ARE YOU LOOKING AT ME?
AN OBJECTIVE STATE OF MIND REDUCES SENSITIVITY TO OTHER'S EMOTIONAL EXPRESSIONS

by

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Abstract

An objective state of mind refers to a mental state in which people perceive themselves as the object of another's observation. Previous research has shown that this state affects people's metacognitive process, emotional experience, and social behavior. An objective mental state often arises during everyday social interaction, but few studies have investigated how it influences one's social perception during an encounter. Here we examine how the perception of others' emotion is influenced by triggering an objective state of mind. We developed an online experiment using webcams, questions, and pre-programmed conversations to manipulate participants' mental states. We then measured their accuracy in reading the emotional expressions of people they believed they were interacting with. Three conditions were compared. In the Evaluated condition, participants were asked to classify the emotional expressions of two study assistants, after being informed that one of the assistants might select them as a partner in a competitive game. In the Evaluating condition, different participants classified the emotional expressions of the same assistants, but this time believing that they would be able to select one assistant as a game partner. In the Neutral condition, the same emotion classification task was performed, but participants were not given any other instructions. The results showed that participants in the Evaluated condition were significantly less accurate in classifying emotions than in the other two conditions. We interpret this finding as supporting the view that an objective mental state reduces the ability to read other's emotional cues. We discuss possible mechanisms by which this may occur, including increased stress, divided attention, and the role of latent imitation in forming empathy for others.

Lay summary

People with an objective state of mind tend to imagine themselves from other's perspective and perceive themselves as the object of another's observation. While such mental state often arises during everyday social interaction, few studies have investigated how it influences one's social perception during an encounter. In the current study, we used an online experiment to examine how the perception of others' emotion is influenced by triggering an objective state of mind. We found that participants with an objective mental state were significantly less accurate in classifying emotions than participants with a subjective or neutral mental state. We interpret this finding as supporting the view that an objective mental state reduces the ability to read other's emotional cues.

Preface

This thesis is based on the experiment conducted in UBC's Vision Laboratory. I was responsible for designing the experiment, analyzing the data, interpreting the results, and writing the manuscript, with the help and guidance from my supervisor Dr. James T. Enns and postdoctoral researcher Dr. Veronica Dudarev (UBC Vision Lab). Dr. Enns and Dr. Dudarev also contributed substantially to editing the manuscript. Jamie Kai (Research Technician, UBC Vision Lab) coded the program for the experiment and provided technical assistance throughout the course of the study. The data collection was done by undergraduate research assistant Noor Brar and me.

All research described in this thesis was approved by the University of British Columbia Behavioral Research Ethics Board (H20-01720). The project title is Social perception.

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In addition, I wish to acknowledge the help provided by our lab manager and technician, Jamie Kai, as he worked hard to code the program needed for this experiment. I also want to thank our research assistant, Noor Brar, for her help with the experiment.

I also wish to thank my family and partner for their encouragement and support throughout my study.

Introduction

Several lines of research suggest that performing a task in the presence of another person is not the same as doing it alone. Indeed, the influence of the mere presence of another person was one of the first social effects on cognitive processes to be documented (Green & Gange, 1977; Triplett, 1898). More recent research has shown that the simple presence of a passive onlooker alters participants' behavior and attention system (Michel, Bölte, & Liepelt, 2018; Risko & Kingstone, 2011; Turner et al., 2020). The present study focuses more closely on how the social other is perceived by the participant in a social exchange, by manipulating whether the participant believes they are being evaluated by the other versus whether the participant is the one doing the evaluation. This comparison is made in the context of an emotional expression classification task.

Three different lines of work provide important background for the rationale of this study, including studies examining the perception of emotions in others, the role of stress on emotion perception, and how an objective mental state influences emotion perception. The next sections provide a brief summary of relevant literature on each of these topics before we return to the specific rationale for conducting the present study.

Perception of emotions in others

Most of the facial expressions people encounter in the course of everyday life are subtle and fleeting. These expressions are often displayed in the context of many other sources of information, including many visual and auditory sources of distraction in the surrounding environment. Nevertheless, the majority of people can recognize emotion expressions in others quickly and without much effort. Indeed, some studies suggest that emotion perception is a highly automatic process, meaning that it can operate quickly and with minimal cognitive

resources (Tracy & Robins, 2008; Tsouli, Pateraki, Spentza, & Nega, 2017). Furthermore, studies also propose that emotion perception is supported by an internal simulation mechanism, which denotes that people identify and understand others' emotions through recreating the perceived facial expressions in themselves (Goldman & Sripada, 2004; Wood, Rychlowska, Korb & Niedenthal, 2016; Oberman & Ramachandran, 2007). To simplify, hereafter we will refer to this account as "internal simulation".

Internal simulation proposes that people often mimic other's emotional expressions, either internally or externally, and such mimicry in turn provides cues for people to infer the other's internal state (Hess & Fischer, 2013). Several lines of research support this account. First, a number of studies have reported that viewing emotional expressions spontaneously triggers facial mimicry of these expressions. For instance, Rymarczyk and colleagues (2016) showed that participants viewing dynamic facial expressions of fear and disgust spontaneously demonstrated facial mimicry of these emotions. Such mimicry has also been found for other positive and negative emotions, such as happiness and anger (Bush, Barr, Mchugo, & Lanzetta, 1989; Dimberg, Andréasson, & Thunberg, 2011). It is also suggested that the mere observation of other people's emotional expressions activate similar brain networks as an actual imitation of the expressions (Carr, Lacoboni, Dubeau, Mazziotta, & Lenzi, 2003).

A second line of research in support of internal simulation reports that directly modulating the capacity for facial mimicry of emotions seems to influence people's emotion perception. For example, Neal and Chartrand (2011) showed that participants whose facial muscular feedback was dampened by a cosmetic procedure did worse in an emotion identification task than participants in the control group. However, when participants' facial muscular activity was amplified by adding load to facial muscles during contraction, their

accuracy rate of emotion identification was significantly higher, compared to participants whose muscular activity was not amplified. Similarly, Hyniewska and Sato (2015) found that intentionally asking participants to pose positive or negative expressions (cheek raising and brow lowering) shifted their valence judgments of emotional expressions in the same direction as the posed emotion. Wood and colleagues (2016) interpret such effect by saying that the modulation of facial mimicry likely affect people's inner simulation process, which then influences emotion perception by providing different internal cues.

There is also evidence suggesting that emotion perception is a fairly automatic process, which demands minimal cognitive resources and can occur without conscious deliberation (Tracy & Robins, 2008; Tsouli et al., 2017). For instance, Tracy and Robins (2008) showed that people were able to accurately recognize facial expressions, including complex emotions such as pride, embarrassment, and shame, even when they are cognitively taxed by remembering a seven-digit number. Furthermore, other studies suggest that emotion perception can occur without conscious awareness. Dimberg, Thunberg, and Elmehed (2000) showed that subliminal presentations of positive and negative facial expressions influenced participants to respond with different facial muscle activities that corresponded to the expressions they saw. The subliminal presentation of facial expressions has also been reported to elicit greater amygdala activities in participants (Whalen et al., 1998).

Despite the claims we have reviewed here, that emotion perception occurs in part through internal simulation and that it appears to be a spontaneous and automatic process, other evidence suggests that emotion perception is nonetheless susceptible to influences such as stress and certain other mental states.

The influence of social stress on emotion perception

Past research shows that social stress can influence a number of cognitive functions (Mendl, 1999), including the perception of emotion from facial expressions. The small number of studies on this question all suggest that social stress leads to an increase in people's sensitivity to emotional expressions (for reviews see von Dawans, Strojny, & Domes, 2021). For instance, one study reported that experiencing acute social stress increased participants' sensitivity to fearful emotional cues in children (Chen et al., 2014), while another study showed that social stress enhanced participant's perception of happy facial expressions (von Dawans, Spenthof, Zimmer, & Domes, 2020). Domes and Zimmer (2019) found that individuals experiencing elevated social stress, as elicited by a virtual Trier Social Stress Test, were more sensitive to both positive and negative emotion expressions than people in the control group.

Emotion perception in an objective mental state

Everyday social encounters between people almost always include an "observer-observed" dimension, meaning that each individual can at times feel that they are either the observer of another person's behavior or that their own behavior is being observed (Argyle, Lalljee and Cook, 1968). When individuals feel that they are the observers, they tend to focus on their perceptions of the outside world. In contrast, when people feel they are ones being observed, they tend to imagine the situation and themselves from another's perspective (Argyle & Williams, 1969). Past research has used the term "objective state of mind" to refer to the mental state in which people perceive themselves as the object of another's observation (Noah, Schul, & Mayo, 2018). It has been suggested that people with an objective state of mind are prone to focus on external aspects of themselves, such as their overt behaviors or physical

appearances, instead of their internal states (Fenigstin, Scheier, & Buss, 1975; Noah, Schul, & Mayo, 2018).

A term that is closely related to the concept of an objective mental state is "objective self-awareness." The literature on self-awareness uses this term to describe a shift of attention from others to oneself (Duval & Wicklund, 1972). Govern and Marsch (2001) have gone on to further subdivide the concept of self-focused attention into three different types: private self-awareness, public self-awareness, and awareness of one's surroundings. People engaged in private self-awareness tend to focus on the aspects of the self that are only accessible to themselves (e.g., inner feelings, thoughts). People engaged in public self-awareness tend to focus on the aspects of the self that are visible to others (e.g., their appearance, observable behaviors) (George & Stopa, 2008). For the purposes of the present study, we see the concept of public self-awareness to be most closely aligned to our use of the term "objective state of mind," since both terms describe the mental state where people focus on themselves as they believe they are being observed.

Combining the insights from past research on emotion perception through internal simulation and from past research on an objective state of mind leads to a hypothesis worthy of investigation. If internal simulation plays an important role in emotion perception, and if an objective state of mind focuses attention away from one's internal states in favor of the external world, then the internal processes necessary for emotion perception may be disadvantaged when people are in an objective state of mind. Consistent with hypothesis, Noah, Schul, and Mayo (2018) have already shown that being observed reduced the facial-feedback effect. The facial-feedback hypothesis proposes that the facial activity related to particular emotional expressions can affect people's emotion experience (Strack & Stepper, 1988). In Noah and colleagues' study (2018), participants watched amusing cartoons either with or without a camera placing in front of

them, while they were holding a pen between their teeth or lips. They found that when participants were sitting in front of a camera, their own facial expressions had less influence on their affective experience. The authors interpreted this finding to imply that when participants felt they were being observed, they relied less on their internal cues and therefore were less influenced by their posed emotional expressions. This interpretation also implies that if the spontaneous imitation of someone else's facial expression aids in emotion perception, then being observed should decrease that individual's access to the results of internal simulation and subsequently reduce their ability to detect emotions in others.

In another study, Noah, Schul, and Mayo (2018) had participants read tiramisu recipes in easy-to-read handwriting or in hard-to-read handwriting and then estimate its preparation time. Participants were initially asked to either imagine that others are observing and choosing them, in order to induce an objective state of mind, or that they are choosing others to induce a feeling of being the observer. Participants who were put into an objective state of mind relied less on their internal metacognitive feelings and estimated the preparation time for easy-to-read and hard-to-read recipes to be the same. However, the other group predicted a higher preparation time for the hard-to-read recipe, having been influenced by the difficulty of handwriting. Although this study did not examine emotion perception, the results support the hypothesis that when one is in an objective state of mind, they will reduce their reliance on the information provided by internal cues.

Study Overview

The purpose of the present study was to examine whether inducing an objective state of mind in the participants of an online experiment would influence their sensitivity to the expression of emotions in others. Participants watched short videos of actors looking at emotion-

provoking pictures that only the actors could see. Participants were asked to guess, based only on the actors' facial expressions, whether the valence of the picture was positive or negative. The pictures viewed by the actors were selected from International Affective Picture System (IAPS) (Lang, Bradley, & Cuthbert, 2008).

Participants' sensitivity in discriminating positive from negative expressions in the brief emotional expressions of the actors was compared across three conditions, which we refer to as Evaluating, Evaluated, and Neutral. In the Evaluating condition, participants were told that they would choose one of the actors as their partner in a mind-reading competitive game. In the Evaluated condition, participants were told that the actors – who were introduced as "research assistants" – would choose whether to partner with them as a game partner. In the Neutral condition, no manipulation of mental states was used. A self-report questionnaire was used to assess participants' stress and their perception of the experimental situation. We hypothesized that participants in the Evaluated condition would be less accurate in classifying emotional expressions than participants in the Evaluating and Neutral conditions. This would suggest that being in an objective state of mind can hinder people's ability to read emotional cues.

Method

Participants

All aspects of this experiment were approved prior to data collection by the University of British Columbia Behavioral Research Ethics Board (H20-01720).

A total of 158 volunteer participants were recruited through the University of British Columbia Human Subject Pool. All participants received one course credit in return and those participants assigned to the evaluating and evaluated condition received a $5 gift card as a bonus at the end of the session. Data from 8 participants were excluded from this analysis because they either did not complete the experiment or participated in the experiment more than one time. This left 150 participants (26 male, 124 female), ranging in age from 17 to 51, with 50 being randomly assigned to the Evaluated, Evaluating, or Neutral conditions. Participants' self-reported their cultural background was East Asian (44%), European (20.7%), South Asian (15.3%), South East Asian (6.7%), Middle Eastern (5.3%), Hispanic (1.3%), African (0.7%), First Nations (0.7%), and others (5.3%).

Apparatus and stimuli

The experiment was hosted on the Pavlovia platform for online behavioral research (Open Science Tools Ltd., Nottingham, UK), and informed consent and all questionnaire responses were collected through Qualtrics (Qualtrics, Provo, UT, USA).

The stimuli shown to participants in the emotion classification task consisted of 3-sec video segments that were taken from a previous study (Enns & Brennan, 2009), with participants' permission. In that study, participants (who we will refer to as actors in the present study) were asked to view emotional images selected from the IAPS image set (Lang et al., 2008) while their face was recorded. The images were selected to represent emotional events

ranging from negative to positive in valence and from low to high in intensity, resulting in a 2 x 2 set of emotional images.

For half of these recordings, the actors were simply asked to view the images and to indicate whether they were negative or positive in valence while thinking about autobiographical events that the images reminded them of. Any emotional expressions made by the actors in this condition were thus elicited *spontaneously*. For the other half of the recordings, the same actors were again instructed to indicate whether the images were negative or positive in valence while at the same time expressing with their faces the emotion that they believed was most reflective of their experience. The emotional expressions made in this condition were thus elicited *intentionally*.

The video clips from three actors were selected as stimulus materials for the present study. Our choice was anchored by our interest in having expressions that were reliably strong in the Intentional condition, regardless of the strength of expressions in the Spontaneous condition. This would ensure an equal number of videos with strong and weak emotional signals. For each actor, the clips were evenly divided between Spontaneous and Intentional expressions, negative- and positive-valence expressions, low- and high-intensity expressions, and three different images in each cell. This resulted in a total of 2 x 2 x 2 x 3 = 24 video clips for each of the three actors and 72 video clips in total.

Procedure

Once participants had volunteered for the study, and after providing their consent via Qualtrics, they were directed to the Pavlovia website to begin the testing session. Participants were randomly assigned to one of the three conditions. In the Evaluating and Evaluated condition, participants were told that they would first complete an emotion perception task and

then play a mind-reading game with one of our research assistants. They were instructed on the mind-reading game and practiced one trial of it. Then, the research assistants were introduced to the participants by showing the fictitious names and still photos of these two research assistants. The photos were screen shots taken from the video clips. After that, participants performed the emotion classification task, which consisted of viewing and classifying a series of videos involving both of the study assistants. In the Neutral condition, participants started with the emotion classification task, and no game was mentioned. Finally, all participants completed a post-experiment questionnaire.

Objective mind state manipulation

To manipulate participants' state of mind we told some participants they would choose a study assistant as partner for an interactive game (Evaluating condition). We told other participants that they would be chosen by a study assistant as a partner (Evaluated condition) for an interactive game. Photos and names of the study assistants were then shown to participants in order to allow participants to familiarize with their potential game partners. We used the same actors who posed emotional expressions as the potential game partners – introducing them as our study assistants, in order to have participants believe that the people whose emotions they judge during the emotion classification task are their potential partners for the game. No mention of the game was made in the Neutral condition.

We used four ways to enhance the manipulation. Firstly, the game was of a mind-reading kind that required cooperation with one's teammate in order to succeed, and thus choosing a like-minded partner was important. Secondly, to emphasize the importance of choosing a like-minded partner, participants were offered a chance to "interact" with the two research assistants by either asking them questions (Evaluating condition) or answering their questions (Evaluated condition).

For the Evaluating condition, this allowed participants to get to know the research assistants in order to help them make a decision of whom to choose as their partner. For the Evaluated condition, they were told that their answers would be used by the research assistants to help determine if they wanted to pair up with the participant, which in turn triggered the objective state of mind. The chat used a simulated instant messaging interface within the online experiment. Thirdly, the game was competitive: participants were told that the team (pair) that scores among the highest 5 would receive a monetary prize. Finally, in both Evaluating and Evaluated condition, participants' web cameras were also turned on, which potentially strengthened the manipulation.

Emotion perception task

We adapted the emotion perception task previously used in Enns and Brennan (2009) to assess participants' accuracy of emotion perception. Participants were presented with video clips of the actors who were looking at emotional images selected from the IAPS image set (Lang et al., 2008). They were asked to indicate on each trial whether the actor was looking at a positive or negative picture, by providing a rating on a 7-point scale (from -3/highly negative to +3/highly positive). Each trial began with a fixation cross, followed by a 3-second video clip, followed by the visual scale prompting participants to respond. To keep the experiment short, each participant was only presented with videos of 2 randomly selected actors (48 trials). The task was divided into two blocks, including 24 trials with Actor I and 24 trials with Actor II. The order of spontaneous and intentional expressions was random within each block. After completing a block of trials, participants "interacted" with the respective actor (see section *Interviews with the potential partners* below).

Mind-reading competitive game

The mind-reading game was introduced to the participants in order to manipulate their mental state. No actual game was played during the experiment, and participants in the Evaluated and Evaluating condition only played one practice trial of this game. Participants were first presented with the instruction of the game. They were told that in each round of this game, they and their potential team partners (one of the research assistants) would see three abstract shapes. One team member would name one of the shapes, and the other member would need to guess which shape it is based on the name provided by the first member. Participants were then given a practice trial of this game (against the computer).

In the practice trial, participants saw three abstract shapes and were asked to guess which shape was "Galli". After they chose, the correct answer was shown on the screen to provide feedback.

In order to make the game feel more realistic as well as to motivate participants, they were told that the number of correct guesses would be counted for each team. Participants in the top five winning teams would receive a $5 gift card, while the research assistant who scored the most would receive a $100 gift card. However, in reality, all participants in the Evaluated and Evaluating condition received a $5 gift card as bonus reward.

Interviews with the potential game partners

After completing the emotion classification task with each actor, participants were introduced to a chat where they could interact with the person. In the Evaluating condition participants were presented with three get-to-know-you questions (e.g., "What are your hobbies?", "Are you more of an introvert or extrovert?"), and were asked to choose 2 of them to direct to the research assistant. The questions were randomly selected from a list of 31 get-to-

know-you questions, and the research assistants' answers were pre-programmed. In the Evaluated condition, participants were "asked" two get-to-know-you questions by a research assistant, and they typed their reply as they would in an instant messenger. In reality, the two questions were randomly selected from the same 31 get-to-know you questions mentioned above. The chat closely simulated an instant messaging interface, showing a small icon with the face of the respective actor, a grey generic icon for the participant, and chat box for typing. The timings of the automatic prompts (questions in the Evaluated condition and responses in the Evaluating condition) were randomized between 0.5 and 2 seconds.

Webcam manipulation

To further strengthen our manipulation of objective state of mind, we also asked participants in both the Evaluated and Evaluating conditions to grant us access to their computer cameras at the beginning of the experiment. In the Evaluated condition, participants were told that the research assistant could monitor their performance through the camera. In the Evaluating condition, participants were told that their eye movements were being recorded. No recordings were actually made. In the Neutral condition, we did not request any access to participants' webcams.

Post-experiment questionnaire

Following completing the tasks on Pavlovia platform, participants were directed to Qualtrics to complete the post-experiment questionnaire. Participants in all three experimental conditions were asked about their age, gender, and cultural background. They were also asked to rate how stressed they felt during the task (7-point-scale; "Not stressed at all" = 1, "Very much stressed" = 7), whether they thought there was a hidden purpose of the experiment, and if they experienced any issues during the online study. The questionnaire also assesses the degree to

which participants in the Evaluating and Evaluated condition felt observed and evaluated, as well as how much they felt they were evaluating others (7-point-scale; “Not at all” = 1, “Very much” = 7). At the end of the questionnaire, they were also asked to indicate whether they thought being evaluated, or evaluating others, played a role in influencing their accuracy of emotion perception (7-point-scale; “Not at all” = 1, “Very much” = 7) and if it is making it better or worse (7-point-scale; “Worse = 1, “Better” = 7).

All participants were debriefed after they completed the post-experiment questionnaire. In the debriefing, we explained the real purpose of the experiment and our manipulation method. We told participants that no recordings were made during the experiment, no game would actually take place, and all the interactions with “research assistants” were pre-programmed. All participants in the Evaluated and Evaluating condition received a $5 gift card as a bonus reward.

Results

Sensitivity to emotional expression

The main analysis in this study concerned the participants' ability to accurate classify the actors' expressions in the 24 video clips shown for each actor. These video clips were equally divided between occasions when the actor's expressions were elicited spontaneously versus intentionally and between occasions when the strength of the emotion in the picture the actor was seeing was low or high. Table 3 shows participants' average ratings for emotion expressions in each category.

Sensitivity to emotional expressions was measured as the difference between the mean ratings on positive and negative trials. Since ratings were made on a 7-point scale (from -3 to +3), the minimum possible sensitivity score was -6 and the maximum was +6. The higher the score, the more sensitive a participant is to the others' emotions.

The data for the three evaluation conditions were examined with mixed analysis of variance (ANOVA) involving the between-participant factor of evaluative condition (neutral, evaluated, evaluating) and the within-participant factors of actor's reaction type (spontaneous, intentional) and image intensity (low, high). Figure 1 shows the means involved in this analysis, along with 95% confidence intervals based on the between-participant factors.

Table 1 shows the emotion sensitivity scores (with 95% confidence intervals) for the three evaluation conditions (i.e. Neutral, Evaluated, and Evaluating), and each of the four categories of videos in the study: spontaneous and intentional reactions to images of high and low emotional intensity. All sensitivity scores were positive, with none of the confidence intervals overlapping with zero, which indicates that participants were generally sensitive to the difference between positive and negative emotions expressed by the actors. In addition, the data

also shows that when actors expressed emotions spontaneously, the sensitivity score was lower than when actors were intentionally trying to show the emotion depicted in the image they were viewing ($F(1,147) = 959.39$, $p < .001$, $\eta_p^2 = .87$). Finally, when actors viewed images rated as high in intensity, the emotion sensitivity scores were larger than when actors viewed images rated as low in intensity ($F(1,147) = 64.46$, $p < .001$, $\eta_p^2 = .31$).

The main effect of evaluation was significant, $F(2,147) = 7.34$, $p = .001$, $\eta_p^2 = .09$. Planned comparisons between conditions revealed that participants in the Evaluated condition were less sensitive than participants in Evaluating condition ($t(147) = 3.38$, $p = .001$) and neutral condition ($t(147) = 3.25$, $p = .001$). The difference between the Evaluating and neutral condition was not significant, $t(147) = .13$, $p = .90$.

Evaluation conditions did not interact significantly with actor's reaction type, image intensity, nor with the interaction of reaction type x intensity (all p-values > .08). This meant that in each of the four within-participant factors (reaction type x image intensity), the same pattern was found. Namely, participants in the Evaluated condition were less sensitive to the actor's emotional expressions than participants in Evaluating and Neutral conditions. One-way ANOVAs for each of these within-participant factors revealed significant differences of sensitivity scores in three of the four conditions: spontaneous-high ($F(2,147) = 4.38$, $p = .014$, $\eta_p^2 = .056$), intentional-low ($F(2,147) = 4.43$, $p = .014$, $\eta_p^2 = .057$), and intentional-high ($F(2,147) = 4.990$, $p = .008$, $\eta_p^2 = .064$). Planned comparisons further showed that participants in the Evaluated condition were less sensitive to these three kinds of expressions when compared to participants in the Evaluating and Neutral condition (all $ps < .05$). The same differences of sensitivity scores in the spontaneous-low condition were not significant when considered on their own ($p > .30$).

To summarize, participants in the Evaluated condition were significantly less sensitive to the actors' emotional expressions than participants in the Evaluating or Baseline conditions. This main effect held for intentionally posed expressions as well as for spontaneous expressions of intense emotions. In what follows we consider the information collected from post-experimental questionnaire to provide further context for this effect.

Post-experiment questionnaire

Table 2 shows the questions asked in the post-experimental questionnaire, and the means, standard deviation and correlations for participants' responses.

Stress. A one-way ANOVA showed a significant main effect of condition on self-reported stress, $F(2,147) = 5.66$, $p = .004$, $\eta_p^2 = .07$. Planned comparisons revealed that participants in the evaluated and evaluating conditions both reported feeling significantly more stressed than participants in the neutral condition ($t(147) = 2.79$, $p = .006$, $t(147) = 3.02$, $p = .003$, respectively). There were no significant differences in stress between Evaluated and Evaluating condition ($p = .82$). An examination of the correlation between emotion sensitivity and self-reported stress indicated that participants who reported feeling the most stressed tended to be least sensitive to the actors' emotional expressions ($r = -.22$, $p < .01$). When self-reported stress was examined seperately on the ratings of positive and negative emotions (Table 4), we found that in the Evaluated condition, participants who reported feeling the most stressed tended to rate the actors' positive emotion as least positive ($r = -.34$, $p < .05$).

It is also possible that the effect of the mind state was completely mediated by stress. To test this possibility, a multiple regression was conducted. It revealed a significant effect of evaluative condition on participants' emotion sensitivity after controlling for self-reported stress, $F(2, 146) = 6.71$, $p = .002$). Although the interaction between evaluative condition and stress was

not significant ($F(2, 146) = 1.79$, $p = .17$), the negative correlation between stress and sensitivity was reliable in the evaluated condition ($r = -.32$, $p = .024$), but not in either the evaluating condition ($r = -.20$, $p = .17$) or the neutral condition ($r = .04$, $p = .79$).

This result indicated that induced objective mindset and self-reported stress each had independent effects on participants' sensitivity to the actors' emotional expressions. In other words, stress decreased participant's ability to read actor's emotions, yet above and beyond that, participant's emotion perception is also decreased when their objective state of mind was triggered.

Feeling observed. A one-way ANOVA showed a significant main effect of condition on self-reported feeling of being observed, $F(2,147) = 40.45$, $p < .001$, $\eta_p^2 = .36$. Planned comparisons showed that participants in both Evaluating ($t(147) = 7.95$, $p < .001$) and Evaluated condition ($t(147) = 7.62$, $p < .001$) felt significantly more observed than participants in the Neutral condition. However, no difference was found between the Evaluated and Evaluating condition ($p = .75$). When we examined individual differences in feeling observed, we found that participants who reported feeling more observed tend to feel more stressed as well ($r = .46$, $p < .01$).

Feeling evaluated/evaluating others. Independent samples t-tests were conducted to compare how much participants felt they were evaluated or were evaluating others in the Evaluated and Evaluating condition. Although participants in both conditions felt that they were more or less evaluated or were evaluating others during the experiment (see Table 2), there was no significant difference in their ratings across conditions ($p > .33$). Additionally, participants with a stronger feeling of being observed tend to be those who reported to have a stronger feeling of being evaluated ($r = .7$, $p < .01$).

Conscious appraisal of the manipulation. Overall, participants were not fully convinced that they had been interacting with research assistants in real-time in either Evaluated (M = 1.98, SD = 1.45) or Evaluating condition (M = 1.86, SD = 1.34), with no difference between the two conditions (p = .67). In addition, when explicitly asked about whether evaluating others or being evaluated makes their emotion perception better or worse, participants in the Evaluating condition reported the influence to be more positive than participants in the Evaluated condition (p = .04), although the mean ratings in both condition were very close to the midpoint ($M_{Evaluated}$ = 3.64, $SD_{Evaluated}$ = 1.14; $M_{Evaluating}$ = 4.18, $SD_{Evaluating}$ = 1.42; "Worse" = 1, "Better" = 7).

Discussion

The purpose of this study was to examine how an objective mental state might influence one's ability to accurately identify another person's emotional expressions. We tried to induce an objective mental state in participants by encouraging them to believe they may or may not be chosen as a game partner by a study assistant (Evaluated condition). We compared emotion classification accuracy in this condition with two other conditions, one in which participants were encouraged to believe they would be choosing one of the study assistants as a game partner (Evaluating condition), and another in which no game scenario was described (Neutral condition). The main finding of the study was that participants in the Evaluated condition were consistently less accurate in classifying emotional expressions than participants in either the Evaluated or the Neutral conditions.

The post-experiment questionnaire did not point to any differences reported by the participants in their conscious appraisal of the situation. This included participants' reports on their feeling of stress, being observed, being evaluated, or feeling they were evaluating others. In addition, participants' reports generally indicated that they did not have strong feelings that their evaluations of others or being evaluated by others influenced their emotion perception in any way. Together with differences we observed in the emotion classification task, these post-experiment questions suggest that the influences of an objective mental state on emotion perception is not the consequence of any strategic decision made by the participant. Nor it is a consequence of experimental demand characteristics induced by the study manipulations. Instead, the dissociation between our performance measures (emotion classification) and the self-report measures is consistent with the effect of objective mental state on emotion perception

being implicit. Participants seem to be unaware that the factors manipulated in the study reduced their ability to accurately classify the emotional expressions made by the actors in the videos.

In the next sections we will consider the consequences of these findings for three possible classes of mechanisms that may be underlying the results. We do not see these three classes as being mutually exclusive alternatives. Indeed, they may form an interconnected web of influences that are all important in contributing to the overall effect. In the subsections that follow, we examine each possible mechanism in turn and suggest ways in which a more refined understanding of how objective mental state leads to a reduction in emotion expression sensitivity may be achieved in future studies.

Stress

One possibility is that people feel more stressed when they are being judged by others and that this increase in stress reduces the accuracy of perceptual discriminations. This possibility is supported in the present study by the finding that participants who reported feeling most stressed tended to be least sensitive to emotional expressions. This finding seems superficially inconsistent with the literature we reviewed in the introduction showing *facilitating* effects of social stress on emotion perception (Chen et al., 2014; von Dawans et al., 2020; Dommes & Zimmer, 2019). We suggest two possible avenues for reconciling the present result with these previous findings. First, past studies measured emotion perception after participants had been subjected to a stress manipulation. In the present study we measured emotion perception *during* a stressful social interaction. It is possible that people are less accurate in emotion classification during a stressful event, and that only later do they become sensitized to emotional cues after the stressful event has passed. Second, the present study tested emotion classification accuracy using video clips of actors experiencing emotions in real time, while

previous studies used static images for the emotion measure. Multiple studies report an advantage for emotion identification based on dynamic videos over static images (for reviews see Dobs, Bulthoff, Schultz, 2018; Krumhuber, Kappas, Manstead, 2013), with differentiation between positive and negative expressions potentially available very early in the emergence of an expression (Jack, Garrod, Schyns, 2014). This interpretation supports the possibility that our dynamic displays provided a better opportunity to observe the mediating effects of stress on emotion discrimination. However, we hasten to remind readers that stress was not the only factor having an influence of emotion discrimination in the present study. The statistical analyses that examined the combined influences of objective mental state and self-reported stress showed that they made significant independent contributions to reduced accuracy in emotion discrimination. This implies that the heightened stress involved in the social interaction cannot be the sole explanation of reduced accuracy.

Divided attention

Another possible factor in the reduction of emotion accuracy in the present study is that participants in the Evaluated condition may have been subjected to a dual task that had a greater secondary cognitive load than participants in the Evaluating condition. Attention researchers have studied dual task performance in a large number of ways, with the general conclusion that task interference is greatest when two tasks overlap in the cognitive resources they each demand (Duncan, 1980; Pashler, 1994). Recall that these participants were asked to classify the actors' emotions while, at the same time, trying to create a positive personal impression for the study assistant who might select them for the competitive game. Participants in the Evaluating condition also had a secondary task— trying to assess the actors for their value as potential future teammates — but this task might not have shared as many cognitive resources with the

emotion classification task as in the Evaluated condition. We do not favor this account because much past research has led to the widely held view that the perception of emotional expressions in others is an automatic process, meaning one that is not readily interfered with by a secondary task (Tsouli et al., 2017). Indeed, several studies have reported that this process is not disrupted even when the emotional expressions are presented subliminally (Dimberg, Thunberg, & Elmehed, 2000; Whalen et al., 1998), nor when the secondary task has a large cognitive load (Aviezer et al., 2011). This question deserves further study. One of the avenues to explore is the possibility that the demands of the Evaluated condition in the present study posed a cognitive load that was larger and/or more overlapping in its cognitive resources with the emotion perception task than in previous studies. We turn to this theoretical possibility in the next section.

Objective mental state interferes with the internal simulation of emotion perception

A leading theory of emotion perception proposes that we classify other's emotion expressions by mentally simulating the states we perceive in others (Wood et al., 2016). This simulation mechanism provides internal cues which support and facilitate emotion perception (Neal & Chartrand, 2011; Hyniewska & Sato, 2015). This perspective is also consistent with previous studies that have manipulated objective mental state (Noah et al., 2018). These authors have emphasized that the objective state of mind directs attention away from the internal bodily cues that ordinarily contribute to our emotional experiences, in order to focus attention on one's outward appearance and behavior to others. We propose that the combination of these two theoretical perspectives — emotion perception through internal simulation and objective mental state directing attention away from internal emotional signals — offers a reasonable account of the reduction of emotion accuracy in the present study. Nevertheless, this account also warrants more rigorous and targeted testing in future studies. At present, we can only offer the present

data as a first glimpse at the possibility that objective mental state may reduce accuracy in an emotion classification task because it interferes with access to the way emotions are regularly processed via internal simulations. This hypothesis opens up a wide range of opportunities for manipulating objective mental state in order to study other social perceptions that rely on internal simulations. These could include action and intention perception, the experience of empathy, and the perception and production of interpersonal synchrony. We find the present results encouraging for this line of future research because our manipulation of objective self-awareness, which was only mildly believable according to the exit poll questions, nonetheless led to an observable effect on performance.

Implications

The results of the present study, derived from a relatively simple manipulation that was conducted entirely online, offers an important implication for future methods on this topic. Previous studies on objective mental state have tended to use deceptive narratives, photographs, and the presence of cameras to manipulate a participant's mental state, and they have all been conducted in a laboratory setting with live research assistants (Noah et al., 2018a, 2018b). An advantage of using the online protocol reported here is that it allows for the manipulation of objective mental state in a real-world setting, the participant's home environment. Previous studies in the laboratory have indicated that the neutral condition is more similar in its effectiveness to the Evaluated condition, rather than to the Evaluating condition, as was found here (Noah et al., 2018). It is possible that merely being in an unfamiliar lab setting and/or interacting with a live study assistant is sufficient to trigger an objective state of mind in a participant. If so, then our online protocol may have contributed to the effectiveness of the manipulation in the participants, though a direct comparison in future studies is warranted.

Limitations and Future Directions

There are a few limitations of the present study that are worth future consideration. First, the present study was conducted online, and participants were not entirely convinced that they were actually interacting with a live person. Whether these responses were biased by a conscious strategy (the desire to appear "savvy" and skeptical, as opposed to naïve) or reflected the actual failure on our side to make the pre-recorded interactions realistic and believable, the key finding remains that, behaviorally, participants were affected by the manipulation. That is, participants' objective accuracy on the emotion classification task was lower in the Evaluated condition than in the other two. Yet, based on the present results, it is not possible to definitively conclude whether the effect was implicit, or whether participants merely under-reported their feelings of stress, feelings of observed, and belief in the story we told them. Future studies adopting similar methodology to the current study would benefit from improving the pre-programmed interaction to be more realistic. This may potentially be accomplished by providing real photographs of the actors (instead of presenting screen shots) and improving the design of the chat interface.

A second limitation was that stress in this study was measured retrospectively by one self-reported questionnaire item, and participant's recollection of their own stress levels during the experiment may have been inaccurate. Although the positive correlations between self-reported stress and feeling of being evaluated somewhat support the validity of our measurement of stress, it will still be prudent for future study to include a more objective measure of stress, such as measuring salivary cortisol levels (von Dawans, Spenthof, Zimmer, & Domes, 2020).

Conclusion

The present study provides evidence for the negative influence of an objective mental state on emotion perception in others. We used an online experiment to manipulate the mental

state of participants and found that those encouraged to adopt an objective mental state were less sensitive to emotional expressions than those encouraged to adopt a subjective mental state. We interpret this finding as support for the hypothesis that the perception of emotion is influenced by one or more of the mechanisms we have discussed, including stress, divided attention, and the internal simulation of other's emotions. We also believe that our online manipulation of objective mental state offers an effective way for future studies to examine the difference between an objective mental state and other contrasting mental states.

Tables

Table 1. *Descriptive statistics for emotion sensitivity across all participants (N=150) in the four categories of emotion expression in the videos.*

Actor Emotion	Image Intensity	Mean	SD	SE	95% CI
Spontaneous	Low	.48	.39	.032	[0.417 - 0.543]
	High	.68	.51	.042	[0.598 - 0.762]
Intentional	Low	2.50	.91	.074	[2.355 - 2.645]
	High	2.93	.97	.080	[2.773 - 3.087]
Overall		1.65	.51	.042	[1.568 - 1.732]

Table 2. *Correlation Matrix for post-experiment questionnaire.*

	Mean	SD	Correlations							
			1	2	3	4	5	6	7	8
1. Overall Sensitivity	1.65	.51	1							
2. How stressed did you feel?	2.24	1.33	-.22**	1						
3. How much did you feel you were being observed by others?	3.29	1.90	-.10	.46**	1					
4. How much did you feel evaluated?	4.05	1.66	.01	.45**	.70**	1				
5. How much did you feel you were evaluating the RAs?	4.22	1.91	.21*	-.03	.14	.04	1			
6. Did you believe the RAs were interacting with you in real-time?	1.92	1.39	-.01	.19	.25*	.23*	-.01	1		
7. Do you think your ability to read other's emotions is influenced by whether you are evaluating (being evaluated)?	3.09	1.71	-.05	.02	.22*	.22*	.18	.13	1	
8. Does evaluating others (being evaluated) make you better or worse at reading others' emotions?	3.91	1.31	.08	-.09	.15	-.05	.31**	-.06	.19	1

Note: *$p < .05$. **$p < .01$. Questions 4-8 were only asked in the Evaluating and Evaluated conditions.

Table 3. *Mean ratings for positive and negative emotion expressions.*

	Positive				Negative			
	Low-Spontaneous	High-Spontaneous	Low-Intentional	High-Intentional	Low-Spontaneous	High-Spontaneous	Low-Intentional	High-Intentional
Neutral	-.097	-.020	1.283	1.143	-.570	-.743	-1.340	-2.023
Evaluating	-.013	.057	1.220	1.053	-.557	-.737	-1.457	-1.970
Evaluated	-.090	-.040	1.013	.950	-.510	-.550	-1.180	-1.643

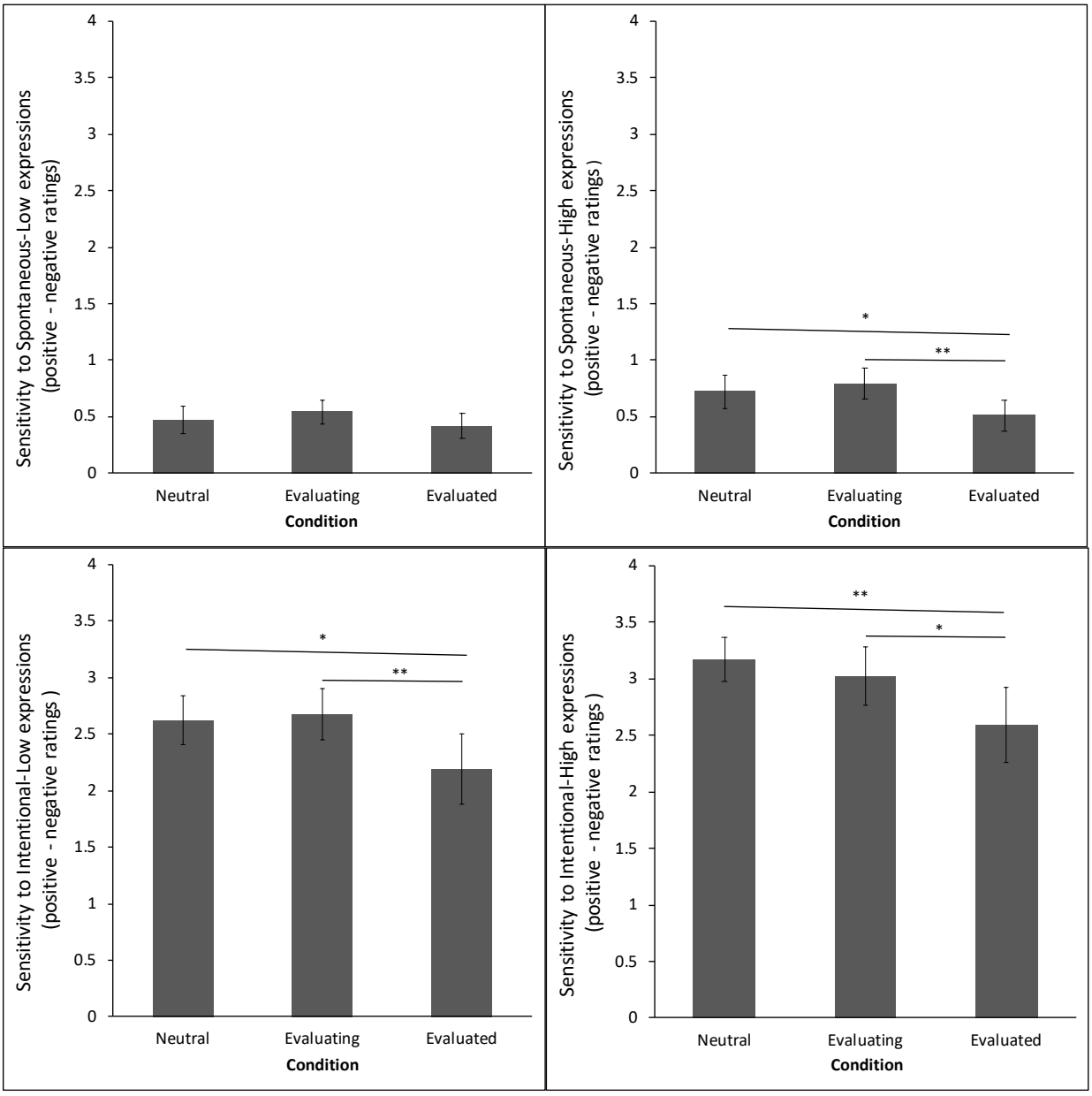
Table 4. *Correlations between self-reported stress and ratings for positive and negative emotion expressions.*

	Evaluating Condition		Evaluated Condition	
	Positive	Negative	Positive	Negative
Self-reported stress	-.107	.187	-.339*	.203

Note: *$p < .05$.

Figures

Figure 1. *Sensitivity to Spontaneous-Low, Spontaneous-High, Intentional-Low, and Intentional-High expression in Evaluating, Evaluated, and Neutral conditions. Error bars show the 95% CI.*



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