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Making Food Decisions Together: Physiological and Affective Underpinnings of Relinquishing Preferences and Reaching Decisions

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Abstract

We used a novel interdisciplinary experimental paradigm where two types of dyads—15 dyads with one depressed and one non-depressed participant and 15 dyads with two non-depressed participants—engaged in a series of food-decision-making tasks. We examined how different communicative events during the decision-making process were reflected in the affective responses of the interacting participants, as indicated in their skin conductance (SC) response rates. The participants' SC response rates were found to be higher during the emergence of the final decision, compared to the other segments during the process. Furthermore, relinquishing one's initially expressed preferences was associated with SC response rates higher than the baseline. However, during the relinquishment segments, there was a negative interaction between depression diagnosis and SC response rates, which suggests that, compared to their non-depressed comparisons, it is affectively less arousing for the participants with depression to give up their previously expressed preferences.

Keywords

joint decision making, skin conductance, affective arousal, relinquishment, depression

Introduction

Empirical research on naturally-occurring joint decision-making interaction has shown it to be a complex and challenging interactional endeavor (Asmuß & Oshima, 2012; Bilmes, 1981, 1995; Boden, 1994, 1995; Clifton, 2009; Huisman, 2001; Siitonen & Wahlberg, 2015; Tysoe, 1984; Wening et al., 2016). It involves the use of multiple resources: syntax, lexical choices, prosody, body postures, material objects, and gaze, in and through which participants manage their relative distribution of agency during the different phases of the process in contextually appropriate ways (De Stefani, 2013; Kushida & Yamakawa, 2015; Olbertz-Siitonen & Piirainen-Marsh, 2021; Stevanovic, 2012b; Stevanovic et al., 2017; Stevanovic, 2013, 2015; Stivers, 2005; Tate & Rimel, 2020).

Despite its complexity, joint decision-making has been associated with certain, repeatable communicative events that come across as constitutive of the entire decision-making activity. Specifically, drawing on a rich body of studies in the field of conversation analysis, joint decision-making interaction may be described with reference to *sequences of*

proposals and their subsequent responses (Weiste et al., 2020). A proposal consists of a “formulation of a state of affairs that is of current interest” (Huisman, 2001, p. 72), which in certain activity contexts could involve a mere expression of preference (Stevanovic, 2012a, p. 790). It is, however, only through the recipients' subsequent responses to proposals that joint decisions emerge. The responses to proposals can be of different types, leading to a range of different interactional outcomes (Stevanovic, 2012a; Stevanovic et al., 2021). Archetypically, we may distinguish between *acceptances* and *rejections*; the former promotes the emergence of decisions, while the latter hampers or postpones it. However, other outcomes are also possible. For example, upon hearing about the co-participant's preferences, a

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participant may make an announcement to give up his or her own earlier expressed preference, such *relinquishments* thus forwarding the process of finding a joint solution to the matter at hand.

Another reoccurring communicative event that marks the participants' activity *as* joint decision-making is, of course, the *emergence of a joint decision*. This communicative event has been shown to be accomplished by the coordinated use of various resources, such as prosodic salience and specific lexical displays of agreement and commitment (Stevanovic, 2012b; Stivers, 2005), the matching of body sway and pitch register (Stevanovic et al., 2017), as well as material artifacts and writing (Lindholm et al., 2020). Since joint decision-making processes often involve several sequences of proposals and responses, the identifiability of the end of the sequence is of particular importance in the context of joint decision-making, where the outcome of the interaction—the decision—may be consequential for the participants. The participants therefore need to have a common understanding of what is the last and binding plan for future action—the one to which the participants commit themselves. Thus, the management of this final phase of a joint decision-making process is likely to necessitate heightened intersubjectivity between the participants in interaction (Stevanovic et al., 2017).

Different communicative events may be assumed to have different affective consequences, which, in turn, may vary with respect to their relative problematicity for the participants. Drawing on the considerations of “face” by Goffman (1955) and Brown and Levinson (1987 [1978]) and on the conversation-analytic notion of “preference” (Pomerantz & Heritage, 2013), research on interactional sociology has argued that rejections are more face-threatening actions than acceptances (Clayman, 2002). Such orientations have been observed in the recipients typically producing their acceptances straight away and without hesitation, while rejections are commonly produced with mitigations and delays (Davidson, 1984; Houtkoop, 1987; Pomerantz, 1984). For the same reason, rejections may sometimes be circumvented entirely by replacing them with more indirect “non-acceptances” (Stevanovic, 2012a). Some problematicity, albeit possibly of different nature, may also be involved when a participant gives up his or her own preference as a response to a proposal by the co-participant—given that relinquishing one's own preferences is something that people are generally reluctant to do (Grüne-Yanoff & Hansson, 2009; Rabinowicz, 2009). The heightened intersubjectivity associated with the final commitment phase of joint decision-making processes may also have affective consequences. Due to a long-established link between attention and arousal (Das et al., 1994; Lynn, 1966; Unsworth & Robinson, 2017), we may assume that participants' intensified sensitivity to and careful monitoring of each other may lead to a higher level of arousal in them.

In this paper, our aim is to increase understanding of the physiological and affective consequences of the above-mentioned key communicative events constitutive of joint decision-making interaction. Using a novel interdisciplinary experimental paradigm with pairs of participants making food decisions together, we examine how different communicative events are reflected in the participants' skin conductance (SC) responses. In so doing, we contribute to the rising field within the domain of conversation analysis (see e.g., Schegloff, 2007) in which the central interest has been in describing how emotion is embedded in the participants' systematic ways of organizing their conduct in sequences of interaction (Sorjonen & Peräkylä, 2012). Some researchers in this field have also considered the moment-to-moment changes of physiological arousal in relation to specific types of communicative events as a way to address the embeddedness of emotion in social interaction (Peräkylä et al., 2015; Stevanovic et al., 2019; Voutilainen et al., 2014; for a review on autonomic nervous system activity in emotion, see Kreibitz, 2010). For example, drawing on the dyadic systems view by Beebe and Lachmann (2002) and focusing on the participants' SC responses during dyadic storytelling sequences, Peräkylä et al. (2015) found that affiliative story reception is associated with a decrease in the storyteller's arousal and an increase in the story recipient's arousal. Findings from the above-mentioned studies have offered new ways of thinking about the more precise nature of different communicative events and to increase understanding of the specific challenges that different people may have in their interactions with others. Joint decision-making interaction as a potential locus of power and authority, on the one hand, and participation and equality, on the other (Weiste et al., 2020), may be assumed to be specifically relevant interactional context to study in this respect. Thus far, however, there are only few studies on the physiological and affective underpinnings of joint decision-making interaction.

In our own recent study, we investigated the physiological and affective underpinnings of joint decision-making interaction (Stevanovic et al., 2021), using a simple, collaborative word-invention task (i.e., coming up with adjectives to describe specific targets). In this study, we observed that SC response rates during the task were higher when a participant made a proposal herself, compared to when she responded to her co-participant's proposal. Furthermore, the proposal speakers' response rates were higher when the recipient accepted the proposal, compared to when the proposal was not accepted. We interpreted these findings with reference to the sense of responsibility for the emerging decision that the proposal speakers might have experienced when their proposals were accepted and the decisions emerged. In this study, we seek to complement these findings by using a different, interactionally more complex, social food-decision-making paradigm, which we created with the primary aim of

increasing the stakes that a participant can have for the decision-making outcome, even in a laboratory setting. The present task (detailed further below) has, however, two further advantages. First, due to the nature of the task, the co-participants' initial responses to proposals tend to be temporally separated from the emergence of the final decision. This will help us test and potentially exclude the possibility that the acceptance of a proposal would be arousing in itself, and to confirm the idea of that the effect is attributed to the emergence of decisions. Second, in addition to acceptances and rejections, the task also makes it relevant for the participants to produce relinquishments as responses to proposals, which enables us to investigate the physiological and affective underpinnings of this solitary communicative action, in relation to acceptances and rejections.

Depression and Social Interaction

In addition to the considerations above, we also wanted to explore the possibility that the physiological and affective underpinnings of the key communicative events constitutive of joint decision-making interaction would differ for participants with and without depression. Although depression is one of the most prevalent and debilitating forms of psychopathology (Kessler et al., 2005; McCarron et al., 2021) with a long list of symptoms (American Psychiatric Association, 2013; Otte et al., 2016), not much is known about whether and how depression might interfere with joint decision-making practices. There are, however, various reasons why we think that the case of depression would be fruitful to consider from this perspective.

First, studies on narratives and storytelling in therapeutic interactions and clinical interviews have identified specific depression-related patterns of language use, which highlight the feelings of helplessness, low personal agency, and a lack of control in the individuals with depression (Angus & Greenberg, 2011; Ekberg & LeCouteur, 2015; Muntigl, 2016; Vanheule & Hauser, 2008). Such patterns might however not similarly characterize conversational interactions in non-clinical contexts. Contrarily, individuals with depressive symptoms may be skillful in hiding their depressive symptoms (Kirk et al., 2000). Such hiding may be motivated, for example, by a fear of career damages (Paton, 2014) or by a desire to maintain normality in front of other people (Draucker, 2005). Concealing depressive symptoms may also be motivated by the cultural patterns where emotional control, self-esteem, and invulnerability are central virtues (Emslie et al., 2006). Thus, given the tendencies of the individuals with depression, on the one hand, to undermine their level of agency and, on the other hand, to hide such tendencies when interacting with others in non-clinical contexts, the production of the "agentive" communicative actions associated with joint decision-making interaction might involve extra interactional work by the participants with depression.

This in turn might lead to a heightened level of arousal for these participants.

Second, social interaction can be conceptualized as a chain of communicative events, which—as any other social cues—may be perceived as positive or negative. From this perspective, it is relevant to consider the literature on how individuals with depression react to rewards and punishments. Many studies have associated depression with alleviated reactions such social cues, such as winning or losing money in mock gambling paradigms (Henriques & Davidson, 1990, 2000; Sloan et al., 2001) or watching sad or amusing films (Rottenberg et al., 2002). Some researchers have therefore considered alleviated reactivity to positive and negative social cues as a hallmark of major depressive disorder (see Čolić et al., 2020; Henriques & Davidson, 1991; Rottenberg, 2005). Yet, other research has suggested individuals with depressions could display heightened sensitivity to both positive and negative social cues (Allen et al., 2004; Gilbert, 2006; Needles & Abramson, 1990; Steger & Kashdan, 2009). Our study seeks to contribute to this discussion by considering how participants with and without depression react to those positive and negative social cues that are an inherent part of the key communicative actions constitutive of joint decision-making interaction (i.e., acceptances, rejections, and relinquishments).

Third, in general, depression has been associated with dysregulation in both parasympathetic and sympathetic branches of the autonomic nervous system (e.g., Beauchaine, 2015; Brush et al., 2019; Kemp et al., 2010; Koenig et al., 2016; Rottenberg, 2007; Rottenberg et al., 2007; Sarchiapone et al., 2018). These idiosyncrasies include a flat or low skin conductance profile (Vahey & Becerra, 2015), which has been shown to be a reliable feature of depression and a valid marker of suicidal risk (Sarchiapone et al., 2018), and is consistent with theorizing about behavioral and physiological underarousal as a prominent part of depressive symptomatology (Benning & Ait Oumeziane, 2017). However, as pointed out above, such underarousal may not apply to moments of social interaction outside of the laboratory. Instead, these situations may be characterized by increased threat arousal and pathological worry, which have mostly been associated with anxiety but which have also been shown to be a part of the etiology of depression (Hofmann et al., 2010; Starcevic, 1995). In this paper, we seek to contribute to this debate with the help of a joint decision-making paradigm that relies of the participants' use of everyday conversational practices.

Research Hypotheses

We will measure the moment-by-moment changes of arousal, as indicated by the participants' SC response rates, in relation to key communicative events constitutive of joint decision-making interaction—that is, different types of responses to proposals and the emergence of a decision. The more

specific hypothesis, which we seek to test empirically, are the following:

Hypothesis 1: Due to a need of heightened intersubjectivity (Stevanovic et al., 2017), the emergence of a final decision will be associated with higher SC response rates, compared to the earlier negotiation phase of the process.

Hypothesis 2: Different types of responses to proposals will be associated with different SC response rates. Here, we make the following, more specific predictions:

- (a) Assuming that an acceptance is a preferred response to a proposal (Davidson, 1984; Houtkoop, 1987), we expect that, for both participants, acceptance will be associated with SC response rates near the baseline.
- (b) Assuming that a rejection is a potentially face-threatening action (Brown & Levinson, 1987 [1978]) and thus challenging to both produce and receive, we expect that rejections will be associated with SC response rates higher than the baseline.
- (c) Assuming that the relinquishment of one's previously expressed preference is a problematic action to produce (Grüne-Yanoff & Hansson, 2009; Rabinowicz, 2009), we expect that the SC response rates of the relinquishing participant will be higher than the baseline. The literature does not, however, allow us to predict how the witnessing of types of social actions might be reflected in the SC response rates of the co-participants.

Hypothesis 3: SC response rates will be different for participants with and without depression and these differences will play out differently depending on the participants' moment-by-moment communicative actions. However, given the mixed evidence so far, involving both the ideas of the physiological underarousal (Benning & Ait Oumeziane, 2017) and increased threat arousal and worry (Starcevic, 1995) as parts of depressive symptomatology, we refrain from making more specific predictions about the direction of the effect.

Methods

Ethics

Informed, written consent was given by all participants prior to study, after they had been informed about the aims of the study and about their rights to withdraw their consent anytime they wished (see below). Institutional Review Board approval was obtained from the Ethics Committee of the Helsinki University Central Hospital [18.06.2018].

Participants

For the study, we recruited participants ($N=15$) who had been diagnosed with moderate depression within the past

12 months, and, as a comparison group, participants ($N=45$) who had *not* got a depression diagnosis within the past 10 years. To maximize the similarity between the two participant groups in features other than depression, all participants were recruited using the same social media platforms. All participants accepted to the study were legal-aged females, who spoke Finnish as their mother tongue. As a proxy for controlling for similar general cognitive capacities in both participant groups, all participants needed to have at least 5 years (3 years if under 25) of working life experience and with at least one bachelor's degree or equivalent level of education. The participants in the two diagnostic groups were also of similar age (for the participants with a depression diagnosis: $M=32.7$ years; $SD=5.0$; for the non-depressed comparisons: $M=31.5$ years; $SD=7.0$). The participants were divided into two groups of pairs: 15 pairs, where one participant had a depression diagnosis ("case pair"), and 15 pairs, where neither participant had been diagnosed with a mental health problem within the past 10 years ("comparison pair").

The participants were recruited through social media and University of Helsinki mailing lists. Potential participants were asked for background information (re age, education, work history, and earlier depression diagnosis) through a phone interview. Based on this information the candidate was either excluded from the research or guided to the group of participants with a depression diagnosis ($N=15$) or to the comparison group of participants without a depression diagnosis ($N=45$). The clinical status of the participants with depression diagnosis was confirmed by a medical specialist in psychiatry and general practice, who met each participant privately and did a clinical interview and needed inquiry on symptoms by using the Beck Depression Inventory (Beck et al., 1961) and Montgomery-Åsberg Depression Rating Scale (Montgomery & Åsberg, 1979). The medical specialist also took care of arranging for the participants treatment when needed.

Before the experiment both participants were guided to fill out a set of questionnaires and the purpose of the research was clarified verbally and in writing. The participants were told that our focus will be on the structures of decision-making interaction and on the impact of mood on its dynamics. The clinical status of those participants with depression diagnosis was not revealed to the interaction partner, because the information could have affected the dynamics of the subject of study and, furthermore, could have unnecessarily stigmatized these participants. The participants were also given the opportunity to ask questions about the research. The participants were informed about the researchers' obligation to maintain secrecy, the practices of the anonymity and data management, the publication of the research results, and the voluntariness of participation in the research. The participants were also told that, even after the written consent, they could still any time withdraw their participation without this affecting their position or treatment. The participants were also told how to reverse their consent in practice. As

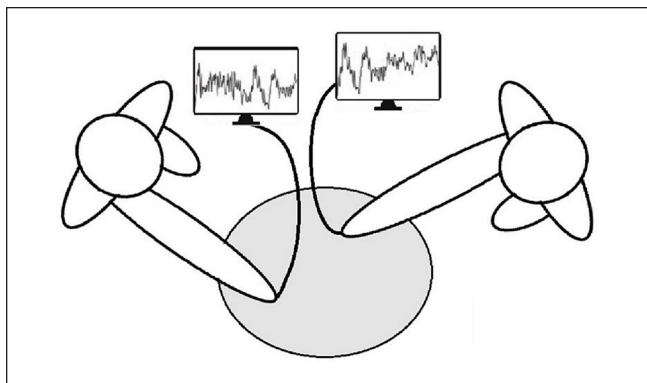


Figure 1. The participants sat facing each other at about an 120° angle from each other, while SC was measured from the left foot of each participant. To avoid foot movements that would impair SC data quality, the participants' left feet were placed on a footstool.

compensation for their time, all participants were given a gift card in the amount of 30 Eur, which could be used at the shops, restaurants, and hotels belonging to the Finnish company network “The S Group.”

Due to an issue with data recording, one of the comparison pairs was removed from the final analysis, resulting in a final $N=43$ with respect to participants without any mental health diagnosis and $N=15$ with respect to participants with depression diagnosis. Due to the exploratory nature of this study, limited availability of suitable subjects, and resource constraints with regard to the confirmation of the depression diagnosis, formal power analysis was not conducted when choosing the sample size.

Equipment

The participants sat facing each other at about an 120° angle from each other (see Figure 1). NeXus-10 (Mind Media, The Netherlands) devices were used to measure electrodermal activity/skin conductance (SC) and blood volume pulse (BVP) from both participants at a 128 Hz sampling rate. SC was measured with two foam electrodes that were placed on the medial side of the left foot. The BVP sensor was attached to the second digit of the left foot. Eye-movements were recorded at 60 Hz sampling rate with two binocular head-mounted Pupil Labs eyetrackers (Pupil Labs UG haftungsbeschränkt, Berlin, Germany). The eye-trackers were calibrated on a LG OLED55C7V 55" monitor with 16 calibration markers. The open-source Pupil Capture software was used to record and calibrate the eye tracker. Shimmer3 IMUs (Shimmer Sensing, Ireland, Dublin) were attached to each participant's right wrist to record linear acceleration and angular velocity. A custom-made software (<https://github.com/samtuhka/InteractionExperiment-Controller>) was used to synchronize the NeXus, Shimmer3 and Pupil data with Unix timestamps. In this paper, only skin conductance data

were analyzed, which were related to the annotations of the audio recordings of the experiments (see below).

Experiment

One pair of participants was studied at a time. The experiment involved the participants imagining a series of food decision-making situations where they should agree on what they would eat together. Three different tasks with somewhat different eating and food preparation arrangements were used: (1) ordering a pizza and agreeing on its fillings, (2) choosing on what to have for breakfast, and (3) preparing a salad and selecting its ingredients. To increase the stakes that the participants would have in making their final joint food decisions to represent their actual eating preferences, the participants were told that, after the completion of the experiments with all participant pairs, one pair, determined by drawing lots, would have their eating plans actually realized.

As depicted in Figure 2, at the beginning of each trial, the participants were instructed to think privately about their food preferences and to write down three food items that they would like to consume in the given context. Thereafter, the participants were asked to start negotiating their preferences with each other, with the aim of coming up with a final selection of four items that would be included in their meal or dish. A trial was considered as completed when the list of four food items was presented and oriented to by the participants themselves as ready. The order of the trials with three different food decision-making tasks, as well as the placement of these trials in relation to two other tasks not reported here, was counterbalanced across pairs.

For the purposes of future studies, the participants were asked to fill in a set of questionnaires at the beginning of each session: (1) Locus of Control Scale (Rotter, 1966), (2) Self-Monitoring Scale (Snyder & Gangestad, 1986), (3) Empowerment Scale (Rogers et al., 2010), (4) Ten-Item Personality Inventory, TIPI (Gosling et al., 2003), as well as to answer questions about their perceptions and experiences of the task requirements, their interaction partner, and the dynamics of interaction.

Annotations

We used Praat (Boersma & Weenink, 2015) to annotate the following two features of the participants' interactional conduct during the joint decision-making tasks.

First, we broke each task down into two phases. After the participants had read the items from their lists to each other, the participants started to negotiate their joint food choices. This *negotiation phase* consisted of the participants reacting to each other's food preferences, which involved acceptances and rejections of the co-participant's food proposals and relinquishments of one's own food preferences. The *decision phase* involved the participants listing their jointly selected

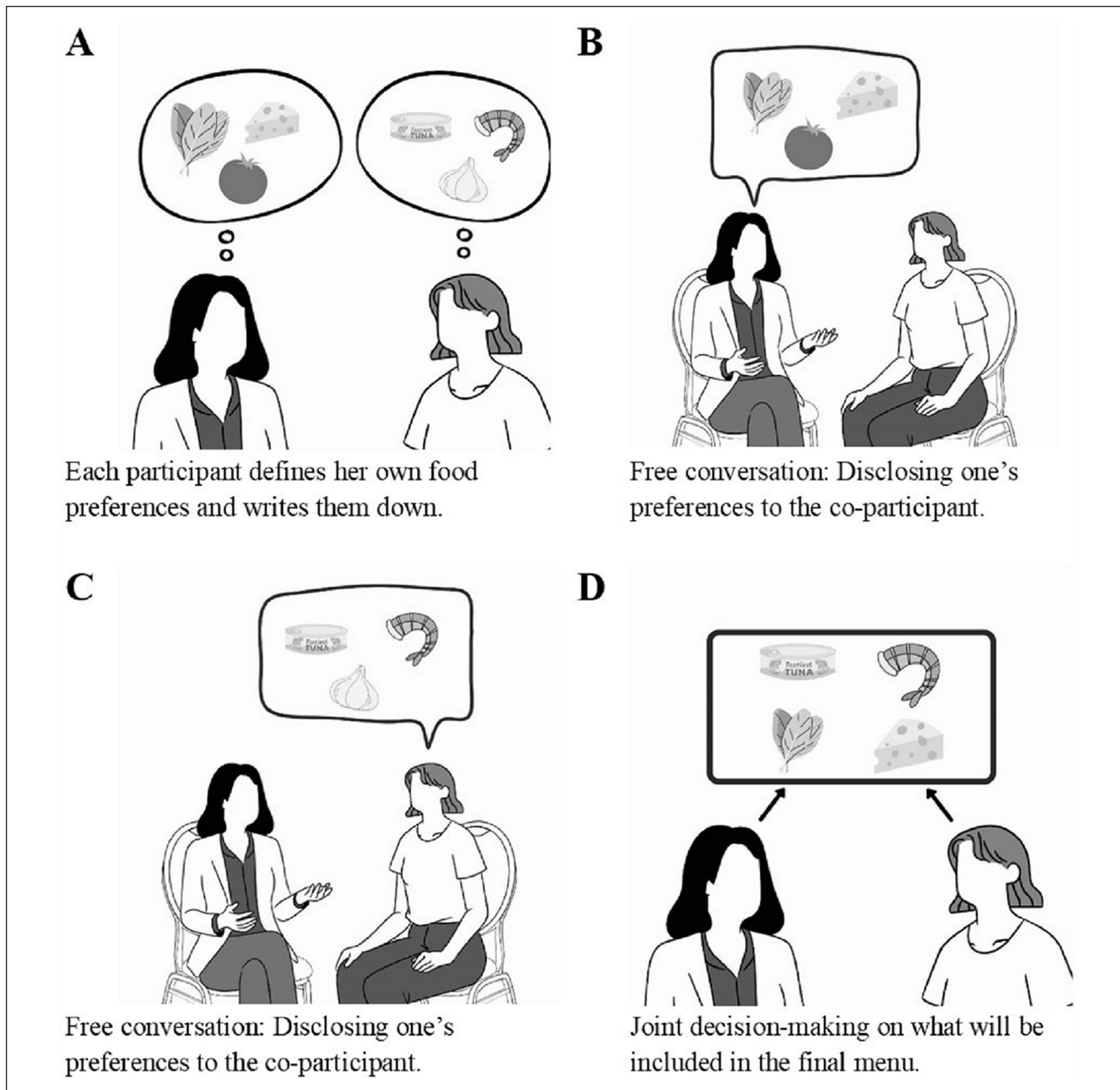


Figure 2. A schematic depiction of an experimental trial. The participants first determine their individual food preferences (A), then they discuss these with each other (B and C), and finally settle on a menu (D).

items, thus establishing the decision. The moment of the transition from the negotiation phase to the decision phase was identified on the basis of a combination of both prosodic cues (e.g., silence followed by an utterance with a raised intensity and/or pitch level; cf. Goldberg, 2004; Stevanovic, 2012b; Szczepek Reed, 2009) and lexical content (e.g., *So, we'll have coffee, croissants, cheese, and apple juice, sounds delicious!*).

Second, for the *negotiation phase*, we annotated all the responsive turns as to whether they conveyed *acceptance* or

rejection of the co-participant's proposal or a *relinquishment* of one's own food preference. In all the trials, we identified altogether 423 such responses ($M=4.86$ responses during one task), while *acceptances* ($N=331$) were significantly more frequent than *rejections* ($N=61$) and *relinquishments* ($N=31$). *Acceptances* were usually produced in the form of positive evaluations of the food item, either as such (e.g., *cashew-pähkinä on mun mielest tosi hyvää*. "I think cashew nut is very good.") or in relation to the other food items that have been previously mentioned (e.g., *sun marinoidut sipulit*

sopis kans siihen tosi hyvin “your marinated onions would go very well with it”). *Rejections*, then again, were typically produced without strong general evaluations (*mä en oo hirvee oliivin ystävä* “I am not really a friend of olives”). They could also highlight the unfittedness of the food item in relation to the other previously-mentioned food items (e.g., *siis tomaattihan ei sovi mun mielestä hirveen hyvin kalaan* “I think tomato does not go that well with fish”). *Relinquishments* were also typically produced in a mitigated manner, with first-person singular forms being generally replaced by passive forms (e.g., *se voi jäädä pois se aurinkokuivattu tomaatti* “the sundried tomato can be left out” or *lohi varmaan jää pois* “the salmon will probably be left out”).

The annotations were carried out independently by two raters—with one annotating the entire data and the other annotating a randomly chosen sample (consisting approximately 10% of the entire data set) for validation. We assessed the interrater reliability by using Cohen’s kappa coefficient. When missing cases (e.g., locations where one coder had marked a responsive turn and the other had not) were placed into their own category, we derived a Cohen’s kappa of .79—indicating a substantial degree of agreement (Landis & Koch, 1977). Alternatively, if the missing cases (13% of all cases) could be assumed to be random (we did not find any systematicity in them) and deleted listwise (De Raadt et al., 2019), the resulting Cohen’s kappa would be .97—indicating almost perfect degree of agreement.

Data Processing and Analysis

Data processing and visualization was conducted via custom-made Python 3 (Van Rossum & Drake, 2009) scripts using the SciPy (Virtanen et al., 2020), NumPy (Harris et al., 2020) and Matplotlib (Hunter, 2007) third-party libraries. The linear mixed model analyses were conducted with R (R Core Team, 2020) and the lme4 package (Bates et al., 2015).

In order to distinguish between overlapping SC responses (Bach et al., 2010; Benedek & Kaernbach, 2010), the signal was deconvoluted using the Richardson-Lucy algorithm (Richardson, 1972). Individual SC responses were detected computationally through peak detection—by finding all local maxima with a prominence of at least $.05 \mu\text{S}$ and height of at least one standard deviation above the mean level (see Figure 3).

SC response rates were calculated for all Praat-annotated phases and turns for all participants (i.e., the number of SC responses was divided by the length of the event). Statistical analyses in regard to SC response rates were conducted with linear mixed models to account for the repeated measures structure of the data and for the non-independence of data within dyads. The p -values were obtained using the Satterthwaite approximation for degrees of freedom (Satterthwaite, 1941)—though as a note of caution, one should point out that there is no consensus on how and if

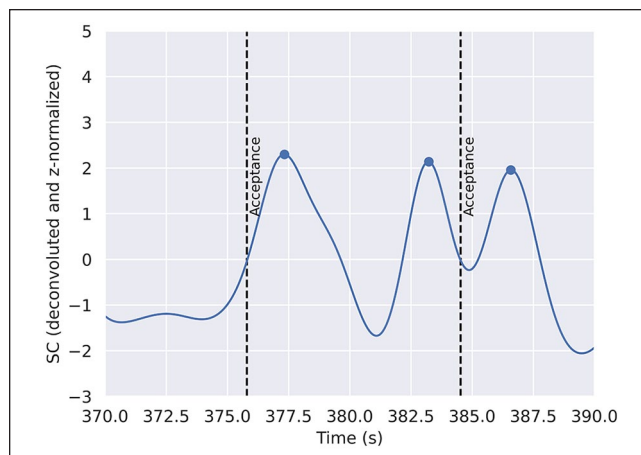


Figure 3. An example time series of the deconvoluted and z-normalized SC signal (depicted by the solid line). The dots indicate the peaks of individual SC responses. The dashed vertical lines indicate the beginning of accepting responses from the speaker (whose SC signal is depicted in the figure).

p -values should be obtained in mixed models (Luke, 2017). Marginal and conditional R^2 (Nakagawa & Schielzeth, 2013) values were used to assess the goodness of fit of the models.

Results

Key Communicative Events

In terms of the relative frequency of *acceptances*, *rejections*, and *relinquishments*, there were no significant differences between participants with and without depression (see Table 1—note the difference in N between the groups). In addition, there were no significant differences with respect to clinical status in how many of the previously-written individual preferences were included in the final choices of a dyad. Instead, in both types of dyads, the final decision-making outcome with four food items represented a relatively equal balance between the participants’ preferences, with each participant getting approximately two preferences accepted, independent of whether the participant was depressed ($M=1.91$; $SD=0.66$) or non-depressed ($M=2.14$; $SD=0.67$).

Skin Conductance With Respect to Diagnostic Status and Joint Decision-Making Phase

To investigate Hypothesis 1 and Hypothesis 3, we assessed the effect of the phase (negotiation or decision) of the conversation, and the diagnostic status of the participants (depressed or non-depressed), on the participants’ SC response rates. The statistical analysis was done with a linear mixed model—with SC response rate as the dependent variable. Diagnosis, phase of the conversation, and their

Table 1. Percentage of Acceptances, Rejections, and Relinquishments among Participants with and without a Depression Diagnosis.

Category	Depressed (n = 15)	Non-depressed (n = 43)
Acceptances	81%	77%
Rejections	14%	15%
Relinquishments	5%	8%

interaction were chosen as fixed effects while the dyad and participant were chosen as nested random effects (random intercepts) to control for the non-independence of the data points. The fixed effects summary of the model can be seen on Table 2.

The marginal R^2 of the model was .07 (i.e., the fixed effects alone explain 7% of the observed variance), while the conditional R^2 was .14 (i.e., fixed effects and random effects explain about 14% of the observed variance).

We observed that the phase of the conversation ($p = .006$) has a significant effect on the SC response rates. More specifically, during decision phases participants had on average higher SC response rates than during the negotiation phases. The differences are visualized in Figure 4.

Skin Conductance During the Negotiation Phase

In addition, we examined the *negotiation* phases more closely focusing on the moments of *acceptance*, *rejection*, and *relinquishment*. In terms of the SC analysis, these moments were analyzed as 5-second segments. With respect to the speaker (the one accepting, rejecting or relinquishing), the start of each of these 5-second segments was at 1 second before the beginning of the Praat annotation. With respect to the recipient, the start of each segment was at the end of the Praat annotation (on average 0.55 second after the start).

To investigate *Hypothesis 2* and *Hypothesis 3*, we compared SC response rates during *acceptances*, *rejections*, and *relinquishments* to the participant's baseline during the task ($M = 2.89$ responses per minute, $SD = 1.05$)—calculated as the mean response rate throughout the whole task. The means and standard deviations can be seen in Figure 5. The statistical analysis was performed with six separate linear mixed models (for the three categories of verbal responses and for the speakers and recipients) with the SC response rate as the dependent variable. Diagnosis, task segmentation (e.g., whether the SC response rate was determined from the baseline of the entire discussion or from the 5-second segments) and their interaction were treated as fixed effects and dyad and participant as nested random effects.

Acceptances showed no significant increase over the baseline regardless of the role (speaker or recipient) or the diagnosis (depressed or non-depressed). Nor was there a difference in baseline between depressed and non-depressed

participants. However, during *rejections* (see Table 3) the recipients of the rejection had SC response rates significantly lower than the baseline. It should nevertheless be noted that the marginal R^2 of the model is rather small at .05 (i.e., the fixed effects explain only 5% of the observed variance) and the effect may be present only in the non-depressed participants (depression:rejection interaction being positive but non-significant). Finally, during *relinquishments* both the speaker (see Table 4) and the recipient (see Table 5) had significantly higher SC response rates over the baseline. Though, for the speakers, the effect existed only for the participants without depression (i.e., there was a negative interaction between depression diagnosis and SC response rates during *relinquishment* segments).

Discussion

In this study, we have considered how different communicative events during joint decision-making interaction over food choices are reflected in the physiological and affective responses of the interacting participants with and without depression. Our hypotheses were partially supported by the empirical results, which we will discuss below.

As for *Hypothesis 1*, our data support the conclusion that SC response rates are dependent on the phase of joint decision-making interaction, so that they are higher during the final phase of the decision-making process, compared to when the content of the decision is still under negotiation. As has been argued above, the management of the final phase of a joint decision-making process necessitates heightened intersubjectivity (Stevanovic et al., 2017). The criticality of reaching common understanding on what has been decided and when is reflected by the fact that, in organizational meetings of large scale, there is commonly a chairperson who uses a gavel to mark the exact moment of the emergence of the decision, thereby also facilitating the closing down of the topic and the introduction of the next item on the agenda (Pomerantz & Denvir, 2007). While in more informal contexts, the closure of joint decision-making processes has been associated with the use of a multitude of communicative resources (Lindholm et al., 2020; Stevanovic, 2012b; Stevanovic et al., 2017; Stivers, 2005), this study complements the big picture by showing that the heightened intersubjectivity at the level of interactional behaviors has a physiological correlate, instantiating itself in a higher level of physiological and affective arousal. If such arousal is present when participants discuss such mundane issues as what to eat, it is expected to be even more prevalent when the decisions are more substantially consequential for them. Our findings may thus shed light on the (at times frustrating) common-place observation that, despite the multitude of proposals “in the air,” the ultimate joint commitment to specific actions may be easily left pending in interactional encounters (on “non-decisions,” see Lukes, 2005; Stevanovic, 2012a).

Table 2. Model Summary on the Effect of Depression Diagnosis and the Phase of the Decision-Making Process on SC Response Rates.

Fixed effects	Estimate	Std. Error	df	t Value	p
(Intercept)	3.11	0.4	96.15	7.73	<.001
Diagnosis	0.41	0.76	126.47	0.54	.5881
Segment	1.38	0.5	287	2.76	.006
Diagnosis:Segment	1.72	0.98	287	1.75	.081

Note. Diagnosis; 0=no depression diagnosis, 1 = depression diagnosis. Phase; 0= negotiation, 1 = decision.

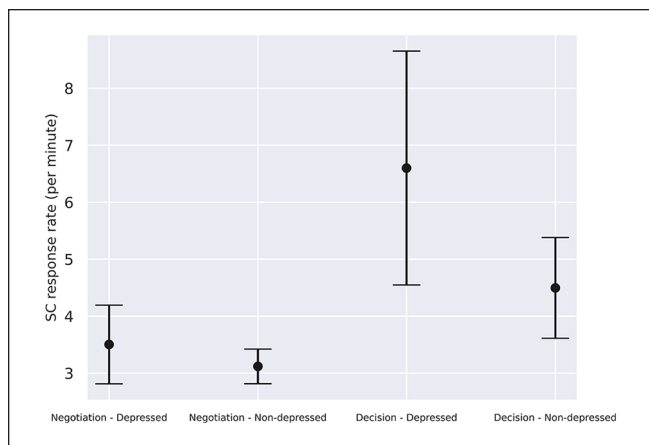


Figure 4. SC response rates among participants with and without depression diagnosis during the negotiation and decision phases. The black dots indicate means while the lines represent 95% confidence intervals.

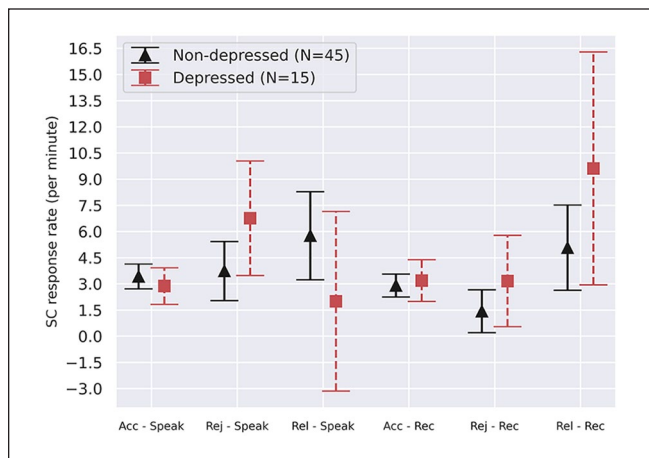


Figure 5. The mean SC response rates and 95% confidence intervals for the different verbal response categories (Acc= Acceptance, Rej= Rejection, Rel= Relinquishment) for both the speaker (Speak) and the recipient (Rec).

We also predicted that, during the negotiation phase of the joint decision-making process, different types of responsive actions would be associated with different SC response rates, as formulated in *Hypothesis 2*. Considering acceptance as a preferred response to a proposal (Davidson, 1984; Houtkoop,

1987), we expected that acceptances would be interactionally easy to produce and receive, which would be associated with SC response rates near the baseline. Our data support the hypothesis. This finding also sheds light on the results of our previous study, where we used a word-invention task that was structured in a way that the acceptance of a proposal and the establishing of a decision were accomplished practically at the same time, these moments having been associated with arousal (Stevanovic et al., 2021). On the basis of the present results, we may now tease apart whether it is the co-participants’ accepting responses to proposals or the emergence of decisions that underlies the heightened level of physiological arousal in the proposal speakers, and then exclude the former possibility. Our results suggest that an acceptance of a proposal as such is not a matter of arousal, but it is the decision-implicativeness that underlies the arousal response—something that in the experimental paradigm used in this study was seen to happen during the final “decision phase” of the joint decision-making process (see above).

In contrast to acceptances, we assumed that rejections would involve an inherent threat to the participants’ face (Brown & Levinson, 1987 [1978]) and that this threat would be reflected in the participants exhibiting SC rates higher than the baseline. This hypothesis was not supported by our data. Not only were rejections associated with SC response rates near the baseline, but the response rates were even lower than that (at least for the participants without depression). This suggests that, in this type of activity context, rejections may indeed be considered as quite unproblematic actions, not only for the producers of the rejections but also, and specifically, for their co-participants—that is, those very participants whose proposals were rejected. It is possible that, in this context, any possible face-threatening implications of rejections were effectively mitigated by the rejections being temporally separated from the initial revealing of the lists of the participants’ individual preferences. Inasmuch as this is the case, our results would point to a subtle difference between considering rejections as inherently face-threatening actions (Brown & Levinson, 1987 [1978]) and seeing proposal speakers as vulnerable to the ways in which their proposals will be treated by their co-participants (Rawls, 1987). It therefore appears that, if such acute vulnerability can be minimized, for example, by increasing the temporal distance between the proposal and its rejection, the

Table 3. Model Summary on the Effects of Depression Diagnosis and Rejection on SC Response Rates of Recipients.

Fixed effects	Estimate	Std. Error	df	t value	p
(Intercept)	2.79	0.5	114.39	5.59	<.001
Diagnosis	0.41	0.98	114.39	0.42	.674
Rejec	-1.42	0.69	97.69	-2.05	.0431
Diagnosis:Rejec	1.36	1.3	98.81	1.04	.301

Note. Diagnosis; 0 = non-depressed, 1 = depressed. Rejec; 0 = baseline, 1 = rejection. The marginal R^2 for the model is .05 while the conditional R^2 is .12.

Table 4. Model Summary on the Effects of Diagnosis and Relinquishment on SC Response Rates of Speakers.

Fixed effects	Estimate	Std. error	df	t Value	p
(Intercept)	2.79	0.54	75.17	5.12	<.001
Diagnosis	0.41	1.07	82.62	0.38	.703
Relinq	2.98	0.9	84.99	3.32	.001
Diagnosis:Relinq	-4.17	1.94	81.78	-2.15	.035

Note. Diagnosis; 0 = non-depressed, 1 = depressed. Relinq; 0 = baseline, 1 = relinquishments. The marginal R^2 for the model is .12 while the conditional R^2 is .13.

Table 5. Model Summary on the Effects of Diagnosis and Relinquishment on SC Response Rates of Recipients.

Fixed effects	Estimate	Std. error	df	t value	p
(Intercept)	2.79	0.55	84.74	5.11	<.001
Diagnosis	0.41	1.07	84.74	0.39	.701
Relinq	2.36	0.88	83.80	2.67	.009
Diagnosis:Relinq	3.94	2.03	82.83	1.94	.056

Note. Diagnosis; 0 = non-depressed, 1 = depressed. Relinq; 0 = baseline, 1 = relinquishments. The marginal R^2 for the model is .19 while the conditional R^2 is .25.

face-threatening implications of the rejection will thereby also be minimized. While this claim—and especially its physiological underpinnings—should be subjected to empirical testing, the idea is nonetheless in line with the basic insights about the preference organization, according to which dispreferred actions tend to be produced with delay (Pomerantz, 1984).

We also hypothesized that the relinquishment of one's initially listed preferences would be an interactionally problematic action and thus be associated with SC response rates higher than the baseline. This hypothesis was supported by our data. While giving up something for the greater good may be seen as a perfect way of maintaining solidarity, one needs to "surrender one's position" (Graham, 1998), which may also be associated with a threat to one's face, given that self-consistency is a prominent aspect of self and identity (e.g., Cooper, 2007; Gawronski & Strack, 2012). It may thus be considered as the kind of "emotional labor" (Hochschild, 1979, 1983) that is even physiologically taxing. But intriguingly, our results also suggest that such solidarity is also arousing to witness as a co-participant. While we could not predict this result on the basis of prior literature, it is in line with the basic Goffmanian insight, according to which face threats are contagious, with both participants "sharing this sentiment just when they have reason to feel apart" (Goffman,

1956, p. 268). Even if it was just one participant relinquishing one's preference, the two participants could be seen to be "in the same boat"—both reacting with elevated physiological arousal.

In *Hypothesis 3*, we predicted that the SC response rates would be different for participants with and without depression, and that these differences would play out differently depending on the participants' moment-by-moment communicative actions. This hypothesis was largely not supported. However, we observed a negative interaction between depression diagnosis and SC response rates during relinquishment segments—that is, it is physiologically and affectively less arousing for participants with depression (vs. participants without depression) to give up their previously expressed preferences. This finding seems to support the notion of depression-induced physiological underarousal in response to social cues (Benning & Ait Oumeziane, 2017). In our study, those "social cues" that were associated with depression-related underarousal were produced by the participants themselves. The choice to produce a communicative action that involved surrendering of one's position was the own making of the participants with depression. The specific mechanisms behind such "relaxed" physiological responses, however, cannot be determined based on our data alone. For example, the effect could be accounted for with

reference to a lesser commitment to the initially expressed preferences by the participants with depression, to their lower degree of immersion in the imaginative elements of the task, or to their conceding attitude toward maintaining their views in the face of competing ones—all mechanisms that would fit well with literature associating depression with low personal agency (Angus & Greenberg, 2011; Ekberg & LeCouteur, 2015; Muntigl, 2016; Vanheule & Hauser, 2008). Then again, our finding that it was nonetheless arousing for the participants with depression to witness the relinquishments of their co-participants could be accounted for with reference to the preservation of the normal levels of empathy in depression (O'Connor et al., 2007).

We acknowledge some limitations of our work. First, all our participants were female. Our results might have been different had we included male dyads or cross-gender dyads into our sample. Analogously, the fact that the participants were strangers to each other may have generated interactional patterns different from what characterize interactions between everyday acquaintances, friends, or family members. Moreover, it is possible that, in this study, the possible face-threatening implications of rejections were mitigated by the task requirements, which made rejections very much expected, as the initial lists of food preferences contained more items than the participants were able to select for their final menu. It should be noted, though, that the same argument holds also for the relinquishments, which were nonetheless associated with elevated arousal levels. Also, our results may have been impacted by self-selection bias. Our participants were volunteers socially courageous enough to decide to participate in a study which required talking with a stranger, which may have influenced the stress-related physiological responses in all our dyads. Furthermore, it should be noted that, though skin conductance measures provide powerful tools for assessing the level of arousal in participants, they provide no direct information about the valence of that arousal. Finally, the imbalance between the two diagnostic groups must also be acknowledged as a limitation.

Our study found evidence that the reaching of decisions is a physiologically arousing communicative event. The matter that joint commitment is taxing, not only cognitively, but also physiologically, might thus partially explain the apparent ineffectiveness of some of our daily decision-making interactions. But not only is the reaching of decisions physiologically taxing. So is also the relinquishing of preferences. Thus, despite hundreds of social skills books and blogs emphasizing the value of maintaining solidarity by giving up something for the greater good, our study suggests that such emotional work does not come about without taking its toll. Our data, furthermore, suggest that these two different types of social concerns might be differentially altered in depression. While there may be no differences with respect to the first concern, it is possible that the experience of relinquishment, as indicated by the participants' physiological

correlates, has specific depression-induced characteristics, which would need to be investigated in more detail in future research with larger participant samples. More generally, further conversation-analytically informed research is needed to unravel how the organized features of interactional practices are intertwined with the physiological arousal responses of different types of participants and what the social import of these responses specifically is.

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Ethics Statement

Institutional Review Board approval was obtained from the Ethics Committee of the Helsinki University Central Hospital [18.06.2018].

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