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Invisible Man: Exclusion From Shared Attention Affects Gaze Behavior and Self-Reports

Anne Böckler[1,4], Paul Hömke[1,2], and Natalie Sebanz[1,3]

Abstract

Social exclusion results in lowered satisfaction of basic needs and shapes behavior in subsequent social situations. We investigated participants' immediate behavioral response during exclusion from an interaction that consisted of establishing eye contact. A newly developed eye-tracker-based "looking game" was employed; participants exchanged looks with two virtual partners in an exchange where the player who had just been looked at chose whom to look at next. While some participants received as many looks as the virtual players (*included*), others were ignored after two initial looks (*excluded*). Excluded participants reported lower basic need satisfaction, lower evaluation of the interaction, and devaluated their interaction partners more than included participants, demonstrating that people are sensitive to epistemic ostracism. In line with William's need-threat model, eye-tracking results revealed that excluded participants did not withdraw from the unfavorable interaction, but increased the number of looks to the player who could potentially reintegrate them.

Keywords

ostracism, social cognition, shared attention, triadic interaction, eye gaze

Introduction

Being ostracized—that is, being excluded by other individuals or groups—can have devastating consequences both for the ostracized individual/individuals and for society. Social exclusion can result in limited access to interpersonal warmth and relationships, information, and/or goods (for a review, see Williams, 2007), and people who have been severely ostracized show increased rates of attempted suicide and depression (Williams & Zadro, 2001) and are more likely to engage in violent acts such as mass shootings (Leary, Kowalski, Smith, & Phillips, 2003).

In the most widely used experimental paradigm for studying social exclusion, participants are excluded from receiving a ball in a real-life or a virtual ball-tossing game (Williams, 1997). In such games, participants are involved in a short triadic interaction with two actual or virtual partners, in which a ball is tossed from one person to another. While some people remain included throughout the game, receiving approximately a third of all tosses, others are included only at the very beginning of the game, and do not receive the ball as the game continues. During this kind of social exclusion, participants show increased blood pressure, enhanced levels of stress hormones (Stroud, Tanofsky-Kraff, Wilfley, & Salovey, 2000), and augmented activation in brain areas related to pain processing (Eisenberger, Liebermann, & Williams, 2003). Self-reports immediately after being ostracized point toward lower fulfillment of basic needs (reduced feelings of belongingness, control, meaningful existence, and self-esteem), lower evaluation of interpersonal relationships (value, closeness, and importance of the relationship with the interaction partners), and a tendency to devaluate their interaction partners (assigning more negative and fewer positive attributes to the other; Williams, 2007).

Besides immediate emotional consequences (''reflexive'' effects), previous studies have examined the effects of exclusion on participants' behavior in subsequent social situations or interactions (''reflective'' effects). Such reflective consequences can be diverse, ranging from enhanced cooperation and prosocial behavior to increased aggression or complete withdrawal. It has been argued that the way participants behave

[1] Donders Institute for Brain, Cognition, and Behaviour, Radboud University, Nijmegen, Netherlands
[2] Language and Cognition Department, Max Planck Institute for Psycholinguistics, Nijmegen, Netherlands
[3] Department of Cognitive Science, Central European University, Budapest, Hungary
[4] Department of Social Neuroscience, Max Planck Institute of Human Cognitive and Brain Sciences, Leipzig, Germany

Corresponding Author:
Anne Böckler, Donders Institute for Brain, Cognition, & Behaviour, Centre for Cognition, Radboud University, P.O. Box 9104, 6500 HE Nijmegen, Netherlands.
Email: aboeckler@cbs.mpg.de

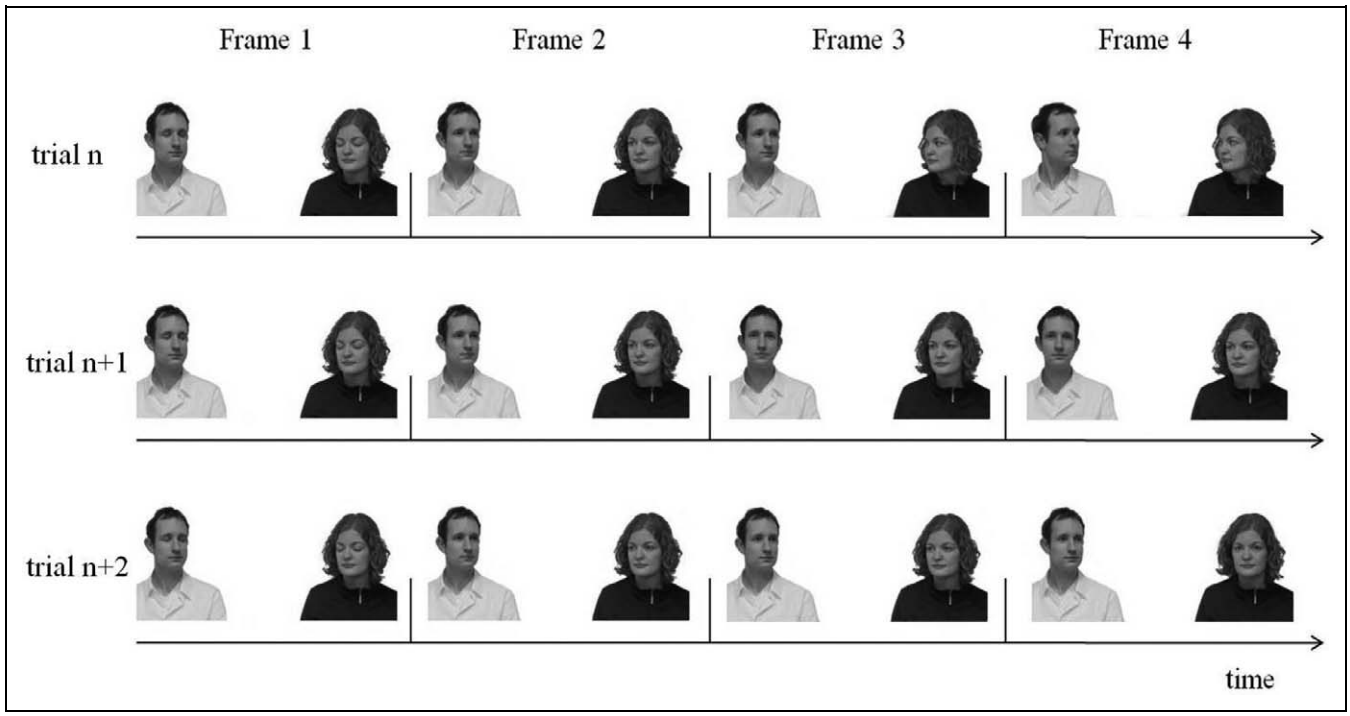

Figure 1. Stimuli and event sequence. First, the depicted individuals had their eyes closed (Frame 1: 700 ms), then they looked straight ahead (Frame 2: 700 ms). In the third frame, one of the players looked at another player (700 ms), who returned the gaze in Frame 4 (700 ms). The player who was looked at in a given trial could choose whom to look at in the next trial. *Top panel* shows a trial in which the right player looks at the left player (Frame 3), who then looks back at the right player (Frame 4). *Middle panel* shows the subsequent trial in which the left player looks at the participant (Frame 3) who then looks back (Frame 4, participant's gaze not depicted). *Bottom panel* illustrates the following trial in which the participant chooses to look at the right player (Frame 3, participant's gaze not depicted), who then returns the look (Frame 4).

in later social interactions depends on their prevalent motive (see Williams, 2007 for a review). When the ostracized individuals have strong belongingness needs, they will try to reaffiliate by showing prosocial behavior. In contrast, when efficacy needs are dominant, ostracized individuals will withdraw from the social interactions or behave antisocially.

The present study set out to investigate the behavior of excluded participants *during* an unfavorable interaction. What are the immediate behavioral responses to being denied the opportunity to interact with others? Do people reflexively try to reaffiliate or do they withdraw from the interaction while it is still ongoing? During the classic ball-tossing game, excluded participants have no opportunity to intervene and reintegrate themselves (since they do not have access to the manipulated object) and, hence, that particular paradigm does not allow this aspect of social behavior to be investigated. In order to address this question, we developed a new eye-tracker-based interactive ''looking game'' game in which (a) excluded and included participants had the same action opportunities and (b) the behavior of participants could be tracked throughout the interaction.

The present study employed this new looking game, in which participants and two virtual interaction partners exchanged direct eye gazes, and used eye tracking to record responses. The relation between the participant and the other players (*included* vs. *excluded*) was manipulated by whether participants did or did not receive direct looks from their interaction partners. While some participants were gazed at equally as often as the virtual players (included condition), others received no more looks after two initial looks at the beginning (excluded condition). Analogous to the ball-tossing games in previous studies, one of the players on the screen gazed either at the participant or at the other virtual player (see Figure 1). The one being looked at in a given trial returned the gaze (i.e., engaged in mutual eye contact with the gazer) and was then allowed to choose whom to look at in the following trial, and so on. Because participants were free to look anywhere during the game, participants in both conditions (included and excluded) could attempt to engage in social behavior (i.e., look at the other players) regardless of the actions of the other players, providing a behavioral indicator which we are able to track throughout the interaction.

Eye movements of the included and excluded participants were compared. We analyzed the number and duration of fixations directed at the virtual interaction partners' faces, torsi, and areas other than those occupied by the interaction partners, in order to examine whether excluded participants engaged in any kind of strategic looking or coping behavior indicating approach or withdrawal. In particular, if excluded participants were to try to withdraw from the unfavorable social interaction, this might be reflected in an overall tendency to avoid looking at the interaction partners' eyes or faces. Alternatively, excluded participants may try to approach and reaffiliate, and

try to "force" their virtual interaction partners' attention by gazing more intensely at the player who is in the position of choosing whom to look at next. This would result in especially long or numerous fixations to the face of that individual, especially just before he or she chooses where to direct his or her gaze.

Besides investigating participants' immediate behavior during social inclusion/exclusion, our new interaction game allowed us to address a second, more general question. Previous studies have shown that the nature of the manipulated object and the nature of the interaction partner do not seem to modulate effects of exclusion. The negative consequences of exclusion appear even when the tossed objects are bombs that can kill the virtual players and even when people know that the interaction partners are computers that are merely running scripts (van Beest, Williams, & van Dijk, 2011; Williams, Cheung, & Choi, 2000; Zadro, Williams, & Richardson, 2004). However, an open question remains: To what extent does the nature of the interaction itself matter? While ostracism exclusion paradigms mostly manipulate exclusion by denying participants the opportunity to partake in joint actions involving object manipulation (e.g., tossing a ball), social interaction in the present study was based on shared attention (i.e., mutual gaze). Can exclusion from such an epistemic intentional relation (Barresi & Moore, 1996) induce similar negative emotional consequences as have been reported for the exclusion from object exchange?

On one hand, humans are extremely sensitive to eye contact, and mutual gaze plays an important role in social interaction, social learning, and affiliation (Csibra & Gergely, 2009; Senju & Johnson, 2009, Tomasello & Carpenter, 2007). For instance, when mothers or caretakers denied mutual gaze (i.e., they were "still faced"), their children displayed emotional distress (Ham & Tronick, 2006), and adults reported negative effects when they received the so-called *silent treatment* or *cold shoulder* (i.e., they were denied eye contact) by another person (Williams, Shore, & Grahe, 1998; Wirth, Sacco, Hugenberg, & Williams, 2010). These findings strongly suggest that being "invisible" to others may be perceived as ostracizing and that such epistemic exclusion does indeed have the same effect as exclusion from object exchange.

On the other hand, there may be differences between exclusion from object exchange and exclusion from an epistemic relation such as sharing attention (Barresi & Moore, 1996). Exclusion from a merely attention-based relation does not directly reduce access to objects or to action opportunities. Therefore, the quality of the experience of merely observing shared attention in others depends primarily on people's interpretation of the scene. Observing mutual gaze between other agents (which characterizes exclusion from shared attention in a triad) may, for instance, simply signify their interest in each other and does not necessarily imply rejection or threat of another person. In fact, previous studies on the observation of eye contact have revealed that people often react to the perception of mutual gaze in others in the same way that they react to experiencing direct gaze themselves. Participants showed an enhanced tendency to follow another's gaze when the other had established eye contact with them beforehand (Bristow, Rees, & Frith, 2007; Senju & Csibra, 2008) but also when two faces looked at each other before providing gaze cues (Böckler, Knoblich, & Sebanz, 2011). Thus, in some situations, observing shared attention in others is interpreted as a general social signal rather than a sign of exclusion per se.

In order to address whether exclusion from an attention-based interaction also induces feelings previously reported in ostracism paradigms, some related indicators were measured in three experiments: self-rated basic need satisfaction, evaluation of relationships, and ratings of interaction partners.

Method

Participants

Sixty-six students (mean age 22; 53 female; 62 right-handed) participated in the study. Each participant took part in one of the three experiments (1a, 1b, or 1c). Participants reported normal or corrected-to-normal vision, signed informed consent prior to the experiment, and received course credits or payment for participation. The study followed ethical standards in accordance with the Declaration of Helsinki (2007/2008).

Procedure and Materials

The experiments consisted of two parts. In the first part, participants played an eye-tracker-based shared attention game. Participants were randomly assigned to one of the two experimental conditions (included or excluded). In the second part of the experiment, participants filled in several questionnaires. While the exclusion manipulation (Part 1) was identical across Experiments 1a, 1b, and 1c, the questionnaires completed in Part 2 differed between Experiments 1a, 1b, and 1c.

Part 1: Exclusion Manipulation. During the computer-based game, participants looked at a 17-in. monitor that depicted the upper bodies of two humans (one male and one female). Participants were instructed to play a "looking game" with them, in which the player who had just been looked at could choose whom to look at next, and so on. Gaze behavior was registered throughout the game by means of an eye tracker (iviewx, SMI). Importantly, participants' eye movements were fed back into the program (Delphi programming software), so that the faces on the screen could respond according to participants' looking behavior. During the game, participants in the inclusion condition received as many looks as the two virtual players on the monitor (i.e., a third of the looks), while participants in the exclusion condition received two looks at the beginning of the game and then were never looked at again (i.e., a 30th of the looks).

Each trial started with the presentation of the two virtual players on the monitor with their eyes closed (Frame 1, see Figure 1). After 700 ms, they opened their eyes and looked neither at the participant nor at each other, but straight ahead (Frame 2). After another 700 ms, one of the virtual players gazed either at the participant or at the other virtual player for 700 ms (Frame 3). The one being looked at returned the gaze (Frame 4,

700 ms) and then the trial was over. The player who was looked at in Frame 3 could then choose whom to look at in the following trial, and so on. The intertrial interval was 1,000 ms. Participants were free to look around on the screen, but were instructed that when one of the virtual players looked at them in Frame 3, they needed to respond by returning the gaze (Frame 4) to continue the game. In the subsequent trial, participants could choose which virtual player to look at (in Frame 3), the looked-at virtual player would respond by returning the participants' gaze (Frame 4), and would be the one to choose in the next trial. The game consisted of 60 trials and lasted about 5 min.

Part 2: Questionnaires. Subsequent to the exclusion manipulation, participants filled in several questionnaires including a short manipulation check (Williams et al., 2000). The manipulation check consisted of three questions: How included the participants felt, what proportion of looks they thought they had received, and how much they could participate in the game. Participants responded on a scale from 1 (*not at all/none*) to 9 (*very much so/many*). Different questionnaires were completed in the three different experiments, but all participants completed the manipulation check.

Experiment 1a: Twenty-one participants (11 in the excluded condition) filled in a mood assessment scale and the Basic Need scale (see Williams et al., 2000). Mood was rated for valence (happiness and anger) and arousal on a scale from 1 (*low valence/high arousal*) to 9 (*high valence/low arousal*). Basic needs (self-esteem, feeling of control, belongingness, and meaningful existence) were assessed by means of four questions rated on a scale from 1 (*low satisfaction*) to 9 (*high satisfaction*).

Experiment 1b: Twenty-three participants (10 in the excluded condition) completed an assessment of relational evaluation concerning their interaction partners (Buckley, Winkel, & Leary, 2004). Participants rated relational evaluation by means of three questions about how valuable, close, and important they felt to their coplayers on a scale from 1 (*not at all*) to 7 (*very much so*).

Experiment 1c: Twenty-two participants (10 in the excluded condition) provided personality ratings of the two coplayers (Williams et al., 2002). In particular, they evaluated both interaction partners on four negative and four positive personality traits using scales from 1 (*high on negative/low on positive*) to 7 (*low on negative/high on positive*).

Data Analysis

Questionnaires. In order to compare the ratings made by the excluded and the included participants in Experiments 1a, 1b, and 1c, Mann-Whitney *U* tests were performed on the manipulation checks, the mood assessment, the Basic Need scale, the relational evaluation, and the personality ratings of the coplayers. The Mann-Whitney *U* test is a nonparametrical statistical test for comparing independent samples according to their values of ordinally scaled data.

Gaze Behavior. Since the participants of all three experiments took part in the looking game, gaze behavior was analyzed for all participants together to increase the sample size. Gaze data were available only for 55 of the 66 participants due to calibration problems. Data from one participant were excluded because the number of fixations was more than three standard deviations above the mean. Average number of fixations and average duration of fixations were analyzed separately for Frames 2, 3, and 4 (i.e., from the moment the faces on the screen opened their eyes). Frame 1 (eyes closed) allowed participants to prepare themselves for the upcoming trial. Since no direction of attention or gaze behavior took place during this frame, we did not include it in the analysis.

Analyses were performed only on trials in which participants were not included (in both the inclusion and the exclusion condition), that is, in which they observed shared attention between the two players on the screen (since excluded participants only received looks twice in the very beginning and could only choose whom to look at twice). For these trials, seven areas of interest were defined: eyes of gazer (player whose turn it was), eyes of gaze receiver, mouth of gazer, mouth of gaze receiver, torso of gazer, torso of gaze receiver, and the area between the two virtual players on the screen.

To test whether excluded participants showed a different pattern of gaze behavior than included participants, a general analysis of gaze behavior was performed for Frames 2–4 using a 2×7 repeated measures analysis of variance (ANOVA) including the between-subject factor game condition (included vs. excluded) and the within-subjects factor gaze area of interest. We hypothesized that, if excluded participants were trying to refrain from the interaction, we would find they made fewer or shorter looks toward the interaction partners' faces or eyes in Frames 2, 3, and 4 than included participants.

To test whether excluded participants engaged in strategic approach-oriented looking behavior, such as trying to attract looks from the gazer, we ran a separate ANOVA on Frame 2. In Frame 2, the players on the screen have already opened their eyes, but have not yet decided whom to look at. If excluded participants were trying to evoke the gaze of the player whose turn is to select who to look at in a given trial, they should gaze especially often or especially long at the eyes of this particular player compared to all other areas. We therefore combined all areas of interest except the eyes of the gazer and calculated the average numbers of fixation and the average duration of fixation. We then ran a 2×2 ANOVA on the factors game condition (included vs. excluded) and gaze area of interest (eyes of gazer vs. average of all other areas).

Results

Questionnaires

Experiment 1a: Ratings on manipulation checks showed that participants in the excluded group perceived that they were less included, received fewer looks, and could participate less ($z = 3.9$, $p < .001$). Excluded participants

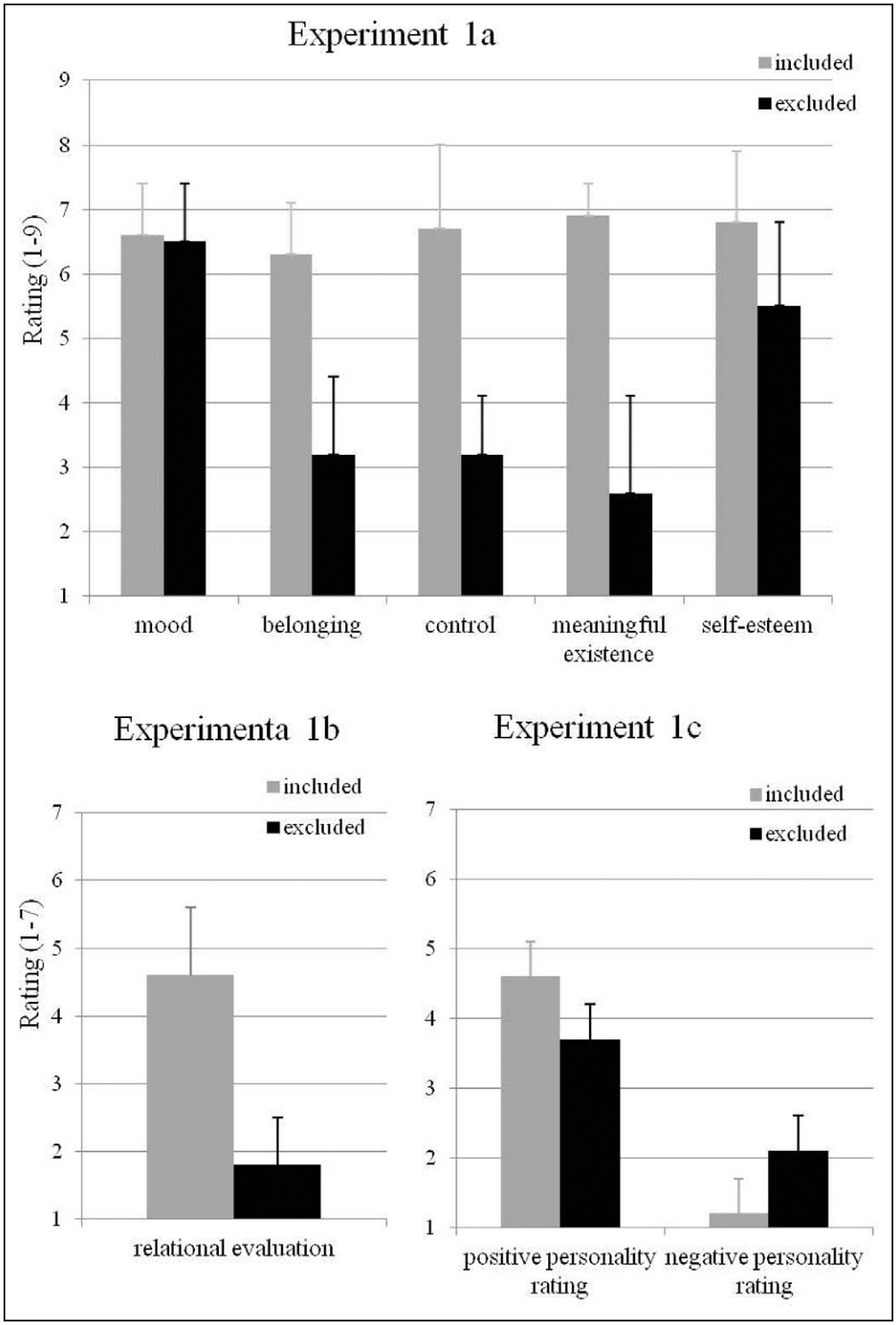

Figure 2. Means and standard deviations of participants' ratings on mood, basic needs (Experiment 1a), relational evaluation (Experiment 1b), and personality of their interaction partners (Experiment 1c).

did not differ from included participants in mood judgments ($z = 0.1$, $p = .94$), that is, they reported to be as happy, angry, and aroused as included participants. However, excluded participants reported significantly lower basic need satisfaction (belonging: $z = 3.8$, $p < .001$, control: $z = 3.8$, $p < .001$, meaningful existence: $z = 3.9$, $p < .001$, and self-esteem: $z = 2.3$, $p < .05$) compared to included participants (see Figure 2).

Experiment 1b: As in Experiment 1a, results of the manipulation check indicated that the exclusion manipulation

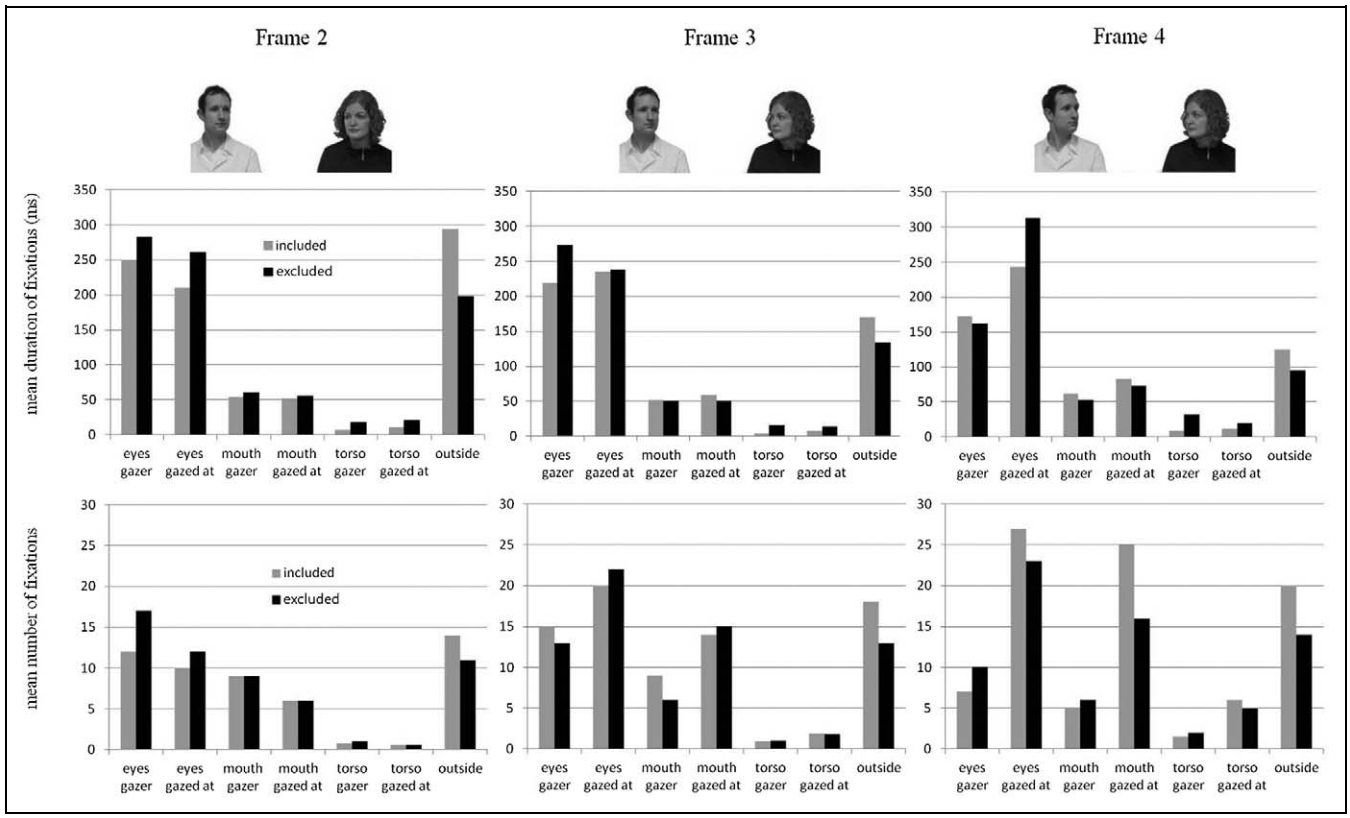

Figure 3. Gaze behavior for trials in which participants observed the two interaction partners looking at each other. Mean duration (upper panel) and mean number (lower panel) of participants' fixations are illustrated for Frames 2 (straight gaze), 3 (one person looking at the other), and 4 (eye contact), for the seven gaze areas of interest.

worked ($z = 4.0$, $p < .001$). Furthermore, excluded participants rated the relation to their interaction partners significantly less positively than included participants (relational evaluation: $z = 3.7$, $p < .001$), that is, they reported feeling less valuable, close, and important to the virtual players (see Figure 2).

Experiment 1c: As in previous experiments, the manipulation check revealed lower ratings on the ability to participate, on the extent of inclusion, and on received looks in the excluded group ($z = 4.0$, $p < .001$). Moreover, excluded participants evaluated their interaction partners more negatively ($z = 2.6$, $p < .01$) and less positively ($z = 3.2$, $p < .01$) on personal traits than included participants (see Figure 2).

Gaze Behavior

Gaze behavior (mean number and mean duration of fixations in Frames 2–4) was measured for included and excluded participants in all three experiments and is depicted in Figures 3 and 4. There was no main effect of game condition (included vs. excluded), as mean number of fixations and duration of fixations did not differ between included and excluded participants ($Fs_{1,53} < 1$). The main effect of gaze area of interest was significant for all frames and for both average number and duration of fixations ($Fs_{1,318} \geq 17.5$, $p < .001$). Participants looked especially long and often at the eyes of the players on the screen and at the area between the two individuals, while the mouth areas and torsi received fewer and shorter looks. This pattern was observed in both included and excluded participants, reflected in the absence of a significant two-way interaction of game condition and gaze area of interest for number of fixation ($Fs_{1,318} \leq 1.5$, $p \geq .20$) and for duration of fixation ($Fs_{1,318} \leq 2.0$, $p \geq .11$).

To specifically test whether excluded participants tried to "force" eye contact with the player whose turn it was in a given trial (the gazer), we performed an additional 2 × 2 ANOVA on game condition (included vs. excluded) and gaze area (eyes of gazer vs. mean of all other areas) for number of fixations and duration of fixations during Frame 2. This ANOVA revealed a significant two-way interaction of game condition and gaze area for mean number of fixations ($F_{1,53} = 4.1$, $p < .05$). Excluded participants looked significantly more often at the eyes of the player whose turn it was to choose whom to look at, compared to the average of all other areas ($t_{23} = 5.1$, $p < .001$), while this difference was smaller for included participants ($t_{28} = 3.6$, $p < .01$). There was a tendency of excluded participants looking more often at the eyes of the player whose turn it was than included participants ($t_{23} = 1.5$, $p = .08$, one tailed; see Figure 4), while excluded and included participants did not differ regarding fixations to the mean of all other areas

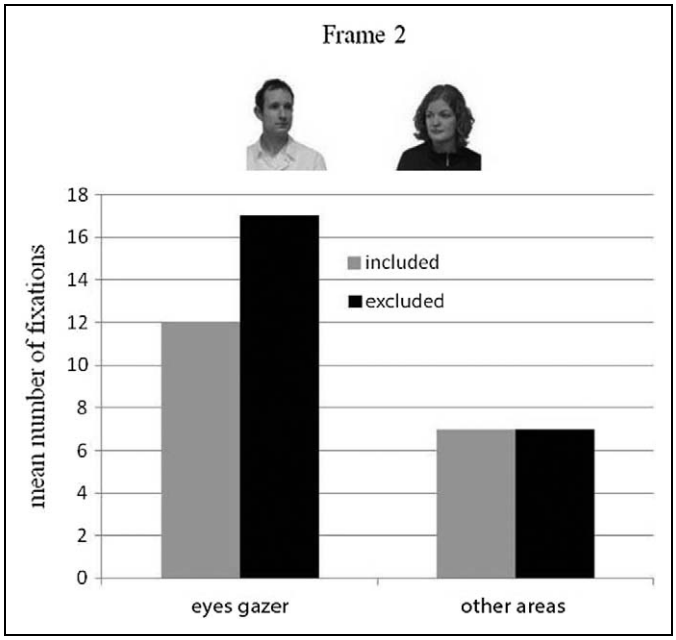

Figure 4. Mean number of fixations in Frame 2 (interaction partners gaze straight ahead) for trials in which participants observed the two interaction partners looking at each other.

($t_{23} < 1$). Subsequent analyses revealed that excluded and included participants did also not differ regarding fixations to the eyes of the gazed-at player, the mouths and torsi of the players, or the area in between players ($t_{23} \leq 1$). No effect was found for mean duration of fixations ($F_{1,53} < 1$).

Discussion

The present study aimed to directly investigate participants' (gaze) behavior while they were being excluded from a social interaction. To that end, we developed an interactive looking game in which included and excluded participants had the same action opportunities and their behavior could be tracked throughout the critical interaction. Gaze behavior of included and excluded participants was compared during an attention-based triadic game. Results revealed that excluded participants showed a similar overall pattern of fixations during the experiment as included participants, in terms of both number and duration of fixations. Hence, excluded participants did not look less at the faces or eyes of their virtual interaction partners and did not increase looks at unrelated locations on the screen, such as the other players' mouths, clothes, or the space between the other players. This suggests that excluded participants did not lose interest in the game and did not try to withdraw from the unpleasant interaction.

Importantly, excluded participants, more so than included participants, looked particularly often at the eyes of the person who had the power to reintegrate them, compared to looking at other areas on the screen. This was reflected in a larger difference between the amount of fixations to the eyes of the gazer and to all other areas in excluded participants. This might suggest that excluded participants more actively tried to attract the gazer's attention and to elicit a look from him or her in the hope of becoming "visible" again and being able to rejoin the game. Hence, immediately after the exclusion interaction, people showed a tendency to try to reaffiliate with the interaction partners who excluded them. This tendency may be similar to the prosocial behaviors that people sometimes show in social interactions following ostracizing experiences (Williams, 2007) and is consistent with William's temporal need-threat model, where individuals first respond to ostracism by trying to get reincluded (Williams, 2009). The present findings are, of course, only a first indication of differential looking behavior in different inclusion conditions, and more research is needed to draw stronger conclusions.

Also, additional research is necessary to address the mechanisms underlying the observed looking behavior. It might prove fruitful to investigate the influence of interindividual differences in prevalent needs (e.g., belongingness vs. efficacy needs) on participants' behavior during the excluding interaction. Similarly, future studies could employ the present paradigm to address whether the gaze behavior during the game predicts how excluded participants act in subsequent social situations. While needs and motives modulate behavioral strategies in later social situations (Williams, 2007), the behavior during the critical interaction might be much more reflexive and independent of the behavior displayed later on. Accordingly, it may be that the increased number of fixations on the eyes of the gazer by an excluded person does not so much reflect the purposeful attempt to reaffiliate as it does the enhanced vigilance that excluded participants have for relevant inclusion/exclusion cues (i.e., eye gaze). A social monitoring system that indicates when one's inclusionary status is at risk (Leary, Tambor, Terdal, & Downs, 1995) may lead to hypersensitivity for cues that signal inclusion possibilities (Gardner, Pickett, & Knowles, 2005).

A second aim of the present study was to investigate whether exclusion from an attention-based triadic relations elicits similar consequences as exclusion from object- and action-based relations. Self-reports in all three experiments revealed that people who were excluded from the attentional relation reported lowered satisfaction of basic needs (Experiment 1a) and rated the relation with their interaction partners more negatively (Experiment 1b). In addition, excluded participants showed a tendency to assign more negative and fewer positive personal traits to their interaction partners, even though they were entirely unknown to them (Experiment 1c). The latter result complements and extends previous findings that showed that people consider others more attractive and more likable when they look directly at them (Mason, Tatkow, & Macrae, 2005).

The present results also extend other earlier findings by showing that people are not just sensitive to exclusion from eye contact in dyadic relations (Wirth et al., 2010; where averted gaze directly communicates rejection, threat, or punishment) but also in triadic interactions (where mutual gaze is observed between others). Furthermore, observed eye contact in others does not necessarily indicate the rejection of the spectator, but

can be understood as a social signal that denotes the importance of a subsequent action (Böckler et al., 2011) or the interest of the observed agents in each other. Nonetheless, participants in the present study were susceptible to the ostracizing excluding quality of observed mutual gaze. This finding further emphasizes the important role of mutual gaze in the emotional regulation of social relationships and indicates that the interpretation of eye contact in others depends on the given context in which it is observed. In general, the present findings reveal people's sensitivity to epistemic relations and suggest that being denied involvement in interpersonal exchange (be it object-centered or merely attention-based) is at the bottom of feeling ostracized. It is possible that effects of ostracism originate, at least partly, in the violation of expectations about turn-taking and reciprocity in social exchange (Berthoz, Armony, Blair, & Dolan, 2002). Future research will need to address the relative contribution of different components of social exclusion on the emotional, relational, and behavioral consequences.

Interestingly, the self-report ratings revealed no effects of exclusion on participants' mood judgments (valence and arousal). Reports of the effect of ostracism on self-indicated mood tend to be inconsistent in the literature: Some studies have found that mood is affected by ostracism and others have not (Williams, 2007). The absence of effects on how participants evaluate their own mood has often been taken as an indication that ostracism induces a temporary state of cognitive deconstruction (Baumeister, Twenge, & Nuss, 2002), making participants unable to judge and self-regulate their current emotional states. However, since no additional means of accessing people's emotional states were employed in the present study, no definite conclusions on effects of epistemic ostracism on mood can be drawn.

Taken together, the present study provides first evidence for differential behavior of excluded and included participants during an attention-based interaction. Exclusion from a looking game led participants to adjust their own looking behavior, possibly in order to attract the attention of the player who could reintegrate them. When reintegration was denied, negative emotional and relational effects resulted. This suggests that ostracism can be induced in social interactions that are merely based on sharing attention (Barresi & Moore, 1996) and illustrates the importance of being visible to others.

Declaration of Conflicting Interests

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Author Biographies

Anne Böckler is currently finishing her PhD at the Radboud University in Nijmegen and works as a postdoc at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig. She is interested in joint attention and social cognition and has started to investigate effects of meditation on theory of mind and prosocial behavior.

Paul Hömke is a student assistant in the Language and Cognition Department at the Max Planck Institute for Psycholinguistics. He received his research master degree in cognitive neuroscience from Radboud University. His research interests include language, communication, cultural cognition, and social cognition.

Natalie Sebanz is an associate professor at the Department of Cognitive Science at Radboud University Nijmegen, the Netherlands, and at Central European University, Budapest. She studies how perception, action, and cognition contribute to social interaction in humans and other animals. For her research, she has received the European Young Investigator Award (EURYI 2007, European Science Foundation) and the Young Mind and Brain Prize (2010, Center for Cognitive Science, University of Turin).