Physiological Synchrony Predicts Reduced Reciprocity in Human Face-to-Face Interactions

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Abstract

Across species, cooperative decisions are often asymmetric: one individual risks their own resources before knowing whether others will reciprocate. Such uncertainty is central to the evolution of trust and reciprocal exchanges. Physiological synchrony is frequently assumed to support cooperation, yet it remains unclear both how synchrony arises and how it functions in these asymmetric social interactions. We tested whether mutual visibility shapes physiological synchrony, and whether synchrony in turn predicts cooperative behaviour in repeated trust-reciprocity exchanges. Skin conductance synchrony was stronger and more temporally aligned when individuals interacted face-to-face, yet facial expressivity did not account for this effect. Contrary to the dominant perspective, higher synchrony predicted reduced reciprocity, and only when partners could see each other. Exploratory analyses suggested that this negative link depended on arousal, indicating that the social function of synchrony is shaped by both mutual visibility and the affective state of the individual involved. These findings show that physiological synchrony is not a uniformly prosocial mechanism but a context-dependent phenomenon that can undermine cooperation under certain conditions, offering insight into the mechanisms and the function of synchrony in shaping cooperative exchanges.

1. Introduction

Across species, cooperative exchanges often involve risky decisions. Individuals expose themselves or their resources, trusting that others will reciprocate rather than exploit. Navigating this uncertainty involves making complex judgments about others' intentions, reliability, and character. Often these judgments are based on past experiences, others' reputations, and social heuristics, but there are times when such information is unavailable – for example, when one individual shares food with a conspecific it has not interacted with before. These decisions of seemingly "blind" trust are actually not blind at all. In humans, they often arise from rapid, intuitive judgments – what we call a 'gut feeling' – shaped by the unconscious exchange of cues that happens during social interaction. Through this ongoing exchange, people's behaviour and bodily states can become spontaneously aligned–a phenomenon known as automatic mimicry or interpersonal synchrony (1,2). Previous research has shown that people are unaware of such synchrony, yet their decisions are nonetheless influenced by it (3,4). Most studies have examined interactions where both partners occupy similar roles – for example, two people deciding to cooperate (4) or two individuals on a date (5). In contrast, many real-world trust interactions involve asymmetrical roles, where the stakes are unequally distributed and one individual risks more than the other. Returning to the food-sharing example, if one individual gives food to another with the expectation it will be reciprocated later, the risk is unbalanced: if the recipient shares in return, trust is reinforced and both benefit, but if they do not, the donor bears the full cost. Employing a state-of-art physiological dyadic set-up, the current study addresses this gap by investigating how physiological synchrony develops during face-to-face interactions between individuals occupying distinct roles, and how this synchrony predicts subsequent trust and reciprocity. By focusing on these asymmetries, we move closer to understanding the core function of synchrony in real-life social interactions – where roles, and their consequences, are often unequal.

The intuition to trust others, as well as the propensity to reciprocate, relies strongly on the ability to see and interact with one another. During face-to-face interactions, there is a continuous and unconscious flow of nonverbal cues that signal emotional states and intentions. This information is critical to form interpersonal judgments, especially in the face of uncertainty or lack of prior information. Falling back on basic evolutionary threat detection mechanisms, we have the ability to automatically evaluate the trustworthiness of a stranger within milliseconds (6), even based on subtle perceptual cues such as facial features (7,8) or pupil size (9–11). Providing immediate access to a partner's emotional signals, face-to-face interaction helps reduce uncertainties about other people's intentions and facilitates social decisions. Research using economic games showed that individuals are more likely to trust, cooperate, and understand one another when they can see and respond to each other in real time, compared to situations where this visual and social feedback is absent (12–14). It is not just seeing a face that matters, but *what* the face displays that most strongly shapes social decisions. For instance, players showing angry facial expressions are rated as untrustworthy and elicit less investment compared to smiling players (15). Moreover, people place greater trust in individuals displaying genuine smiles than in those showing fake smiles (16). Similar results can also be observed in the physiological realm: people are more likely to reciprocate trust and are less likely to cheat when they observe physiological cues like pupil dilation (17,18), which can signal genuine intention and emotional engagement (19).

These findings highlight how the immediacy and richness of face-to-face settings foster trust and prosocial behaviour, perhaps via a deeper interpersonal alignment. During social interactions, the emotional states of individuals tend to spontaneously synchronise across behavioural (20), neural (21), and physiological levels (2). Because this interpersonal synchrony emerges outside of awareness, researchers have proposed that it may function as an embodied mechanism for intuitively predicting others' intentions and emotional states (22,23). From this perspective, synchrony offers a plausible neurophysiological basis for the so-called 'gut feeling' that guides social decisions in uncertain situations. An increasing number of studies support this view, showing that synchrony of different domains aids cooperation, coordination, and compassion (4,24–28). Similar results have even been found when interacting with artificial agents, where behavioural synchrony can facilitate altruistic decisions and positive social evaluation (29,30). Research on economic games has further investigated the role that synchrony plays in more risky decisions, when our stakes are in the firing line of a cheater. During a Public Good Game – secretly investing tokens in a shared pot that will be equally split between players – physiological synchrony rose when participants cooperated (31), and predicted higher reciprocity expectations (32). Likewise, increased synchrony was associated with cooperative decisions (3) and more positive expectations of others' cooperative behaviour (33) during a Prisoner's Dilemma Game – a scenario in which two individuals must choose between cooperating and betraying each other. Although the specific type of physiological synchrony influencing behavior varies – sometimes heart rate (32), sometimes skin conductance (4), or both (31) – it seems to play a significant role in shaping social behavior.

Considering the observed prosocial effects of both synchrony and face-to-face interaction separately on risky social decision-making, a logical next question is whether face-to-face interaction is necessary for the effect of synchrony on decision-making to occur. While this may be more intuitive for behavioural synchrony – we need to see each other for our behaviours to synchronise – it is less obvious for neural and physiological synchrony. We know that synchrony at these levels can also develop without visual cues: it can occur when people are blindfolded in the same room (34), or even while doing the same task in different rooms (35). This happens because they receive the same environmental cues or are engaged in similar tasks at the same time, which can drive synchronisation (36). Yet, visual cues dramatically boost synchrony: for instance, while couples physiologically synchronised when blindfolded, their synchrony was higher when they looked at each other than when not (34). Visual cues not only enhance synchrony but also its effect on behaviour. Behrens et al. (2020) found that SCL synchrony predicted cooperative decisions only when participants were in face-to-face interaction: when visual contact was blocked, synchrony still emerged, but to a lesser extent, and it no longer predicted cooperation (4). Consistent results were also found for inter-brain synchrony (37). This suggests that face-to-face interaction may not be *necessary* for neural and physiological synchrony to arise, but it may allow synchrony to guide our intuitions on other people's intentions. In other words, in the presence of visual cues, synchrony is more likely to reflect genuine social responsiveness. If this is true, then we should not only observe higher overall synchrony in face-to-face interactions – as previous studies have shown (4,37) – but also more coherent temporal dynamics, such as delays in responding to each other (response lag distributions) that reflect mutual alignment. However, previous research has not investigated these temporal aspects of synchrony, focusing instead on average synchrony strength.

All these studies convincingly demonstrate that interpersonal synchrony plays a role in shaping social decisions, often shaped by the presence of visual cues which guide our intuitive social judgments. Most paradigms involve simultaneous decision-making scenarios where both parties' stakes are at risk. As in, they do not represent the sharing food situation, where one person's trust decision precedes and awaits the other's reciprocation. This temporal asymmetry is essential to investigate trust: it reflects both the vulnerability inherent in placing trust before reciprocity is guaranteed – such as paying for a stranger's coffee – and the willingness to reciprocate when defecting has no short-term risks and consequences, like choosing not to repay the favour when there's no expectation of meeting again. Since the literature has primarily focused on economic games where people make the same decision simultaneously, it remains unclear how physiological synchrony informs trust decisions and the willingness to reciprocate when only one party's resources are at risk.

To address this question, we recruited 61 same-sex dyads of strangers to participate in a Trust Game designed to investigate how physiological synchrony and visual cues influence intuitive trust and reciprocity. The Trust Game (38), a widely used economic paradigm (39–41), is a good approximation of real-world scenarios where trust involves unilateral vulnerability: in which one player, the trustor, decides how much of their own resources to entrust to the other player, the trustee, who then decides how much to return. Critically, trustors received no feedback about trustees' decisions during gameplay, maintaining uncertainty, thereby increasing ecological validity. Each dyad played a modified version of the iterated Trust Game under two counterbalanced conditions: face-to-face, where they could see each other, and face-blocked, where a visual barrier prevented any visual contact. Throughout the sessions, we continuously recorded facial expressions via cameras, alongside physiological measures including heart rate and skin conductance level. Building on previous findings (4,37), we hypothesise that (1) physiological synchrony, and (2) both trust and reciprocity will be higher when participants can see each other compared to when they cannot; and (3) physiological synchrony will be positively associated with trust and reciprocity, but only when interacting face-to-face. Additionally, if hypothesis 1 is supported, we aim to explore whether the degree of facial expressivity further facilitates physiological synchrony in face-to-face settings.

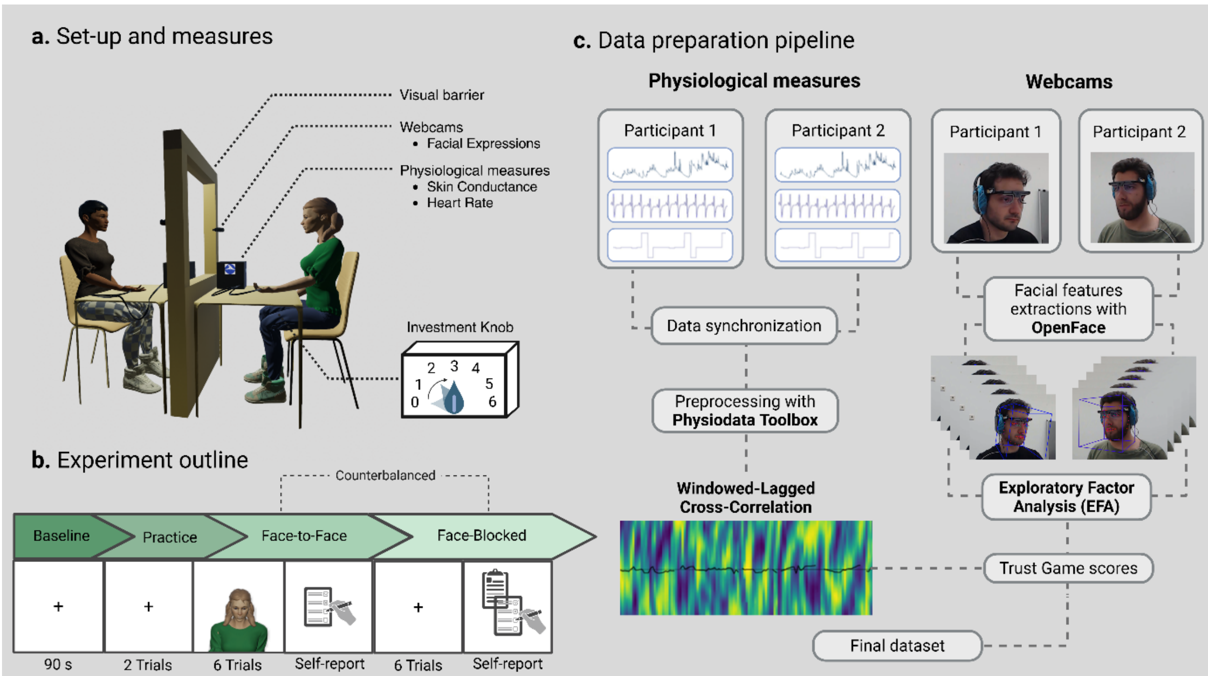

*Figure 1: **Set-up, task outline and data preparation. (a)** Participants sat at a table divided by a visual barrier and made investments using a hidden knob. Facial behaviour was recorded via webcams, and physiological activity (skin conductance and heart rate) was recorded with a BIOPAC system. **(b)** The experiment began with a 90-s baseline and two practice trials, followed by two counterbalanced conditions (Face-to-Face vs. Face-Blocked), each consisting of six trust game trials. After each block, participants completed self-report questionnaires. **(c)** Physiological data were synchronised, preprocessed with the Physiodata Toolbox, and analysed for dyadic synchrony using windowed lagged cross-correlation. Webcam recordings were processed with OpenFace to extract facial action units, which were reduced via exploratory factor analysis. Physiological synchrony, facial factors, and action unit measures were then merged with trust game outcomes to form the final dataset.*

2. Methods

2.1 Participants

122 healthy volunteers participated in the study (56 females, mean age =21.47; SD = 4.24), recruited via the Leiden University recruitment platform (SONA) or by personal arrangement with the researcher. Participants were paired in dyads, each including two individuals of the same sex who were unacquainted (N=61). The inclusion criteria were unimpaired or corrected-to-normal vision, no previous or current

history of psychological and neurological conditions, and no regular use of psychoactive substances. The study was conducted in the laboratories of Leiden University. Two participants were excluded due to non-respondence in skin conductance (levels below 2 μS). Because of the dyadic nature of the study, participants with missing values from individual measures were excluded pairwise, leaving 59 dyads (N=118) for all analyses. Participants were compensated either with course credits or with a monetary reward based on the standard hourly rate of Leiden University, and they could earn a bonus of a maximum of 2.5€ based on one randomly selected trial, of which we calculated an amount relative to their final capital. All participants were 18 years old or older, and written informed consent was obtained from each of them before the start of the experiment. The experimental procedures followed the Declaration of Helsinki and were approved by the Ethical Committee of the Faculty of Behavioural and Social Sciences of Leiden University (no. Kret-V2-3172).

2.2 Design and procedure

We used a 2x2 repeated measures mixed-design, with conditions as a two-level within-subject factor (Face-to-Face, Face-Blocked) and game role as a two-level between-subject factor (Trustor, Trustee). Trust and Reciprocity were operationalised as Trustor's Investment and Trustee's Return respectively for each trial (see *Variables Quantification*). Physiological synchrony, expressed by the degree of correlation between the physiological signals of the participants, was calculated using the Windowed Lagged Cross-Correlation (WLCC) (42).

Participants arrived at the experimental location a few minutes apart. Upon arrival, each participant was escorted separately into different preparation rooms to ensure no prior contact. After reading the information letter and signing the informed consent form, researchers applied electrodes (see *Physiological data acquisition and preparation*). Participants were then informed of their assigned role and received both oral and written instructions for the Trust Game. To ensure that the participants understood the task and their respective roles, they answered three control questions. If a participant did not answer a question correctly, the game was explained again until they were able to answer correctly. Participants were then guided separately into the lab, wore headphones for audio instructions, and were seated at a table 1.25 meters long, divided by a visual barrier to prevent mutual visibility (see *Figure 1*). The experiment began with a 90-second baseline measurement to allow participants' physiological activity to stabilise before the task began, followed by two practice trials with the visual barrier in place. After two practice trials, the main task consisted of two blocks of the Trust Game, each consisting of 6 trials of the trust game for a total of 12 trials (see *Materials*). One block was conducted in the Face-to-Face condition, allowing participants to see each other, and the other in the Face-Blocked condition, in which a blind prevented visual contact (see *Figure 1*). The order of conditions was counterbalanced across dyads. After the first block, participants completed a series of self-report questionnaires. At the end of the block, a second 90-second baseline recording was collected, after which participants filled out the self-report questionnaires again. Upon completion, electrodes were removed, and participants were brought into separate rooms to fill out trait questionnaires and final self-reports. Finally, they were debriefed and compensated for their participation. Crucially, participants could not see each other when filling out the post-block self-reports.

2.3 Materials

Trust game

The task was programmed in E-Prime (Psychology Software Tools, Inc., 2016), and participants received prerecorded instructions of the experiment via headphones. In the trust game, participants play either in the role of the trustor or the trustee. Both participants start with a capital of 6€. The trustor is the first to decide how much to invest in the trustee (0€-6€). The amount invested is tripled and sent to the trustee (i.e., added to their capital), who decides how much to reciprocate to the trustor. The amount sent back by the Trustee is not tripled again. After each trial, the remaining balance of both the trustor and trustee is registered, and the funds are reset to 6€ as a new endowment for the subsequent trial. Participants invested using a customised knob with seven steps (0-6). The knob was hidden under the table, and participants received auditory feedback on the amount chosen, so they did not have to look at it. Since the amount the trustee had available will typically exceed 6€ when the trustor invested more than 0€, the steps on the knob became functionally representative of proportions of the total amount received (e.g., setting the knob to 3 returns 50%, 4 returns 66.67%, and so on). While adjusting the knob, participants received auditory feedback indicating the corresponding euro amount for each setting, rather than the percentage, just as with the original values.

Importantly, the trustor did not receive feedback about how much the trustee returned after each trial. Prior work demonstrated a causal link between beliefs on the trustee's reciprocity and the investment of the trustor in the subsequent trials (43). Thus, feedback about trustees' decisions was intentionally omitted to isolate the putative effects of nonverbal behaviour and physiological synchrony on trustors' choices.

Self-report

Participants completed a series of self-report questionnaires. After completing each interaction block, they rated their co-player's trustworthiness, the smoothness of the interaction, and the awkwardness of the interaction on a 7-point Likert scale, and completed the Inclusion of Other in the Self (IOS) scale (44). The IOS is a single-item pictorial measure that presents participants with a series of seven increasingly overlapping circles labelled "Self" and "Other", and asks them to select the pair that best represents their perceived closeness to the co-player. At the end of the experiment, participants provided overall ratings of their co-player's attractiveness and similarity, and filled out a demographic questionnaire. Here, participants additionally completed the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001), the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987), and the Judgment of the Self in the Other questionnaire (47). These measures were collected for other purposes beyond the scope of this paper.

2.4 Physiological data acquisition and preparation

Throughout the experiment, three different physiological signals were measured: skin conductance level (SCL), heart rate (HR), and pupil dilation. The former two were collected using the electrodermal activity (EDA) and electrocardiography (ECG) modules of the BIOPAC MP150 data acquisition system, sampled at 2000 Hz. Pupil dilation and eye movements were recorded using Tobii Pro Glasses 2. The software AcqKnowledge (AcqKnowledge v. 5.0; BIOPAC Systems Inc.). AcqKnowledge software (AcqKnowledge v. 5.0; BIOPAC Systems Inc.) was used to record and synchronise physiological signals, event markers from E-Prime, and markers sent by the eye-tracking glasses. Physiological signals were preprocessed using the Physiodata Toolbox (48) and down-sampled at 20Hz for subsequent analyses.

Although pupil size data were collected with the initial intention of including them in the present analyses, we ultimately excluded them due to insufficient data quality. Participants frequently moved their heads, particularly during decision-making phases, resulting in substantial data loss. Moreover, pupil size measurements were heavily affected by luminance changes in the environment.

Skin Conductance

Two electrodes were placed on the intermediate phalanges of the index and ring fingers of the non-dominant hand. To ensure optimal signal quality, a rest period of approximately 15 minutes was adopted between electrode placement and the start of data collection. Using PhysioData Toolbox, the raw SC signal was low-pass filtered at 2 Hz to remove high-frequency noise and then visually inspected for artefacts. Short-duration artefacts (< 2s) were removed and replaced using linear interpolation.

Heart Rate

Two electrodes were placed on the left side of the abdomen and below the right collarbone. The Physiodata Toolbox was used to extract 20 Hz continuous instantaneous heart rate (IHR) signals. The raw ECG signals underwent band-pass filtering at 1-50 Hz, R-peak detection, and inter-beat interval (IBIs) extraction. R-peaks were visually inspected and corrected if missed or incorrectly detected. For continuous and smooth heart rate data, inter-beat intervals (IBIs) at these locations were linearly interpolated. Participants who had less than 30% coverage of IBIs relative to the overall duration of the time signal were excluded from further analysis. The heart rate data used for analysis were expressed in beats per minute (bpm).

2.5 Facial expressions data acquisition and preparation

Videos were recorded using two Logitech HD webcams, synchronised via AcqKnowledge software to ensure precise temporal alignment with physiological signals from BIOPAC systems and marked event epochs. Due to technical issues, five dyads were excluded because of camera failure, and an additional four dyads were removed due to insufficient usable video data. Facial behaviour analysis was conducted using OpenFace 2.2.0, an open-source tool for facial landmark tracking and facial action unit (AU) recognition (49). Each video was processed with OpenFace's *FeatureExtraction* module, which automatically detects faces and extracts a range of frame-by-frame features. For each frame, OpenFace automatically detects faces in video frames and extracts 2D and 3D facial landmarks (68-point model), which are then used to compute facial Action Units (AUs). The AU detection used pre-trained classifiers integrated into OpenFace. The output includes time-aligned measurements of AU presence and intensity for each frame, enabling quantitative analysis of facial expressions over time. The software estimated 17 AUs with an average confidence of 92.2%. We recorded a total of 836495 frames across the experiment. Frames in which participants' faces were not trackable due to movement, data loss, or poor video quality were excluded from analysis. This amounted to 9698 frames, leaving 826797 frames for the final dataset.

2.7 Variable quantification

Trust and Reciprocity

To assess social behaviour during the Trust Game, we computed two key variables. Trustor Investment, ranging from 0 to 6 euros, was used as a measure of Trust (40), with higher investments indicating greater willingness to invest resources for the partner's disposal. On average, Trustors invested €4.14 (SD = 1.63). For the analysis, Trust was normalised to rescale it between 0 and 1. This approach was chosen to enhance interpretability and avoid heteroscedasticity and multicollinearity issues. Reciprocity was assessed using the return ratio, a standard measure in Trust Game research (40). The return ratio is calculated as the proportion of the amount received by the Trustee that is returned to the Trustor:

$$Return\ Ratio = \frac{\gamma}{3\chi}$$

where γ is the amount received by the Trustee and 3χ is the tripled investment from the Trustor. This approach allows for a direct assessment of relative reciprocity, independent of the absolute amounts invested by the Trustor. On average, Trustees returned 61.6% (SD = 34.4 %) of what they received, consistent with the range found in previous studies (40,50).

Physiological synchrony

We quantified physiological synchrony using a Windowed-Lagged Cross-Correlation (WLCC) approach (51) for heart rate (HR) and skin conductance level (SCL) separately. This method estimates the strength of the association between two physiological time series while accounting for non-stationarity and temporal lag between the signals, both of which are essential features of dynamic dyadic interactions. To address non-stationarity, each time series was segmented into overlapping windows, allowing the cross-correlation to vary across time. Lag was incorporated by shifting one series relative to the other within each window, identifying moments of strongest alignment. This approach provides a fine-grained and time-sensitive estimate of physiological synchrony that reflects the fluid nature of interpersonal exchanges. Four parameters define the analysis: (1) the window size (w_{max}), or length of each segment; (2) the window increment (w_{inc}), or how far the window shifts along the time series; (3) the maximum lag (τ_{max}), or the largest temporal offset allowed between segments; and (4) the lag increment (τ_{inc}), or the step size used to vary the lag between segments. Following established procedures in the literature (4,5), and considering both physiological plausibility and the dynamics of the interaction, we set the WLCC parameters as follows: a window size of 8 s (160 samples), a window increment of 2 s (40 samples), a maximum lag of 4 s (80 samples) and a lag increment of 100 ms (2 samples). For each dyadic interaction, the strength of synchrony was operationalised as the average of the peak cross-correlation values across all windows.

Physiological synchrony is known to develop gradually over time as individuals attune to each other's signals. Therefore, physiological synchrony cannot be reliably assessed during the first trial of a block, as participants require time to synchronise, and residual effects from the previous block may still influence their responses. Therefore, we excluded the first trial of each condition to better isolate steady-state synchrony once dyads had sufficient time to physiologically align.

To confirm that our synchrony measures reflected interpersonal coupling, we tested for pseudo synchrony by comparing real and pseudo-dyads using Fisher z-transformed correlations of SCL and HR, separately for each condition. All details on the pseudo synchrony analysis are provided in the Supplementary Information.

Synchrony Lag

We not only examined the average peak cross-correlation as a measure of physiological synchrony but also analysed the lag at which this peak occurred. For each dyad and window, the lag value was defined as the time shift (in seconds) at which the maximal cross-correlation between partners' physiological signals occurred, as identified by the WLCC procedure (51). Within each analysis window, one participant's time series was systematically shifted relative to the other's time series in increments of 100 ms, across a maximum lag range of ±4 seconds. The lag corresponding to the peak cross-correlation coefficient was extracted for each window, yielding a distribution of lag values that reflects the temporal alignment of physiological responses over the course of the interaction. This approach provides a fine-grained, temporal measure of the direction and magnitude of synchrony, with lag values close to zero indicating near-simultaneous physiological changes, and larger absolute values reflecting delayed coordination between partners.

Facial Expressivity

To extract patterns of facial expression in the AU data, we conducted an Exploratory Factor Analysis (EFA) on the full dataset using the *factor_analyzer* package in Python. We used principal axis factoring to extract factors, followed by varimax rotation to improve interpretability by minimising cross-loadings. The number of factors to retain was determined through a scree plot and Kaiser's criterion (eigenvalues > 1), resulting in the extraction of 5 factors explaining a total of 33.4 % of the variance. Factor loadings were computed using a threshold of $|0.3|$ to identify meaningful contributions to each factor (52). As a further control, we computed correlations between factors and AUs in the target dataset, confirming that the factors derived from the full data still showed meaningful AU associations ($0.35 \leq |R| \leq 0.96$). The full analysis is presented in the *Supplementary Materials.* We report the factor loading and a potential interpretation of the action units' co-activation in Table 1.

Factors	Key AUs	Factor Interpretations
Factor 1	AU12 (lip corner puller), AU10 (upper lip raiser), AU06 (cheek raiser), AU14 (dimpler)	Enjoyment smile (6+12) (52), Affiliation smile (10+12+14) (53).
Factor 2	AU01 (inner brow raiser), AU02 (outer brow raiser)	Eyebrows up (1+2) as a conversational sign (52)
Factor 3	AU20 (lip stretcher), AU15 (lip corner depressor), AU17 (chin raiser)	Discomfort or negative affect (54)
Factor 4	AU26 (jaw drop), AU17 (chin raiser), AU23 (lip tightener), AU09 (nose wrinkler)	Controlled negative reaction
Factor 5	AU04 (brow lowerer)	Frown (53)

*Table 1: **Summary of Factor Loadings and Interpretations for Facial Action Units (AUs)**. A factor analysis was conducted on the facial expression data. AU contributing to the factors are listed in order of their loadings, from highest to lowest. Factors were interpreted based on the AUs with the highest loadings and their known emotional associations according to the literature. Factor labels reflect common AU combinations and potential corresponding affective states.*

2.8 Analysis

All analyses were conducted using linear mixed-effects models, implemented in R (version 4.1.2) using the *lme4* package (55). Models were fit separately to test each hypothesis and included random intercepts for Dyad to account for the non-independence of observations within dyads. Condition was the only factorial predictor and was treatment-coded, with Face-Blocked as the reference category. We report the intraclass correlation coefficient (ICC) from null models to quantify the proportion of variance explained by between-dyad differences. To assess the magnitude of observed effects, we report f^2 as a measure of the proportion of variance explained uniquely by a specific predictor, relative to the unexplained variance in the full model. Following Cohen's (1988) guidelines, values of $f^2 = 0.02$, 0.15, and 0.35 are interpreted as small, medium, and large effect sizes, respectively. All models used maximum likelihood estimation (LRT) for model comparison. For significant interactions, simple slope analyses or estimated marginal means were conducted to probe the nature of the interaction and identify the source of the effect. Residual diagnostic was performed using the *DHARMA* package (56). In cases where residuals significantly deviated from normality (as indicated by a significant Kolmogorov–Smirnov test), we applied a clustered parametric bootstrap to obtain robust confidence intervals. In cases where outlier tests indicated influential points, we repeated the analysis excluding those observations. In both cases, the results remained consistent and robust for all models (see *Supplementary Materials*). Full model specifications and residual diagnostic are detailed in the *Supplementary Materials*.

Hypothesis Testing

To test our first hypothesis (**H1**), namely that skin conductance level (SCL) synchrony would be higher in the Face-to-Face compared to the Face-Blocked condition, we built a linear mixed-effects model predicting dyadic SCL synchrony with Condition as a fixed effect and Dyad as a random intercept (**Model 1**). Including a random intercept for Dyad was appropriate as it explained 63,8% of the variance in SCL Synchrony (ICC = 0.638). This model tested whether being visually co-present enhanced physiological synchrony between interacting partners.

To further explore differences in the temporal dynamics of synchrony, we analysed the distribution of lag value – defined as the time shift (in seconds) at which maximal cross-correlation between partners' SCL signals occurred. We used the Anderson–Darling k-sample test, a nonparametric method for comparing the equality of distributions, to test whether the lag distributions differed between conditions. The AD test does not require specifying the distributional form of the underlying populations. Instead, it allowed us to assess whether all lag values – across Face-to-Face and Face-Blocked conditions – could plausibly have been drawn from a single, common population, without assuming which distribution that is. Namely, whether synchrony in the Face-to-Face condition followed a more coherent, Gaussian-like pattern centred around zero (lag = 0: perfect temporal synchrony), while the Face-Blocked condition would show a more dispersed, noisy distribution, reflecting less coordinated physiological coupling. A statistically significant result indicates that the lag distributions between conditions are unlikely to be explained by sampling variation from a shared underlying population, supporting the inference that the synchrony dynamics differ between experimental contexts. Visual inspection complemented statistical results to evaluate the central tendency and dispersion of lag values across conditions.

Since H1 was supported, we proceeded to investigate whether this enhanced physiological alignment was associated with greater facial expressivity between partners. Facial expressions were entered in an exploratory factor analysis of time series data extracted from facial action units (see *Variable Quantification*). A repeated-measures ANOVA was conducted with five facial expression factors as within-subject variables and Condition as a between-subjects factor. Holm-corrected pairwise comparisons were used to follow up on significant effects. Next, we computed an Overall Expressivity score by averaging the absolute values of Factor 1, Factor 2, and Factor 3 scores for each participant – these being the components associated with greater expressivity in the Face-to-Face condition. This composite measure was used to predict SCL synchrony using a linear mixed-effects model. The model included Condition, Overall Expressivity, and their interaction as fixed effects, with a random intercept for Dyad.

To investigate whether trustors' investments (**Trust**) and the amount returned by the trustees (**Reciprocity**) were higher when participants could see each other compared to when they could not (**H2**), we fitted two linear mixed-effect models. First, we modelled Trust as a function of Condition, including random intercepts for Dyad (**Model 2**). The null model showed that 49,6% of the variance in Trust was explained at the dyad level (ICC = 0.496). As this model yielded a null result, we conducted an exploratory follow-up analysis to examine potential order effects, under the assumption that beginning with a Face-to-Face interaction may have influenced subsequent behaviour in the Face-Blocked condition. Even though the order of conditions was fully counterbalanced, it is possible that beginning with either face-to-face or face-blocked interactions shaped Trustors' strategies and first impression, thereby affecting the behaviour in the subsequent condition. (i.e., once having seen the Trustee's face, the Trustor may not be able to "unsee" them). Thus, we extended the model to include Order (whether participants began in the Face-to-Face or Face-Blocked condition) and its interaction with Condition (**Model 2.1**), comparing model fit using likelihood-ratio tests (LRTs). Similarly, we examined Reciprocity using a linear mixed-effects model predicting returns from Condition, with random intercepts for Dyad (**Model 3**). The null model indicated that 38,9% of the variance in Reciprocity was attributable to between-dyad differences (ICC = 0.389).

Crucially, including Order of Conditions when predicting Reciprocity did not improve the model fit ($\chi^2(2) = 4.11$, $p = .127$).

Finally, we tested whether Trust and Reciprocity were higher in dyads that were more physiologically synchronised (**H3**). To achieve this, we extended Model 2.1 to also include the mean-centred SCL synchrony as a predictor of Trust. The model, therefore, included mean-centred SCL synchrony, Condition, Order of Condition, and all interactions, including random intercepts for Dyads (**Model 4**). Order of Condition was also included as a fixed factor, based on the effect observed in Model 2.1, where order moderated the effect of Condition on Trust. Following the same analytical pipeline, we extended Model 3 to include mean-centred SCL synchrony as a predictor of Reciprocity. The model included Condition, SCL synchrony, and their interaction as fixed effects, again including Dyad as a random effect (**Model 5**). Model fit was not significantly improved by including the Order of Condition ($\chi^2(2) = 2.35$, $p = .124$) as a predictor.

Exploratory analysis

Because we did not observe the expected association between physiological synchrony and trust, and given the unexpected negative link between synchrony and reciprocity, we conducted a series of follow-up analyses aiming at identifying potential moderating factors and contextual influences that could clarify these patterns. Therefore, all follow-up analyses from this point onward should be considered exploratory.

To quantify the evidence of absence for the null effect observed in Model 3, we conducted a Bayesian mixed-effects model. The model was estimated using the *brms* package (57) in R, which provides an interface to the Stan computational framework. The continuous predictor was centred, and the factorial predictors were sum-zero coded. The model was estimated using four chains, each with 4000 iterations (including 1000 warm-up samples). We used regularising Gaussian priors with $M=0$ and $SD=5$ for fixed effects and the default half Student t priors with 3 degrees of freedom for the random effects and residual standard deviations. We checked model convergence by inspecting the trace plot, the histogram of the posteriors, the autocorrelation plots (58), and the Gelman-Rubin diagnostic. To assess the strength of evidence for the absence of an interaction between Condition and SCL synchrony, we compared the full model, including the interaction term, to a reduced model excluding this interaction using a Bayes Factor analysis based on bridge sampling (59). The resulting Bayes factor quantifies the relative evidence in favour of the full model versus the simpler model and thus allows us to evaluate support for the null hypothesis.

Given the asymmetry of the trust game where trustors were naïve to trustees' decisions and trustees had all the information, we explored whether the effect of synchrony on trustees' behaviour was further moderated by the trustor's arousal during investment. To do this, we used a linear mixed-effects model with Condition, SCL synchrony (centred), mean Trustor's SCL level (z-scored), and all levels interactions as fixed effects, and random effects for Dyads (**Model 6**). To interpret the three-way interaction, we used the *interact.plot* function to visualise the effect of SCL synchrony on Reciprocity across levels of Condition and at three values of the continuous moderator (mean -1 SD, mean, mean + 1SD). We conducted simple slope analyses to statistically probe the conditional effects of SCL synchrony at these values. Crucially, adding the Trustor's arousal significantly improved the fitting of the model ($\chi^2(3) = 11.39$, $p = .022$).

3. Results

Effect of visual contact on synchrony

First, we confirmed that our synchrony measures reflected interpersonal coupling by comparing real and pseudo-dyads' synchrony for SCL and HR, separately for each condition (*Method*). SCL synchrony was greater in real than pseudo-dyads in the Face-to-Face condition only ($p = .032$), supporting genuine interaction effects. HR synchrony showed no such pattern, in line with previous studies (60). Given this, we focused our subsequent analyses on SCL synchrony.

A small but significant difference between conditions was observed in **Model 1**, with synchrony being higher when participants could look at each other compared to when they could not ($\beta = 0.020$, $p = .020$, $t = -2.322$, $f2 = 0.007$), in line with existing literature (4) (*Figure 2*). In physiological synchrony, in most instances, there is a time difference between the two interaction partners. This so-called lag reflects the temporal alignment of skin conductance synchrony between dyad members across trials. We also observed a significant difference in the lag distribution where maximum synchrony was found between conditions ($AD = 12.01$, $T.AD = 14.50$, $p < .001$). Visual inspection showed that in the Face-to-Face condition, the lag distribution was centred around zero and approximately normal, suggesting a more coordinated turn-taking and coupled interactions (*Figure* 2). In contrast, the Face-Blocked condition exhibited a more dispersed and irregular lag distribution, suggesting a breakdown in temporal alignment when visual contact was absent.

Since Hypothesis 1 was confirmed, we tested whether overall facial expressivity differed between conditions. A repeated-measures ANOVA indicated that participants were overall more expressive in the Face-to-Face condition ($F(1, 615) = 63.53$, $p < .001$, $\eta^2 = .022$), with post-hoc comparisons indicating higher expressivity for Factor 1 ($p < .001$), Factor 2 ($p = .001$), and Factor 3 ($p < .001$), while Factor 4 ($p = .001$) and Factor 5 ($p < .001$) were more expressed in the Face-Blocked condition (see *Supplementary Materials* for full results). Specifically, positive and affiliative facial expressions, conversational signals, as well as indicators of distress were more pronounced in the face-to-face condition, whereas frowning or expressions associated with controlled or negative affect were more prominent in the face-blocked condition. To further explore potential associations between facial expressivity and physiological synchrony, we fitted a linear mixed-effects model including Condition, Overall Expressivity, and their interaction; Overall Expressivity was not a significant predictor of SCL synchrony ($p = .410$). This finding is consistent with the correlation matrix (see *Figure 3*), where SCL synchrony was weakly correlated also with individual Action Units (all $|R\text{s}| < .13$), suggesting that facial expressivity – whether aggregated or at the level of specific AUs – was not strongly associated with physiological synchrony in our study.

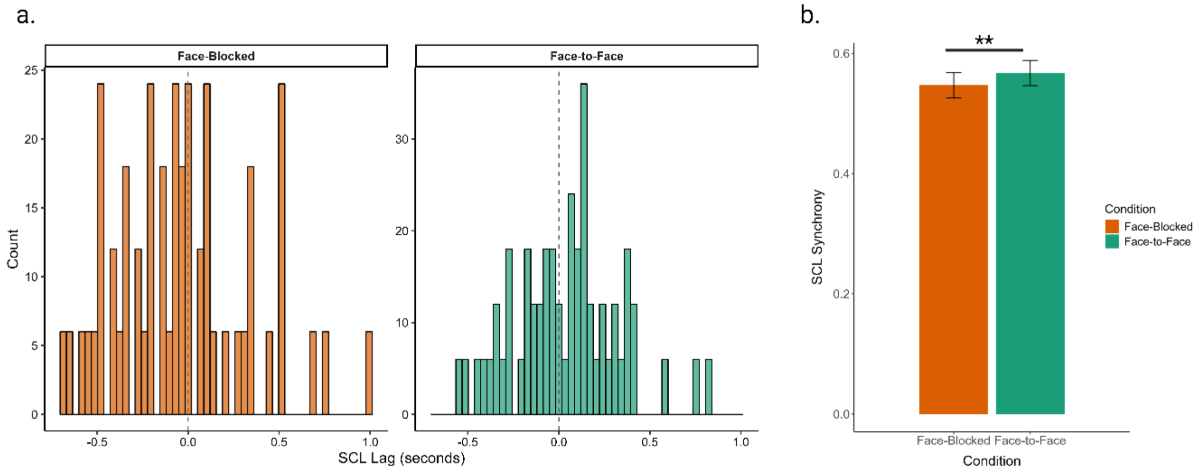

Figure 2: Differences in Physiological Synchrony and Lag Distributions between Face-to-Face and Face-Blocked Interaction Conditions. a) distribution of physiological synchrony lags (in seconds) for Face-to-Face (FTF) and Face-Blocked (FB) conditions. The FTF condition shows a lag distribution centered around zero and approximately normal, indicating tight temporal alignment and coordinated turn-taking between dyad members; b) Predicted values of skin conductance level (SCL) synchrony for each condition

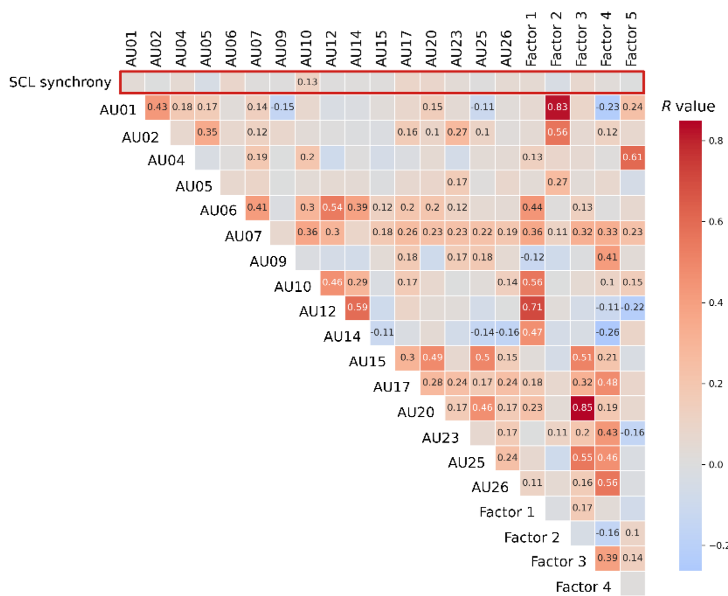

*Figure 3: **Correlations among AU factors, individual AUs, and SCL Synchrony**. Correlation matrix displaying relationships between factor scores derived from the Action Unit factor analysis, individual Action Unit activities, and the dyadic SCL synchrony level. Only correlation coefficients with an absolute value greater than 0.1 (R > |0.1|) are reported to highlight meaningful associations.*

Effect of face-to-face interaction on Trust and Reciprocity

Trust

Model 2 revealed a marginal effect of Condition ($\beta = 0.025$, $t = -1.769$, $p = .077$, $f^2 = 0.004$), with slightly but not significantly higher investments in the face-to-face condition. When adding the Order of Conditions and its interaction with Condition to the model (**Model 2.1**), the fitting of the model improved ($\chi^2(2) = 12.59$, $p = .001$). The interaction was significant ($\beta = 0.088$, $t = -3.039$, $p = .002$, $f^2 = 0.022$), indicating that the effect of Condition on Trust was dependent on the order in which participants played the game *(Figure 4*). Estimated marginal mean comparisons revealed that, in dyads that started playing face-blocked and then moved to face-to-face (Order 2), trustors showed an increase in their investment during the face-to-face interaction ($t = 3.392$, $p < .001$), while in dyads who began with face-to-face and then moved to face-blocked (Order 1), trustors maintained relatively stable investments ($t = -0.9494$, $p = .343$). This pattern indicates that once the trustor had seen the trustee, they had formed a first impression that carried over into subsequent face-blocked interactions. In other words, after "giving a face" to the trustee, trustors may have continued to interact based on that impression–even when visual contact was no longer possible.

Reciprocity

In **Model 3**, we observed a significant main effect of Condition ($\beta = 0.071$, $t = 3.525$, $p <.001$, $f^2 = 0.018$), indicating that trustees reciprocated more in the Face-to-Face condition than in the Face-blocked condition (*Figure 4*). This effect is in line with previous literature indicating that face-to-face communication fosters prosocial behaviour (13).

Effect of SCL synchrony on trust and reciprocity in face-to-face interactions

Effect of SCL synchrony on Trust

To examine if SCL synchrony predicted higher levels of Trust in the Face-to-Face condition (**H3a**), we extended Model 2.1 to include SCL synchrony (**Model 4**). Contrary to our hypothesis, SCL synchrony did not significantly predict trustor investment ($\beta = –0.099$, $t = -1.484$, $p = .138$, $f^2 < .001$), nor did the interaction between SCL Synchrony and Condition ($\beta = 0.037$, $t = 0.3753$, $p = .708$, $f^2 < .001$) (*Figure 4*). To further assess the robustness of this null finding, we conducted an exploratory Bayesian mixed-effects analysis (see *Supplementary Material*). The Bayes factor provides moderate evidence against the full model in favour of the null hypothesis ($BF_{10} = 0.21$), suggesting that SCL synchrony did not meaningfully predict trustor investment in our experiment.

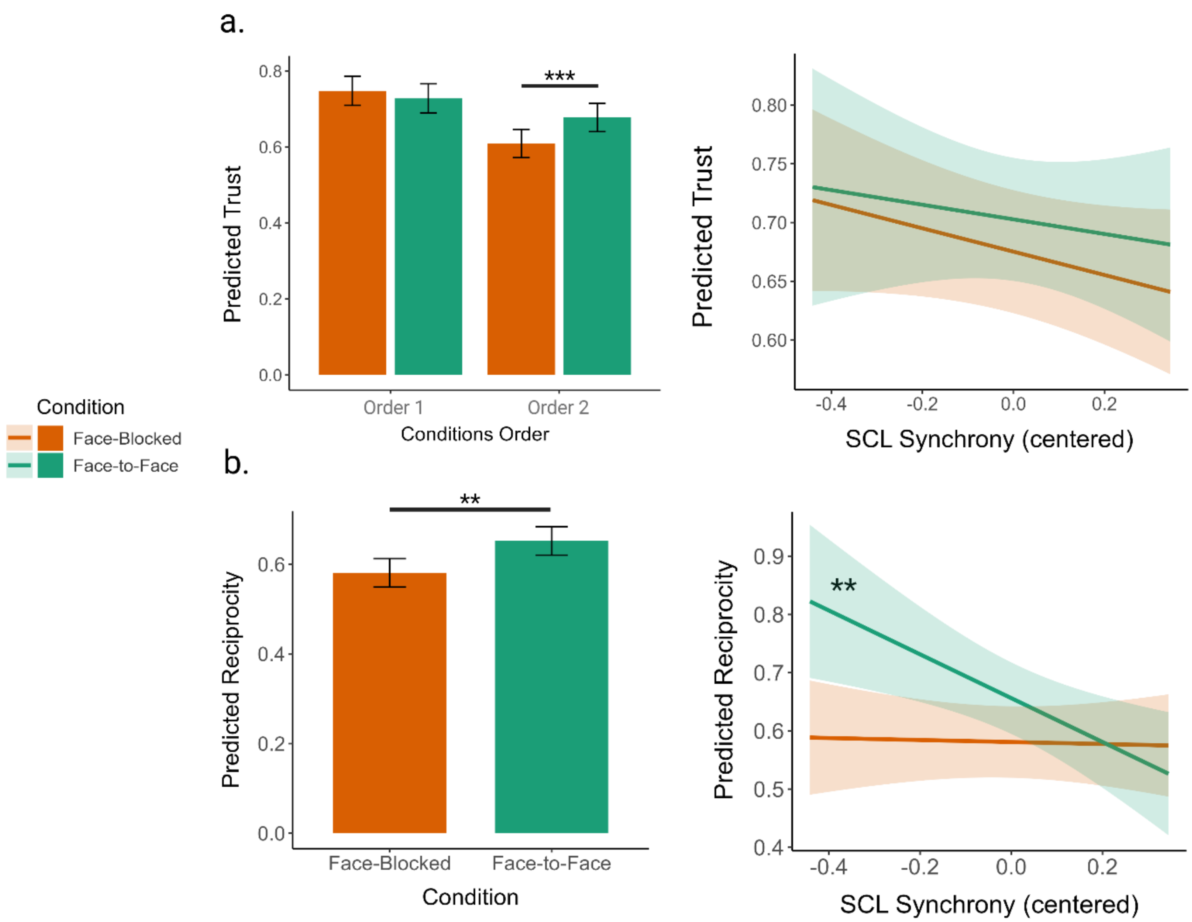

*Figure 4: **Effects of Condition, Condition Order, and Physiological Synchrony on Trust and Reciprocity.** Synchrony values are negative due to centering, but we did not observe any negative synchrony value in the original data. Error bars represent the standard error of the mean, and shaded ribbons indicate the 95% confidence interval. **a**) On the left, interaction effect of Condition and Order on Trustor investment. Trustors who started in the Face-Blocked condition and then switched to Face-to-Face (Order 2) showed increased investments (β = -0.265, p = .002), while those who began Face-to-Face and then moved to Face-Blocked (Order 1) maintained stable investments. On the right, Interaction between SCL synchrony and Condition on Trustor investment. No significant effect of SCL synchrony on Trustor investment was observed (β = –0.485, p = .316). **b**) On the left, Main effect of Condition on Reciprocity. Trustee returns were significantly higher in face-to-face (β = -0.021, p = .009). On the right, Interaction between SCL synchrony and Condition on Reciprocity. In the Face-to-Face condition, higher SCL synchrony predicted significantly lower reciprocity (β = –5.57, p = .001), whereas synchrony had no significant effect in the Face-Blocked condition (β = –0.85, p = .478). while synchrony values are negative due to centering, we did not observe any negative synchrony values in the original data.*

Effect of SCL synchrony on Reciprocity

To examine if SCL synchrony predicted higher levels of Reciprocity in the Face-to-Face condition (**H3b**), we extended Model 2.1 to include SCL synchrony (**Model 5**). Consistent with Model 3, we found a significant effect of Condition (β = 0.075, t = 3.718, $p < .001$, $f^2 = 0.018$) on the trustee's reciprocity. While the main effect of SCL Synchrony was not significant (β = -0.017, t = -0.190, p = .849, $f^2 < 0.001$), we found a significant interaction between Condition and SCL synchrony (β = -0.359, t = -2.639, p = .008, f^2 = 0.024), but in the opposite direction of what we had initially expected. Specifically, simple slope analyses revealed that higher SCL synchrony predicted *lower* reciprocity only in the Face-to-Face condition (β = –0.376, SE = 0.131, 95% CI [–0.635, –0.118], p = .004), but not in the Face-Blocked condition (β = –0.017, SE = 0.09, 95% CI [–0.195, 0.161], p = .850) (*Figure 4*). This suggests that stronger physiological synchrony may reduce reciprocity when partners are visually co-present and potentially exchange emotional cues. Crucially, Order of Condition did not improve the model fit.

Exploratory Analysis

In Model 5, opposite to what we predicted, we found that higher SCL synchrony predicted significantly lower trustee reciprocity in the Face-to-Face condition. Given that the trustor decides without ever having received any feedback on previous decisions, it is possible that their autonomic state – perhaps reflecting the uncertainty or the lack of engagement of a blind investment – was picked up by the trustee during Face-to-Face interactions, which unconsciously processed this synchrony as ambiguity or threat. To explore this, first we confirmed that Trustors and Trustees differed in their overall arousal levels, as expected: Trustors, who make blind and riskier decisions without feedback, showed higher arousal than Trustees, who only reciprocate and thus hold more power in the interaction (β = -0.223, t = -3.111, p = .001, *Supplementary Materials*). We next explored whether the trustor's overall arousal moderated the effect of SCL synchrony on Reciprocity (**Model 6**).

Results revealed a significant three-way interaction between Condition, SCL synchrony, and Trustor Arousal (β = 0.300, t = 2.016, p = .044, f^2 = 0.015), suggesting that the effect of synchrony on reciprocity was moderated by both the experimental condition and the trustor's skin conductance level during investment. We compared the effect of SCL Synchrony mean -1SD, mean, and mean + 1 SD of the Trustor's Arousal. At low arousal levels (mean -1 SD), the negative association between synchrony and reciprocity in the Face-to-Face condition was the strongest and significant (β = -0.632, t = -3.088, p =.002). At mean arousal levels, higher synchrony still predicted significantly lower reciprocity in the Face-to-Face condition but to a lesser extent (β = -0.395, t = -2.922, p = .003). At high levels of trustor arousal (mean +1 SD), the effect of synchrony on reciprocity in the Face-to-Face condition disappeared (p = .367). Crucially, the effect of Synchrony on Reciprocity was absent in the Face-Blocked condition across all levels of the simple slopes analysis (ps > .483) (*Figure 5*). These results indicate that the association between SCL synchrony and reciprocity in the Face-to-Face condition is modulated by the trustor's physiological state. Specifically, higher synchrony predicted less reciprocity when trustors exhibited lower arousal – potentially reflecting reduced engagement or boredom (61) – suggesting that synchrony may amplify negative social outcomes when trustors are perhaps not emotionally engaged.

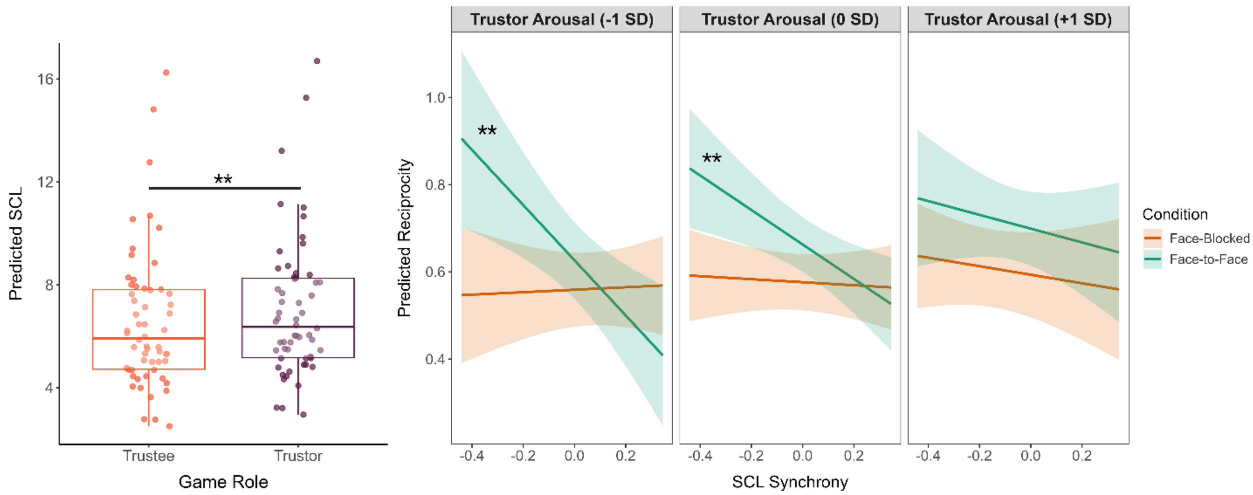

Figure 5: Arousal Differences by Role and Moderation of Reciprocity by Synchrony, Condition, and Trustor Arousal. On the left, a box plot comparing predicted skin conductance level (SCL) arousal between Trustors and Trustees. Trustors exhibited significantly higher arousal than Trustees, consistent with their role in making riskier decisions without feedback (p = .001). On the right, a three-way interaction plot illustrating the effect of SCL synchrony, Condition (Face-to-Face vs. Face-Blocked), and Trustor's mean arousal (z-scored SCL during investment, plotted at –1 SD, 0 SD, and +1 SD) on Trustee Reciprocity. In the Face-to-Face condition, higher SCL synchrony predicted significantly lower reciprocity at both low (–1 SD) and average (0 SD) levels of Trustor arousal, but not at high (+1 SD) arousal. No significant effects were observed in the Face-Blocked condition. Shaded areas and error bars represent 95% confidence intervals.

4. Discussion

Many studies have proposed that synchrony at different levels enhances cooperation and prosocial behaviours, yet most of them focused on interactions where both partners engage in similar choices at the same time (3,4,33). Daily life however often abounds with situations where we must make "blind" trust decisions, risking our own resources, or in which we are tempted to run away with the loot at the expense of others. How does synchrony shape our choices in these unbalanced scenarios? The current study sheds light on this question by investigating whether physiological synchrony affects our decisions to trust or to reciprocate, and whether visual cues further enhance this effect.

In line with our prediction and existing literature (4,37), we demonstrated that synchrony of skin conductance is higher when visual access is available to the participants, as opposed to when it is absent. This outcome is supported by our analysis of the lag – the temporal shifts between participants' physiological signals – which revealed a dispersed and irregular distribution when participants could not see each other. In contrast, when they interacted face-to-face, the distribution was quasi-normal and centred around zero, indicating higher temporal alignment and more stable physiological coupling between participants. Collectively, these results reinforce the idea that mutual visibility not only boosts physiological synchrony but also facilitates its dynamics, likely due to the continuous exchange of social cues and real-time behavioural adjustments (4). Our exploratory factor analysis of facial expressions revealed that participants were indeed more expressive in the face-to-face condition, particularly on factors related to enjoyment and affiliative smiles, conversational cues, and mild negative affect. However, the extent of facial expressivity did not correlate with skin conductance synchrony. This suggests that facial expressions alone may not account for the increased synchrony observed during face-to-face interactions, implying that other visual or contextual cues might play a role in enhancing physiological coupling. Supporting this interpretation, we showed that skin conductance synchrony affected reciprocity (i.e., the trustee's payback to the trustor) but *exclusively* when dyads could see each other. Thus, even though physiological synchrony can emerge without interacting face-to-face (34), the presence of visual cues may be essential for synchrony to carry social meaning and inform our decisions.

While finding an effect of synchrony on reciprocity only in the face-to-face condition aligned with our predictions, the direction of this effect came as a surprise: more physiological synchrony was associated with *less* reciprocity, challenging previous findings (4,31,32) as well as our initial expectations. Although a significant portion of prior research emphasises the positive effects of synchrony, our results support the argument, now increasingly recognised in the literature, that synchrony does not always have prosocial outcomes (62). Instead, the effects of synchronisation can also vary depending on the type of emotions involved, the nature of the interaction, and the broader social context (22). For instance, synchronising with large pupil size during a trust game can increase trust, while synchronising with small pupil size reduces it (9). Consistently, behavioural synchrony of affiliative expression, like a smile, leads to increased trustworthiness (63), while the synchrony involving ambiguous or stress-related behaviours (such as scratching, yawning, or lip biting) does not (12). These outcomes also manifest at the physiological level, as arousal can modulate both the strength and effects of synchrony (2). Research has demonstrated that physiological synchrony can be higher in more intense competitive interactions compared to cooperative ones (64–66), and may, in these cases, reflect tension or conflict (60). Overall, these findings suggest that synchronising on negative or ambiguous affects, or in conflicting contexts, can be maladaptive.

Based on these premises, we considered whether our task may have unintentionally triggered negative or ambiguous emotions in the trustor – reflected in their arousal – which the trustee then synchronised with, ultimately leading to reduced reciprocity. Our exploratory analysis confirmed this intuition: the effect of skin conductance synchrony on reciprocity was moderated by the trustor's arousal level. Higher synchrony predicted less reciprocity, especially when the trustor showed lower arousal. This effect disappeared when the trustor's arousal was higher. Notably, the moderation of trustor arousal on synchrony was significant only when participants could look at each other. The trustor's low arousal may have signalled disengagement or boredom (61), possibly due to the absence of feedback and the repetitive nature of the task. It is possible that the trustee picked up on some trustor's subtle cues during face-to-face interactions, which in turn shaped how the trustee interpreted their physiological attunement (4). For instance, the trustee may have synchronised with the trustor's disengagement, perhaps interpreting low arousal as a lack of interest in the interaction (61) – especially since the trustee was aware of the trustor's riskier position and might have expected higher arousal. Confirming this interpretation, the negative effect of synchrony disappeared when the trustor exhibited higher arousal. Notably, the lack of a correlation between skin conductance synchrony and facial expressivity suggests that the cues driving this effect may be more subtle. While these results provide intriguing evidence that the effect of physiological synchrony on behaviour can be moderated by arousal in the presence of visual cues, this interpretation is hypothesis-generating rather than confirmatory. Future studies should test this interaction directly using preregistered hypotheses and experimental designs that explicitly manipulate or measure the relationship between synchrony, arousal, and visual cues.

When focusing on the trustor, we found that skin conductance synchrony was not associated with trust – the amount of money invested by the trustor, diverging from previous literature on cooperation (4,37). The robustness of the null effect was corroborated by an exploratory Bayesian analysis, providing substantial evidence that the trustor investments were not related to the level of dyadic physiological synchrony in our sample. We consider the lack of feedback as the prime suspect for this null result. Even though excluding feedback can be a better approximation of the blind trust decisions we sometimes take in daily life, it might have led to a lack of contingency: without knowing whether their trust was reciprocated, trustors could not learn to associate their "gut feeling" with (un)trustworthy behaviour. Interpersonal synchrony may facilitate the prediction of others' internal states (22). In our design, however, synchrony lacked predictive utility: trustors had no opportunity to validate whether the physiological alignment signalled reciprocity or not. Synchrony might still occur, as it did, but it cannot be used as a predictive cue to guide social decisions. So far, only one study has directly manipulated feedback in an experiment to test the effect of synchrony on cooperation, concluding that it did not impact the level of cooperation itself (4). However, the authors did not test whether the feedback moderated the effect of synchrony *on* cooperation. It remains an open question when and whether the functional role of synchrony in shaping social decisions depends on the contingency and information value of the interaction.

Turning to the behavioural results, we predicted trust and reciprocity to be higher in face-to-face compared to face-blocked conditions. While this was clearly the case for reciprocity, aligning with prior literature, the effect on trust was more nuanced. Specifically, an order effect emerged: trust was higher in the face-to-face condition only for the dyads that started the task in the face-blocked condition and then moved to the face-to-face condition, while trust levels remained stable in dyads that began with the face-to-face condition. Research suggests that once a trustor forms an impression based on someone's face, that impression can persist and continue to influence their behaviour, even if the face is no longer present (6,67). Put it differently, once the trustors "gave a face" to the trustee, they could not easily unsee it. This result raises important concerns regarding the use of counterbalancing in similar studies. Although often considered a reliable deterrent against order effects, counterbalancing may prove counterproductive in tasks where expectations and impressions play a critical role.

Finally, we want to highlight several important considerations for future research. First, we did not observe a robust synchrony of heart rate, with pseudo dyads showing levels of synchrony comparable to the real dyads. This is not entirely unexpected, as synchrony is not assumed to emerge consistently across interactions or modalities (60,62). Yet, it raises the question of whether different contexts may differentially support the emergence of specific types of synchrony – and whether these, in turn, are more likely to influence behaviour. Future research should explore how contextual factors shape the conditions under which different forms of synchrony arise. Next, we found that skin conductance synchrony was significantly higher in face-to-face than face-blocked interactions, but the effect size was smaller than in previous studies (4,37). This may be due to the use of fewer trials, chosen for time constraint and to reduce task monotony, but also the type of task. In previous studies, participants had similar roles during the game. It could be that they were more aligned because they both acted in a similar way at the same time. These findings emphasise the need for further discussion about the optimal number of trials and the type of task chosen in synchrony research, balancing ecological validity with statistical power. Finally, although we aimed to make the study as ecologically valid as possible, it remains a laboratory interaction with certain constraints: participants could not talk, the task followed a strict temporal structure, and the setting was still artificial. In addition, a common critique of the trust game is that it involves no real monetary loss, but rather the potential to gain slightly more or less. These considerations highlight the importance of interpreting the results within these constraints and invite reflection on how to best balance experimental control and ecological validity in synchrony and trust research alike.

Returning to the asymmetries that often define real-world trust decisions, this study sheds new light on the role of physiological synchrony in guiding social behaviour. We demonstrated that, while mutual visibility appears to enhance synchrony and its social relevance, synchrony itself does not uniformly foster prosocial behaviour. Instead, the effect of synchrony appears contingent on the social context, visual cues, and the arousal states of the individuals. Namely, in face-to-face settings, synchrony was only predictive of behaviour when arousal was also taken into account, suggesting that *what* we attune to may matter as much as the fact that we attune at all. These results move us closer to understanding the mechanisms that guide intuitive decisions in socially risky situations.

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