication video, recovery period) to control for variation in the population means of the dependent variables (the average IBI for that participant) relative to their means for the baseline period.

Furthermore, if they were found to be statistically significant, the interactions of the task-specific dummy variables with the lagged values of participant 1 and partner IBI variables were planned to be included in the final model equations. Significance of these interaction terms indicated if that "task" affected linkage. In order to test the statistical significance of these equations overall, the coefficient estimates of the lagged IBI variables were averaged using pooled estimation techniques and 95% confidence intervals were computed using nonparametric bootstrap Monte Carlo methods with 1000 simulated datasets. The lag structure was extended for a maximum of 10 seconds, as was done in Scarpa et al. (2018) and Kissel (2020); this eliminates apparent serial correlation in the models' fitting errors.

The significance of the lag structure coefficient estimates from the pooled estimation were used as a guide for which linkage coefficients to record and use to predict emotion detection accuracy. Specifically, only coefficients that were significant in the pooled estimation from the first lagged second for at least one of the eight equations were pulled from the four equations for each participant as potential predictors. Of the coefficients collected, only their absolute values were used as the linkage coefficients could be negative and only their magnitude was of interest. Due to the complete extent of the linkage being masked by only pulling these particular coefficients, the number of significant lagged seconds in each task by lagged natural log IBI of partner interaction up to lag 10 was summed for each dyad. The number of linked seconds across all time periods for round 1 and round 2 were also summed. The individual linkage coefficient magnitudes and the total linked seconds by task and across a given round of the experiment for each participant were all used as potential predictors in multiple regression equations of emotion word, valence, intensity, and quadrant detection accuracy (by round). These regression equations were calculated for the entire dataset, as well as for CP1 and IP1 participants independently.

4.5.3. Control variables. Several variables were collected or computed as potentially needing statistical control in the analyses based on the results of Kissel (2020). In particular, the LSAS, SHS, and DASS were collected during the prescreen to control for social anxiety, touch and overall sensory hypersensitivity, depression, general anxiety, and stress; this also ensured the participants in the current study were similar to their videoed counterparts. Scores on the LSAS were computed by summing the values of the rating for each question. These numeric scores were also translated into different categories of severity of social anxiety (no social anxiety, 0-29; mild, 30-49; moderate, 50-64; marked, 65-79; severe, 80-94; and very severe, > 95). For the SHS, the rating values for each question were averaged for a total score. The three questions regarding touch sensitivity were also averaged separately to form a touch hypersensitivity measure. These averages were translated into categories of “not sensitive” (less than 3), “somewhat sensitive” (between 3 and 4), and “sensitive” (greater than 4). The DASS was scored per the instructions in its manual (Lovibond & Lovibond, 1995b), yielding three subscale values. The numeric scores for depression, anxiety, and stress were translated into severity categories from normal to extremely severe for each subscale. Each of the quantitative versions of the scores were entered as predictors in regression equations predicting emotion detection accuracy and the linkage coefficient variables to determine if they impacted either the independent or dependent variables of interest in the experiment. The categorical versions of the scores were entered into ANOVAs with emotion detection accuracy variables as dependent variables to see if there were mean differences in these outcomes based on severity category.

Due to demonstrated effects on linkage in Kissel (2020), phase of the menstrual cycle as measured by the MBL RHHQ was also entered into an ANOVA predicting emotion detection accuracy and the various linkage variables. Additionally, given the effect of same versus different self-reported race/ethnicity of participants on emotion intensity detection accuracy and several linkage variables in Kissel (2020), t-tests were performed to determine if there were mean differences in emotion detection or linkage coefficients between participants with the same self-reported race/ethnicity as the videoed participants (Caucasian/White) versus those with a different self-reported race/ethnicity (see Table 1).

5. Results

For descriptive statistics of emotion detection accuracy variables; linkage coefficients and other physiological variables including very low, low, and high frequency heart rate variability and RMSSD; and LSAS, SHS, and DASS scores and severity categories refer to Tables 2 through 4.

5.1. Emotion Detection Results

5.1.1. Discrete emotion word detection accuracy. Overall, participants had a mean percentage accuracy score of 37.77% (*SD*=17.10%) for the first round of videos and 35.82% (SD=14.84%) for the second round. On average, participants selected the correct emotion word for 4.53 (SD=2.05) of the twelve emotions viewed in the first set of videos and 4.30 (*SD*=1.78) for the second set. There were no significant differences in the number of videos correctly labeled with their corresponding emotion words regardless of the order in which the videos were presented (CP1 or IP1). However, participants correctly selected the word corresponding to the emotion expressed more often for the set of clips in which the videoed receiver correctly detected the emotions conveyed (*M*=4.78, *SD*=2.17 versus *M*=4.17, *SD*=1.56 in CP1 and *M*=4.42, *SD*=2.00 versus *M*=4.29, *SD*=1.94 in IP1). Binomial tests with the probability of "success" set to chance level (25%) indicated that the null hypothesis should be rejected for eight of the twelve IP emotion videos and nine of the twelve CP emotion videos—the proportion of "successful" detections was significantly higher than 25% for each of these videos, *p*<.05. Even for the seven total videos whose emotion "word" label's detection did not pass the binomial test, the observed detection was greater than or equal to 25%. The IP videos depicted neutral touch (video 1: 30%, *p*=.35; video 3: 29%, *p*=.39; video 8: 33%, *p*=.23) and anger (video 2: 30%, *p*=.35). The CP videos depicted neutral touch (video 8: 29%, *p*=.39), sympathy (video 7: 25%, *p*=.58), and happiness (video 10: 39%, *p*=.10). The range of percentage accuracy was 0-75%.

5.1.2. Valence detection accuracy. On average, participants had a valence percentage accuracy of 56.74% (*SD*=13.19%) for the first set of videos and 56.56% (*SD*=12.88%) for the second set of videos viewed. This corresponds to an average of 6.81 (*SD*=1.58) valences detected in round 1 and 6.79 (*SD*=1.55) valences detected in round 2. There were no significant differences in valence detection based on the order in which the videos were viewed. However, as with emotion “word” detection, detection was higher for the set of clips in which the videoed receiver also correctly detected the emotions conveyed (*M*=7.26, *SD*=1.68 versus *M*=6.74, *SD*=1.51 in CP1 and *M*=6.83, *SD*=1.61 versus *M*=6.38, *SD*=1.38 in IP1). Binomial tests with the proportion of “success” set to chance level (25%) indicated that the null hypothesis should be rejected for eight of each set of twelve videos, *p*<.05. For the eight total videos whose emotion “valence” label’s detection did not pass the binomial test, the observed detection was greater than 25%. The IP videos depicted neutral touch (video 1: 26%, *p*=.53; video 3: 29%, *p*=.39; video 8: 35%, *p*=.20) and happiness (video 5: 35%, *p*=.20). The CP videos depicted neutral touch (video 1: 33%, *p*=0.23; video 8: 33%, *p*=.23), surprise (video 5: 35%, *p*=.20), and sadness (video 9: 33%, *p*=.23). The minimum valence percentage accuracy was 25%, with a maximum of 83.33% (corresponding to a range of 3-10 correct valences detected).

5.1.3. Intensity detection accuracy. Participants had the highest intensity detection accuracy out of all the detection accuracies assessed, with an average detection accuracy of 72.34% (*SD*=16.49%) for the first set of videos viewed and 71.28% (*SD*=19.41%) for the second round. For round 1 an average of 8.68 (*SD*=1.98) correct intensities were detected; in round 2, an average of 8.55 (*SD*=2.33) were detected. Percentage intensity detection accuracy ranged from

0% to 91.67%, or 0 to 11 correct intensities detected. Binomial tests indicated that the proportion of successful intensity detections was greater than chance level (25%), $p<.001$ for all videos. As with emotion "word" and "valence" detection, intensity detection was higher for the set of clips in which the videoed receiver also correctly detected the emotions conveyed (*M*=8.91, *SD*=2.13 versus *M*=8.52, *SD*=2.54 in CP1 and *M*=8.58, *SD*=2.17 versus *M*=8.46, *SD*=1.84 in IP1).

5.1.4. Quadrant detection accuracy. Participants had a mean quadrant percentage accuracy score of 46.63% (*SD*=16.27%) for round 1; on average, participants selected the correct quadrant for 5.60 (*SD*=1.95) of the twelve emotions viewed in round 1. For round 2, the mean quadrant percentage accuracy was 44.33% (*SD*=16.49%), corresponding to 5.32 (*SD*=2.00) quadrants successfully detected. The range of quadrant percentage accuracy was 0 to 75%, corresponding to 0 to 9 quadrants correctly detected. Quadrant detection was higher for the set of clips in which the videoed receiver also correctly detected the emotions conveyed (*M*=6.17, *SD*=2.10 versus *M*=5.04, *SD*=2.06 in CP1 and *M*=5.58, *SD*=1.91 versus *M*=5.04, *SD*=1.65 in IP1). There was a significant difference in successful quadrant detection based on the order in which videos were viewed; for participants in the CP1 condition, quadrant detection accuracy was significantly higher for the first round of videos (CP), $t(22)= 2.44$, $p=.02$. There was no significant difference in performance between round 1 (IP) and round 2 (CP) for the participants in the IP1 condition. Binomial tests with the proportion of "success" set to chance level (25%) indicated that the null hypothesis should be rejected for eleven of the IP videos and ten of the CP videos, $p<.05$. For the three total videos whose emotion "quadrant" label's detection did not pass the binomial test, the observed detection was greater than or equal to 25%. The IP video depicted happiness (video 5: 35%, $p=.20$). The CP videos depicted surprise (video 5: 35%, $p=.20$) and sadness (video 9: 25%, $p=.58$).

5.2. Physiological Linkage Results

5.2.1. Pooled estimation. Eight pooled regression equations using OLS procedures were estimated; each equation corresponded to the communicator or receiver in the videos and the order in which the videos were viewed. Specifically, for participants in the CP1 condition, there were four equations assessing 1) their linkage with the communicator in the CP videos in the first round through the second baseline, 2) their linkage with the receiver in the CP videos in the first round through the second baseline, 3) their linkage with the communicator in the IP videos from the second baseline to the end of the second set of videos, and 4) their linkage with the receiver in the IP videos from the second baseline to the end of the second set of videos. Similarly, for those in the IP1 condition, four equations assessed 1) their linkage with the communicator in the IP videos in the first round through the second baseline, 2) their linkage with the receiver in the IP videos in the first round through the second baseline, 3) their linkage with the communicator in the CP videos from the second baseline to the end of the second set of videos, and 4) their linkage with the receiver in the CP videos from the second baseline to the end of the second set of videos.

Each of the eight equations predicted the average natural log IBI of the participant watching the emotion communication videos, and used the following form ("IBI" refers to the natural log transformed IBI in all terms):

$$IBI_P(i,t) = \Phi_{PP}(B)IBI_C(i,t) + \Phi_{CP}(B)IBI_R(i,t) + \alpha_{P,I} + \beta_{P,it} + \sum \gamma_{Pj}D_{Pj(i,t)} + \sum \gamma_{Pj}D_{Pj(i,t)}\,\Phi_{CP}(B)IBI_P(i,t) + \sum \gamma_{Pj}D_{Pj(i,t)}\,\Phi_{PP}(B)IBI_P(i,t) + u(i,t)$$

These equations contain the following terms as described previously: participants' own past IBI length ("own-effect" lag structure: ($\Phi_{PP}(B)$) and videoed participant's past IBI length ($\Phi_{CP}(B)$—"C" refers to the videoed communicator; this subscript would change if the videoed receiver's

IBIs were used) where terms of the type $\Phi_{PP}(B)$ represent a distributed lag structure going back *p* periods (number of seconds) as a *p*th degree polynomial in the lag operator (B); participant-specific (fixed-effects-style) intercepts (α_C,i), linear time trends (β_C,it), and dummy variables ($D_{Cj(i,t)}$) for each "type" of event occurring in the experiment; and the interactions of the task-specific dummy variables with the lagged values of the participant's and videoed communicator's or receiver's IBIs. Specific values of the coefficients for the eight equations and their significance can be found in Table 5.

5.2.2. Individual linkage equations for each pairing. Separate OLS regression equations of the same form as used for the pooled estimation predicting the natural log IBIs for each participant individually were also calculated. From these four equations per participant (based on condition, CP1 or IP1), the absolute values of the following coefficients were collected for use in the regression equations predicting emotion detection accuracy: lags 1 and 2 of the receiver's or communicator's IBIs predicting the participant's IBIs across the entire experiment, lags 1 and 2 of the interaction of the second baseline dummy variable with the receiver's or communicator's IBIs, and lag 1 of the interactions between the receiver's or communicator's IBIs and the neutral touch-only communication dummy variable, first and second rounds of emotion communication dummy variables, and first and second rounds of recovery periods dummy variables. These coefficients were not significant in all dyads but were selected based on the pooled regression results; the greatest number of significant continuous lags across CP1 and IP1 participants was 2 seconds. Values of all coefficients and their significance values in the regression equations for each individual pairing are available upon request as supplemental material. As described in section 4.5.2., the number of linked seconds across all the interactions between the receiver's or the communicator's IBIs and experimental tasks predicting the participant's IBIs was summed. The average number of linked seconds (the average number of seconds the communicator's or receiver's IBIs predicted the participant's IBIs across all videos and recovery periods in a given round) was 7.12 (*SD*=3.73) for round 1 communicators, 6.86 (*SD*=3.75) for round 1 receivers, 4.30 (*SD*=2.52) for round 2 communicators, and 4.65 (*SD*=3.03) for round 2 receivers. Participants linked for longer with the communicators and receivers that appeared in the first set of videos they were shown. CP1 participants linked with the CP communicator for 7.33 (*SD*=3.89) seconds and the CP receiver for 6.95 (*SD*=4.44) seconds, as opposed to 4.05 (*SD*=2.62) for the IP communicator and 4.38 (*SD*=3.22) for the IP receiver, who they viewed second. IP1 participants linked with the IP communicator for 6.91 (*SD*=3.65) seconds and the IP receiver for 6.77 (*SD*=3.04) seconds, but only linked with the CP communicator for 4.55 (*SD*=2.46) and with the CP receiver for 4.91 (*SD*=2.89). These differences in linkage length were significant except for the difference between the IP and CP receiver for the IP1 participants, $t(21)=1.91$, $p=.07$. Even if the difference in the number of chances for linkage across round 1 and round 2 are equated, longer linkage still occurred between the participant and the communicator and receiver of the original dyad they viewed (though this difference was not significant). For a summary of the maximum, minimum, and average number of linked seconds per each task/round, see Table 3. This table also contains the descriptive statistics for the linkage coefficients' absolute values.

5.3. Control Variable Results

5.3.1. Prescreen control variables. Multiple linear regression equations with LSAS; DASS Depression, Anxiety, and Stress subscales; and SHS total and touch scores entered as predictors indicated no significant effect of these variables on emotion word, valence, or quadrant detection accuracy values. However, DASS Depression subscale score was a significant predictor of round 1 and round 2 intensity detection accuracy (R1: β=-2.70, *p*=.001; R2: β=-3.65, *p*=.001) for CP1 participants; both full multiple regression equations were significant (R1: F(6, 22)=4.45, *p*=.008, R^2=.63; R2: F(6, 22)=3.78, *p*=.02, R^2=.59). DASS Depression subscale score was also a significant predictor of round 2 (IP) quadrant detection accuracy for CP1 participants (β=-2.35, *p*=.01), though the overall model was not significant, F(6, 22)=2.18, *p*=.10, R^2=.45.

The same quantitative total scores of the prescreen surveys were entered as predictors in multiple regression equations predicting the absolute values of the selected linkage coefficients' absolute values (lags 1 and 2 of the receiver's or communicator's IBIs predicting the participant's across the entire experiment, lags 1 and 2 of the interaction of the second baseline dummy variable with the receiver's or communicator's IBIs, and lag 1 of the interactions between the receiver's or communicator's IBIs and the neutral touch-only communication dummy variable, first and second rounds of emotion communication dummy variables, and first and second rounds of recovery periods dummy variables) and the sum of lagged seconds per task. Several of these regression models were significant; specifically the models predicting the absolute value of lag 2 of the CP communicator's IBIs predicting the participant's IBIs during the second baseline for IP1 participants (F(6, 21)=5.05, p=.005, R^2=.67), the absolute value of lag 1 of the CP communicator's IBIs predicting the participant's IBIs during the second round of recovery periods for IP1 participants (F(6, 21)=2.81, p=.049, R^2=.53), the absolute value of lag 2 the CP1 receiver's IBIs predicting the participant's IBIs during the second baseline (F(6,21)=3.77, p=.02, R^2=.60), the number of significant linked seconds of the IP receiver's IBIs predicting the participant's during the first baseline for IP1 participants (F(6, 21)=2.22, p=.03, R^2=.56), and the number of significant linked seconds of the IP communicator's IBIs predicting the participant's during the second baseline for CP1 participants (F(6, 20)=3.48, p=.03, R^2=.64).

Although the models were not significant for predicting other linkage dependent variables, all prescreen measures predicted at least one linkage indicator. Specifically, LSAS predicted three linkage indicators for IP1 participants and one for CP1 participants, SHS touch score predicted zero linkage indicators for IP1 participants and one for CP1 participants, SHS total score predicted one linkage indicator for IP1 participants and two for CP1 participants, DASS Depression score predicted two linkage indicators for IP1 participants and one for CP1 participants, DASS Anxiety score predicted two linkage indicators for IP1 participants and one for CP1 participants, and DASS Stress score predicted five linkage indicators for IP1 participants and one for CP1 participants. The specific linkage indicators and coefficients are available upon request. Given that all the prescreen survey measures were associated with some aspect of linkage (and/or intensity and quadrant accuracy) for at least one of the two groups of participants, all prescreen survey measures were retained as potential covariates in final regression models predicting emotion word, valence, intensity, and quadrant detection accuracy.

Because the prescreen variables predicted linkage to a greater degree (more linkage variables were predicted by prescreen variables) for IP1 versus CP1 participants, t-tests were performed to evaluate if participants in these two conditions differed in their scores on the LSAS, DASS subscales, and SHS touch and total scores. These tests revealed that despite the random assignment to condition, IP1 and CP1 participants differed significantly in their DASS Anxiety and DASS Stress scores. The IP1 scores for these two DASS subscales were significantly higher than those for the CP1 participants. The mean IP1 DASS Anxiety score was 7.29 (SD=8.53), as opposed to 3.35 (*SD*=3.08) for CP1 participants, $t(29.14)= -2.13$, $p=.04$. For DASS Stress, the mean IP1 score was 11.42 (*SD*=8.80) versus 6.17 (*SD*=5.13) for CP1 participants, t(37.32)= -

2.51, p=.02. The results of these t-tests, as well as a summary of all the other significant differences between the CP1 and IP1 participants, appear in Table 6.

ANOVAs using the severity categories for LSAS; DASS Depression, Anxiety, and Stress subscales; and SHS total and touch scores indicated two significant mean differences in emotion word and intensity detection accuracy values based on severity. Specifically, emotion word detection in the first set of videos differed between participants in the “normal” versus “severe” category of DASS Depression scores with mean percent accuracy being significantly higher in the “normal” range participants (*M*=39.58% versus *M*=4.17% for “severe”, *p*=.03), F(4,42)=2.48, *p*=.06 (Figure 1). There were also significant differences for emotion intensity detection in the first set of videos based on LSAS severity categories, but post hoc tests could not be performed due to the “very severe” categorization having only one participant, F(5,41)=3.68, *p*=.008 (Figure 2). However, the mean emotion intensity detection accuracy was calculated for each LSAS severity category separately and this revealed that detection accuracy was much lower for participants scoring in the “moderate” range for social anxiety (M=38.88%, SD=34.69%) as opposed to all other categories (mean range of 72.92% for “no social anxiety” to 83.33% for “very severe”). Severity categories for all six prescreen measure scores did not affect round two emotion detection of any type (word, valence, intensity, or quadrant).

5.3.2. Abstention requests and R-HHQ results. Unlike with Kissel (2020), all participants except one complied with all abstention requests (from alcohol, caffeine, food, and exercise). The one participant had eaten a grab and go sandwich one hour (as opposed to two hours) before the study began. Additionally, no participants endorsed any of the exclusion criteria on the prescreen, but one participant revealed resting tachycardia during the laboratory session. The only medical conditions reported on the prescreen by laboratory session participants were prior concussion (1), Celiac's disease (1), hyperhidrosis (1), polycystic ovarian syndrome (2), and eczema (2).

ANOVAs with phase of the menstrual cycle as the independent variable indicated no significant mean differences in emotion word, valence, intensity, or quadrant detection accuracy values for either the first or second set of videos. However, the mean absolute value of the linkage coefficient for lag 2 of the videoed communicator's IBIs predicting the participant's IBIs during the second baseline ($F(3,39)=3.03$, $p=.04$) and the mean number of seconds of the videoed communicator's IBI's predicting the participant's IBIs during the second set of videos' recovery periods ($F(3,37)=3.39$, $p=.03$) were higher in those in the middle versus the end of their menstrual cycle (see Figures 3 and 4).

5.3.3. Same versus mixed self-reported race/ethnicity pairing results. The four videoed participants self-reported their race/ethnicity as Caucasian/White. Twenty-five participants self-reported being Caucasian/White, while twenty-two reported being people of color. While there were no differences in emotion detection of any type (word, valence, intensity, quadrant) between participants with the same versus different self-reported race/ethnicity as those in the video clips, there were significant differences in six linkage-related variables. T-tests indicated that the mean absolute value of the lag 1 linkage coefficient of the initial videoed communicator's IBIs predicting the participant's IBIs during the second baseline ($M=.09$, $SD=.09$ in same, $M=.04$, $SD=.04$ in mixed), as well as the initial receiver's IBIs lag 1 coefficient during the same time period ($M=.08$, $SD=.08$ in same, $M=.04$, $SD=.04$ in mixed), were higher if the participant's self-reported race was the same as the videoed participants: $t(37.62)=2.22$, $p=.03$ and $t(33.49)=2.42$, $p=.02$.

Meanwhile, the mean absolute value of the lag 1 linkage coefficient for the communicator's IBIs predicting the participant's IBIs for the second round of videos overall (*M*=.03, *SD*=.03 in same, *M*=.07, *SD*=.07 in mixed), the mean absolute value of the lag 1 linkage coefficient for the videoed receiver's IBIs predicting the participant's IBIs during the second round of recovery periods (*M*=.04, *SD*=.04 in same, *M*=.07, *SD*=.04 in mixed), the mean number of seconds of the first round communicator's IBIs predicting the participant's IBIs during the emotion communications (*M*=.52, *SD*=.95 in same, *M*=1.25, *SD*=1.29 in mixed), and the mean number of seconds of the second round communicator's IBIs predicting the participant's IBIs during the emotion videos (*M*=.14, *SD*=.48 in same, *M*=.60, *SD*=.75 in mixed) were higher if the participant's self-reported race/ethnicity was different from the videoed participants: $t(27.52)= -2.36$, $p=.03$; $t(39)= -2.48$, $p=.02$; $t(41)= -2.13$, $p=.04$; and $t(31.9)= -2.31$, $p=.03$, respectively. For a summary of the significant t-test results, see Table 7.

5.4. Regression Results

Initial multiple regression equations predicting emotion word, valence, intensity, and quadrant detection accuracy for both rounds 1 and 2 of videos were calculated using the full dataset (IP1 and CP1 participants combined) and all possible linkage indicators for a given round as predictors (all absolute values of the lagged seconds for that round's communicator and receiver predicting the participant and the interactions with the dummy variables, as well as the sum of significant lagged linked seconds per each "task" and overall for that round). The initial multiple regression equation predicting emotion word accuracy percentage for round 1 from all round 1 linkage variables indicated no linkage variables as significant predictors. Valence accuracy percentage for round 1 was predicted by the absolute value of the linkage coefficient for lag 1 of the videoed communicator's IBIs predicting the participant's IBIs during the second baseline. Intensity accuracy percentage for round 1 was predicted by the number of significant linked seconds of the videoed receiver's IBIs predicting the participant's IBIs during the first baseline. Quadrant accuracy percentage for round 1 was predicted by the absolute values of the linkage coefficient for lag 1 of both the videoed communicator's and receiver's IBIs predicting the participant's IBIs during the second baseline, the number of significant linked seconds of the videoed receiver's IBIs predicting the participant's IBIs during the first baseline and first round of recovery periods, and the number of significant linked seconds of the videoed communicator's IBIs predicting the participant's IBIs overall.

The initial multiple regression equation predicting emotion word accuracy percentage for round 2 from all round 2 linkage variables indicated that the absolute value of the linkage coefficient for lag 1 of the round 2 videoed communicator's IBIs predicting the participant's IBIs overall significantly predicted successful detection. Valence accuracy percentage for round 2 was predicted by the number of significant linked seconds of the videoed communicator's IBIs predicting the participant's IBIs during the second round of emotion communication videos. Intensity accuracy percentage for round 2 was predicted by this linkage variable as well. Quadrant accuracy percentage for round 2 was not predicted by any linkage variables.

A second round of multiple regression equations for each type of emotion detection accuracy per round were calculated including only the significant linkage variables, along with the prescreen survey measures' quantitative scores (LSAS, SHS total and touch scores, and DASS subscale scores) and whether or not the participant had the same reported race/ethnicity as the videoed participants as covariates because these demonstrated a relationship with one or more emotion detection type or linkage variable in either CP1 or IP1 participants. These predictors were entered in blocks with the prescreen survey scores entered first, followed by matching or not matching self-reported race/ethnicity, and, lastly, the relevant linkage variables. These multiple regression equations revealed the DASS Depression subscale score as the only significant prescreen predictor of any emotion detection type, specifically emotion intensity detection for both rounds 1 and 2. It was only significant in blocks 1 and 2 for round 1 emotion intensity detection, but remained significant in all three blocks (including the final block with the linkage variable) for round 2 emotion intensity detection.

As a result, the multiple regression equations were further pared down in order to conserve power given the small sample size. In this next round of regression equations, only those prescreen variables demonstrated to have an effect on the particular linkage variable(s) related to the emotion detection type examined in a given equation were tested for inclusion. Specifically, these were self-reported race/ethnicity for round 1 valence detection accuracy, DASS Depression and LSAS for round 1 emotion intensity detection accuracy, and self-reported race/ethnicity, DASS Stress, and LSAS for round 1 emotion quadrant detection accuracy. For round 2, these were self-reported race/ethnicity for emotion word and valence detection accuracies and DASS Depression and self-reported race/ethnicity for emotion intensity detection accuracy. These prescreen variables were retained for final regression models only if they resulted in a positive change in adjusted R^2 with their inclusion.

The final equations for the overall dataset were as follows:

Emotion word detection accuracy (round 1)=B_0+ B_1(DASS Stress)+ B_2(DASS Anxiety)+ B_3(Depression)+ B_4(SHS touch score)+ B_5(SHS total score)+ B_6(LSAS)+ B_7(Self-reported race/ethnicity)

As stated earlier, no linkage variables were found that predicted emotion word detection accuracy for round 1. As such, the final model included here examines the effect of the prescreen measures only. This overall model was not significant, $F(7, 39)=1.64$, $p=.15$, with an $R^2=.23$. Only SHS total score was a significant predictor, $\beta_5=.56$, $p=.01$.

Valence detection accuracy (round 1)= B_0+ B_1(absolute value of the linkage coefficient for lag 1 of the videoed communicator's IBIs predicting the participant's IBIs during the second baseline)

The overall model was significant, $F(1, 41)=5.41$, $p=.03$, with an $R^2=.12$, $\beta_1= .341$, $p=.03$.

Intensity detection accuracy (round 1)= B_0+ B_1(number of significant linked seconds of the videoed receiver's IBIs predicting the participant's IBIs during the first baseline)

The overall model was significant, $F(1, 41)=6.23$, $p=.02$, with an $R^2=.13$, $\beta_1=.36$, $p=.02$.

Quadrant detection accuracy (round 1) =B_0+ B_1(absolute value of the linkage coefficient for lag 1 of the videoed communicator's IBIs predicting the participant's IBIs during the second baseline)+ B_2(absolute value of the linkage coefficient for lag 1 of the videoed receiver's IBIs predicting the participant's IBIs during the second baseline)+ B_3(number of significant linked seconds of the videoed receiver's IBIs predicting the participant's IBIs during the first baseline)+ B_4(number of significant linked seconds of the videoed receiver's IBIs predicting the participant's IBIs during the first round recovery periods)+ B_5(number of significant linked seconds of the videoed communicator's IBIs predicting the participant's IBIs overall)

The overall model and individual predictors were all significant, F(5, 37)=9.25, p<.001. The specific beta values were: $\beta_1=.68$ ($p=.003$), $\beta_2=-.45$ ($p=.049$), $\beta_3=.62$ ($p<.001$), $\beta_4=-.46$ ($p=.001$), $\beta_5=.59$ ($p<.001$).

Emotion word detection accuracy (round 2)=B_0+ B_1(absolute value of the linkage coefficient for lag 1 of the round 2 videoed communicator's IBIs predicting the participant's IBIs overall)

The overall model was significant, $F(1, 39)=7.60$, $p=.009$, with an $R^2=.16$, $\beta_1=-.40$, $p=.009$.

Valence detection accuracy (round 2)= $B_0+ B_1$(number of significant linked seconds of the videoed communicator's IBIs predicting the participant's IBIs during the second round of emotion communication videos)

The overall model was significant, $F(1, 39)=5.39$, $p=.03$, with an $R^2=.12$, $\beta_1= -.35$, $p=.03$.

Intensity detection accuracy (round 2)= $B_0+ B_1$(number of significant linked seconds of the videoed communicator's IBIs predicting the participant's IBIs during the second round of emotion communication videos)

The overall model was significant, $F(1, 39)=9.18$, $p=.004$, with an $R^2=.19$, $\beta_1=-.44$, $p=.004$.

Quadrant detection accuracy (round 2): No final regression equation was found for round 2 quadrant detection accuracy. No models and no prescreen or linkage predictors were significant. All B, beta, standard error, significance, and R^2 change values for the round 1 and round 2 final models can be found in Table 8.

5.4.1. Regression results (CP1 participants only). Multiple regression equations predicting the emotion word, valence, intensity, and quadrant accuracy percentage for rounds 1 and 2 were calculated individually for CP1 versus IP1 participants. For CP1 participants, no linkage variables predicted emotion word detection accuracy for round 1. Round 1 emotion valence detection accuracy was predicted by the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's IBIs overall for round 1. Round 1 emotion intensity detection accuracy was predicted by two linkage variables: 1) the number of significant seconds of the CP receiver's IBIs predicting the participant's IBIs during the first baseline and 2) the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's IBIs during the second baseline. Round 1 emotion quadrant detection accuracy was also predicted by two linkage variables: 1) the number of significant seconds of the CP receiver's IBIs predicting the participant's IBIs during the first baseline and 2) the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's IBIs overall for round 1.

For round 2, emotion word accuracy detection was predicted by two linkage variables: 1) the number of significant seconds of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos and 2) the absolute value of the lag 1 coefficient of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos. Round 2 emotion valence detection accuracy was predicted by the absolute value of the lag 1 coefficient of the IP communicator's IBIs predicting the participant's during the second round overall. Round 2 emotion intensity and quadrant detection accuracy were both predicted by the number of significant seconds of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos.

Along with the same potential covariates and the predictors entered in blocks as mentioned in the equations for all participants (and then pared down based on these results and whether the potential covariate impacted the emotion detection or linkage variable of interest), the final regression models for CP1 participants only are:

Emotion word detection accuracy (round 1)= B_0+ B_1(DASS Stress)+ B_2(DASS Anxiety)+ B_3(Depression)+ B_4(SHS touch score)+ B_5(SHS total score)+ B_6(LSAS)+ B_7(Self-reported race/ethnicity)

Mirroring the combined sample emotion word detection accuracy results for round 1, no linkage variables were found that predicted emotion word detection accuracy for CP1 participants. Although the model including just the prescreen measures was not significant, $F(7, 15)=1.77$, $p=.17$, with an $R^2=.45$, SHS total score was a significant predictor, $\beta_5=.76$, $p=.03$.

Valence detection accuracy (round 1)= B_0+ B_1(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's overall for round 1)

The overall model was significant, F(1, 19)=4.48, p=.048, with an R^2=.19, β_1=.44, *p*=.048.

Intensity detection accuracy (round 1) = B_0+ B_1(Depression)+ B_2(number of significant seconds of the CP receiver's IBIs predicting the participant's during the first baseline)+ B_3(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second baseline)

The overall model and individual predictors were all significant, F(3, 17)=13.37, p<.001. The beta values were: β_1=-.58 (*p*=.001), β_2=.38 (*p*=.01), β_3=.29 (*p*=.049).

Quadrant detection accuracy (round 1) = B_0+ B_1(number of significant seconds of the CP receiver's IBIs predicting the participant's during the first baseline)+ B_2(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's overall for round 1)

The overall model and individual predictors were all significant, F(2, 18)=5.76, p=.01. The beta values were: β_1=.51 (*p*=.01) and β_2=.43 (*p*=.03).

Emotion word detection accuracy (round 2) = B_0+ B_1(number of significant seconds of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos)+ B_2(absolute value of the lag 1 coefficient of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos)

The overall model and individual predictors were all significant, F(2, 16)=7.43, p=.005. The beta values were: β_1=-.52 (*p*=.01) and β_2=.41 (*p*=.04).

Valence detection accuracy (round 2)= B_0+ B_1(Anxiety)+ B_2(absolute value of the lag 1 coefficient of the IP communicator's IBIs predicting the participant's during the second round overall)

The overall model and individual predictors were all significant, $F(2, 16)=10.49$, $p=.001$. The beta values were: $\beta_1=-.49$ ($p=.01$) and $\beta_2=-.48$ ($p=.01$).

Intensity detection accuracy (round 2) = B_0+ B_1(Depression)+ B_2(Stress)+ B_3(number of significant seconds of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos)

The overall model and individual predictors were all significant, $F(3, 15)=17.19$, $p<.001$. The beta values were: $\beta_1=-.84$ ($p<.001$), $\beta_2=.57$ ($p=.004$), $\beta_3=-.42$ ($p=.02$).

Quadrant detection accuracy (round 2) = B_0+ B_1(Depression)+ B_2(Stress)+ B_3(number of significant seconds of the IP communicator's IBIs predicting the participant's during the second round of emotion communication videos)

The overall model was significant, $F(3, 15)=6.39$, $p=.005$. The beta values were: $\beta_1=-.80$ ($p=.006$), $\beta_2=.55$ ($p=.03$), $\beta_3=-.27$ ($p=.27$). Without the inclusion of DASS Depression and Stress, the beta value for the linkage variable was -.48 ($p=.04$).

All B, beta, standard error, significance, and R^2 values can be found in Table 10.

5.4.2. Regression results (IP1 participants only).

As with CP1 participants, no linkage variables predicted emotion word detection accuracy for IP1 participants in round 1. Round 1 emotion valence detection accuracy was predicted by the absolute value of the lag 2 coefficient of the IP receiver's IBIs predicting the participant's overall for round 1. Round 1 emotion intensity detection accuracy was predicted by two linkage variables: 1) the number of significant seconds of the IP receiver's IBIs predicting the participant's during the first round of recovery periods and 2) the absolute value of the lag 1 coefficient of the IP receiver's IBIs predicting the participant's during the first round of emotion communication videos. Round 1 emotion quadrant detection accuracy was not predicted by any linkage variables for IP1 participants.

Many more linkage variables predicted round 2 emotion detection accuracy types for IP1 participants. Emotion word accuracy detection was predicted by two linkage variables: 1) the total number of significant seconds of the CP communicator's IBIs predicting the participant's during the second round across all tasks and 2) the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall. Round 2 emotion valence detection accuracy was predicted by the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall. Round 2 emotion intensity detection accuracy was predicted by the number of significant seconds of the CP communicator's IBIs predicting the participant's during the second round of emotion communication videos. Lastly, the round 2 emotion quadrant was predicted by two linkage variables: 1) the number of significant seconds of the CP communicator's IBIs predicting the participant's during the second baseline and 2) the absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall.

Along with control variable covariates and all predictors entered in blocks as before, the final regression models for IP1 participants only are:

Emotion word detection accuracy (round 1): No final regression equation was found for round 1 emotion word detection accuracy for IP1 participants. No models and no prescreen or linkage predictors were significant.

Valence detection accuracy (round 1)= B_0+ B_1(absolute value of the lag 2 coefficient of the IP receiver's IBIs predicting the participant's overall for round 1)

The overall model was significant, $F(1, 20)=8.43$, $p=.009$, with an $R^2=.30$, $\beta_1=.54$, $p=.009$.

Intensity detection accuracy (round 1) = B_0+ B_1(number of significant seconds of the IP receiver's IBIs predicting the participant's during the first round of recovery periods)+ B_2(absolute value of the lag 1 coefficient of the IP receiver's IBIs predicting the participant's during the first round of emotion communication videos)

The overall model and individual predictors were all significant, $F(2, 19)=5.73$, $p=.01$. The beta values were: β_1=-.44 (p=.03) and β_2=-.56 (p=.008).

Quadrant detection accuracy (round 1): No final regression equation was found for round 1 emotion quadrant detection accuracy for IP1 participants. No models and no prescreen or linkage predictors were significant.

Emotion word detection accuracy (round 2) = B_0+ B_1(total number of significant seconds of the CP communicator's IBIs predicting the participant's during the second round across all tasks)+ B_2(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall)

The overall model and individual predictors were all significant, $F(2, 19)=10.34$, $p=.001$. The beta values were: β_1=-.56 (p=.003) and β_2=.37 (p=.04).

Valence detection accuracy (round 2)= B_0+ B_1(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall)

The overall model was significant, $F(1, 20)=6.69$, $p=.02$, with an R^2=.25, β_1=-.50, p=.02.

Intensity detection accuracy (round 2) = B_0+ B_1(number of significant seconds of the CP communicator's IBIs predicting the participant's during the second round of emotion communication videos)

The overall model was significant, $F(1, 20)=6.49$, $p=.02$, with an R^2=.25, β_1=-.50, p=.02.

Quadrant detection accuracy (round 2) = B_0+ B_1(number of significant seconds of the CP communicator's IBIs predicting the participant's during the second baseline)+ B_2(absolute value of the lag 1 coefficient of the CP communicator's IBIs predicting the participant's during the second round overall)

The overall model was significant, F(2, 19)=9.56, p=.001. The beta values were: β_1=-.57 (*p*=.003) and β_2=-.63 (*p*=.002).

All B, beta, standard error, significance, and R^2 change values can be found in Table 9.

5.5. Other Physiological Variable Results

All other physiological variables collected (mean heart rate; RSA; respiration rate; RMSSD; very low, low, and high frequency heart rate variability power and peak power frequencies; the LF/HF ratio; and mean PEP and LVET) during the first and second baseline were entered into multiple regression equations predicting emotion word, valence, intensity, and quadrant detection accuracy for both rounds of videos as exploratory analyses. BMI served as a covariate. None of these models were significant; only the model for the second round of emotion word detection accuracy had a significant predictor: baseline 1 LF peak power frequency (β=-2.38, *p*=.03).

6. Discussion

The present study had an overarching goal to further explore the role of physiological linkage in emotion communication and comprehension and addressed two related aims. The first aim focused on the boundary conditions of physiological linkage. Though past research has demonstrated that physiological linkage can occur across time and space (i.e., between video recorded individuals and those watching the recording at a later date; e.g., Soto & Levenson, 2009), the recordings observed by the "live" participants were rich with affectual details: vocal tones, facial expressions, and body language. The recordings in the present study were absent of all these except for body language, and even this was limited to the forearm and hand. Even with this minimal stimulation, physiological linkage was still present between the video observers and the women recorded in the videos. This linkage was fleeting; both the linkage coefficients and time spent linked were lower than the participants who experienced touch interactions in Kissel (2020).

6.1. Addressing Aim 1

From the pooled estimation results, the most notable linkage occurred between IP1 participants and IP receivers during the neutral touch video and round 1 recovery periods, between IP1 participants and CP communicators and receivers during the second round overall, between the CP1 participants and CP communicators during the first round overall and first round of recovery periods, and between the CP1 participants and CP receivers during the second baseline. Although linkage was present regardless of the emotion detection of the original videoed recipient, there was no notable linkage in the pooled results for CP1 participants with either IP communicators or receivers, while IP1 participants linked with communicators and receivers from both IP and CP dyads. This suggests that accuracy of communication and not just intent to communicate emotion might matter. This is further supported by the IP1 participants linking to the CP communicators to a significantly greater extent than the CP1 participants linked to the IP communicators. It must be kept in mind that the IP1 participants were more stressed and anxious than the CP1 participants based on their prescreens. Kissel (2020) demonstrated greater linkage in those indicating a psychological disorder (of which the most commonly reported was generalized anxiety disorder or GAD); as such, the IP1 participants' state stress and anxiety may explain their increased linkage. Overall, linkage was present, supporting Aim 1 and the hypothesis that physiological linkage can occur given minimal stimulation and interaction, at least in emotional contexts.

The second hypothesis, that video observers would link more with videoed communicators than videoed receivers, was not supported. While participants did have higher magnitude linkage coefficients and longer times linked per task on average with communicators during Round 1, the reverse was true for Round 2 (higher average magnitude and time linked with videoed receivers). Additionally, these differences were not significant, with relatively similar magnitude linkage coefficients and time spent linked with communicators and receivers in both rounds. Unexpectedly, the observers linked more with both the communicators and receivers in the original videos they viewed rather than linking to one role more than the other (i.e., IP1 participants linked more with the IP communicator and receiver and the CP1 participants linked more with the CP communicator and receiver). This might suggest some kind of primacy effect in the development of linkage (once linked to one person or group, it may take longer or be more difficult to develop strong or lasting linkage with another given "spillover" linkage from that initial connection). This greater linkage in round 1 could also be explained by habituation or fatigue effects. Fatigue seems more likely than habituation, given the change in the presented dyad (and corresponding change in the way in which the emotions were communicated). Research assistants reported greater levels of fidgeting and yawning in round 2 in the experimental session notes.

However, partially supporting hypothesis 2, CP1 participants displayed more meaningful linkage with CP communicators in the pooled estimation results and IP1 participants displayed greater linkage with the CP communicators than the CP1 participants did with the IP communicators according to the various t-tests performed. This again suggests that accuracy of communication, or at least variation and amount of action performed by a communicator, might matter. The IP communicator displayed much less variation in the emotions displays and moved less in general than the CP communicator (Thapar et al., 2021).

6.2. Addressing Aim 2

The second main aim was to determine if physiological linkage between observers and either the videoed communicators or receivers predicted successful decoding of the emotions communicated in the video. Linkage with either the videoed communicators or receivers did impact all four types of emotion detection accuracy (word, valence, intensity, and quadrant), but not always in the expected (positive) direction. The particular linkage coefficients influencing decoding performance also differed based on participants' condition (IP1 or CP1).

Regarding the four types of emotion decoding accuracy, video observers did not significantly decode all twenty-four emotions viewed above chance levels. While decoding accuracy was at or above 25% for each video for all four types of detection accuracy, some of the binomial tests indicated that this was no different than chance for either emotion word, valence, or quadrant detection accuracy for twelve videos. Specifically, participants struggled to decode neutral, sympathy, sadness, happiness, and surprise from CP videos and neutral, anger, and happiness from IP videos. Like with Kissel (2020), participants did best detecting emotion intensity, but struggled most with emotion word detection as opposed to emotion quadrant detection. Experiencing the tactile sensation of the touch communication may provide additional information that helps in specifying the corresponding word for that emotion.

Results differed from Study 3 of Hertenstein et al. (2006), in which participants successfully identified anger, fear, happiness, disgust, love, and sympathy from correctly perceived videos (incorrectly identified sadness, surprise, embarrassment, envy, pride, gratitude) and disgust and sympathy from incorrectly perceived videos (no others identified above chance levels). However, Hertenstein et al.'s (2006) study also included males, and in their 2011 re-analysis, they discovered that anger was successfully communicated only when males comprised at least one member of the dyad. As such, the current all-female sample may have struggled, especially given the social norms against women expressing anger (Simon & Nath, 2004). Both the current sample and the participants from Hertenstein et al. (2006) struggled with sadness and surprise, but the difficulty with happiness and sympathy was unexpected. The videos were examined again and it was determined that compared to the most prototypical displays, these videos were "unusual." For example, Thapar et al. (2021) found that the top three most common touch types in Kissel (2020) were holding, swinging, and shaking for happiness and stroking, holding, and resting for sympathy. In the happiness video, the CP communicator incorporated finger-interlocking (more associated with love), lifting, poking, and drawing a smiley face, while the IP communicator only used holding. The CP communicator also only used holding for their sympathy display. The participants in the current study may have further outperformed those of Hertenstein et al. (2006) given more prototypical displays; however, this was limited due to choosing only two dyads' videos for the two rounds.

6.3. The Control Variables

As mentioned earlier in this discussion, the CP1 and IP1 participants differed significantly in their DASS Anxiety and Stress subscale scores despite random assignment. These prescreen measures did impact various linkage indicators and may partially explain the differences in linkage seen between these two groups. However, DASS Depression, which did not differ significantly between CP1 and IP1 participants, was the main prescreen variable that impacted the detection results (particularly for emotion intensity detection accuracy). In all the equations in which DASS Depression was included, it had the expected negative effect on emotion detection. DASS Anxiety also impacted various emotion detection accuracies negatively, while DASS Stress had a slight positive effect (perhaps a display of the Yerkes-Dodson law).

Other control variables also had effects on linkage or the four types of emotion detection accuracy. Perhaps unsurprisingly, SHS touch score did not have an impact on the final results; however, SHS total score was the only significant predictor of round 1 emotion word detection accuracy overall. SHS total score predicted several linkage coefficient magnitudes and times spent linked in Kissel (2020); the current study's results also support the idea that being hypersensitive in general may make one more amenable to external influences, such as drivers of physiological linkage. Also as in Kissel (2020), phase of participants' menstrual cycles affected physiological linkage. This was in the opposite direction from Kissel (2020), however, with higher linkage in participants in the middle as opposed to the end of their cycles. The videoed participants were all in the beginning or middle of their cycles; perhaps this matching led to similar heart rate responses as opposed to the conjectured baroreceptor sensitivity influence (because estradiol enhances vagally mediated baroreceptor control of heart rate; Tanaka et al., 2003) offered by Kissel (2020).

Due to the differences in intensity detection accuracy and various linkage indicators in same versus mixed self-reported race/ethnicity dyads in Kissel (2020), potential differences were assessed between participants with the same versus different self-reported race/ethnicity as the videoed communicators and receivers (who were White/Caucasian). Like in Kissel (2020), more linkage indicators were significantly higher in “mixed” pairings (pairings of video observers and videoed participants with different self-reported race/ethnicities). However, unlike with Kissel (2020), there is no “live” interracial contact that could be stressful (Trawalter, Richeson, & Shelton, 2009) and account for increased linkage due to increased arousal. Moderators of increased linkage in interracial dyads or settings require future investigation. The one past study that has examined cultural matches versus mismatches in physiological linkage found support for cultural equivalence in empathic accuracy (correct decoding of the other’s emotions regardless of if they had the same or different ethnicity), but some support for the cultural advantage model in terms of linkage (linkage occurred to a greater extent in matched individuals; Soto & Levenson, 2009). Regardless, even with evidence of equivalent empathic accuracy across cultures, at least in terms of common touch displays, a survey of over 14,000 participants from 45 countries found differences in affective touch behaviors, such that there was a greater amount of diversity of affective touch in warmer, less conservative, and religious countries, and among younger, female, and more liberal participants (Sorokoska et al., 2021). These cultural differences could impact physiological linkage while experiencing or viewing touch emotion communications, especially with participants with a greater degree of mismatch.

6.4. A Second Look at Aim 2

With the impact of these control variables in mind, I return to the second main aim of the present study. As summarized previously, linkage between the observers and the videoed participants influenced emotion detection accuracy, but not always “success.” For the overall dataset, linkage had no relationship with round 1 emotion word detection accuracy or round 2 quadrant detection accuracy. However, SHS total score (or general hypersensitivity) predicted round 1 emotion word detection accuracy, suggesting that some physiological awareness or sensory perception is involved in decoding observed touch communications. For round 1, linking with the videoed communicator (either IP or CP) at a greater magnitude or for a longer amount of time had a positive effect on emotion intensity, valence, and quadrant detection accuracy. Additionally, being more similar to the videoed receiver, as indicated by linkage during the first baseline before any videos had been viewed, also increased quadrant detection accuracy. Linking with the videoed receiver during the recovery periods or to a greater magnitude into the second baseline, however, decreased quadrant detection accuracy. Perhaps linking with the receiver is an internal distraction; the observer may sense the receiver’s confusion instead of the task-relevant signals from the communicator of the emotion the observer is trying to decode.

In round 2 for the overall dataset, there is no impact of videoed receivers on emotion detection accuracy of any type. The significant predictors of emotion word, valence, and intensity are all related to linkage with the videoed communicator, but all are in the negative direction. This seems confusing until one considers the entire constellation of results and the differing participant experiences for those in the CP1 and IP1 conditions. Participants in the CP1 condition began the experiment with a relatively easy or unambiguous task. The videos they viewed were generally prototypical touch displays of the communicated emotions and were readily understood by the person receiving them in the video. Then, the task suddenly became harder after a break (the second 5-minute baseline). The touch displays were less varied and clear, to the point that the videoed participant could not decode them. Some CP1 participants even commented on this during the debriefing period, asking what was “wrong” with the videos in the latter half of the experiment, despite no indications at the start of the experiment that there were any differences in the round 1 and 2 videos. IP1 participants had the reverse experience. Their initial task was challenging, and they worked hard to classify their videos, performing only slightly worse than their CP1 counterparts during round 1 on average. Then, the task became unexpectedly easier and they may have updated their strategy for decoding the emotions. Overall, there was a strong order effect, at least for the regression results.

The results holistically support the idea that decoding the IP videos was a more difficult task. Emotion detection accuracy of all four types was higher in round 2 for IP1 participants (when they saw the CP videos) and lower in round 2 for CP1 participants (when they viewed the IP1 videos). Given their experience in round 1, CP1 participants might continue with the same strategy for decoding the round 2 videos. In round 1, linkage with both the CP communicator and receiver increased emotion valence, intensity, and quadrant detection accuracy, with linkage with the communicator predicting more types of detection. In round 2, CP1 participants linked with the IP communicator, but to a lesser extent and to no avail—this linkage predicted worse emotion detection of all four types. Although IP1 participants linked with the IP communicator and receiver, this information was not helpful. Linkage had no impact on emotion word or quadrant detection accuracy, and linkage with the IP receiver increased emotion valence detection accuracy but decreased intensity detection accuracy. In Round 2, IP1 participants linked with the new CP communicator to a greater degree than the CP1 participants linked with the IP communicator, but this linkage had a largely negative effect on their emotion word, valence, intensity, and quadrant detection accuracy. This is likely because they were using a different strategy based on their Round 1 experience. These results further suggest that the observers do have increased focus on the communicators, but linking with them can help or hinder the decoding process based on whether the communicator is effectively communicating (as in CP1 participants) or if linkage is somehow involved in the original strategy for decoding touch communications (as in IP1 participants).

7. Conclusions

Within the realm of basic emotion research, touch and dyadic interactions have been relatively understudied. Additionally, despite the recent zeitgeist surrounding the phenomenon of physiological linkage, little is known about how this synchrony arises and is maintained. The current study adds to both these bodies of literature. The study's first aim regarding the boundary conditions and minimum stimulation necessary for physiological linkage to occur was supported. However, the hypotheses encapsulated in Aim 2 received mixed support; physiological linkage plays a role in the process of decoding observed emotions communicated via touch, but not necessarily successful detection. Furthermore, the results of Hertenstein et al.'s (2006) Study 3 were replicated: individuals can successfully decode videos of emotions communicated via touch alone.

Overall, it seems that increased linkage occurs between observers and videoed individuals if the videoed individuals convey affective content and do so in an understandable fashion. Linkage can continue after observations of the emotions have ended, as indicated by linkage into the second baseline, and there seems to be either a primacy or fatigue effect, with earlier linkage or tiredness impacting later linkage with other (new) individuals. Physiological linkage can both help and hinder observational decoding of emotions communicated via touch; which effect it has depends on other contextual factors, such as if the observer has a similar resting heart rate as those they are observing and if they have linked with different individuals beforehand. The person communicating the emotion seems to receive increased attention by observers and linkage between these communicators and observers has a greater (if not positive) impact on decoding the communicated emotion. Interestingly, in Kissel (2020), linkage driven by the communicator (as opposed to the receiver, with linkage assessed bidirectionally) was also more important for detecting experienced (instead of observed) touch emotion communications.

While the current study provides additional insights about the boundary conditions for physiological linkage, it does not answer the question of how physiological linkage arises. Although there are many correlations between touch and physiological processes that could explain how experienced touch communications result in linkage, this is not the case for observed touch communications. One potential explanation for linkage that occurs across time and space, such as occurred in the current study between observers and videoed participants (and in past studies such as Soto & Levenson, 2009), is mirror neurons. Mirror neurons are neurons that fire when an action is performed, as well as when observing the same action performed by others (Rizzolatti et al., 1996). First observed in monkeys, mirror neurons are also hypothesized to play a role in physiological linkage in humans (Järvelä, Kivikangas, Kätsyri, & Ravaja, 2013). Animal studies suggest the presence of an additional mirror system in the parietal cortex for tactile and visual stimulation (Bremmer et al., 2001; Graziano et al., 2000); however, some of these neurons are view dependent (Caggiano et al., 2011). Schaefer, Xu, Flor, and Cohen (2009) found support for a similar mirror neuron system for observed versus experienced touch in humans. Participants in their study demonstrated activation of somatosensory cortices when observing a hand being touched in both egocentric and allocentric perspectives. This mirror neuron system for tactile, as opposed to action, observation may be useful for rapidly assessing and evaluating how another person feels (Rizzolatti et al., 2001).

As a result of the tactile observation mirror neuron system, people may have a similar physiological reaction to viewing others communicating emotions via touch as opposed to experiencing emotion communication via touch themselves. This could result in physiological linkage between the observer and the touching communicators, regardless of whether the viewing occurred “live” or over real-time or recorded video. Past studies have examined mirror neuron phenomena through the use of functional brain scans and EEG, but these only allow for correlational assessment. Future research should pair transcranial magnetic stimulation (TMS) with evaluations of physiological linkage to determine if linkage is a downstream or peripheral effect of mirror neuron activation. There is also some evidence that some forms of physiological linkage, such as inter-brain synchrony, are explicitly caused by social interactions (like cooperation) rather than mirroring (Park, Shin, & Jeong, 2022), further necessitating elucidation of the drivers of linkage.

Beyond the lack of TMS data to further examine how linkage arises, the present study had additional limitations. First, the small sample size resulted in the final regression equations being underpowered. This was not an issue for the linkage analyses (because the “n” was time in seconds), but limits the conclusions that can be drawn between linkage and emotion decoding. Second, symptoms of depression, anxiety, and stress on the day of the experimental session were not assessed, despite the prescreen values of these having a significant effect on linkage and emotion detection accuracy. As in Kissel (2020), generalizability was limited by the exclusion of male participants and the restricted age range of the sample.

7.1. Future Directions

Clear future directions exist for research and incorporation of findings into virtual interaction technologies/platforms. First, in terms of research, data from Kissel (2020) and the current study should be further examined. Specifically, these analyses should focus on other methods of characterizing physiological linkage, both in a modeling and measure sense. Though Kissel et al. (2021) did not find any impact of latent profiles of linkage on emotion detection accuracy, this may not be the case for observing versus experiencing the touch communications. As such, these profiles of linkage should be created using the stability-influence model in the R package *rties* (Butler & Barnard, 2019). These profiles could reveal what patterns of linkage (e.g., in-phase vs. anti-phase) are important for accurate decoding of observed emotions and if the pattern of linkage differs between observers and videoed communicators or receivers. Patterns of linkage might also differ by emotion valence; Chen et al. (2021) found that in-phase linkage corresponded more with shared positive emotion as opposed to negative emotion and shared emotion in general (both of which displayed anti-phase linkage). In addition to creating these profiles from the IBI data, PEP and LVET can be cleaned and extracted as a time series from AcqKnowledge software (unlike with Mindware's IMP software). Linkage in these systolic time intervals between the observers and videoed participants should also be examined to determine if synchrony in the sympathetic nervous system affects decoding differently.

Kissel (2020) and the current study should be replicated in men. While Hertenstein et al. (2006) found that women and men did not differ statistically in their emotion detection accuracy for observed touch communications, women display greater linkage in stranger dyads (Scarpa et al, 2018) and the current study suggests this linkage impacts emotion detection accuracy. Hence, replicating this study in men may elucidate alternative mechanisms for decoding the observed touch communications. Replication should also be performed with mixed-sex dyads (with one man and one woman) because linkage in endocrine system responses showed sex-specific and hormone specific mechanisms during mixed-dyad conversations (Djalovski, Kinreich, Zagoory-Sharon, & Feldman, 2021).

Future versions of the current study or Kissel (2020) should also include a measure of interoceptive accuracy or awareness. In order for an individual to understand and act on the physiological changes resulting from physiological linkage (as would be assumed if linkage has a behavioral effect, such as in decoding touch communications), they must be able to perceive their own bodily state. Interoception is the perception of internal bodily changes (Garfinkel et al., 2015), and this could provide for the detection of linkage-induced changes. Fotopoulou and Tsakiris (2016) describe how maternal touch and social interactions shape interoceptive processes from infancy. Interoception in adults also plays a role in decoding expressive versus non-expressive full body movement (Christensen, Azevedo, & Tsakiris, 2021), suggesting that this ability to detect internal changes could affect observations of touch communications.

Beyond expanding the literature on touch, dyadic processes, and emotion, the current study has implications for the study of empathy/empathic accuracy and the development of features for virtual interaction technologies. Physiological linkage has been associated with empathy in couples (Chatel-Goldman, Congedo, Jutten, & Schwartz, 2014), friends (Zerwas et al., 2021), and strangers (Levenson & Ruef, 1992). Specifically, couples with high trait empathy tend to demonstrate more physiological linkage with each other. However, interpersonal touch increases linkage to a greater degree for couples with low trait empathy (Chatel-Goldman, Congedo, Jutten, & Schwartz, 2014). This impact of touch, particularly on those with low trait empathy, is important because touch can serve as an interpersonal emotion regulator in couples and increases individual positive affect, psychological intimacy, and well-being (Debrot, Schoebi, Perrez, & Horn, 2013). Hence, low trait empathy individuals can experience better relationships with their partners, potentially through the increased linkage resulting from touch.

In friends, the relationship between physiological linkage and empathy is more complex. While there is evidence to suggest that physiological linkage relates to trait levels of empathy and subjective reports of perceived empathic accuracy (see Thorson, 2018 for review), Zerwas et al. (2021) found that physiological linkage was not associated with in-the-moment empathetic accuracy, while linkage between the observing friend's physiology and their stressed friend's self-rated emotional experiences was predictive of empathetic accuracy. This correlation between other's self-reported experience and the perceiver's/observer's physiology seems important for empathy in strangers as well; individuals higher in emotional empathy were more physiologically influenced by an interaction with a distressed stranger (Brown, West, Sanchez, & Mendes, 2021). However, empathy and physiological linkage seem to correspond most closely in negative emotional contexts, particularly in stranger dyads. In the original examination of the relationship between physiological linkage and empathic accuracy, Levenson and Ruef (1992) found evidence that linkage in skin conductance and finger pulse transmit time was positively associated with empathic accuracy for negative emotions, but not positive emotions.

Given these interrelationships between touch, empathy, and physiological linkage, care should be taken to develop interventions that harness their benefits, even in constrained situations. Beginning in March 2020, much of the world was beginning to struggle with restrictions due to the COVID-19 pandemic. These restrictions resulted in a reduction in interpersonal contact (and therefore touch interactions) and an increase in the use of virtual interaction platforms, such as Zoom for video conferencing. An online survey of 1,982 participants revealed that the longer the duration and greater severity of these restrictions increased desire for touch interactions. This longing also increased pleasantness ratings of videos of touch communications (Meijer et al., 2022).

Meijer et al.'s results suggest that it would be beneficial to include substitutes for interpersonal touch when this interaction is limited. Specific features can be incorporated in virtual interactions to address this aim. For example, if users seek to be understood (as when someone decodes their touch-communicated emotion), certain cell phone applications have been created that can detect users' emotions based on their finger strokes and tactile interactions with the keyboard. Separate applications have decoded positive, negative, and neutral states (Shah, Teja, & Bhattacharya, 2015) and four distinct emotions (happy, sad, stressed, and relaxed; Ghosh et al., 2019). These applications could be further engineered to send details about these states to remote therapists or friends. Electronic agents have also been created that can mimic human conversational touch (Bickmore, Fenrando, Ring, & Schulman, 2010); instead of a generic facial display and voice, these could be paired with video conferencing such that one would see and hear their loved one and friend while interacting with a more naturalistic body. The recently developed Nao robot, which contains many different touch sensors, is also capable of decoding affective touch, so it could provide feedback to users about how their touches are perceived (Andreasson, Alenljung, Billing, & Lowe, 2017).

While widespread use of these technologies may be limited for the near future, these robots and smartphone applications could be utilized in therapies for those with touch and social processing difficulties. Several studies suggest that atypical touch processing in individuals with autism spectrum disorder (ASD) might contribute to their social difficulties (Miguel et al., 2017; Cascio, Moore, & McGlone, 2019). Touch-focused interventions without the stress of social interaction could be beneficial.

Overall, the current study suggests that the benefits of touch, at least in regard to physiological linkage, can be partially induced by observation of emotional content. High tech solutions are not necessary for the development of linkage, nor are rich emotional displays. Humans seemed poised to connect; even features like on screen text-based chat in Zoom increase physiological linkage while observing the same video (Jarvela et al., 2016). Linkage can increase empathic accuracy (Levenson & Ruef, 1992) and feelings of social presence (Jarvela et al., 2016). Manipulating physiological linkage and its ties to touch and emotion communication could help combat challenges in feelings of connectedness with friends, family, and colleagues when separated.

Table 1. *Participant characteristics*

Demographic Measures	**Mean±SD or N(%)**
Age (in years)	19.45±1.82
Major	
Animal & Poultry Sciences	2 (4.26%)
Biology	6 (12.77%)
Engineering (all subfields)	1 (2.13%)
Business (all subfields)	6 (12.77%)
Public Health	2 (4.26%)
Finance	1 (2.13%)
Food Science & Technology	1 (2.13%)
HNFE	5 (10.64%)
Hospitality & Tourism Management	1 (2.13%)
Human Development	2 (4.26%)
Neuroscience (all subfields)	6 (12.77%)
Psychology	9 (19.15%)
Double major	3 (6.38%)
Undecided	1 (2.13%)
Education Level	
Undergraduate	45 (95.74%)
Graduate	2 (4.26%)
Gender Identity	
Cis female (cisgender)	1 (2.13%)
Female	44 (93.61%)
Woman	2 (4.26%)
Sexual Orientation	
Other	1 (2.13%)
Bisexual	4 (8.51%)
Heterosexual	42 (89.36%)
Social Class (of place where grew up)	
Blue collar, working class	5 (10.64%)
Lower middle class	6 (12.77%)
Middle class	19 (40.43%)
Poor, working class	3 (6.38%)
Upper middle class/professionals	14 (29.79%)
Family Annual Income	
$10,000-$25,000	1 (2.13%)
$25,000-$50,000	12 (25.53%)
$50,000-$75,000	8 (17.02%)
$75,000-$100,000	8 (17.02%)
Over $100,000	18 (38.30%)
Race/Ethnicity	
African American/Black/African Origin	6 (12.77%)
Asian American/Asian Origin/Pacific Islander	12 (25.53%)

Caucasian/White	25 (53.19%)
Hispanic/Latino(a)	2 (4.26%)
Multiple races/ethnicities	2 (4.26%)
Same/Different Self-reported Race/Ethnicity	
Same	25 (53.19%)
Different	22 (46.81%)
Dominant Hand	
Ambidextrous	1 (2.13%)
Left	5 (10.64%)
Right	41 (87.23%)
Height (cm)	165.12±7.49
Weight (lb)	143.83±30.02
BMI (kg/m²)	23.89±4.59
Phase of Menstrual Cycle	
Birth control/no period	15 (31.91%)
Beginning	14 (29.79%)
Middle	9 (19.15%)
End	9 (19.15%)

Table 2. *Emotion detection accuracy*

Type of Detection Accuracy	**Overall**			**IP1 Participants**			**CP1 Participants**		
Round 1	**Mean (SD)**	**Min**	**Max**	**Mean (SD)**	**Min**	**Max**	**Mean (SD)**	**Min**	**Max**
Emotion Word, Sum	4.53 (2.05)	0	9	4.29 (1.94)	1	9	4.78 (2.17)	0	8
Emotion Word, %	37.77 (17.10)	0.00	75.00	35.76 (16.20)	8.33	75.00	39.86 (18.11)	0.00	66.67
Valence, Sum	6.81 (1.58)	4	10	6.38 (1.38)	4	9	7.26 (1.68)	4	10
Valence, %	56.74 (13.19)	33.33	83.33	53.13 (11.48)	33.33	75.00	60.51 (14.04)	33.33	83.33
Intensity, Sum	8.68 (1.98)	0	11	8.46 (1.84)	2	10	8.91 (2.13)	0	11
Intensity, %	72.34 (16.49)	0.00	91.67	70.49 (15.34)	16.67	83.33	74.28 (17.75)	0.00	91.67
Quadrant, Sum	5.60 (1.95)	0	8	5.04 (1.65)	2	8	6.17 (2.10)	0	9
Quadrant, %	46.63 (16.27)	0.00	75.00	42.01 (13.79)	16.67	66.67	51.45 (17.53)	0.00	75.00
Round 2									
Emotion Word, Sum	4.30 (1.78)	0	8	4.42 (2.00)	0	8	4.17 (1.56)	0	7
Emotion Word, %	35.82 (14.84)	0.00	66.67	36.81 (16.65)	0.00	66.67	34.78 (12.97)	0.00	58.33
Valence, Sum	6.79 (1.55)	3	10	6.83 (1.61)	3	10	6.74 (1.51)	4	10
Valence, %	56.56 (12.88)	25.00	83.33	56.94 (13.38)	25.00	83.33	56.16 (12.62)	33.33	83.33
Intensity, Sum	8.55 (2.33)	0	11	8.58 (2.17)	2	11	8.52 (2.54)	0	11
Intensity, %	71.28 (19.41)	0.00	91.67	71.53 (18.04)	16.67	91.67	71.01 (21.15)	0.00	91.67
Quadrant, Sum	5.32 (1.98)	0	9	5.58 (1.91)	1	9	5.04 (2.06)	0	8
Quadrant, %	44.33 (16.49)	0.00	75.00	46.53 (15.91)	8.33	75.00	42.03 (17.13)	0.00	66.67

Table 3. *Descriptive statistics for linkage coefficients and baseline physiological variables*

Physiological Variable	**Mean**	**SD**	**Minimum**	**Maximum**
Absolute value linkage coefficients (Communicator predicting Observer)				
Round 1, overall (lag 1)	0.06	0.07	0.01	0.38
Round 1, overall (lag 2)	0.07	0.08	0.01	0.43
Round 1, second baseline (lag 1)	0.06	0.07	0.003	0.28
Round 1, second baseline (lag 2)	0.09	0.07	0.004	0.36
Round 1, neutral touch video (lag 1)	0.12	0.10	0.002	0.34
Round 1 emotion communication (lag 1)	0.04	0.04	0.001	0.18
Round 1 recovery (lag 1)	0.06	0.05	0.01	0.24
Round 2, overall (lag 1)	0.05	0.05	0.002	0.23
Round 2, overall (lag 2)	0.07	0.06	0.002	0.23
Round 2, second baseline (lag 1)	0.04	0.05	>.001	0.22
Round 2, second baseline (lag 2)	0.04	0.05	0.001	0.23
Round 2 emotion communication (lag 1)	0.04	0.05	0.001	0.21
Round 2 recovery (lag 1)	0.04	0.04	0.001	0.36
Absolute value linkage coefficients (Receiver predicting Observer)				
Round 1, overall (lag 1)	0.05	0.05	>.001	0.20
Round 1, overall (lag 2)	0.07	0.08	0.001	0.36
Round 1, second baseline (lag 1)	0.06	0.07	>.001	0.27
Round 1, second baseline (lag 2)	0.09	0.08	>.001	0.40
Round 1, neutral touch video (lag 1)	0.14	0.28	>.001	1.88
Round 1 emotion communication (lag 1)	0.04	0.04	0.001	0.18
Round 1 recovery (lag 1)	0.05	0.05	0.001	0.18
Round 2, overall (lag 1)	0.07	0.07	0.003	0.33
Round 2, overall (lag 2)	0.10	0.09	0.003	0.34
Round 2, second baseline (lag 1)	0.05	0.06	0.001	0.25
Round 2, second baseline (lag 2)	0.07	0.07	0.001	0.24
Round 2 emotion communication (lag 1)	0.06	0.08	>.001	0.45
Round 2 recovery (lag 1)	0.05	0.04	0.002	0.15
Number of significant linked seconds (Communicator predicting Observer)				
Round 1, overall	0.74	1.11	0	4
Baseline 1	3.40	2.19	0	8
Round 1, Baseline 2	0.93	1.12	0	5
Round 1, neutral touch video	1.09	1.21	0	5
Round 1 emotion communication	0.86	1.17	0	4
Round 1 recovery	0.84	1.31	0	5
Round 2, overall	0.88	1.21	0	5
Round 2, Baseline 2	3.17	2.01	0	8
Round 2 emotion communication	0.37	0.66	0	2
Round 2 recovery	0.98	1.17	0	5
Round 1, across all tasks	7.12	3.73	0	16
Round 2, across all tasks	4.30	2.52	0	10
Number of significant linked seconds (Receiver predicting Observer)				

Round 1, overall	0.49	0.83	0	3
Baseline 1	3.56	2.22	0	9
Round 1, Baseline 2	0.63	1.02	0	4
Round 1, neutral touch video	1.23	1.67	0	8
Round 1 emotion communication	0.67	0.84	0	3
Round 1 recovery	0.77	1.04	0	3
Round 2, overall	0.85	1.48	0	6
Round 2, Baseline 2	3.22	2.29	0	10
Round 2 emotion communication	0.93	1.15	0	5
Round 2 recovery	0.73	0.98	0	4
Round 1, across all tasks	6.86	3.75	1	20
Round 2, across all tasks	4.65	3.03	0	12
ECG Measures (Baseline 1)				
Heart rate	85.44	11.99	62.18	115.31
RSA	5.92	1.72	3.23	14.82
IBI length	715.99	101.71	520.33	964.88
Respiration rate	15.94	2.49	11.07	22.12
RMSSD	33.77	33.54	7.82	226.63
VLF power	1424.10	4518.33	120.04	30421.17
VLF peak power frequency	0.02	0.01	0.003	0.04
LF power	4632.71	26044.32	77.34	173413.21
LF peak power frequency	0.08	0.02	0.04	0.12
HF/RSA power	62716.79	412657.68	25.23	2737764.99
HF/RSA peak power frequency	0.19	0.08	0.12	0.40
LF/HF ratio	2.18	2.00	0.06	10.91
ECG Measures (Baseline 2)				
Heart rate	83.71	10.26	58.56	104.26
RSA	5.98	1.17	3.39	10.13
IBI length	728.00	94.85	575.48	1024.60
Respiration rate	16.10	3.15	11.36	23.62
RMSSD	36.45	34.75	10.60	237.25
VLF power	2023.00	3223.17	93.68	19628.49
VLF peak power frequency	0.02	0.01	0.003	0.04
LF power	1142.58	1320.09	104.28	7761.17
LF peak power frequency	0.07	0.02	0.04	0.12
HF/RSA power	1117.22	3743.83	29.52	25114.40
HF/RSA peak power frequency	0.19	0.08	0.12	0.39
LF/HF ratio	2.31	1.52	0.31	6.19
ICG Measures (Baseline 1)				
PEP	69.32	32.07	24	140
LVET	272.55	48.30	192	380
ICG Measures (Baseline 2)				
PEP	70.55	33.36	24	164
LVET	47.38	47.38	184	354

Table 4. *LSAS, SHS, and DASS*

Prescreen Survey	**Mean**	**SD**	**Minimum**	**Maximum**
LSAS	37.00	25.96	4	111
LSAS severity	**N**		**Percentage (%)**	
No social anxiety	24		51.1	
Mild	11		23.4	
Moderate	3		6.4	
Marked	5		10.6	
Severe	3		6.4	
Very severe	1		2.1	
SHS total	2.68	0.48	1.65	3.96
SHS severity	**N**		**Percentage (%)**	
Not sensitive	39		83.0	
Some sensitivity	8		17.0	
Hypersensitive	0		0.0	
SHS touch	2.51	1.17	1.00	5.00
SHS touch severity	**N**		**Percentage (%)**	
Not sensitive	33		70.2	
Some sensitivity	10		21.3	
Hypersensitive	4		8.5	
DASS Depression	6.36	9.03	0	41
DASS Depression severity	**N**		**Percentage (%)**	
Normal	36		76.6	
Mild	4		8.5	
Moderate	3		6.4	
Severe	2		4.3	
Extremely severe	2		4.3	
DASS Anxiety	5.36	6.70	0	32
DASS Anxiety severity	**N**		**Percentage (%)**	
Normal	38		80.9	
Mild	2		4.3	
Moderate	3		6.4	
Severe	1		2.1	
Extremely severe	3		6.4	
DASS Stress	8.85	7.64	0	33
DASS Stress severity	**N**		**Percentage (%)**	
Normal	39		83.0	
Mild	3		6.4	
Moderate	3		6.4	
Severe	2		4.3	
Extremely severe	0		0.0	

Table 5. *Pooled estimation results*

Predictor	**B**	**SE**	**t**	**p**	**95% CI LB**	**95% CI UB**
For predicting IP1 participants' IBIs, Baseline 1 to Baseline 2, by IP Videoed Communicator						
second1	0.00235	0.001677	1.40	0.161	-0.000936	0.005636
second2	-.004176	.001376	-3.03	0.002	-.00687	-0.00148
second3	-0.0025	.0016483	-1.52	0.130	-.005729	.000732
second4	-0.00694	.0026336	-2.63	0.008	-.012101	-.00177
second5	-0.00013	.0012451	-0.11	0.914	-.002575	.002305
second6	.001901	0.001196	1.59	0.112	-.000444	.004245
second7	.002902	.001268	2.29	0.022	.000417	.005387
second8	-0.0046	.0015066	-3.05	0.002	-.007552	-0.00165
second10	-0.00095	.0018252	-0.52	0.603	-.004526	.002628
second11	-7.5E-05	.000999	-0.07	0.940	-.002033	.001883
second12	-0.01233	0.001134	-10.87	0.000	-.014551	-0.0101
second13	.003689	0.001861	1.98	0.047	.000042	.00733
second14	-0.01036	.0014207	-7.29	0.000	-.013146	-0.00758
second15	-.003585	.0017192	-2.09	0.037	-.006955	-0.00022
second16	.005246	0.001417	3.70	0.000	.002469	.008022
second17	-0.00012	.0011668	-0.10	0.918	-.002407	.002166
second18	-.004462	.0026492	-1.68	0.092	-.009655	.000730
second19	-.005883	.0016987	-3.46	0.001	-.009213	-0.00255
second20	-0.00108	.0014625	-0.74	0.459	-.003949	.001783
second21	-0.00173	.0018069	-0.96	0.339	-.005269	.001814
second22	-0.00699	.0014287	-4.89	0.000	-.009789	-0.00419
pair1	998.455	44.7939	22.29	0.000	910.658	1086.25
pair2	996.287	44.75467	22.26	0.000	908.57	1084.00
pair3	971.715	44.11984	22.02	0.000	885.240	1058.19
pair4	1029.67	45.74335	22.51	0.000	940.016	1119.33
pair5	990.849	44.52356	22.25	0.000	903.582	1078.11
pair6	961.937	43.84391	21.94	0.000	876.002	1047.87
pair7	990.775	44.56034	22.23	0.000	903.436	1078.11
pair8	1011.58	45.12702	22.42	0.000	923.132	1100.03
pair10	996.337	44.80854	22.24	0.000	908.511	1084.16
pair11	973.621	44.13614	22.06	0.000	887.113	1060.12
pair12	974.988	44.22443	22.05	0.000	888.307	1061.66
pair13	1006.67	45.01996	22.36	0.000	918.433	1094.91
pair14	1009.69	45.11366	22.38	0.000	921.268	1098.11
pair15	989.368	44.55716	22.20	0.000	902.035	1076.
pair16	937.101	43.14362	21.72	0.000	852.539	1021.66

pair17	961.094	43.80807	21.94	0.000	875.229	1046.95
pair18	970.366	44.27907	21.91	0.000	883.579	1057.15
pair19	996.736	44.7653	22.27	0.000	908.995	1084.47
pair20	965.887	43.98037	21.96	0.000	879.684	1052.08
pair21	988.197	44.44339	22.23	0.000	901.087	1075.30
pair22	996.140	44.75504	22.26	0.000	908.419	1083.8
First baseline P	0.428171	13.40917	0.03	0.975	-25.8540	26.7103
Second_baseline P	3.86377	11.56146	0.33	0.738	-18.79688	26.5244
Neutral touch P	16.95981	10.03157	1.69	0.091	-2.702229	36.6218
Emotion communication (round 1) P	6.87536	4.435596	1.55	0.121	-1.81848	15.569
Recovery (round 1) P	2.909484	5.028641	0.58	0.563	-6.94674	12.765
Cut five seconds from start of each task P	0.454804	3.429767	0.13	0.895	-6.267596	7.1772
Other P	-4.96017	4.089878	-1.21	0.225	-12.9764	3.05605
LIBI_P						
L1.	1.08304	.0149489	72.45	0.000	1.0537	1.11233
L2.	-.582042	.0222567	-26.15	0.000	-.625666	-0.53842
L3.	.387058	.0233945	16.54	0.000	.34120	.432911
L4.	-.1157176	.0243855	-4.75	0.000	-.163514	-0.06792
L5.	-.0677671	.0213798	-3.17	0.002	-.109672	-0.02586
L6.	.110854	.0196337	5.65	0.000	.07237	.149336
L7.	.009355	.0213779	0.44	0.662	-.032546	.051256
L8.	-.004057	.0220541	-0.18	0.854	-.047283	.039169
L9.	.018253	.0182939	1.00	0.318	-.017603	.054109
L10.	.021639	.0107811	2.01	0.045	.00051	.042770
LIBI_V (C)						
L1.	.016505	.0108207	1.53	0.127	-.004703	.037714
L2.	.008508	.016195	0.53	0.599	-.023234	.040250
L3.	-.0040626	.0176563	-0.23	0.818	-.038669	.030544
L4.	-.0373941	.0180563	-2.07	0.038	-.072785	-0.002
L5.	.049111	.0161785	3.04	0.002	.01740	.080821
L6.	-.0351048	.0151038	-2.32	0.020	-.064709	-0.0055
L7.	-.0048759	.0155358	-0.31	0.754	-.035326	.025574
L8.	.002599	.0159817	0.16	0.871	-.028726	.033923
L9.	.008638	.0134967	0.64	0.522	-.017816	.035091
L10.	-.0139907	.0083425	-1.68	0.094	-.030342	.002360
First baseline*LIBI_P						

L1.	-.0008053	.0024181	-0.33	0.739	-.005545	.003934
L2.	-.0025529	.0019359	-1.32	0.187	-.006347	.001241
L3.	.003405	.0017264	1.97	0.049	.00002	.006788
L4.	-.0004224	.0013681	-0.31	0.758	-.003104	.002259
L5.	.004202	.0015924	2.64	0.008	.00108	.00732
L6.	-.0061677	.0020298	-3.04	0.002	-.010146	-0.00219
L7.	.003954	.0022666	1.74	0.081	-.000489	.008396
L8.	.001615	.0024903	0.65	0.517	-.003266	.006495
L9.	-.0032501	.0025316	-1.28	0.199	-.00821	.001711
L10.	-.0007035	.0015263	-0.46	0.645	-.00370	.002287
Second baseline*LIBI_P						
L1.	-.0137021	.0176778	-0.78	0.438	-.048351	.020946
L2.	.053305	.0275405	1.94	0.053	-.000675	.107284
L3.	-.0522926	.0306475	-1.71	0.088	-.112362	.00777
L4.	.001099	.0323686	0.03	0.973	-.062344	.064541
L5.	.049144	.0295061	1.67	0.096	-.008689	.106976
L6.	-.0477288	.0269488	-1.77	0.077	-.100549	.005091
L7.	.017714	.0280463	0.63	0.528	-.037257	.072685
L8.	-.0282426	.0286614	-0.99	0.324	-.084419	.027934
L9.	.065819	.0256962	2.56	0.010	.01545	.116183
L10.	-.0425159	.0159149	-2.67	0.008	-.073709	-0.011322
Neutral touch*LIBI_P						
L1.	-.0519023	.0218588	-2.37	0.018	-.094746	-0.009058
L2.	.067930	.0304804	2.23	0.026	.00819	.127672
L3.	.017082	.0340336	0.50	0.616	-.049624	.083788
L4.	-.0874041	.0316202	-2.76	0.006	-.149380	-.02542
L5.	.068462	.0326255	2.10	0.036	.00452	.132408
L6.	-.0251564	.0326853	-0.77	0.442	-.089220	.038907
L7.	-.0442441	.0301743	-1.47	0.143	-.103386	.01489
L8.	.097803	.031141	3.14	0.002	.03677	.158839
L9.	-.0698044	.0299217	-2.33	0.020	-.128452	-0.011157
L10.	.029798	.0198971	1.50	0.134	-.00920	.068796
Emotion communication (round 1)*LIBI_P						
L1.	.007151	.0096071	0.74	0.457	-.011679	.025981
L2.	.020461	.0144247	1.42	0.156	-.007812	.048733
L3.	-.022487	.0149834	-1.50	0.133	-.051855	.006880
L4.	-.0028904	.0144776	-0.20	0.842	-.031267	.025485
L5.	.013199	.0136722	0.97	0.334	-.013599	.039996

L6.	-.003779	.013415	-0.28	0.778	-.030073	.022514
L7.	-.0160696	.0134544	-1.19	0.232	-.042440	.010301
L8.	.003058	.0134992	0.23	0.821	-.023401	.029516
L9.	.002534	.0121375	0.21	0.835	-.021255	.026323
L10.	-.005741	.0076519	-0.75	0.453	-.020739	.009256
Recovery (round 1)*LIBI_P						
L1.	.019777	.0117577	1.68	0.093	-.003269	.042821
L2.	-.0135472	.0182067	-0.74	0.457	-.049233	.022138
L3.	.011373	.0189443	0.60	0.548	-.025758	.048504
L4.	-.0345138	.0185376	-1.86	0.063	-.070848	.001820
L5.	.042227	.0178624	2.36	0.018	.00722	.07723
L6.	-.0453917	.0165202	-2.75	0.006	-.077772	-0.013011
L7.	.019566	.0157238	1.24	0.213	-.011253	.050384
L8.	-.012156	.0157704	-0.77	0.441	-.043066	.018754
L9.	.012200	.0139985	0.87	0.383	-.015237	.039637
L10.	-.0116198	.0087394	-1.33	0.184	-.028749	.005509
First baseline*LIBI_V						
L1.	-.000696	.001168	-0.60	0.551	-.002986	.00159
L2.	.001092	.0025433	0.43	0.668	-.003893	.006076
L3.	.002139	.0027338	0.78	0.434	-.003219	.007497
L4.	-.0031069	.0023075	-1.35	0.178	-.007623	.00141
L5.	.000951	.0022199	0.43	0.668	-.003400	.005302
L6.	-.0001024	.0020169	-0.05	0.960	-.004056	.003850
L7.	.000743	.0019719	0.38	0.706	-.003122	.004608
L8.	-.0024667	.0020612	-1.20	0.231	-.006507	.001573
L9.	.001955	.0021554	0.91	0.365	-.002270	.006179
L10.	-.0006317	.0015278	-0.41	0.679	-.003626	.002362
Second baseline*LIBI_V						
L1.	.010619	.0173918	0.61	0.541	-.023470	.044706
L2.	-.0517371	.0272228	-1.90	0.057	-.105094	.0016
L3.	.052026	.0305048	1.71	0.088	-.007764	.111815
L4.	.000744	.0322349	0.02	0.982	-.062437	.063924
L5.	-.0495084	.0294501	-1.68	0.093	-.10723	.008214
L6.	.047161	.0268281	1.76	0.079	-.005423	.099744
L7.	-.0164432	.0278697	-0.59	0.555	-.071068	.038181
L8.	.028395	.0285714	0.99	0.320	-.027605	.084395
L9.	-.0653615	.0255443	-2.56	0.011	-.115429	-0.015294
L10.	.041122	.015801	2.60	0.009	.01015	.07209

Neutral touch*LIBI_V						
L1.	.051262	.0220366	2.33	0.020	.00807	.094453
L2.	-.0690401	.030199	-2.29	0.022	-.128231	-0.009849
L3.	-.0143486	.0334022	-0.43	0.668	-.079818	.051120
L4.	.086061	.0317367	2.71	0.007	.02386	.148265
L5.	-.0717424	.0330591	-2.17	0.030	-.136539	-.00694
L6.	.024880	.0329721	0.75	0.451	-.039746	.089505
L7.	.045773	.0304497	1.50	0.133	-.013909	.105455
L8.	-.0976855	.0313232	-3.12	0.002	-.159079	-0.036291
L9.	.068541	.030073	2.28	0.023	.00960	.127484
L10.	-.028954	.0200593	-1.44	0.149	-.068271	.010362
Emotion communication (round 1)*LIBI_V						
L1.	-.0074613	.0095807	-0.78	0.436	-.026240	.011316
L2.	-.0210956	.0144212	-1.46	0.144	-.049361	.007170
L3.	.022648	.0150022	1.51	0.131	-.006756	.05205
L4.	.002383	.0144866	0.16	0.869	-.026011	.030777
L5.	-.0133131	.0136671	-0.97	0.330	-.04010	.013474
L6.	.004250	.0134114	0.32	0.751	-.022037	.030536
L7.	.015416	.0134991	1.14	0.253	-.011043	.041874
L8.	-.0026839	.0135717	-0.20	0.843	-.029285	.023916
L9.	-.0023984	.0121422	-0.20	0.843	-.026197	.021400
L10.	.005532	.007626	0.73	0.468	-.009415	.02047
Recovery (round 1)*LIBI_V						
L1.	-.020958	.0117353	-1.79	0.074	-.043960	.002043
L2.	.014178	.0181501	0.78	0.435	-.021397	.049752
L3.	-.0120053	.0188987	-0.64	0.525	-.04905	.025036
L4.	.035421	.0185773	1.91	0.057	-.000991	.071833
L5.	-.0425299	.0177162	-2.40	0.016	-.077254	-0.007805
L6.	.045088	.0163854	2.75	0.006	.01297	.077203
L7.	-.0190022	.0157708	-1.20	0.228	-.049913	.011908
L8.	.012393	.0158202	0.78	0.433	-.018615	.043400
L9.	-.0122292	.0139947	-0.87	0.382	-.039659	.015200
L10.	.011101	.0087126	1.27	0.203	-.005976	.028177
For predicting IP1 participants' IBIs, Baseline 1 to Baseline 2, by IP Videoed Receiver						
second1	0.001679	0.001703	0.99	0	-0.001659	0.005017
second2	-0.004552	.001381	-3.30	0.001	-.007259	-.001844
second3	-0.002896	.001664	-1.74	0.082	-.006157	.000364
second4	-0.007241	.002607	-2.78	0.005	-.012350	-.002131

second5	-0.000465	.001254	-0.37	0.711	-.002922	.001991
second6	.001513	.001231	1.23	0.219	-.0009	.003926
second7	.002530	.001269	1.99	0.046	.000042	.005017
second8	-0.004912	.001484	-3.31	0.001	-.007820	-.002003
second10	-0.001269	.001823	-0.70	0.486	-.004842	.002303
second11	-0.000423	.001023	-0.41	0.679	-.002427	.001581
second12	-0.012691	.001167	-10.88	0.000	-.014978	-.01040
second13	.003352	.001850	1.81	0.070	-.000273	.006977
second14	-0.010692	.001425	-7.50	0.000	-.013485	-.007898
second15	-0.003913	.001714	-2.28	0.022	-.007273	-.000553
second16	.004861	.001458	3.34	0.001	.00200	.007717
second17	-.0005	.001199	-0.42	0.677	-.002849	.001849
second18	-0.004824	.002653	-1.82	0.069	-.010024	.000375
second19	-0.006219	.001692	-3.68	0.000	-.009536	-.002902
second20	-0.001439	.001481	-0.97	0.331	-.004342	.001464
second21	-0.002086	.001802	-1.16	0.247	-.005618	.001445
second22	-0.007308	.001438	-5.08	0.000	-.010127	-.0044
pair1	1037.699	44.55362	23.29	0	950.3732	1125.02
pair2	1035.368	44.50795	23.26	0	948.1316	1122.6
pair3	1010.887	43.82386	23.07	0	924.9917	1096.78
pair4	1068.621	45.51972	23.48	0	979.4012	1157.8
pair5	1029.899	44.26641	23.27	0	943.1364	1116.66
pair6	1001.12	43.53984	22.99	0	915.7816	1086.45
pair7	1029.855	44.29875	23.25	0	943.0291	1116.68
pair8	1050.569	44.889	23.4	0	962.5858	1138.55
pair10	1035.357	44.53649	23.25	0	948.0643	1122.64
pair11	1012.724	43.85525	23.09	0	926.7673	1098.68
pair12	1014.153	43.94119	23.08	0	928.0271	1100.27
pair13	1045.669	44.76743	23.36	0	957.9243	1133.41
pair14	1048.698	44.87021	23.37	0	960.7521	1136.64
pair15	1028.415	44.2875	23.22	0	941.6106	1115.21
pair16	976.334	42.806	22.81	0	892.4335	1060.23
pair17	1000.265	43.51399	22.99	0	914.9767	1085.55
pair18	1009.526	43.95809	22.97	0	923.3674	1095.68
pair19	1035.796	44.51718	23.27	0	948.5414	1123.0
pair20	1005.043	43.6995	23	0	919.3912	1090.69
pair21	1027.286	44.22835	23.23	0	940.5982	1113.97
pair22	1035.176	44.50354	23.26	0	947.9484	1122.4
First baseline P	0.882731	13.22104	0.07	0.947	-25.03073	26.7961
Second baseline P	3.918741	11.40701	0.34	0.731	-18.4392	26.2766
Neutral touch P	9.679843	10.14787	0.95	0.340	-10.21016	29.5698

Emotion communication (round 1) P	6.530558	4.52625	1.44	0.149	-2.340968	15.402
Recovery (round 1) P	2.344829	5.051764	0.46	0.643	-7.556712	12.2463
Cut five seconds from start of each task P	.3328672	3.65042	0.09	0.927	-6.822017	7.48775
Other P	-5.212569	4.56764	-1.14	0.254	-14.16522	3.74008
LIBI_P						
L1.	1.08283	.013928	77.75	0.000	1.05554	1.11013
L2.	-0.572014	.020630	-27.73	0.000	-0.612450	-.531578
L3.	.378227	.021745	17.39	0.000	.335606	.420847
L4.	-0.109465	.023072	-4.74	0.000	-0.154687	-.064243
L5.	-.065306	.020552	-3.18	0.001	-0.105589	-.025023
L6.	.103472	.018949	5.46	0.000	.066332	.140612
L7.	.012349	.020393	0.61	0.545	-.0276213	.052319
L8.	-.0062543	.020906	-0.30	0.765	-.0472303	.034721
L9.	.017328	.017382	1.00	0.319	-.0167411	.051397
L10.	.019642	.010409	1.89	0.059	-.0007594	.040044
LIBI_V (R)						
L1.	.014452	.008209	1.76	0.078	-.0016375	.030541
L2.	-.001936	.012520	-0.15	0.877	-.0264749	.022602
L3.	.000344	.014211	0.02	0.981	-.0275103	.028198
L4.	-0.029974	.015158	-1.98	0.048	-0.059684	-.000264
L5.	.037896	.014201	2.67	0.008	.010062	.06573
L6.	-0.034981	.013292	-2.63	0.008	-0.061033	-.008929
L7.	-0.000186	.013496	-0.01	0.989	-.0266374	.026266
L8.	.002713	.013726	0.20	0.843	-.0241902	.029616
L9.	.013592	.011201	1.21	0.225	-.008362	.035546
L10.	-0.017316	.006883	-2.52	0.012	-0.030806	-.003825
First baseline*LIBI_P						
L1.	-0.001218	.002382	-0.51	0.609	-.0058857	.003450
L2.	-0.002176	.001892	-1.15	0.250	-.0058845	.001533
L3.	.003049	.001783	1.71	0.087	-.0004453	.006542
L4.	-8.92E-06	.001488	-0.01	0.995	-.0029256	.002907
L5.	.002999	.001677	1.79	0.074	-.0002877	.006284
L6.	-0.003517	.002011	-1.75	0.080	-.0074596	.000425
L7.	.001051	.002162	0.49	0.627	-.0031872	.005289
L8.	.002063	.002278	0.91	0.365	-.0024026	.006528
L9.	-.000813	.002237	-0.36	0.716	-0.005198	.00357

L10.	-0.002291	.001410	-1.62	0.104	-.0050539	.000472
Second baseline*LIBI_P						
L1.	-0.011613	.017756	-0.65	0.513	-0.046415	.02318
L2.	.042887	.028269	1.52	0.129	-.0125201	.098293
L3.	-.0417585	.032578	-1.28	0.200	-.1056119	.022094
L4.	-0.009400	.036487	-0.26	0.797	-.0809152	.062114
L5.	.041931	.03411	1.23	0.219	-.024925	.108787
L6.	-0.030718	.032060	-0.96	0.338	-.0935556	.032120
L7.	.016406	.032210	0.51	0.611	-.0467252	.079537
L8.	-0.026030	.030217	-0.86	0.389	-.0852568	.033195
L9.	.066193	.026616	2.49	0.013	.014025	.118360
L10.	-0.046373	.016433	-2.82	0.005	-0.078582	-.014164
Neutral touch*LIBI_P						
L1.	-0.055032	.024726	-2.23	0.026	-0.103495	-.006567
L2.	.049034	.028847	1.70	0.089	-.0075075	.105575
L3.	.056216	.032173	1.75	0.081	-0.006844	.11927
L4.	-0.095157	.031296	-3.04	0.002	-0.156497	-.033817
L5.	.059776	.031284	1.91	0.056	-.0015419	.121093
L6.	-0.020520	.034866	-0.59	0.556	-.0888583	.047818
L7.	-0.025640	.031922	-0.80	0.422	-.0882085	.036928
L8.	.075357	.027040	2.79	0.005	.022358	.128355
L9.	-0.068416	.027390	-2.50	0.012	-0.122101	-.014731
L10.	.026211	.019235	1.36	0.173	-.0114902	.063912
Emotion communication (round 1)*LIBI_P						
L1.	.002032	.009404	0.22	0.829	-.0163994	.020463
L2.	.016473	.013457	1.22	0.221	-.0099027	.042847
L3.	-.0115454	.013803	-0.84	0.403	-.0385996	.015508
L4.	-.0089798	.013241	-0.68	0.498	-.0349323	.016972
L5.	.015901	.012539	1.27	0.205	-.008675	.040477
L6.	-0.002204	.013043	-0.17	0.866	-.0277685	.023359
L7.	-0.013176	.012630	-1.04	0.297	-.037931	.011579
L8.	-0.010691	.012296	-0.87	0.385	-.0347913	.013408
L9.	.009742	.011233	0.87	0.386	-.0122746	.031758
L10.	-0.002635	.007251	-0.36	0.716	-0.016847	.01157
Recovery (round 1)*LIBI_P						
L1.	.024000	.011017	2.18	0.029	.002406	.045594
L2.	-0.022208	.016985	-1.31	0.191	-.055499	.011083

L3.	.010089	.017631	0.57	0.567	-.0244689	.044646
L4.	-0.033827	.017091	-1.98	0.048	-0.067326	-.000328
L5.	.036962	.016918	2.18	0.029	.003803	.070120
L6.	-0.039668	.016003	-2.48	0.013	-0.071034	-.008302
L7.	.012600	.014306	0.88	0.378	-.0154408	.040640
L8.	.004267	.013805	0.31	0.757	-.0227915	.031324
L9.	.006185	.012198	0.51	0.612	-.0177233	.030093
L10.	-.0093489	.007896	-1.18	0.236	-.0248253	.006127
First baseline*LIBI_V						
L1.	-.001569	.001222	-1.28	0.199	-.0039632	.000825
L2.	.001427	.001706	0.84	0.403	-.0019163	.004769
L3.	.001254	.002403	0.52	0.602	-.0034567	.005964
L4.	.001293	.002610	0.50	0.620	-.0038237	.006408
L5.	-0.002378	.002037	-1.17	0.243	-.0063697	.001614
L6.	-.0015326	.001841	-0.83	0.405	-.0051409	.002075
L7.	.003816	.001806	2.11	0.035	.000277	.007354
L8.	-0.002753	.001721	-1.60	0.110	-.0061264	.000621
L9.	-0.002321	.001746	-1.33	0.184	-.0057437	.001101
L10.	.002829	.001418	2.00	0.046	.000050	.005608
Second baseline*LIBI_V						
L1.	.008005	.016477	0.49	0.627	-.0242911	.040300
L2.	-0.038863	.026313	-1.48	0.140	-.0904377	.012711
L3.	.039107	.030487	1.28	0.200	-.0206492	.098862
L4.	.010759	.034202	0.31	0.753	-.0562783	.077796
L5.	-0.039650	.032049	-1.24	0.216	-.1024661	.023166
L6.	.028070	.030118	0.93	0.351	-.0309615	.087101
L7.	-0.014223	.030189	-0.47	0.638	-.0733933	.044948
L8.	.024540	.028339	0.87	0.387	-.0310044	.080084
L9.	-0.061609	.024911	-2.47	0.013	-0.110436	-.012782
L10.	.042124	.015392	2.74	0.006	.011956	.072291
Neutral touch*LIBI_V						
L1.	.052844	.023596	2.24	0.025	.006595	.099092
L2.	-0.047812	.027302	-1.75	0.080	-.101325	.005700
L3.	-.051276	.030310	-1.69	0.091	-.1106843	.008132
L4.	.090041	.030016	3.00	0.003	.031210	.148872
L5.	-0.060216	.030170	-2.00	0.046	-0.119348	-.001082
L6.	.018674	.033347	0.56	0.575	-.0466869	.084035
L7.	.026180	.030540	0.86	0.391	-.033678	.086038
L8.	-.07117	.025816	-2.76	0.006	-0.121769	-.020571

L9.	.063465	.026004	2.44	0.015	.012498	.114432
L10.	-0.023793	.018321	-1.30	0.194	-.0597024	.012117
Emotion communication (round 1)*LIBI_V						
L1.	-0.002229	.008919	-0.25	0.803	-.0197109	.015252
L2.	-0.016290	.012835	-1.27	0.204	-.0414457	.008865
L3.	.011272	.013203	0.85	0.393	-.0146065	.037150
L4.	.008030	.012664	0.63	0.526	-.0167906	.032851
L5.	-.0152706	.011953	-1.28	0.201	-.0386986	.008157
L6.	.002572	.012434	0.21	0.836	-.0217985	.026942
L7.	.011911	.012122	0.98	0.326	-.0118478	.035668
L8.	.010731	.011769	0.91	0.362	-.0123368	.033798
L9.	-0.009242	.010668	-0.87	0.386	-.0301522	.011667
L10.	.002175	.006899	0.32	0.753	-.0113466	.015696
Recovery (round 1)*LIBI_V						
L1.	-0.024047	.010433	-2.30	0.021	-0.044496	-.003598
L2.	.021904	.016039	1.37	0.172	-.0095337	.053341
L3.	-0.010081	.016675	-0.60	0.546	-.0427648	.022603
L4.	.032924	.016282	2.02	0.043	.001012	.06483
L5.	-.0353459	.015886	-2.22	0.026	-.0664828	-.00420
L6.	.037358	.015045	2.48	0.013	.007871	.06684
L7.	-0.011489	.013632	-0.84	0.399	-.038207	.015229
L8.	-0.003830	.013130	-0.29	0.770	-.029565	.021904
L9.	-0.005879	.011567	-0.51	0.611	-.0285508	.016793
L10.	.008390	.007489	1.12	0.263	-.0062875	.023067
For predicting CP1 participants' IBIs, Baseline 1 to Baseline 2, by CP Videoed Communicator						
second1	0.006271	0.001906	3.29	0.001	.0025359	.010005
second2	.000523	.0011521	0.45	0.650	-.001735	.002781
second3	-.0080161	.0015312	-5.24	0.000	-.011017	-.00501
second4	.000219	.001501	0.15	0.884	-.002723	.003160
second5	-.0029629	.0017751	-1.67	0.095	-.006442	.000516
second6	.007905	.0012433	6.36	0.000	.005468	.010342
second7	.010087	.001092	9.24	0.000	.007947	.012227
second8	-.0018589	.0017241	-1.08	0.281	-.005238	.001520
second10	-.0011352	.0007161	-1.59	0.113	-.002539	.000268
second11	.000335	.0017017	0.20	0.844	-.003001	.003669
second12	.000971	.0015098	0.64	0.520	-.001988	.003930
second13	.007942	.0016307	4.87	0.000	.004745	.011137
second14	-.0044791	.0016228	-2.76	0.006	-.007660	-0.001298

second15	-.006828	.0024067	-2.84	0.005	-.011545	-0.00211
second16	.004399	.0022945	1.92	0.055	-.000098	.008896
second17	.001131	.0012923	0.88	0.382	-.001402	.003663
second18	.000288	.0027119	0.11	0.915	-.005027	.005603
second19	-.0018616	.0015312	-1.22	0.224	-.004863	.001139
second20	-.0107108	.0013595	-7.88	0.000	-.013375	-0.008046
second21	.001795	.00125	1.44	0.151	-.000655	.004245
pair1	871.7541	36.5450	23.85	0.000	800.125	943.383
pair2	858.69	36.1349	23.76	0.000	787.87	929.515
pair3	904.7585	37.3801	24.20	0.000	831.493	978.024
pair4	862.1756	36.2442	23.79	0.000	791.136	933.21
pair5	887.2424	36.8719	24.06	0.000	814.973	959.51
pair6	885.0281	36.8390	24.02	0.000	812.823	957.233
pair7	864.5911	36.2931	23.82	0.000	793.456	935.726
pair8	917.6886	37.7802	24.29	0.000	843.639	991.738
pair10	882.4116	36.7409	24.02	0.000	810.399	954.424
pair11	872.3065	36.5551	23.86	0.000	800.66	943.955
pair12	860.6099	36.2112	23.77	0.000	789.635	931.584
pair13	883.5636	36.8267	23.99	0.000	811.382	955.744
pair14	894.6205	37.0844	24.12	0.000	821.934	967.306
pair15	900.3248	36.8589	24.43	0.000	828.081	972.56
pair16	857.6296	35.9886	23.83	0.000	787.091	928.167
pair17	900.3378	37.2619	24.16	0.000	827.304	973.371
pair18	879.2343	36.6735	23.97	0.000	807.354	951.11
pair19	870.4479	36.4571	23.88	0.000	798.991	941.904
pair20	897.6735	37.1836	24.14	0.000	824.793	970.554
pair21	873.0927	36.5351	23.90	0.000	801.483	944.702
First baseline P	-3.010231	10.07059	-0.30	0.765	-22.74878	16.7283
Second baseline P	82.2731	81.28309	1.01	0.311	-77.04327	241.589
Neutral touch P	17.7992	10.06706	1.77	0.077	-1.932462	37.5307
Emotion communication (round 1) P	16.1074	4.845952	3.32	0.001	6.60924	25.6055
Recovery (round 1) P	6.11511	5.755499	1.06	0.288	-5.165777	17.3959
Cut five seconds from start of each task P	12.0283	10.69984	1.12	0.261	-8.943624	33.0001
Other P	-16.24049	13.85628	-1.17	0.241	-43.39907	10.918
LIBI_P						
L1.	1.15930	.0145072	79.91	0.000	1.13086	1.18773
L2.	-.6670859	.0217446	-30.68	0.000	-.7097057	-0.624466

L3.	.449325	.0200059	22.46	0.000	.410113	0.488536
L4.	-.1888049	.0196456	-9.61	0.000	-.2273106	-0.150299
L5.	-.0346936	.0201302	-1.72	0.085	-.0741491	0.004761
L6.	.071110	.0202375	3.51	0.000	.031444	0.110775
L7.	.026362	.0201783	1.31	0.191	-.013188	0.065911
L8.	.041117	.0188955	2.18	0.030	.004081	0.078152
L9.	-.0337253	.0168429	-2.00	0.045	-.0667376	-0.000712
L10.	.045924	.0115245	3.98	0.000	.023335	.06851
LIBI_V (C)						
L1.	.030618	.0141878	2.16	0.031	.00281	0.058426
L2.	-.0077138	.0207917	-0.37	0.711	-.048466	0.033038
L3.	-.0236427	.0200674	-1.18	0.239	-.0629751	0.015689
L4.	.031444	.0201256	1.56	0.118	-.0080022	0.07089
L5.	-.0162058	.0203209	-0.80	0.425	-.0560353	0.023623
L6.	-.0178444	.0209971	-0.85	0.395	-.0589991	0.02331
L7.	-.0107296	.0209898	-0.51	0.609	-.0518701	0.03041
L8.	.026517	.0195651	1.36	0.175	-.0118313	0.064864
L9.	.015390	.0183435	0.84	0.401	-.0205635	0.051343
L10.	-.0306754	.0126826	-2.42	0.016	-.0555334	-0.005817
First baseline*LIBI_P						
L1.	-.000084	.0018586	-0.05	0.964	-.0037269	.00355
L2.	-.000395	.0017111	-0.23	0.817	-.0037489	0.002958
L3.	.000586	.0016157	0.36	0.717	-.0025804	0.003753
L4.	.000762	.0018206	0.42	0.675	-.002806	0.00433
L5.	.001057	.0019036	0.56	0.579	-.0026736	0.004788
L6.	-.0025767	.0018041	-1.43	0.153	-.0061129	0.000959
L7.	.001016	.001724	0.59	0.556	-.0023635	0.004394
L8.	.001615	.0017463	0.92	0.355	-.0018079	0.005037
L9.	-.000192	.0015588	-0.12	0.902	-.0032472	0.002863
L10.	-.0023693	.0014488	-1.64	0.102	-.005209	0.00047
Second baseline*LIBI_P						
L1.	.028805	.0251686	1.14	0.252	-.020526	0.078135
L2.	.006822	.0353561	0.19	0.847	-.0624765	0.07612
L3.	-.0075572	.0339125	-0.22	0.824	-.0740262	0.058911
L4.	.008008	.0336976	0.24	0.812	-.0580397	.07405
L5.	-.0221201	.0323023	-0.68	0.493	-.0854331	.04119
L6.	-.031016	.0336206	-0.92	0.356	-.096913	0.03488
L7.	-.0174552	.0349376	-0.50	0.617	-.0859335	0.051023
L8.	.061001	.0362026	1.69	0.092	-.0099564	0.131959
L9.	-.0019038	.0296009	-0.06	0.949	-.0599221	0.056114

L10.	-.0339872	.0178557	-1.90	0.057	-.0689846	0.00101
Neutral touch*LIBI_P						
L1.	-.0436594	.0262553	-1.66	0.096	-.0951204	0.007801
L2.	.018292	.0380733	0.48	0.631	-.0563323	0.092916
L3.	-.002532	.0364735	-0.07	0.945	-.0740208	0.068956
L4.	-.0085083	.0420935	-0.20	0.840	-.0910123	0.073995
L5.	.055429	.045948	1.21	0.228	-.0346302	0.145487
L6.	-.0589171	.0387282	-1.52	0.128	-.134825	0.01699
L7.	.051995	.0369485	1.41	0.159	-.0204243	.12441
L8.	-.0013347	.0373775	-0.04	0.972	-.0745952	0.071925
L9.	-.0076489	.0333148	-0.23	0.818	-.0729467	0.057648
L10.	-.0112795	.0228763	-0.49	0.622	-.0561175	0.033558
Emotion communication (round 1)*LIBI_P						
L1.	-.0126795	.0137454	-0.92	0.356	-.0396207	0.014261
L2.	.030491	.0210314	1.45	0.147	-.0107315	0.071712
L3.	-.0264142	.0191905	-1.38	0.169	-.0640279	0.011199
L4.	.044384	.0180835	2.45	0.014	.008940	0.079828
L5.	-.0414856	.0180291	-2.30	0.021	-.0768229	-0.006148
L6.	.029387	.0172601	1.70	0.089	-.0044433	0.063217
L7.	-.0324309	.0166996	-1.94	0.052	-.0651624	0.0003
L8.	.018533	.0158649	1.17	0.243	-.0125621	0.049628
L9.	.008306	.0152072	0.55	0.585	-.0215007	0.038112
L10.	-.0213767	.0101607	-2.10	0.035	-.0412918	-0.001461
Recovery (round 1)*LIBI_P						
L1.	.038006	.0145905	2.60	0.009	.009409	.06660
L2.	-.0168232	.0212485	-0.79	0.429	-.0584707	0.024824
L3.	-.0261184	.0185493	-1.41	0.159	-.0624755	0.010238
L4.	.018293	.0185192	0.99	0.323	-.0180049	0.05459
L5.	.006686	.0196098	0.34	0.733	-.0317496	0.045121
L6.	-.0433589	.0188705	-2.30	0.022	-.0803454	-0.006372
L7.	.012463	.0184794	0.67	0.500	-.0237573	0.048682
L8.	.012206	.0177694	0.69	0.492	-.0226225	0.047034
L9.	.008263	.0165513	0.50	0.618	-.0241777	0.040703
L10.	-.0167483	.0115129	-1.45	0.146	-.0393138	0.005817
First baseline*LIBI_V						
L1.	-.0004602	.001258	-0.37	0.715	-.0029258	0.002005
L2.	-.0004423	.0015902	-0.28	0.781	-.0035591	0.002674

L3.	-.0012479	.0015145	-0.82	0.410	-.0042163	0.00172
L4.	.002496	.0019548	1.28	0.202	-.0013351	0.006327
L5.	-.0007347	.0020644	-0.36	0.722	-.0047809	0.003311
L6.	-.0004704	.001609	-0.29	0.770	-.003624	0.002683
L7.	.000542	.0015619	0.35	0.729	-.0025194	0.003603
L8.	.000434	.0014127	0.31	0.759	-.0023351	0.003202
L9.	.001924	.0013677	1.41	0.160	-.0007567	0.004604
L10.	-.0016942	.0011453	-1.48	0.139	-.0039389	0.00055
Second baseline*LIBI_V						
L1.	-.0436615	.0240026	-1.82	0.069	-.090707	0.003384
L2.	-.0039477	.0348021	-0.11	0.910	-.0721604	.06426
L3.	.005007	.0336856	0.15	0.882	-.0610172	0.071031
L4.	-.0049721	.0332464	-0.15	0.881	-.0701357	0.060191
L5.	.021268	.0317834	0.67	0.503	-.0410283	0.083563
L6.	.032016	.0324834	0.99	0.324	-.0316518	0.095684
L7.	.013506	.0332407	0.41	0.685	-.0516464	0.078658
L8.	-.0556797	.0349166	-1.59	0.111	-.1241168	0.012757
L9.	-.0005053	.0289789	-0.02	0.986	-.0573045	0.056293
L10.	.033626	.0175547	1.92	0.055	-.0007812	0.068034
Neutral touch*LIBI_V						
L1.	.042253	.0255829	1.65	0.099	-.00789	0.092395
L2.	-.0177634	.0373225	-0.48	0.634	-.0909161	0.055389
L3.	.002588	.0356938	0.07	0.942	-.0673725	0.072548
L4.	.006494	.0411024	0.16	0.874	-.0740675	0.087055
L5.	-.0524474	.0450403	-1.16	0.244	-.1407272	0.035832
L6.	.055957	.037923	1.48	0.140	-.0183731	0.130286
L7.	-.0517277	.036166	-1.43	0.153	-.1226138	0.019158
L8.	.000938	.0366146	0.03	0.980	-.0708268	0.072703
L9.	.007635	.0326461	0.23	0.815	-.0563524	0.071621
L10.	.011410	.0224057	0.51	0.611	-.0325052	0.055325
Emotion communication (round 1)*LIBI_V						
L1.	.011111	.0137103	0.81	0.418	-.0157615	0.037983
L2.	-.0311474	.0210079	-1.48	0.138	-.0723234	0.010028
L3.	.02583	.0190641	1.35	0.175	-.0115361	0.063196
L4.	-.0435507	.0178968	-2.43	0.015	-.0786288	-0.008472
L5.	.042447	.0179623	2.36	0.018	.007241	0.077653
L6.	-.0295625	.017159	-1.72	0.085	-.0631945	0.004069
L7.	.031404	.016586	1.89	0.058	-.001105	0.063912

L8.	-.0190983	.0157777	-1.21	0.226	-.0500229	0.011826
L9.	-.0071368	.0151632	-0.47	0.638	-.0368569	0.022583
L10.	.020282	.010151	2.00	0.046	.000386	0.040178
Recovery (round 1)*LIBI_V						
L1.	-.0381251	.0144095	-2.65	0.008	-.066368	-0.009882
L2.	.016759	.0209804	0.80	0.424	-.0243625	0.057881
L3.	.023873	.0183147	1.30	0.192	-.0120245	0.059769
L4.	-.0159131	.0182741	-0.87	0.384	-.0517306	0.019904
L5.	-.0057598	.0194092	-0.30	0.767	-.0438022	0.032282
L6.	.041108	.0187229	2.20	0.028	.004410	0.077804
L7.	-.0127896	.0181315	-0.71	0.481	-.0483278	0.022748
L8.	-.011524	.0172986	-0.67	0.505	-.0454295	0.022381
L9.	-.0076899	.0162485	-0.47	0.636	-.0395373	0.024157
L10.	.016182	.0113575	1.42	0.154	-.0060791	0.038442
For predicting CP1 participants' IBIs, Baseline 1 to Baseline 2, by CP Videoed Receiver						
second1	-.0001633	0.002043	-0.08	0.936	-.0041669	.003840
second2	-.0027308	.0013738	-1.99	0.047	-.005423	-0.000038
second3	-.0050124	.0022478	-2.23	0.026	-.009418	-0.000606
second4	-.0027195	.001567	-1.74	0.083	-.005791	.000351
second5	-.0036329	.0021425	-1.70	0.090	-.007832	.000566
second6	.001501	.0016131	0.93	0.352	-.001661	.004662
second7	.001414	.0011899	1.19	0.235	-.000919	.003745
second8	-.0018686	.0027039	-0.69	0.490	-.007168	.003431
second10	-.0026987	.0012251	-2.20	0.028	-.0051	-0.000297
second11	-.0026153	.0018953	-1.38	0.168	-.006330	.001099
second12	-.0023854	.0016897	-1.41	0.158	-.005697	.000926
second13	.001467	.0020037	0.73	0.464	-.002461	.00539
second14	-.0036562	.0020868	-1.75	0.080	-.007746	.00043
second15	-.0041324	.0020335	-2.03	0.042	-.008118	-0.000146
second16	-.0026514	.0023708	-1.12	0.263	-.007298	.001995
second17	-.0015741	.001954	-0.81	0.420	-.005404	.002255
second18	-.0034065	.002977	-1.14	0.253	-.009241	.002428
second19	-.0029732	.0018035	-1.65	0.099	-.006508	.000561
second20	-.0066591	.0020498	-3.25	0.001	-.010677	-0.002641
second21	-.0016969	.0015005	-1.13	0.258	-.004638	.001244
pair1	283.313	69.52821	4.07	0.000	147.037	419.589
pair2	278.813	69.18648	4.03	0.000	143.206	414.4
pair3	295.044	70.37043	4.19	0.000	157.116	432.971
pair4	280.129	69.35839	4.04	0.000	144.185	416.072
pair5	288.968	69.99236	4.13	0.000	151.782	426.154

pair6	287.309	69.89768	4.11	0.000	150.308	424.309
pair7	280.309	69.29904	4.04	0.000	144.482	416.136
pair8	299.023	70.78851	4.22	0.000	160.276	437.769
pair10	287.068	69.83452	4.11	0.000	150.191	423.944
pair11	283.576	69.55766	4.08	0.000	147.242	419.91
pair12	279.301	69.20057	4.04	0.000	143.666	414.935
pair13	286.678	69.96172	4.10	0.000	149.552	423.80
pair14	291.397	70.15559	4.15	0.000	153.891	428.903
pair15	293.304	70.324	4.17	0.000	155.468	431.14
pair16	279.385	69.08725	4.04	0.000	143.973	414.797
pair17	293.300	70.28142	4.17	0.000	155.547	431.052
pair18	287.094	69.65958	4.12	0.000	150.559	423.627
pair19	282.663	69.52249	4.07	0.000	146.397	418.928
pair20	292.869	70.25665	4.17	0.000	155.165	430.573
pair21	283.489	69.53959	4.08	0.000	147.190	419.78
First baseline P	-46.85293	62.9863	-0.74	0.457	-170.3073	76.601
Second baseline P	3.30358	16.7151	0.20	0.843	-29.45833	36.0654
Neutral touch P	-6.58909	16.46202	-0.40	0.689	-38.85496	25.6767
Emotion communication (round 1) P	-35.19158	28.57256	-1.23	0.218	-91.19434	20.8111
Recovery (round 1) P	-5.954746	9.075412	-0.66	0.512	-23.74272	11.8332
Cut five seconds from start of each task P	-58.04605	30.04932	-1.93	0.053	-116.9433	0.851174
Other P	53.5584	34.28396	1.56	0.118	-13.63883	120.755
LIBI_P						
L1.	1.13290	.0524309	21.61	0.000	1.03014	1.23566
L2.	-.3113562	.0767089	-4.06	0.000	-.4617071	-0.161005
L3.	.147860	.0514069	2.88	0.004	.047102	.248618
L4.	-.0171162	.0204054	-0.84	0.402	-.0571112	.022878
L5.	-.0630037	.033211	-1.90	0.058	-.128098	.002090
L6.	.034310	.0362717	0.95	0.344	-.0367832	.10540
L7.	.047184	.0240759	1.96	0.050	-5.49e-06	.09437
L8.	-.0131255	.0145182	-0.90	0.366	-.0415815	.015330
L9.	.001263	.0114483	0.11	0.912	-.0211756	.02370
L10.	-.0208268	.0088598	-2.35	0.019	-.0381922	-0.003461
LIBI_V (R)						
L1.	.027919	.0493237	0.57	0.571	-.0687569	.124593
L2.	-.0469395	.0703657	-0.67	0.505	-.1848576	.090978
L3.	.029370	.0490925	0.60	0.550	-.0668525	.125591

L4.	-.0130541	.0279716	-0.47	0.641	-.0678789	.041770
L5.	.024899	.0360661	0.69	0.490	-.0457914	.095588
L6.	-.0195283	.0392184	-0.50	0.619	-.0963972	.057340
L7.	.001088	.0289409	0.04	0.970	-.0556366	.057812
L8.	.023619	.0225832	1.05	0.296	-.0206445	.067882
L9.	.003654	.0184602	0.20	0.843	-.0325279	.039836
L10.	-.0121843	.0140324	-0.87	0.385	-.0396881	.015319
First baseline*LIBI_P						
L1.	.014435	.0141209	1.02	0.307	-.0132421	.042112
L2.	-.0121399	.0052159	-2.33	0.020	-.0223631	-0.001916
L3.	.005780	.0029397	1.97	0.049	.000018	.011541
L4.	-.0008425	.003695	-0.23	0.820	-.0080847	.006399
L5.	-.0046304	.0050493	-0.92	0.359	-.0145272	.005266
L6.	-.0000801	.0053147	-0.02	0.988	-.0104971	.010336
L7.	.004400	.0076723	0.57	0.566	-.0106381	.019437
L8.	.000844	.0046752	0.18	0.857	-.0083193	.010007
L9.	-.0003887	.0024276	-0.16	0.873	-.0051468	.004369
L10.	-.0010663	.0018848	-0.57	0.572	-.0047605	.002627
Second baseline*LIBI_P						
L1.	.104455	.0520634	2.01	0.045	.002410	.206500
L2.	-.283094	.074147	-3.82	0.000	-.4284235	-0.137764
L3.	.183488	.0507541	3.62	0.000	.084009	.28296
L4.	-.050258	.0329312	-1.53	0.127	-.1148038	.014287
L5.	-.0231545	.0401031	-0.58	0.564	-.1017573	.055448
L6.	-.0257226	.0399918	-0.64	0.520	-.1041072	.05266
L7.	.031709	.0336663	0.94	0.346	-.0342776	.097695
L8.	.070009	.0314639	2.23	0.026	.008340	.13167
L9.	-.0599768	.0288634	-2.08	0.038	-.1165497	-.00340
L10.	.044226	.017364	2.55	0.011	.010192	.078259
Neutral touch*LIBI_P						
L1.	-.1016017	.1251608	-0.81	0.417	-.3469193	.143715
L2.	-.0560367	.1495709	-0.37	0.708	-.3491985	.237125
L3.	.042219	.1200019	0.35	0.725	-.1929871	.277424
L4.	.086138	.1383422	0.62	0.534	-.1850156	.357290
L5.	-.0517017	.0790751	-0.65	0.513	-.2066904	.103287
L6.	.013814	.0517882	0.27	0.790	-.0876917	.115319
L7.	.014483	.0553883	0.26	0.794	-.0940793	.12304
L8.	.167223	.1549463	1.08	0.280	-.1364752	.470920
L9.	-.1912676	.1303332	-1.47	0.142	-.4467232	.064187

L10.	.091867	.0399897	2.30	0.022	.013487	.170247
Emotion communication (round 1)*LIBI_P						
L1.	.013586	.0606108	0.22	0.823	-.1052123	.132384
L2.	.010354	.0720584	0.14	0.886	-.1308816	.151590
L3.	.007064	.0408497	0.17	0.863	-.0730022	.087130
L4.	.010267	.0219697	0.47	0.640	-.0327939	.053328
L5.	-.0285489	.0256176	-1.11	0.265	-.0787599	.021662
L6.	.02786	.0258843	1.08	0.282	-.0228738	.078593
L7.	-.0079568	.0187323	-0.42	0.671	-.0446724	.028758
L8.	.006763	.0175377	0.39	0.700	-.0276115	.041137
L9.	-.0103396	.0162186	-0.64	0.524	-.0421284	.021449
L10.	.003727	.0114755	0.32	0.745	-.0187656	.026218
Recovery (round 1)*LIBI_P						
L1.	.047476	.0616167	0.77	0.441	-.0732935	.168246
L2.	-.0543124	.0762345	-0.71	0.476	-.2037334	.095108
L3.	-.0073627	.0443093	-0.17	0.868	-.0942097	.079484
L4.	-.0034146	.0246066	-0.14	0.890	-.0516441	.044814
L5.	.040586	.0308072	1.32	0.188	-.0197971	.100968
L6.	-.0390685	.0319949	-1.22	0.222	-.101779	.023642
L7.	-.0096651	.0226722	-0.43	0.670	-.054103	.034772
L8.	.020339	.0193351	1.05	0.293	-.0175585	.058235
L9.	.005814	.0165955	0.35	0.726	-.0267139	.038341
L10.	-.0131911	.0116572	-1.13	0.258	-.0360394	.009657
First baseline*LIBI_V						
L1.	-.012284	.0117348	-1.05	0.295	-.0352844	.010716
L2.	.015037	.0120364	1.25	0.212	-.0085549	.038628
L3.	-.0057114	.0036048	-1.58	0.113	-.0127769	.001354
L4.	.002946	.0034992	0.84	0.400	-.0039129	.009804
L5.	.001876	.0038718	0.48	0.628	-.0057132	.009464
L6.	-.0006358	.0046517	-0.14	0.891	-.0097532	.008481
L7.	.000377	.006369	0.06	0.953	-.0121071	.012859
L8.	-.000253	.0051714	-0.05	0.961	-.0103891	.00988
L9.	.000647	.0028447	0.23	0.820	-.0049289	.006222
L10.	-.0019717	.0017579	-1.12	0.262	-.0054173	.001473
Second baseline*LIBI_V						
L1.	-.1040655	.0507018	-2.05	0.040	-.203442	-.00468
L2.	.278994	.0724443	3.85	0.000	.137002	.420986

L3.	-.181474	.049835	-3.64	0.000	-.2791516	-0.083796
L4.	.051090	.0324117	1.58	0.115	-.012438	.114617
L5.	.021846	.0392019	0.56	0.577	-.0549901	.09868
L6.	.025330	.0393473	0.64	0.520	-.0517915	.102451
L7.	-.0319925	.0333633	-0.96	0.338	-.0973853	.033400
L8.	-.0655507	.0308775	-2.12	0.034	-.1260711	-0.00503
L9.	.056698	.028313	2.00	0.045	.001204	.112192
L10.	-.0431739	.0170853	-2.53	0.012	-.0766614	-0.009686
Neutral touch*LIBI_V						
L1.	.090521	.1130882	0.80	0.423	-.1311338	.312176
L2.	.069225	.1371469	0.50	0.614	-.1995854	.338035
L3.	-.0440172	.1188242	-0.37	0.711	-.2769149	.188880
L4.	-.0865471	.1364157	-0.63	0.526	-.3539245	.180830
L5.	.051919	.0782715	0.66	0.507	-.1014945	.205332
L6.	-.0147371	.0507761	-0.29	0.772	-.1142592	.08478
L7.	-.0143487	.0542455	-0.26	0.791	-.1206709	.091973
L8.	-.1652612	.1529416	-1.08	0.280	-.4650296	.134507
L9.	.188965	.128693	1.47	0.142	-.0632758	.441205
L10.	-.0902157	.0396648	-2.27	0.023	-.1679595	-0.012471
Emotion communication (round 1)*LIBI_V						
L1.	-.0088201	.0572403	-0.15	0.878	-.1210121	.103371
L2.	-.0107002	.069817	-0.15	0.878	-.147543	.126142
L3.	-.0067918	.0401797	-0.17	0.866	-.0855448	.071961
L4.	-.010064	.0216521	-0.46	0.642	-.0525025	.032374
L5.	.028859	.0251503	1.15	0.251	-.0204363	.078153
L6.	-.026754	.0253819	-1.05	0.292	-.076503	.02299
L7.	.006863	.0183925	0.37	0.709	-.0291872	.042912
L8.	-.0074759	.0171987	-0.43	0.664	-.0411856	.026233
L9.	.011153	.0159731	0.70	0.485	-.0201548	.042460
L10.	-.0035941	.0112954	-0.32	0.750	-.0257333	.018545
Recovery (round 1)*LIBI_V						
L1.	-.0446728	.0602739	-0.74	0.459	-.1628108	.073465
L2.	.053129	.0747185	0.71	0.477	-.0933206	.199578
L3.	.004930	.0434299	0.11	0.910	-.0801931	.090053
L4.	.003624	.0241327	0.15	0.881	-.043677	.050924
L5.	-.0405402	.030481	-1.33	0.184	-.1002836	.019203
L6.	.039358	.0317405	1.24	0.215	-.0228539	.1015
L7.	.009653	.0220788	0.44	0.662	-.0336215	.052928

L8.	-.0196945	.0187636	-1.05	0.294	-.0564715	.017082
L9.	-.0053572	.0162311	-0.33	0.741	-.0371705	.026456
L10.	.012900	.0114476	1.13	0.260	-.0095381	.035337
For predicting CP1 participants' IBIs, Baseline 2 to End, by IP Videoed Communicator						
second1	.005429	0.002388	2.27	0.023	.0007491	.01010
second2	-.0031745	.0014642	-2.17	0.030	-.006044	-0.000304
second3	.006659	.0031784	2.10	0.036	.000429	.012888
second4	.003979	.0027866	1.43	0.153	-.001483	.009441
second5	.004355	.0030648	1.42	0.155	-.001652	.010362
second6	.008984	.0015488	5.80	0.000	.005949	.012020
second7	.000175	.0022493	0.08	0.938	-.004234	.004583
second8	-.0018523	.000734	-2.52	0.012	-.003291	-0.000413
second10	.003824	.0023691	1.61	0.107	-.00082	.008467
second11	-.0037144	.0029687	-1.25	0.211	-.009533	.002104
second12	-.0047632	.0019288	-2.47	0.014	-.008544	-0.000982
second13	-.0020792	.0019134	-1.09	0.277	-.005830	.001671
second14	-.0012526	.0092286	-0.14	0.892	-.019341	.016835
second15	.000974	.0015741	0.62	0.536	-.002111	.004059
second16	.002802	.0026127	1.07	0.284	-.002319	.007922
second17	.000675	.0024516	0.28	0.783	-.00413	.005480
second18	.000196	.0016317	0.12	0.904	-.003002	.003394
second19	.006886	.0016459	4.18	0.000	.00366	.010112
pair1	778.1504	57.41333	13.55	0.000	665.618	890.682
pair2	763.1003	56.80669	13.43	0.000	651.757	874.443
pair3	784.809	57.80676	13.58	0.000	671.506	898.112
pair4	761.2083	56.65422	13.44	0.000	650.164	872.252
pair5	777.0533	57.07511	13.61	0.000	665.184	888.922
pair6	770.5226	57.03168	13.51	0.000	658.739	882.306
pair7	809.3409	58.49876	13.84	0.000	694.681	924.000
pair8	778.5138	57.3263	13.58	0.000	666.152	890.875
pair10	770.4026	57.00368	13.51	0.000	658.673	882.131
pair11	762.4019	56.91857	13.39	0.000	650.840	873.964
pair12	796.6411	57.9764	13.74	0.000	683.005	910.276
pair13	782.1431	57.50591	13.60	0.000	669.430	894.856
pair14	789.7909	54.15104	14.58	0.000	683.65	895.928
pair15	764.2074	56.77636	13.46	0.000	652.924	875.49
pair16	802.779	58.17012	13.80	0.000	688.764	916.794
pair17	765.9114	56.83478	13.48	0.000	654.513	877.309
pair18	776.582	57.3149	13.55	0.000	664.243	888.921
pair19	772.5718	57.12518	13.52	0.000	660.604	884.539
Second baseline P	13.5532	13.86359	0.98	0.328	-13.61997	40.7262

Emotion communication (round 2) P	18.6417	5.489619	3.40	0.001	7.88186	29.4015
Recovery (round 2) P	15.9844	11.42595	1.40	0.162	-6.410876	38.3796
Cut five seconds from start of each task P	-7.857892	2.703581	-2.91	0.004	-13.157	-2.5587
Other P	-1534.943	557.4874	-2.75	0.006	-2627.638	-442.248
LIBI_P						
L1.	1.18796	.0188047	63.17	0.000	1.15110	1.22481
L2.	-.6232887	.023601	-26.41	0.000	-.6695475	-.5770
L3.	.439453	.0181514	24.21	0.000	.403875	.4750
L4.	-.2223611	.0163392	-13.61	0.000	-.2543864	-0.190335
L5.	-.0312628	.0161047	-1.94	0.052	-.0628286	.000303
L6.	.084235	.016485	5.11	0.000	.051924	.116546
L7.	-.0106579	.0178667	-0.60	0.551	-.0456773	.024361
L8.	.044244	.0194132	2.28	0.023	.006194	.082294
L9.	-.0110706	.0203679	-0.54	0.587	-.0509923	.028851
L10.	.009816	.0118855	0.83	0.409	-.0134796	.033112
LIBI_V (C)						
L1.	-.0184999	.0070986	-2.61	0.009	-.0324134	-0.004586
L2.	.024862	.0100467	2.47	0.013	.005170	.04455
L3.	-.0013877	.0104581	-0.13	0.894	-.0218859	.019110
L4.	-.0065503	.0111911	-0.59	0.558	-.0284852	.015384
L5.	.009022	.0109607	0.82	0.410	-.0124614	.030505
L6.	.000882	.0109723	0.08	0.936	-.0206243	.022387
L7.	.004052	.0101317	0.40	0.689	-.0158065	.023910
L8.	-.0037642	.0092987	-0.40	0.686	-.02199	.014461
L9.	.006204	.0087501	0.71	0.478	-.0109462	.023354
L10.	-.0007225	.0060499	-0.12	0.905	-.0125804	.011135
Second baseline*LIBI_P						
L1.	-.0036212	.0028618	-1.27	0.206	-.0092304	.001987
L2.	.002023	.0023119	0.88	0.382	-.0025084	.006554
L3.	-.0023497	.0021188	-1.11	0.267	-.0065027	.001803
L4.	.002085	.0021413	0.97	0.330	-.0021123	.006281
L5.	.001017	.0018516	0.55	0.583	-.0026124	.00464
L6.	-.001365	.0019283	-0.71	0.479	-.0051446	.002414
L7.	.001144	.0018595	0.62	0.538	-.0025003	.004789
L8.	-.0003857	.001439	-0.27	0.789	-.0032061	.002434
L9.	-.0007553	.0013822	-0.55	0.585	-.0034645	.001953

L10.	.001568	.0011498	1.36	0.173	-.0006857	.003821
Emotion communication (round 2)*LIBI_P						
L1.	-.0183594	.0103353	-1.78	0.076	-.0386169	.001898
L2.	.023732	.0128992	1.84	0.066	-.0015505	.049015
L3.	.000153	.0108132	0.01	0.989	-.0210413	.021347
L4.	-.0139875	.0126488	-1.11	0.269	-.0387797	.010804
L5.	.019546	.0131102	1.49	0.136	-.0061501	.045242
L6.	-.0107322	.012752	-0.84	0.400	-.0357265	.014262
L7.	.009111	.0122706	0.74	0.458	-.0149401	.033161
L8.	-.0051803	.0104932	-0.49	0.622	-.0257473	.015386
L9.	.008114	.0129862	0.62	0.532	-.0173395	.033567
L10.	-.0053362	.0086019	-0.62	0.535	-.0221962	.011523
Recovery (round 2)*LIBI_P						
L1.	-.0115926	.0085646	-1.35	0.176	-.0283796	.005194
L2.	.012496	.0103801	1.20	0.229	-.0078494	.032841
L3.	-.0125388	.0095975	-1.31	0.191	-.0313502	.006272
L4.	.007065	.0101111	0.70	0.485	-.0127531	.02688
L5.	-.0007952	.010573	-0.08	0.940	-.0215185	.019928
L6.	.000080	.0101652	0.01	0.994	-.019844	.020004
L7.	.004624	.0098295	0.47	0.638	-.0146419	.023890
L8.	-.0044167	.0091135	-0.48	0.628	-.0222794	.01344
L9.	-.0009076	.009601	-0.09	0.925	-.0197259	.017910
L10.	.005448	.0066641	0.82	0.414	-.0076139	.018509
Second baseline*LIBI_V						
L1.	.000674	.0017739	0.38	0.704	-.0028026	.004151
L2.	.000318	.0023106	0.14	0.890	-.0042107	.00484
L3.	-.00109	.002064	-0.53	0.597	-.0051356	.002955
L4.	-.0006397	.0016821	-0.38	0.704	-.0039366	.002657
L5.	.000246	.0016725	0.15	0.883	-.0030326	.003523
L6.	.001203	.0017972	0.67	0.503	-.0023193	.004725
L7.	-.0036393	.0016139	-2.25	0.024	-.0068026	-0.000475
L8.	.003442	.0012271	2.81	0.005	.001037	.005847
L9.	-.0014151	.0012016	-1.18	0.239	-.0037702	.0009
L10.	-.0002152	.000929	-0.23	0.817	-.0020362	.001605
Emotion communication (round 2)*LIBI_V						
L1.	.015360	.0100239	1.53	0.125	-.0042875	.03500

L2.	-.0233904	.0126489	-1.85	0.064	-.0481827	.001401
L3.	-.0007741	.0106683	-0.07	0.942	-.0216844	.020136
L4.	.013972	.0123707	1.13	0.259	-.010275	.038219
L5.	-.0182117	.012926	-1.41	0.159	-.043547	.007123
L6.	.009815	.0126775	0.77	0.439	-.0150333	.034663
L7.	-.0084616	.0121086	-0.70	0.485	-.0321949	.015271
L8.	.004999	.0102781	0.49	0.627	-.0151469	.025143
L9.	-.0074138	.0127295	-0.58	0.560	-.0323642	.017536
L10.	.004402	.0085061	0.52	0.605	-.0122704	.021074
Recovery (round 2)*LIBI_V						
L1.	.00693	.0078702	0.88	0.379	-.0084959	.022355
L2.	-.0111119	.0101074	-1.10	0.272	-.0309227	.00869
L3.	.012123	.0094447	1.28	0.199	-.0063888	.030635
L4.	-.0047763	.009953	-0.48	0.631	-.0242844	.014731
L5.	.000679	.0104298	0.07	0.948	-.0197639	.021121
L6.	-.0022586	.0100421	-0.22	0.822	-.0219415	.017424
L7.	-.0031599	.0097166	-0.33	0.745	-.0222049	.015885
L8.	.004080	.0089788	0.45	0.650	-.0135193	.021678
L9.	.001820	.0094483	0.19	0.847	-.0166993	.020338
L10.	-.0060825	.0065848	-0.92	0.356	-.0189889	.006823
For predicting CP1 participants' IBIs, Baseline 2 to End, by IP Videoed Receiver						
second1	.0054962	0.002397	2.29	0.022	.0007983	.010194
second2	-.003232	.0014899	-2.17	0.030	-.006152	-0.000311
second3	.006826	.0031952	2.14	0.033	.000563	.013088
second4	.003949	.0028166	1.40	0.161	-.001572	.009469
second5	.004417	.0030431	1.45	0.147	-.001548	.010381
second6	.009087	.0015564	5.84	0.000	.006037	.012137
second7	.000592	.002232	0.27	0.791	-.003783	.004966
second8	-.0017986	.0007543	-2.38	0.017	-.003277	-0.00032
second10	.003878	.0023797	1.63	0.103	-.000787	.008541
second11	-.0037062	.0029759	-1.25	0.213	-.009539	.002126
second12	-.0046456	.0019337	-2.40	0.016	-.008436	-0.000855
second13	-.0019544	.001925	-1.02	0.310	-.005728	.001818
second14	-.0011321	.0092808	-0.12	0.903	-.019323	.017058
second15	.001021	.0016142	0.63	0.527	-.002143	.004184
second16	.003126	.0026009	1.20	0.229	-.00197	.008223
second17	.000699	.0024613	0.28	0.776	-.004125	.005523
second18	.000223	.0016396	0.14	0.892	-.002991	.003436
second19	.006982	.0016705	4.18	0.000	.00371	.010256
pair1	834.9337	45.21719	18.46	0.000	746.306	923.56

pair2	820.0584	44.61975	18.38	0.000	732.602	907.514
pair3	841.4806	45.71225	18.41	0.000	751.88	931.078
pair4	818.1341	44.71607	18.30	0.000	730.489	905.779
pair5	833.878	44.86478	18.59	0.000	745.942	921.814
pair6	827.3192	44.84538	18.45	0.000	739.421	915.217
pair7	865.7112	46.23406	18.72	0.000	775.091	956.331
pair8	835.2872	45.11719	18.51	0.000	746.856	923.718
pair10	827.2322	44.77348	18.48	0.000	739.475	914.989
pair11	819.2961	44.58008	18.38	0.000	731.918	906.674
pair12	853.2637	45.75013	18.65	0.000	763.592	942.935
pair13	838.8715	45.2771	18.53	0.000	750.127	927.616
pair14	846.4888	43.66539	19.39	0.000	760.903	932.074
pair15	821.0732	44.60523	18.41	0.000	733.646	908.50
pair16	859.277	45.82134	18.75	0.000	769.466	949.088
pair17	822.7656	44.66908	18.42	0.000	735.213	910.318
pair18	833.4125	45.09354	18.48	0.000	745.028	921.797
pair19	829.3471	44.94147	18.45	0.000	741.260	917.433
Second baseline P	15.5273	14.41753	1.08	0.281	-12.73154	43.7861
Emotion communication (round 2) P	17.4506	5.372919	3.25	0.001	6.91949	27.981
Recovery (round 2) P	15.3452	11.40522	1.35	0.178	-7.009416	37.6998
Cut five seconds from start of each task P	-8.603601	2.701696	-3.18	0.001	-13.89902	-3.30818
Other P	-1537.709	556.4868	-2.76	0.006	-2628.443	-446.976
LIBI_P						
L1.	1.20087	.0212627	56.48	0.000	1.15920	1.24254
L2.	-.6361916	.026928	-23.63	0.000	-.6889715	-0.583411
L3.	.444200	.0199011	22.32	0.000	.405193	.483206
L4.	-.22343	.0174223	-12.82	0.000	-.2575783	-0.189281
L5.	-.0272572	.0181822	-1.50	0.134	-.0628948	.008380
L6.	.078696	.0177984	4.42	0.000	.043811	.113581
L7.	-.0118085	.018962	-0.62	0.533	-.0489746	.025357
L8.	.041474	.0206819	2.01	0.045	.000936	.08201
L9.	-.00581	.0204954	-0.28	0.777	-.0459817	.034361
L10.	.009917	.0120724	0.82	0.411	-.0137459	.033578
LIBI_V (R)						
L1.	-.037448	.0092074	-4.07	0.000	-.0554949	-0.019401
L2.	.049673	.0135609	3.66	0.000	.023093	.076252
L3.	-.0163801	.0132248	-1.24	0.216	-.0423011	.009540

L4.	-.0062868	.0146651	-0.43	0.668	-.0350308	.022457
L5.	.013472	.0155278	0.87	0.386	-.0169627	.043907
L6.	-.0021712	.0139578	-0.16	0.876	-.0295289	.025186
L7.	.008655	.0132034	0.66	0.512	-.0172238	.034534
L8.	-.0055742	.0124583	-0.45	0.655	-.0299929	.018844
L9.	-.0054947	.0111521	-0.49	0.622	-.0273531	.016363
L10.	.003483	.0076453	0.46	0.649	-.0115019	.018468
Second baseline*LIBI_P						
L1.	-.0040108	.0029027	-1.38	0.167	-.0097003	.001678
L2.	.001941	.0023342	0.83	0.406	-.0026337	.006516
L3.	-.0036165	.0025557	-1.42	0.157	-.0086257	.001392
L4.	.003635	.0023706	1.53	0.125	-.0010114	.008281
L5.	.000307	.001904	0.16	0.872	-.0034245	.004039
L6.	-.0017692	.0018656	-0.95	0.343	-.0054258	.001887
L7.	.000813	.0018238	0.45	0.656	-.0027614	.004387
L8.	.001176	.0014901	0.79	0.430	-.001745	.004096
L9.	-.001675	.0013868	-1.21	0.227	-.0043932	.001043
L10.	.001960	.0011384	1.72	0.085	-.0002718	.004190
Emotion communication (round 2)*LIBI_P						
L1.	-.0419115	.0197705	-2.12	0.034	-.0806623	-0.00316
L2.	.052139	.0268108	1.94	0.052	-.0004116	.104688
L3.	-.014209	.018122	-0.78	0.433	-.0497287	.021310
L4.	-.0062779	.0173976	-0.36	0.718	-.0403778	.027822
L5.	.014859	.0218252	0.68	0.496	-.0279195	.057636
L6.	.010220	.018062	0.57	0.572	-.0251826	.045621
L7.	-.0004189	.0181447	-0.02	0.982	-.0359831	.035145
L8.	.000831	.0173666	0.05	0.962	-.0332082	.034870
L9.	.010653	.0177924	0.60	0.549	-.0242206	.04552
L10.	-.0217571	.0130954	-1.66	0.097	-.0474244	.003910
Recovery (round 2)*LIBI_P						
L1.	-.0055703	.0142132	-0.39	0.695	-.0334287	.02228
L2.	.001674	.0190563	0.09	0.930	-.035677	.039025
L3.	-.0050191	.0143775	-0.35	0.727	-.0331994	.023161
L4.	.001363	.0142745	0.10	0.924	-.0266152	.029341
L5.	-.0014388	.0165205	-0.09	0.931	-.0338195	.030941
L6.	-.0128479	.0144406	-0.89	0.374	-.041152	.015456
L7.	.016448	.0144632	1.14	0.255	-.0119001	.044796
L8.	-.0081297	.014106	-0.58	0.564	-.0357779	.019518

L9.	-.0107754	.0144779	-0.74	0.457	-.0391525	.017601
L10.	.022272	.010601	2.10	0.036	.001493	.043049
Second baseline*LIBI_V						
L1.	.002349	.0019938	1.18	0.239	-.0015591	.006256
L2.	-.0027507	.0019791	-1.39	0.165	-.0066298	.001128
L3.	.001872	.00236	0.79	0.428	-.0027534	.006497
L4.	-.0001513	.0020994	-0.07	0.943	-.0042661	.003963
L5.	-.0015755	.0016699	-0.94	0.345	-.0048485	.001697
L6.	.000988	.0017158	0.58	0.565	-.0023747	.004351
L7.	-.0020929	.0017027	-1.23	0.219	-.0054302	.001244
L8.	.001041	.0013376	0.78	0.437	-.0015813	.003662
L9.	.000389	.0011543	0.34	0.736	-.0018739	.002651
L10.	-.0010565	.0009343	-1.13	0.258	-.0028878	.000774
Emotion communication (round 2)*LIBI_V						
L1.	.037725	.0188972	2.00	0.046	.000686	.074764
L2.	-.0501812	.0257468	-1.95	0.051	-.1006457	.000283
L3.	.013224	.0174476	0.76	0.448	-.0209737	.047422
L4.	.006076	.0166916	0.36	0.716	-.0266406	.038791
L5.	-.01315	.0209913	-0.63	0.531	-.0542937	.027993
L6.	-.0105179	.0172437	-0.61	0.542	-.0443163	.023280
L7.	.000885	.0172459	0.05	0.959	-.0329176	.034687
L8.	-.0008808	.0166401	-0.05	0.958	-.033496	.031734
L9.	-.0097283	.0170499	-0.57	0.568	-.0431468	.023690
L10.	.020159	.0126136	1.60	0.110	-.004564	.044882
Recovery (round 2)*LIBI_V						
L1.	.000961	.0136247	0.07	0.944	-.0257438	.02766
L2.	-.0003668	.018217	-0.02	0.984	-.0360728	.035339
L3.	.004507	.0136183	0.33	0.741	-.0221848	.031199
L4.	.000794	.0134992	0.06	0.953	-.0256649	.027253
L5.	.001213	.0156472	0.08	0.938	-.0294566	.031881
L6.	.010169	.0136873	0.74	0.457	-.0166583	.036997
L7.	-.0142093	.0137384	-1.03	0.301	-.0411371	.012718
L8.	.007514	.0133209	0.56	0.573	-.0185952	.033623
L9.	.011073	.0137088	0.81	0.419	-.0157971	.037942
L10.	-.0218714	.0101458	-2.16	0.031	-.0417574	-0.001985
For predicting IP1 participants' IBIs, Baseline 2 to End, by CP Videoed Communicator						
second1	.0030397	0.001855	1.64	0.101	-.0005968	.00676
second2	.000132	.0016274	0.08	0.935	-.003058	.00332

second3	.004912	.0022693	2.16	0.030	.000464	.0093
second4	.005559	.003084	1.80	0.071	-.000486	0.011603
second5	.007934	.001675	4.74	0.000	.004651	0.011217
second6	.004298	.001482	2.90	0.004	.001394	0.007202
second7	.008573	.0014544	5.89	0.000	.005722	0.011423
second8	.008974	.0020189	4.44	0.000	.005017	0.01293
second10	-.0011921	.0022868	-0.52	0.602	-.005674	.0032
second11	.003831	.0012659	3.03	0.002	.001349	0.006311
second12	.011206	.0014578	7.69	0.000	.008349	0.014063
second13	.002615	.0025555	1.02	0.306	-.002394	0.007624
second14	-.0027463	.0016001	-1.72	0.086	-.005883	0.000389
second15	.003116	.0022365	1.39	0.164	-.001268	0.007499
second16	-.003091	.001308	-2.36	0.018	-.005655	-0.000527
second17	-.001822	.0016634	-1.10	0.273	-.005082	0.001438
second18	.000961	.0030314	0.32	0.751	-.004981	0.006902
second19	.011324	.0021802	5.19	0.000	.007050	0.015596
second20	.005411	.0018865	2.87	0.004	.001713	.00910
second21	.005190	.0018287	2.84	0.005	.001605	.00877
second22	-.0048666	.0031765	-1.53	0.126	-.011093	0.001359
pair1	839.475	53.62715	15.65	0.000	734.365	944.58
pair2	827.080	53.30372	15.52	0.000	722.604	931.556
pair3	803.145	52.74327	15.23	0.000	699.766	906.522
pair4	848.298	53.84539	15.75	0.000	742.760	953.836
pair5	821.788	53.184	15.45	0.000	717.546	926.03
pair6	799.656	52.69027	15.18	0.000	696.382	902.93
pair7	821.922	53.21188	15.45	0.000	717.625	926.218
pair8	837.927	53.57726	15.64	0.000	732.914	942.939
pair10	828.812	53.41368	15.52	0.000	724.120	933.503
pair11	809.68	52.91461	15.30	0.000	705.966	913.393
pair12	789.048	52.45341	15.04	0.000	686.238	891.857
pair13	844.581	53.69877	15.73	0.000	739.330	949.832
pair14	826.672	53.29749	15.51	0.000	722.207	931.136
pair15	814.124	53.05977	15.34	0.000	710.125	918.122
pair16	786.361	52.39065	15.01	0.000	683.674	889.047
pair17	796.789	52.58018	15.15	0.000	693.731	899.847
pair18	799.07	52.583	15.20	0.000	696.009	902.13
pair19	818.32	53.18376	15.39	0.000	714.075	922.557
pair20	801.093	52.72527	15.19	0.000	697.750	904.435
pair21	816.318	53.12281	15.37	0.000	712.196	920.439
pair22	821.347	52.79395	15.56	0.000	717.869	924.824
Second baseline P	3.88100	11.90086	0.33	0.744	-19.44499	27.2069

Emotion communication (round 2) P	17.9401	4.89406	3.67	0.000	8.34757	27.5325
Recovery (round 2) P	-.2986395	4.976057	-0.06	0.952	-10.05184	9.45455
Cut five seconds from start of each task P	-6.225874	2.672418	-2.33	0.020	-11.46388	-.987867
Other P	-2156.38	5.979415	-360.63	0.000	-2168.1	-2144.6
LIBI_P						
L1.	1.08337	.0170529	63.53	0.000	1.04995	1.11679
L2.	-.5504975	.028098	-19.59	0.000	-.6055702	-0.495424
L3.	.368513	.0299282	12.31	0.000	.309853	.427173
L4.	-.1461712	.0305441	-4.79	0.000	-.2060384	-.08630
L5.	.005373	.027959	0.19	0.848	-.0494277	.060172
L6.	.059240	.0290046	2.04	0.041	.002391	.1160
L7.	-.0221894	.0297883	-0.74	0.456	-.0805753	.036196
L8.	.037006	.0262238	1.41	0.158	-.0143932	.088405
L9.	.043606	.0249217	1.75	0.080	-.0052416	.092452
L10.	-.0167179	.0164491	-1.02	0.309	-.0489585	.015522
LIBI_V (C)						
L1.	.024649	.0168262	1.46	0.143	-.008331	.057628
L2.	.005025	.0276999	0.18	0.856	-.0492674	.059317
L3.	-.0212601	.0290762	-0.73	0.465	-.0782502	.035729
L4.	.010944	.0291751	0.38	0.708	-.0462399	.068127
L5.	-.0131809	.0286862	-0.46	0.646	-.0694065	.043044
L6.	.021156	.0290655	0.73	0.467	-.0358133	.078124
L7.	.024235	.0284934	0.85	0.395	-.0316132	.080082
L8.	-.0645534	.0257505	-2.51	0.012	-.1150249	-0.014081
L9.	.012601	.0241691	0.52	0.602	-.0347713	.059972
L10.	.014289	.0160393	0.89	0.373	-.0171485	.045726
Second baseline*LIBI_P						
L1.	-.0027907	.0021046	-1.33	0.185	-.0069158	.001334
L2.	.002969	.0019509	1.52	0.128	-.000855	.006792
L3.	-.0001676	.0019882	-0.08	0.933	-.0040646	.003729
L4.	.000241	.0016917	0.14	0.887	-.003075	.003556
L5.	.002741	.0015296	1.79	0.073	-.000257	.005739
L6.	-.0020862	.0014501	-1.44	0.150	-.0049285	.00075
L7.	.000154	.0014016	0.11	0.913	-.0025936	.002900
L8.	.001628	.0014288	1.14	0.254	-.001172	.004428
L9.	-.0018776	.0015486	-1.21	0.225	-.0049129	.001157

L10.	.000114	.0012283	0.09	0.926	-.0022936	.002521
Emotion communication (round 2)*LIBI_P						
L1.	-.0119875	.0149087	-0.80	0.421	-.0412088	.017233
L2.	.023395	.0223355	1.05	0.295	-.020383	.067173
L3.	-.0491262	.0234086	-2.10	0.036	-.0950078	-0.003244
L4.	.043439	.0239467	1.81	0.070	-.0034971	.090375
L5.	-.0285791	.0230427	-1.24	0.215	-.0737435	.016585
L6.	.032113	.0239592	1.34	0.180	-.0148472	.079073
L7.	-.0108885	.0234127	-0.47	0.642	-.056778	.03500
L8.	-.0194972	.0215305	-0.91	0.365	-.0616976	.022703
L9.	-.0029591	.0209793	-0.14	0.888	-.0440792	.038160
L10.	.014980	.013801	1.09	0.278	-.0120701	.042030
Recovery (round 2)*LIBI_P						
L1.	.006284	.0154242	0.41	0.684	-.0239478	.036515
L2.	.022198	.0223908	0.99	0.322	-.0216889	.066084
L3.	-.0087607	.023801	-0.37	0.713	-.0554112	.037889
L4.	-.0228535	.0242834	-0.94	0.347	-.0704495	.024742
L5.	.011183	.0227592	0.49	0.623	-.0334258	.055791
L6.	-.0066078	.024212	-0.27	0.785	-.0540639	.040848
L7.	.030196	.0233229	1.29	0.195	-.0155176	.075909
L8.	-.0473984	.0209498	-2.26	0.024	-.0884606	-0.006336
L9.	.007105	.021553	0.33	0.742	-.0351396	.049349
L10.	.009722	.0141868	0.69	0.493	-.0180847	.037528
Second baseline*LIBI_V						
L1.	.002325	.0013597	1.71	0.087	-.0003402	.004989
L2.	-.0023567	.0016155	-1.46	0.145	-.0055232	.000809
L3.	-.0017479	.0016847	-1.04	0.300	-.00505	.001554
L4.	.000344	.0017145	0.20	0.841	-.0030168	.003704
L5.	-.0012162	.001601	-0.76	0.447	-.0043541	.001921
L6.	.001025	.001413	0.73	0.468	-.0017445	.003794
L7.	.000813	.0015149	0.54	0.592	-.0021566	.00378
L8.	-.0006701	.0015235	-0.44	0.660	-.0036563	.00231
L9.	.000526	.0014453	0.36	0.716	-.0023071	.003358
L10.	-.0002575	.0009794	-0.26	0.793	-.0021771	.001662
Emotion communication (round 2)*LIBI_V						
L1.	.010141	.0148116	0.68	0.494	-.0188898	.039172

L2.	-.0231942	.0222088	-1.04	0.296	-.066724	.020335
L3.	.047731	.023284	2.05	0.040	.002094	.093368
L4.	-.0427415	.0238485	-1.79	0.073	-.0894851	.004002
L5.	.029068	.0229334	1.27	0.205	-.0158817	.074018
L6.	-.0325935	.0238089	-1.37	0.171	-.0792596	.014072
L7.	.010301	.0232385	0.44	0.658	-.0352466	.055849
L8.	.019641	.0213871	0.92	0.358	-.0222788	.061559
L9.	.002802	.0208447	0.13	0.893	-.0380537	.043658
L10.	-.0149488	.0137083	-1.09	0.276	-.0418174	.011919
Recovery (round 2)*LIBI_V						
L1.	-.0073434	.0152158	-0.48	0.629	-.0371668	.0224
L2.	-.0230446	.0221128	-1.04	0.297	-.0663862	.02029
L3.	.008667	.0235841	0.37	0.713	-.0375587	.054892
L4.	.024250	.0240654	1.01	0.314	-.0229189	.071418
L5.	-.0101338	.0225341	-0.45	0.653	-.0543011	.034033
L6.	.006476	.0239714	0.27	0.787	-.0405082	.053460
L7.	-.0300795	.0230382	-1.31	0.192	-.075235	.015076
L8.	.047359	.0207039	2.29	0.022	.006778	.087938
L9.	-.0071369	.0213174	-0.33	0.738	-.0489195	.034645
L10.	-.0097649	.0140333	-0.70	0.487	-.0372705	.017740
For predicting IP1 participants' IBIs, Baseline 2 to End, by CP Videoed Receiver						
second1	.0023582	0.001850	1.27	0.202	-.0012675	.005983
second2	-.0004601	.0016259	-0.28	0.777	-.003647	0.002726
second3	.004417	.0022587	1.96	0.051	-.000010	0.008844
second4	.004786	.0030761	1.56	0.120	-.001244	0.010815
second5	.007247	.0016596	4.37	0.000	.003995	0.0105
second6	.003783	.0014591	2.59	0.010	.000923	0.006643
second7	.007902	.0014423	5.48	0.000	.005075	0.010728
second8	.008218	.0019999	4.11	0.000	.00430	0.012137
second10	-.0017832	.0022882	-0.78	0.436	-.006268	0.002701
second11	.003288	.0012395	2.65	0.008	.000858	0.005717
second12	.010670	.0014256	7.48	0.000	.007876	0.013463
second13	.001898	.0025552	0.74	0.458	-.003110	0.006906
second14	-.0033	.0015976	-2.07	0.039	-.006431	-0.000168
second15	.002562	.0022254	1.15	0.250	-.001799	0.006924
second16	-.0034572	.0012771	-2.71	0.007	-.005960	-0.000954
second17	-.0022177	.0016476	-1.35	0.178	-.005447	0.001011
second18	.000476	.00302	0.16	0.875	-.005443	0.006395
second19	.010634	.0021654	4.91	0.000	.006389	0.014877
second20	.004855	.0018699	2.60	0.009	.001190	0.008519

second21	.004620	.0018232	2.53	0.011	.001046	0.008193
second22	-.0053353	.0032308	-1.65	0.099	-.011668	0.000997
pair1	919.8007	54.61374	16.84	0.000	812.756	1026.84
pair2	907.4974	54.22439	16.74	0.000	801.216	1013.77
pair3	883.6665	53.62642	16.48	0.000	778.557	988.775
pair4	928.6031	54.87216	16.92	0.000	821.052	1036.15
pair5	902.2587	54.0356	16.70	0.000	796.348	1008.1
pair6	880.2368	53.50438	16.45	0.000	775.367	985.106
pair7	902.3724	54.14325	16.67	0.000	796.250	1008.49
pair8	918.2977	54.54338	16.84	0.000	811.391	1025.2
pair10	909.2126	54.35448	16.73	0.000	802.676	1015.74
pair11	890.2074	53.76242	16.56	0.000	784.832	995.583
pair12	869.6967	53.22458	16.34	0.000	765.375	974.018
pair13	924.9145	54.75112	16.89	0.000	817.60	1032.22
pair14	907.0847	54.24085	16.72	0.000	800.771	1013.39
pair15	894.613	53.97346	16.58	0.000	788.824	1000.4
pair16	867.0232	53.17031	16.31	0.000	762.81	971.238
pair17	877.3561	53.40512	16.43	0.000	772.681	982.031
pair18	879.6731	53.47522	16.45	0.000	774.860	984.485
pair19	898.8086	54.09006	16.62	0.000	792.791	1004.82
pair20	881.6912	53.5737	16.46	0.000	776.685	986.69
pair21	896.8131	54.02127	16.60	0.000	790.93	1002.69
pair22	901.768	54.13251	16.66	0.000	795.667	1007.86
Second baseline P	2.2323	12.07882	0.18	0.853	-21.44249	25.9070
Emotion communication (round 2) P	18.7342	4.890502	3.83	0.000	9.14865	28.3196
Recovery (round 2) P	-.0920423	4.969383	-0.02	0.985	-9.832158	9.64807
Cut five seconds from start of each task P	-6.509622	2.657868	-2.45	0.014	-11.71911	-1.30013
Other P	-2159.72	5.777472	-373.82	0.000	-2171.044	-2148.39
LIBI_P						
L1.	1.08936	.0168695	64.58	0.000	1.05630	1.12242
L2.	-.5595951	.0270245	-20.71	0.000	-0.612564	-.506626
L3.	.371932	.0283447	13.12	0.000	.316376	.427488
L4.	-.1510122	.0289943	-5.21	0.000	-0.207842	-.094182
L5.	.011179	.0266243	0.42	0.675	-.0410051	.063363
L6.	.053298	.0282029	1.89	0.059	-.0019806	.108576
L7.	-.0188672	.0294545	-0.64	0.522	-.0765987	.038864
L8.	.038902	.0260248	1.49	0.135	-.0121075	.089911

L9.	.040462	.0245361	1.65	0.099	-.0076296	.088553
L10.	-.0140924	.0163765	-0.86	0.390	-0.046191	.01800
LIBI_V (R)						
L1.	-.0298485	.0170978	-1.75	0.081	-.0633605	.003663
L2.	.062314	.0263311	2.37	0.018	.010705	.113923
L3.	-.0574016	.0259677	-2.21	0.027	-0.108299	-.006504
L4.	.039672	.0259751	1.53	0.127	-.0112402	.090583
L5.	-.039687	.0252792	-1.57	0.116	-.0892349	.009860
L6.	.041061	.0262064	1.57	0.117	-.0103039	.092426
L7.	.002815	.0268004	0.11	0.916	-.0497143	.055344
L8.	-.0544878	.0245601	-2.22	0.027	-0.102626	-.006349
L9.	.009331	.0231323	0.40	0.687	-.0360091	.054670
L10.	.028144	.0154278	1.82	0.068	-0.002095	.05838
Second baseline*LIBI_P						
L1.	-.0030284	.0021308	-1.42	0.155	-.0072049	.001148
L2.	.003171	.0019834	1.60	0.110	-.0007168	.007058
L3.	-.0000269	.0020031	-0.01	0.989	-.003953	.003899
L4.	.000054	.0016989	0.03	0.974	-.0032756	.003384
L5.	.002566	.0015312	1.68	0.094	-.0004351	.005567
L6.	-.0016928	.0014714	-1.15	0.250	-.0045768	.001191
L7.	.000177	.0014155	0.13	0.900	-.0025974	.002951
L8.	.001540	.0014526	1.06	0.289	-.001307	.004387
L9.	-.0020554	.0015757	-1.30	0.192	-0.005144	.00103
L10.	.000227	.0012393	0.18	0.855	-.0022024	.002655
Emotion communication (round 2)*LIBI_P						
L1.	-.0092233	.0145909	-0.63	0.527	-.0378218	.019375
L2.	.030895	.0214056	1.44	0.149	-.0110601	.072850
L3.	-.0555284	.0217542	-2.55	0.011	-0.098167	-.012889
L4.	.043146	.0223169	1.93	0.053	-.0005961	.086887
L5.	-.0307264	.0212228	-1.45	0.148	-.0723235	.010870
L6.	.036196	.0223423	1.62	0.105	-.0075952	.079987
L7.	-.0156313	.0222615	-0.70	0.483	-.0592645	.028001
L8.	-.0234026	.0203245	-1.15	0.250	-.0632391	.016433
L9.	-.0049549	.0202223	-0.25	0.806	-.044591	.034681
L10.	.020535	.0134641	1.53	0.127	-.0058546	.046925
Recovery (round 2)*LIBI_P						
L1.	-.0048402	.0150919	-0.32	0.748	-.0344207	.024740

L2.	.027697	.0214875	1.29	0.197	-.0144188	.069813
L3.	-.0064166	.0222115	-0.29	0.773	-.0499516	.037118
L4.	-.0160366	.0227942	-0.70	0.482	-.0607139	.028640
L5.	.005472	.0210218	0.26	0.795	-.0357314	.046675
L6.	-.0021359	.0224041	-0.10	0.924	-.0460485	.041776
L7.	.029807	.0223474	1.33	0.182	-.0139949	.073608
L8.	-.0455878	.0202375	-2.25	0.024	-0.085254	-.005921
L9.	.013576	.0207388	0.65	0.513	-.0270721	.054224
L10.	.00121	.0137454	0.09	0.930	-.0257313	.028151
Second baseline*LIBI_V						
L1.	.002430	.0013454	1.81	0.071	-.0002066	.005067
L2.	-.0013182	.001595	-0.83	0.409	-.0044445	.001808
L3.	-.0021063	.0016828	-1.25	0.211	-0.005405	.00119
L4.	-.0012485	.0017013	-0.73	0.463	-0.004583	.00208
L5.	-.0001582	.0016065	-0.10	0.922	-.0033071	.002990
L6.	.000956	.0014412	0.66	0.507	-.0018684	.003781
L7.	.000625	.0015306	0.41	0.683	-.0023752	.003624
L8.	-.0006216	.0015425	-0.40	0.687	-.003645	.002401
L9.	.000234	.001447	0.16	0.872	-.0026023	.003069
L10.	.000042	.000974	0.04	0.965	-.0018667	.001951
Emotion communication (round 2)*LIBI_V						
L1.	.007377	.0145666	0.51	0.613	-.0211742	.035927
L2.	-.0307898	.0213843	-1.44	0.150	-0.072704	.01112
L3.	.054234	.0217469	2.49	0.013	.011610	.096858
L4.	-.0426018	.0223284	-1.91	0.056	-.0863661	.001162
L5.	.031426	.0212192	1.48	0.139	-.0101641	.073016
L6.	-.0369498	.022313	-1.66	0.098	-.0806838	.006784
L7.	.015103	.0222203	0.68	0.497	-.0284498	.058654
L8.	.023686	.0203097	1.17	0.244	-.0161218	.063493
L9.	.004807	.0202096	0.24	0.812	-.0348048	.044417
L10.	-.0206178	.013458	-1.53	0.126	-.0469959	.005760
Recovery (round 2)*LIBI_V						
L1.	.003573	.0149386	0.24	0.811	-.025707	.032853
L2.	-.0285402	.0212835	-1.34	0.180	-.0702563	.013175
L3.	.006367	.0220608	0.29	0.773	-.036873	.049606
L4.	.017540	.0226409	0.77	0.439	-.0268365	.061916
L5.	-.0044691	.0208647	-0.21	0.830	-.0453644	.036426
L6.	.001962	.0222293	0.09	0.930	-.0416076	.045532

L7.	-.0296654	.0221103	-1.34	0.180	-.0730022	.013671
L8.	.045513	.0200317	2.27	0.023	.006251	.084776
L9.	-.0135129	.0205538	-0.66	0.511	-.0537989	.026773
L10.	-.0013084	.0136298	-0.10	0.924	-.0280232	.025406

Table 6. *Significant differences between CP1 and IP1 participants t-test results*

Dependent Variable	**t**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Higher in:**
DASS Anxiety	-2.13	29.14	.04	3.94	IP1
DASS Stress	-2.51	37.32	.02	5.24	IP1
Quadrant accuracy % (round 1)	2.06	45	.046	9.44	CP1
Absolute value, R1 LIBI C predicting LIBI P, R1 overall, lag 1	2.25	25.86	.03	0.05	CP1
Absolute value, R1 LIBI C predicting LIBI P, R1 overall, lag 2	3.44	22.34	.002	0.07	CP1
Absolute value, R1 LIBI C predicting LIBI P, 2nd baseline, lag 1	2.41	27.95	.02	0.05	CP1
Absolute value, R1 LIBI C predicting LIBI P, 2nd baseline, lag 2	2.98	30.63	.006	0.06	CP1
Absolute value, R1 LIBI C predicting LIBI P, R1neutral touch video, lag 1	4.71	31.46	>.001	0.12	CP1
Absolute value, R1 LIBI C predicting LIBI P, R1 recovery periods, lag 1	2.07	41	.045	0.03	CP1
Absolute value, R2 LIBI C predicting LIBI P, R2 overall, lag 1	-3.46	26.35	.002	0.05	IP1
Absolute value, R2 LIBI C predicting LIBI P, R2 overall, lag 2	-2.59	27.78	.02	0.04	IP1
Absolute value, R2 LIBI C predicting LIBI P, 2nd baseline, lag 1	-2.74	28.78	.01	0.04	IP1
Absolute value, R1 LIBI R predicting LIBI P, R1 overall, lag 1	3.43	26.05	.002	0.05	CP1
Absolute value, R1 LIBI R predicting LIBI P, R1 overall, lag 2	3.64	22.54	.001	0.08	CP1
Absolute value, R1 LIBI R predicting LIBI P, 2nd baseline, lag 1	2.62	23.28	.02	0.05	CP1

Absolute value, R1 LIBI R predicting LIBI P, 2^{nd} baseline, lag 2	2.42	41	.02	0.06	CP1
Absolute value, R1 LIBI R predicting LIBI P, R1 emotion videos, lag 1	2.08	30.79	.046	0.03	CP1
Absolute value, R1 LIBI R predicting LIBI P, R1 recovery periods, lag 1	2.25	37.80	.03	0.04	CP1
Number of sig. linked seconds, R1 LIBI C predicting LIBI P, R1 overall	2.08	32.87	.046	0.69	CP1
Number of sig. linked seconds, R2 LIBI C predicting LIBI P, R2 overall	-2.16	33.40	.04	0.75	IP1

Table 7. *Same versus different self-reported race/ethnicity t-test results*

Dependent Variable	**t**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Higher in:**
Absolute value, R1 LIBI C predicting LIBI P, 2nd baseline, lag 1	2.22	37.63	.03	.04	Same self-reported race/ethnicity
Absolute value, R1 LIBI R predicting LIBI P, 2nd baseline, lag 1	2.42	33.49	.02	.04	Same self-reported race/ethnicity
Absolute value, R2 LIBI C predicting LIBI P, R2 overall, lag 1	-2.36	27.52	.03	.04	Dif. self-reported race/ethnicity
Absolute value, R2 LIBI R predicting LIBI P, R2 recovery periods, lag 1	-2.48	39	.02	.03	Dif. self-reported race/ethnicity
Number of sig. linked seconds, R1 LIBI C predicting LIBI P, R1 emotion videos	-2.13	41	.04	.73	Dif. self-reported race/ethnicity
Number of sig. linked seconds, R2 LIBI C predicting LIBI P, R2 emotion videos	-2.31	31.90	.03	.46	Dif. self-reported race/ethnicity

Table 8. *Final regression equations predicting the four types of emotion detection accuracy*

Predictor	B	SE	β	p	F	df	p	Adj. R^2
For Emotion Word Detection (Round 1)					1.64	(7,39)	.15	.09
DASS_Stress	0.02	0.72	0.01	0.98				
DASS_Anxiety	-0.35	0.75	-0.14	0.64				
DASS_Depression	-0.75	0.55	-0.39	0.18				
SHS_touchscore	-4.33	2.75	-0.30	0.12				
SHS_totalscore	19.97	7.66	0.55	0.01				
LSAS_totalscore	0.12	0.13	0.18	0.37				
Same vs. different race	-2.28	6.05	-0.07	0.71				
For Valence (Round 1)					5.41	(1,41)	.03	.10
Abs. value of the lag 1 coefficient of the R1 videoed communicator's IBIs predicting participant's during 2nd baseline	66.02	28.39	0.34	0.03				
For Intensity (Round 1)					6.23	(1,41)	.02	.11
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during 1st baseline	2.75	1.10	0.36	0.02				
For Quadrant (Round 1)					9.25	(5,37)	>.001	.50
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during 1st baseline	4.54	0.86	0.62	>.001				
# of sig. linked seconds of the videoed R1 communicator's IBIs predicting participant's overall	8.63	1.93	0.59	>.001				
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during R1 recovery periods	-7.15	1.93	-0.46	0.001				

Abs. value of the lag 1 coefficient of the R1 videoed communicator's IBIs predicting participant's during 2nd baseline	159.721	50.72	0.68	0.003				
Abs. value of the lag 1 coefficient of the R1 videoed receiver's IBIs predicting participant's during 2nd baseline	-111.22	54.58	-0.45	0.049				
For Emotion Word (Round 2)					7.60	(1,39)	.01	.14
Abs. value of the lag 1 coefficient of the R2 videoed communicator's IBIs predicting participant's during R2 overall	-105.46	38.25	-0.40	0.009				
For Valence (Round 2)					5.39	(1,39)	.03	.10
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the emotion videos	-6.74	2.90	-0.35	0.03				
For Intensity (Round 2)					9.18	(1,39)	.004	.17
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the emotion videos	-11.58	3.82	-0.44	0.004				
For Quadrant (Round 2)								
N/A—no final equation								

Table 9. *Final regression equations predicting the four types of emotion detection accuracy (IP1 participants only)*

Predictor	**B**	**SE**	**β**	**p**	**F**	**df**	**p**	**Adj. R^2**
For Emotion Word Detection (Round 1)								
N/A—no final equation								
For Valence (Round 1)					3.92	(3,18)	.03	.29
SHS total score	20.12	11.73	0.56	0.10				
DASS Anxiety	-0.63	0.45	-0.45	0.19				
Abs. value of the lag 2 coefficient of the R1 videoed receiver's IBIs predicting participant's overall	371.86	110.78	0.76	.004				
For Intensity (Round 1)					5.73	(2,19)	.01	.31
Abs. value of the lag 1 coefficient of the R1 videoed receiver's IBIs predicting participant's during the R1 emotion videos	-308.50	104.29	-0.55	.008				
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during 1st baseline	-7.06	3.00	-0.44	0.03				
For Quadrant (Round 1)								
N/A—no final equation								
For Emotion Word (Round 2)					10.33	(2,19)	.001	.47
Abs. value of the lag 1 coefficient of the R2 videoed communicator's IBIs predicting participant's during R2 overall	-133.08	38.45	-0.56	.003				
Sum of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during R2 across all tasks	2.18	0.99	0.36	0.04				
For Valence (Round 2)					6.69	(1,20)	.02	.21
Abs. value of the lag 1 coefficient of the R2 videoed communicator's	-121.78	47.09	-0.50	0.02				

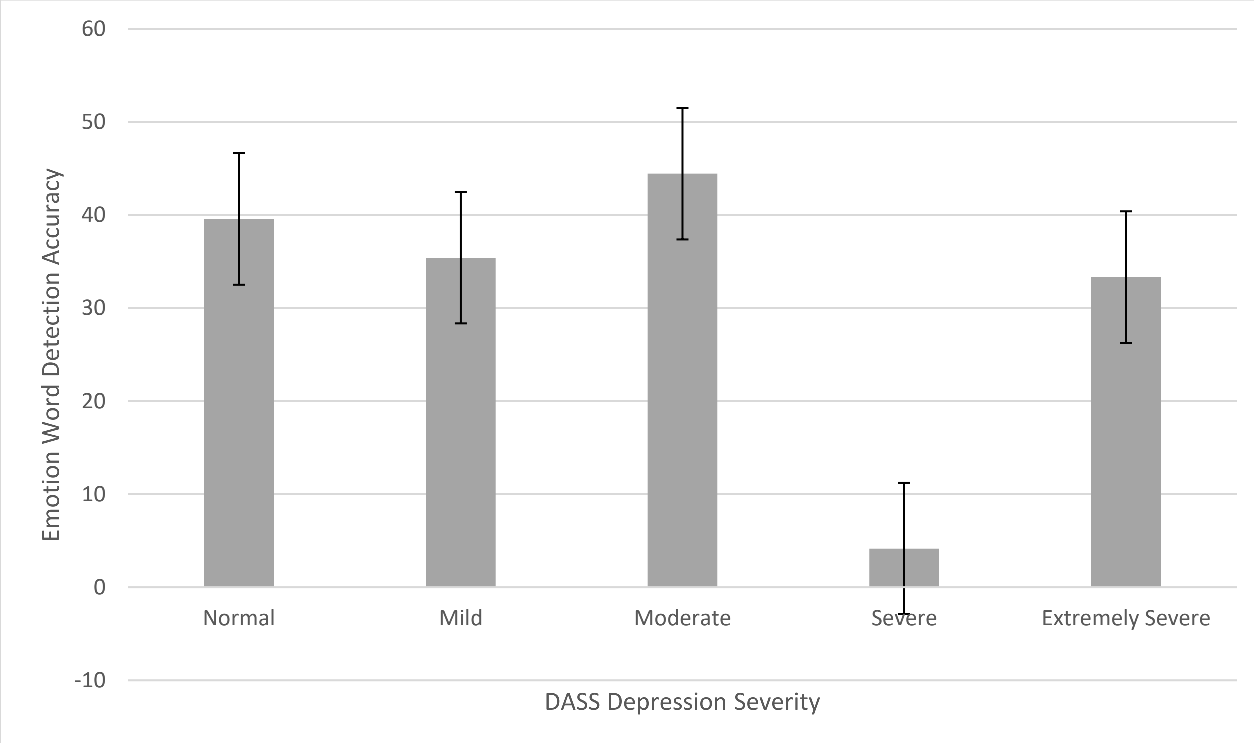
IBIs predicting participant's during R2 emotion videos								
For Intensity (Round 2)					6.49	(1,20)	.02	.21
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during R2 emotion videos	-8.90	3.49	-0.50	0.02				
For Quadrant (Round 2)					9.56	(2,19)	.001	.45
Abs. value of the lag 1 coefficient of the R2 videoed communicator's IBIs predicting participant's during R2 overall	-141.05	38.24	-0.63	.002				
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the 2nd baseline	-3.96	1.18	-0.57	.003				

Table 10. *Final regression equations predicting the four types of emotion detection accuracy (CP1 participants only)*

Predictor	B	SE	β	p	F	df	p	Adj. R^2
For Emotion Word Detection (Round 1)					1.77	(7,15)	.17	.20
DASS_Stress	1.38	1.11	0.39	0.23				
DASS_Anxiety	-1.34	1.84	-0.23	0.48				
DASS_Depression	-1.15	0.91	-0.39	0.22				
SHS_touchscore	-5.99	5.84	-0.33	0.32				
SHS_totalscore	23.66	10.09	0.76	0.03				
LSAS_totalscore	0.11	0.20	0.15	0.58				
Same vs. different race	-13.87	10.69	-0.37	0.21				
For Valence (Round 1)					4.48	(1,19)	.048	.15
Abs. value of the lag 1 coefficient of the R1 videoed communicator's IBIs predicting participant's overall	71.99	34.01	0.44	0.048				
For Intensity (Round 1)					13.37	(3,17)	>.001	.65
DASS Depression	-1.72	0.41	-0.58	0.001				
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during 1st baseline	2.65	0.94	0.38	0.01				
Abs. value of the lag 1 coefficient of the R1 videoed communicator's IBIs predicting participant's during the 2nd baseline	62.79	29.56	0.29	0.049				
For Quadrant (Round 1)					5.76	(2,18)	.01	.32
Abs. value of the lag 1 coefficient of the R1 videoed communicator's IBIs predicting participant's overall	89.30	38.49	0.43	0.03				
# of sig. linked seconds of the videoed R1 receiver's IBIs predicting participant's during 1st baseline	3.41	1.25	0.51	0.01				
For Emotion Word (Round 2)					7.43	(2,16)	.005	.42

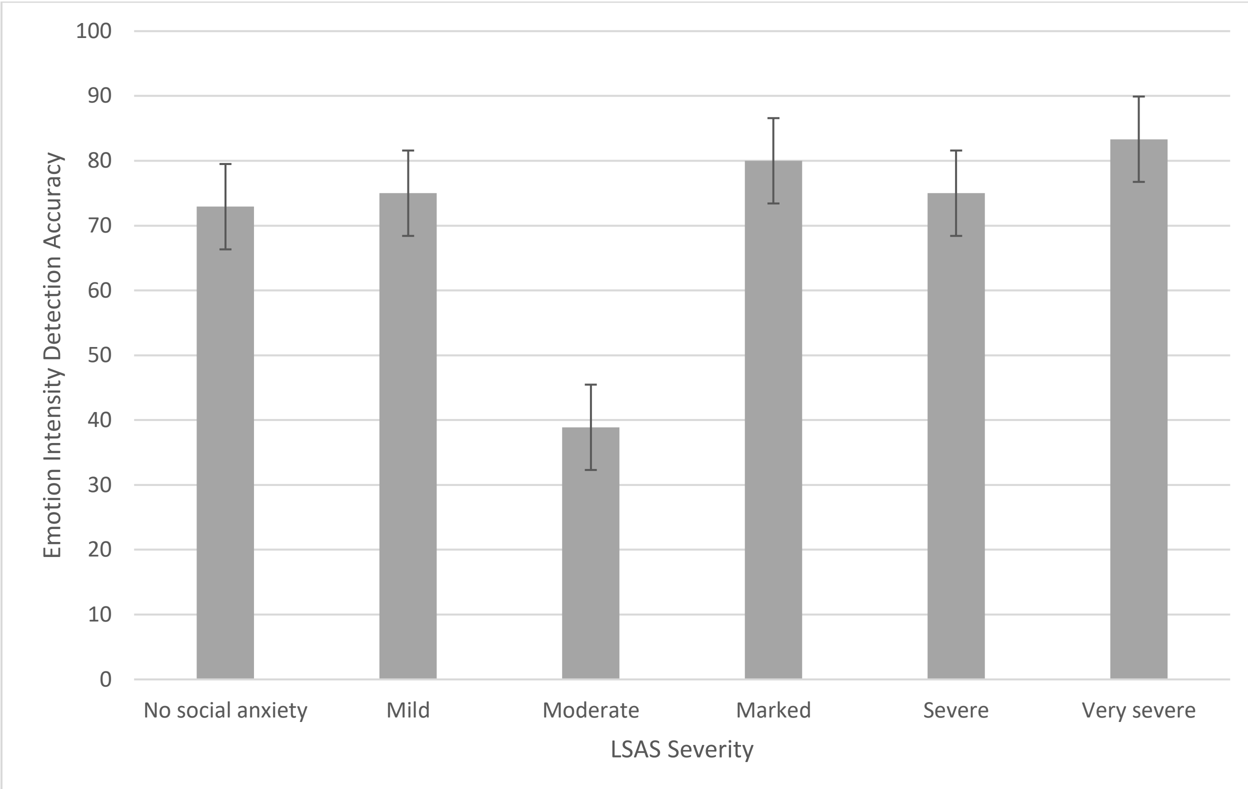
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the R2 emotion videos	-18.67	6.46	-0.52	0.01				
Abs. value of the lag 1 coefficient of the R2 videoed communicator's IBIs predicting participant's during R2 emotion videos	126.00	56.09	0.41	0.04				
For Valence (Round 2)					10.49	(2,16)	.001	.51
DASS Anxiety	-1.90	0.65	-0.49	0.01				
Abs. value of the lag 1 coefficient of the R2 videoed communicator's IBIs predicting participant's overall	-276.06	97.26	-0.47	0.01				
For Intensity (Round 2)					17.19	(3,15)	>.001	.73
DASS Depression	-2.69	0.57	-0.84	>.001				
DASS Stress	2.27	0.67	0.57	0.004				
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the R2 emotion videos	-23.63	9.29	-0.42	0.02				
For Quadrant (Round 2)					6.39	(3,15)	.005	.47
DASS Depression	-2.12	0.66	-0.80	0.006				
DASS Stress	1.80	0.76	0.55	0.04				
# of sig. linked seconds of the videoed R2 communicator's IBIs predicting participant's during the R2 emotion videos	-12.31	10.65	-0.27	0.27				

Figure 1. *Round 1 emotion word detection accuracy by DASS Depression severity*



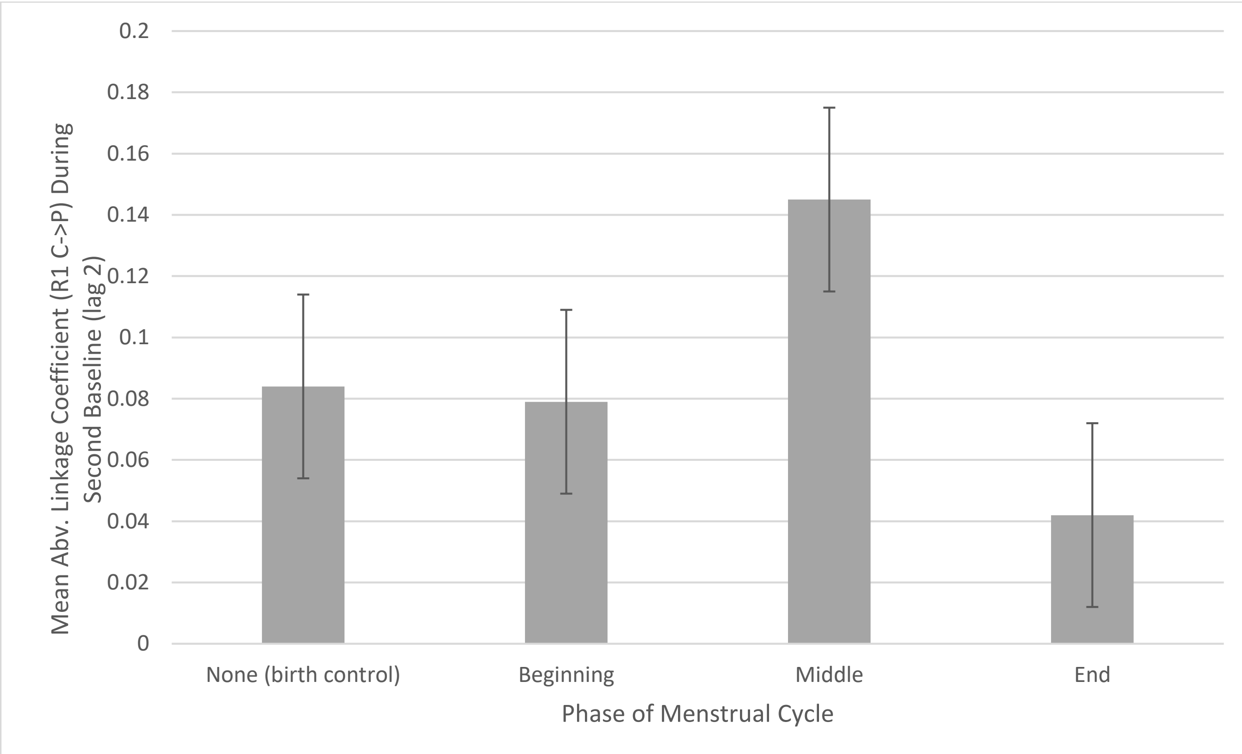
Note. $F(4,42)=2.48$, $p=.06$; mean difference between "Normal" and "Severe", p=.03

Figure 2. *Round 1 emotion intensity detection accuracy by LSAS severity*



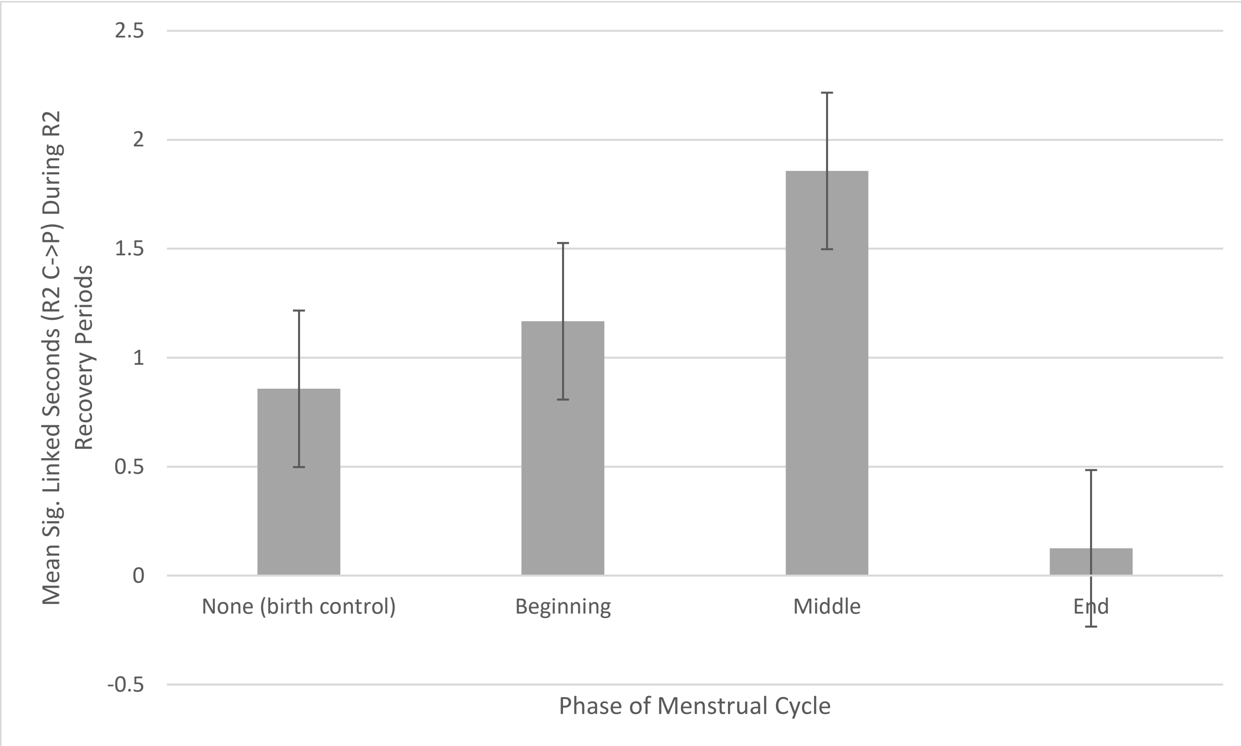
Note. $F(5,41)=3.68$, $p=.008$

Figure 3. *Mean absolute value of the linkage coefficient (lag 2) of the R1 videoed communicator's IBIs predicting the participant's IBIs during the second baseline by menstrual phase*



Note. $F(3,39)=3.03$, $p=.04$

Figure 4. *Mean number of significant linked seconds of the R2 videoed communicator's IBIs predicting the participant's IBIs during the R2 recovery periods by menstrual phase*



Note. $F(3,37)=3.39$, $p=.03$

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APPENDIX A

Mind-Body Laboratory Health History Questionnaire

A very brief medical history must be obtained as part of the experimental protocol. It is very important that you be completely honest. This information will be kept strictly confidential.

1. What is your age, height, weight, and gender?

Age: _____ years

Sex: ___M ___F

Height: _____ feet, _____ inches; weight: _____ pounds

Handedness: ___R ___L

2. Have you ever experienced a concussion or lost consciousness due to a blow to the head?

___ Yes ___ No

If Yes, briefly explain:

3. Have you ever had problems that required you to see a counselor, psychologist, or psychiatrist?

___ Yes ___ No

If Yes, briefly explain:

4. Do you use tobacco products of any kind?

___ Yes ___ No

If Yes, describe what kind how often/much:

5. Have you ever been diagnosed with a psychological disorder?

___ Yes ___ No

If Yes, briefly explain:

6. Do you currently have or have you ever had any of the following?

___ Yes ___ No Strong reaction to cold weather

___ Yes ___ No Circulatory problems

___ Yes ___ No Tissue disease

___ Yes ___ No Skin disorders (other than facial acne)

___ Yes ___ No Arthritis

___ Yes ___ No Asthma

___ Yes ___ No Lung problems

___ Yes ___ No Cardiovascular disorder/disease

___ Yes ___ No Diabetes

___ Yes ___ No Hypoglycemia

___ Yes ___ No Hypertension (high blood pressure)

___ Yes ___ No Hypotension (low blood pressure)

___ Yes ___ No Hepatitis

___ Yes ___ No Neurological problems

___ Yes ___ No Epilepsy or seizures

___ Yes ___ No Brain disorder

___ Yes ___ No Stroke

If you responded Yes to any of the above conditions, briefly explain:

7. Have you ever been diagnosed as having:

___ Yes ___ No Learning deficiency or disorder

___ Yes ___ No Reading deficiency or disorder

___ Yes ___ No Attention deficit disorder

___ Yes ___ No Attention deficit hyperactivity disorder

8. Do you have:

___ Yes ___ No Claustrophobia (extreme fear of small closed spaces)

___ Yes ___ No Blood phobia (extreme fear of needles or blood)

___ Yes ___ No Phobia of any type (if Yes, briefly explain:)

___ Yes ___ No Generalized anxiety disorder

___ Yes ___ No Anxiety disorder of any type (if Yes, briefly explain:)

If you responded Yes, briefly explain here:

9. List any over the counter or prescription medications you are currently taking:

10. List the symptoms that these drugs are treating

11. List any other significant medical conditions that you have or have had in the past:

12. What is your average daily caffeine consumption (approximate number of cups/glasses of coffee, tea, or caffeinated soda)?

13. What is your average weekly alcohol consumption (approximate number of alcoholic beverages)?

14. How many hours of sleep do you average per night?

APPENDIX B

Liebowits Social Anxiety Scale

	Fear				Avoidance			
	None	Mild	Moderate	Severe	Never (0%)	Occasionally (1-33%)	Often (34-66%)	Usually (67-100%)
1. Telephoning in public.	○	○	○	○	○	○	○	○
2. Participating in small groups.	○	○	○	○	○	○	○	○
3. Eating in public places.	○	○	○	○	○	○	○	○
4. Drinking with others in public places.	○	○	○	○	○	○	○	○
5. Talking to people in authority.	○	○	○	○	○	○	○	○
6. Acting, performing or giving a talk in front of an audience.	○	○	○	○	○	○	○	○
7. Going to a party.	○	○	○	○	○	○	○	○
8. Working while being observed.	○	○	○	○	○	○	○	○
9. Writing while being observed.	○	○	○	○	○	○	○	○
10. Calling someone you don't know very well.	○	○	○	○	○	○	○	○
11. Talking with people you don't know very well.	○	○	○	○	○	○	○	○
12. Meeting strangers.	○	○	○	○	○	○	○	○
13. Urinating in a public bathroom.	○	○	○	○	○	○	○	○
14. Entering a room when others are already seated.	○	○	○	○	○	○	○	○
15. Being the center of attention.	○	○	○	○	○	○	○	○
16. Speaking up at a meeting.	○	○	○	○	○	○	○	○
17. Taking a test.	○	○	○	○	○	○	○	○
18. Expressing a disagreement or disapproval to people you don't know very well.	○	○	○	○	○	○	○	○
19. Looking at people you don't know very well in the eyes.	○	○	○	○	○	○	○	○
20. Giving a report to a group.	○	○	○	○	○	○	○	○
21. Trying to pick up someone.	○	○	○	○	○	○	○	○
22. Returning goods to a store.	○	○	○	○	○	○	○	○
23. Giving a party.	○	○	○	○	○	○	○	○
24. Resisting a high pressure salesperson.	○	○	○	○	○	○	○	○

APPENDIX C

Sensory Hypersensitivity Scale

Rate how much you agree with each statement using the following response options: 1 = “Strongly Disagree.” 2 = “Disagree.” 3 = “Neutral/Not Sure.” 4 = “Agree.” to 5 = “Strongly Agree.”

I suffer from allergies

I am allergy-free

I have a number of allergies

I often feel too hot in an environment where others don’t seem to be bothered

I am easily disturbed by high temperatures

I often feel too cold in an environment where others don’t seem to be bothered

I am easily disturbed by low temperatures

My eyes are sensitive to sunlight

I am sensitive to bright light

I am not really bothered by bright lights

I am quite sensitive to pain

I can tolerate a large amount of pain

Things that would ordinarily hurt others are not painful to me

I often react to odors that other do not initially notice

I seem to notice smells that other people do not

I rarely notice smells

When I read, it must be totally quiet

I cannot study or read if there is any conversation or noise around

I can work even in noisy circumstances

I tend to be a picky eater

There are many foods that taste bad to me

I can eat almost anything

I am generally unable to wear clothes made of rough material

I am sensitive to rough textures

I can wear almost any kind of fabric without it bothering me

APPENDIX D

Depression Anxiety Stress Scale

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found myself getting upset by quite trivial things	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I just couldn't seem to get going	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I had a feeling of shakiness (eg, legs going to give way)	0	1	2	3
8	I found it difficult to relax	0	1	2	3
9	I found myself in situations that made me so anxious I was most relieved when they ended	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting upset rather easily	0	1	2	3
12	I felt that I was using a lot of nervous energy	0	1	2	3
13	I felt sad and depressed	0	1	2	3
14	I found myself getting impatient when I was delayed in any way (eg, elevators, traffic lights, being kept waiting)	0	1	2	3
15	I had a feeling of faintness	0	1	2	3
16	I felt that I had lost interest in just about everything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life wasn't worthwhile	0	1	2	3

Reminder of rating scale:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

22	I found it hard to wind down	0	1	2	3
23	I had difficulty in swallowing	0	1	2	3
24	I couldn't seem to get any enjoyment out of the things I did	0	1	2	3
25	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
26	I felt down-hearted and blue	0	1	2	3
27	I found that I was very irritable	0	1	2	3
28	I felt I was close to panic	0	1	2	3
29	I found it hard to calm down after something upset me	0	1	2	3
30	I feared that I would be "thrown" by some trivial but unfamiliar task	0	1	2	3
31	I was unable to become enthusiastic about anything	0	1	2	3
32	I found it difficult to tolerate interruptions to what I was doing	0	1	2	3
33	I was in a state of nervous tension	0	1	2	3
34	I felt I was pretty worthless	0	1	2	3
35	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
36	I felt terrified	0	1	2	3
37	I could see nothing in the future to be hopeful about	0	1	2	3
38	I felt that life was meaningless	0	1	2	3
39	I found myself getting agitated	0	1	2	3
40	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
41	I experienced trembling (eg, in the hands)	0	1	2	3
42	I found it difficult to work up the initiative to do things	0	1	2	3

APPENDIX E

Mind-Body Laboratory Recent Health History Questionnaire (R-HHQ)

A very brief medical history must be obtained as part of the experimental protocol. It is very important that you be completely honest. This information will be kept strictly confidential.

1. When was the last time that you have had any alcohol before the study began?
2. When was the last time you have had a caffeinated beverage before the study began?
3. When was the last time that you ate before the study began?
4. What phase of the menstrual cycle are you currently in (beginning, middle, end, or N/A)?
5. How many hours of sleep did you get last night?
6. Did you engage in vigorous exercise within the last 2 hours?

APPENDIX F

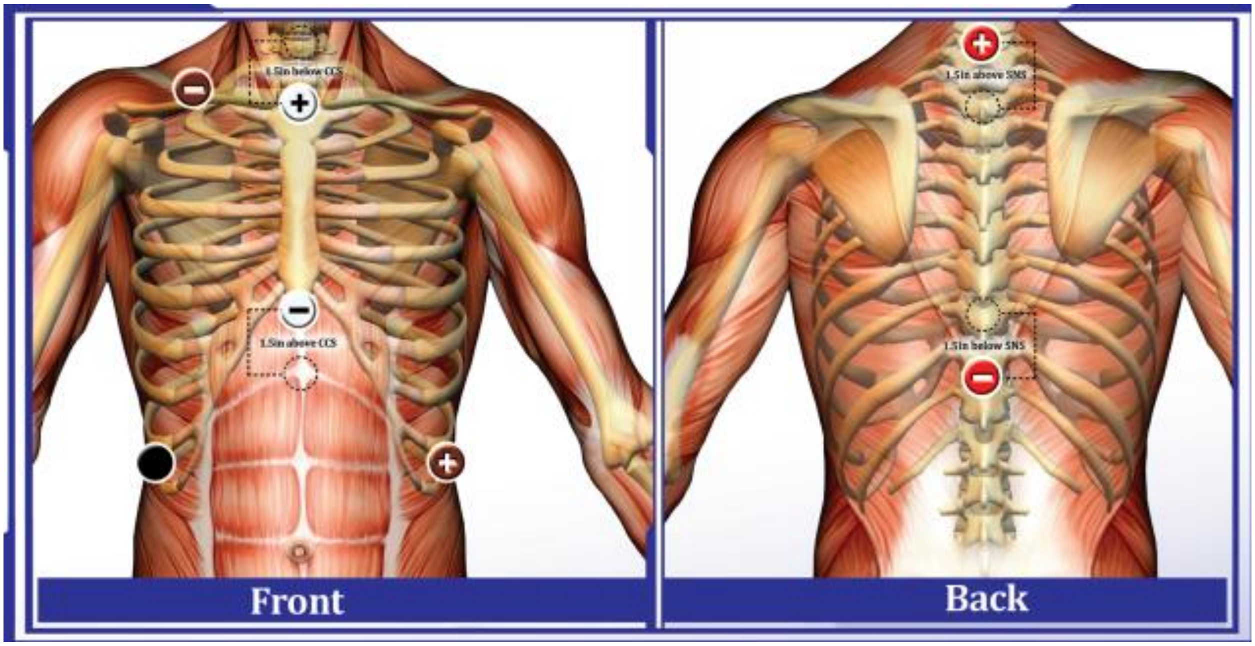

Photo from poster entitled “Electrode Attachment” provided by MindWare Technologies, LTD to users of their physiological recording equipment.