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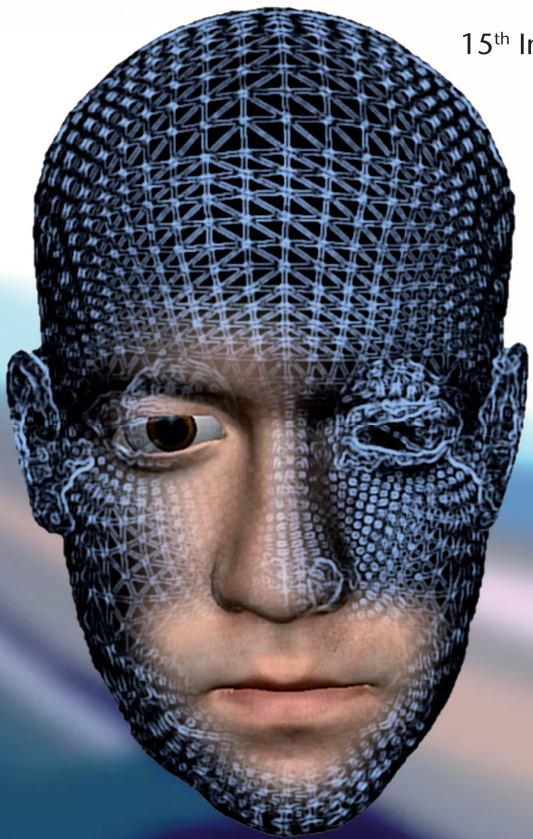

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Does social exclusion hurt virtually like it hurts in real-life? The role of agency and social presence in the perception and experience of social exclusion

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Abstract. Previous research demonstrated effects of social exclusion in experimental face-to-face interactions as well as in digital interactions (e.g. the Cyberball paradigm) and text based communication (e.g. chat rooms), but there is only little research done about social exclusion in more mundane computer-mediated environments compared to face-to-face interactions. The current study investigates effects of social exclusion on participants' needs satisfaction, aggression and physiological arousal as well as on the experienced social presence within an immersive virtual environment with respect to the virtual characters' agency. Results indicate that social exclusion threatens fundamental human needs and increases aggression in face-to-face situations as well as in interactions with avatars and agents. Alongside these results, no evidence was found, that avatars and agents evoke different levels of social presence in the participants. Moreover, this study depicts that inclusionary state as well as agency seems to influence physiological arousal during social exclusion. These findings have implications for understanding how an avatar's agency in collaborative virtual environments as well as in computer games will affect psychological and physiological responses to social exclusion.

Keywords. Social Exclusion; Social Presence; Agency; Social Stress; Virtual Reality

Introduction

The experience of social exclusion is characterized by an aversive and socially threatening situation. These situations are quite frequently encountered in everyday life. As a result, social exclusion has to be regarded as a regular social experience that threatens humans' fundamental social needs, like belonging, control and meaningful existence (Williams, 2007). An individual can be excluded from social relationships or social interactions or can be ignored by others (Williams, 2001), this process – named ostracism – exists in institutional and political contexts and in interpersonal relationships (Zadro, Bolland & Richardson, 2006) and occurs in many disguises and substantially endangers people's social needs. However, social exclusion is frequently associated with anger, low self-esteem, depressive mood and subjective distress (Boyes & French, 2009; Kelly et al., 2012; Leary, 1990; Weik, Maroof, Zöller, Deinzer, 2010; Zadro, Williams & Richardson, 2004). It can be assumed that social exclusion could lead to depression, suicidal behavior or uncontrolled aggression (Leary, Kowalski, Smith & Phillips, 2003; Williams & Zadro, 2001; Zöller, Maroof, Weik & Deinzer, 2010).

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These effects of social exclusion have been studied in various settings ranging from face-to-face paradigms (Williams & Sommer, 1997) to text-based communication (Smith & Williams, 2004) and minimal digital interactions (Williams, 2001). One of the most common experimental procedures to simulate a situation of social exclusion is the Cyberball paradigm (Williams & Jarvis, 2006). It is an abstract computer-based ball-tossing game in which the participants interact with two other players in the laboratory; participants are excluded from the game by two co-players after a few tosses and never get the ball back again in the remaining game. The Cyberball paradigm is an experimentally induced social exclusion that triggers a number of affective, emotional, neuronal and physiological as well as hormonal responses (e.g. Eisenberger, Lieberman & Williams, 2003; Geniole, Carré & McCormick, 2011; Moor, Crone & Van der Molen, 2010; Sijtsema, Shoulberg & Murray-Close, 2011; Wesselmann, Wirth, Mroczek & Williams, 2012; Williams, 2007; Zwolinski, 2012). Nevertheless, the current computer paradigm lacks the day-to-day realism that virtual environments are now able to provide. Therefore, for the first time a recent study investigates a Cyberball paradigm in an immersive virtual environment (IVE) regarding the effects of such social exclusion by virtual characters on participants' reported need satisfaction and mood (Kassner, Wesselmann, Law & Williams, 2012). Another series of research (Cole & Griffiths, 2007; Dupuis & Ramsey, 2011) highlighted the importance of perceived social support within massively multiplayer role playing games (MMORPGs), and showed that these kinds of games allos people to experience social support through the social interaction and social connectedness mediated by virtual characters. This result underlines the social influence of virtual characters for social interactions, like other studies did for physical presence, enjoyment and physiological arousal during game play (e.g. Lim & Reeves, 2010; Weibel, Wissmath, Habegger, Steiner & Groner, 2008).

Current literature divides virtual characters into two categories based on the amount of agency attributed to them. Plenty of studies showed that people respond socially to avatars, which are digital representations of human controllers, as well as to autonomous agents, which are digital representations of a computer algorithm (e.g. Bailenson, Blascovich, Beall & Loomis, 2003; Bailenson, Swinth, Hoyt, Persky, Dimov & Blascovich, 2005; Gratch, Wang, Gerten, Fast & Duffy, 2007; Guadagno, Blascovich, Bailenson & McCall, 2007; Guadagno, Swinth & Blascovich, 2011). But it seems to be inconclusive whether people respond in the same manner to virtual characters and whether the social response to avatars and agents is comparable. In this context social presence is a significant factor to examine computer-mediated social interactions. Following an early definition of Erving Goffman (1959) social presence originates from the basic sensory awareness of others and a person's experience of and behavior towards another social entity. Consequently, this could be adapted for mediated environments, where social presence may be seen as experiencing the presence of a virtual character, attributing mental states (e.g. beliefs, attitudes, intentions, motivations, knowledge, and personality) to them and thus, treating them in a natural way (Bailenson et al., 2005; Blascovich et al., 2002; Biocca, Harms & Burgoon, 2003; Blascovich & Beall, 2010; Novak & Biocca, 2003).

Two current theories were used to explain responses to avatars and agents affecting the concept of social presence. Following the Threshold Model of Social Influence (Blascovich, Loomis, Beall, Swith, Hoyt & Bailenson, 2002) it can be assumed that social influence is related to the behavioral realism and the agency of the characters. In this light, social presence can be understood as social verification; in detail, social presence can be defined as the extent to which participants perceive another social entity as being present. According to that model, social presence should be higher when behavioral realism is higher, but also when the person interacts with a real human (Bailenson et al., 2005). Another approach is the Media Equation concept (Reeves & Nass, 1996; Nass & Moon, 2000), which states that people react toward agents in the same way as they do towards avatars. The aforementioned concept incorporates an evolutionary perspective and postulates that the human brain develops social responses automatically and in an unconscious way to human beings and computer controlled entities in the same way.

Social reactions are depending on how many social cues (also in the sense of behavioral realism) are provided by a virtual character, and not on what kind of agency people expect (Nass & Moon, 2000). Following this assumption, people interacting with an avatar neither would have less nor more experience of social presence than people interacting with an agent (Nowak & Biocca, 2003; Von der Pütten, Krämer, Gratch & Kang, 2010).

However, past research concerning agency focused on aspects like persuasion (Guadagno et al., 2007), interpersonal distance (Bailenson et al., 2003), social evaluations (Guadagno et al., 2011) and also on different facets of social presence (Bailenson et al., 2005; Von der Pütten et al., 2010) as well as physiological arousal in competitive games (Lim & Reeves, 2010), but there is a lack of knowledge regarding the influence of agency on social exclusion. Previous research indeed demonstrated that the negative effects of social exclusion seem to be comparable between persons who thought they were excluded from the Cyberball game by a computer or by real others (Zadro et al., 2004), but no study has to date shown this for a more mundane virtual environment.

Objectives

In sum, there is a lack of research investigating effects of social exclusion when, at the same time, taking agency into account. Moreover, there is no research conducting a direct comparison between face-to-face interactions and interactions with computer generated social entities. There is furthermore an ongoing discussion whether the social influence of avatars and agents is different or not (Blascovich et al., 2002; Von der Pütten et al., 2010). Therefore, the aim of the current study is to investigate effects of social exclusion on participants' social needs and self-esteem as well as on the experienced social presence within an immersive virtual environment with respect to the virtual characters' agency. Experimental evidence comparing social exclusion in a face-to-face interaction to (computer-)mediated interactions (using 3D models) would gain a deeper understanding of processes of social exclusion virtually and how it has to be distinguished from face-to-face situations. This contributes to recent research on social support and social interactions in online games (e.g. Cole & Griffiths, 2007; Dupuis & Ramsey, 2011), and provides more information to develop more ecological valid research paradigms for social interactions (e.g. Kassner et al., 2012).

According to the previous findings it has to be hypothesized that excluded individuals would report a more intense threat of their need satisfaction (belonging, control, meaningful existence) and show a decrease in their reported self-esteem, compared to included persons (Williams, 2001; 2007). Consequently, the first research question focuses on the effects of inclusionary status itself (inclusion/exclusion).

> ***Research Question 1:*** Are there differences between excluded and included participants regarding the satisfaction of their social needs, aggression, social presence and physiological arousal?

Given the inconsistency of findings concerning the effects of agency on social influence and behavior (Bailenson et al., 2005; Novak & Biocca, 2003; Von der Pütten et al., 2010), the second research question addresses agency, operationalized by using three groups of interactions (via face-to-face, avatar, or agent) to prove the influence of different agency on several indicators of social exclusion as well as social presence.

> ***Research Question 2:*** Are there differences in the satisfaction of social needs, aggression, social presence and physiological arousal between the participants interacting with social entities with differing degrees of agency?

Methods

The current study was conducted at the Department of Psychology at the University of Vienna in accordance with the current version of the Declaration of Helsinki. Prior to participation all participants signed an informed consent form indicating the experiment's procedure and the possibility to terminate participation at any time. All statistical analyses were conducted using IBM SPSS Version 20 (SPSS, Inc. Chicago, USA) considering an alpha error of 5%.

Participants

Forty-eight females ranging in age from 20 to 29 years (M=23.31; SD=2.380) participated in the current study. All participants reported that they were in good physical and mental health; also, they indicated that they had not smoked for the last 8 hours, drank no alcohol or caffeine for the last 12 hours, and didn't use any prescription medication besides contraceptives. The present study included only female participants because there is some evidence that social exclusion as a form of non-direct aggression is particularly salient to females (Benenson, Markovits, Thompson & Wranghan, 2011). A recent meta-analysis suggests that women suffer more than males from negative social experiences (Blackhart et al., 2009). This contributes to previous findings of Stroud and colleagues (2002) showing that social exclusion affects females more than males, because females seem to be more socialized to form more intimate and close relationships than men (Cyranowski et al., 2000). From this perspective, it would be assumable that the self-concept of women is strongly based on the relationship with others (e.g. Cross & Madson, 1997).

Procedure

Participants were randomly assigned to a 2 (inclusionary status: included/excluded) x 3 (agency: face-to-face/avatar/agent) between-subject design. Participants volunteered to take part in the experiment in return for course credit. About one week before the experiment participants were asked to fill out an online questionnaire with demographic information. Upon arrival to the laboratory, all participants were told that the study was about studying motor skills and were asked to provide a short questionnaire and additional demographic information in a separate testing room. Subsequently, participants were guided to the waiting room where they had to wait alongside two other students (confederates of the experimenter). Every student had to wear ear-phones to prevent unwanted communication between the confederates and the participants. After a 10 minute waiting period the experimenter entered the room and gave the participant an instruction about the experimental procedure depending on the three agency conditions:

> ***Face-to-face:*** participants were told that they had to play a ball-tossing game with the other two persons in the same room.
>
> ***Avatar:*** participants were told that they had to play with the other two persons over a computer-mediated interface while they all were in different rooms.
>
> ***Agent:*** participants were told that they had to play with two computer generated characters in the laboratory, while the other two persons in the waiting room were obviously guided to "another experiment".

By entering the lab, participants were instructed to be engaged in a ball-tossing game. They were instructed to press one of two keys (one to interact with the left, the other to interact with the right player) on a wireless controller and to kick the ball if the ball came to them during the interaction. Participants in the *face-to-face* condition had to play the game together and in the presence of the confederates using a wireless control unit (F710, Logitech, Switzerland); they were able to move the ball between each other in a predefined range, while participants in the

Figure 1. Participants' point of view during the virtual ball-tossing game. (a) virtual characters, (b) virtual characters tossing a ball to the participant.

conditions avatar and agent were then connected to the virtual environment (see Figure 1) via a Head-Mounted-Display (Sony HMZ-T1, Sony, Japan) with an additional head-tracking system (TrackIR 5, NaturalPoint, US) and used the same wireless control unit as participants in the face-to-face condition to control the ball movement. Avatars and agents were both computer-generated and automatically controlled characters simulating the same behavior as the well-trained confederates in the face-to-face condition. The immersive virtual Cyberball was modeled using Blender 3D. Textures were created with GIMP and OGRE3D was used for rendering.

As the ball-tossing game started, all participants received a standardized number of 4 ball-tosses from the other players at the beginning of the program (duration: between 45s-60s), before participants in the exclusion condition were subsequently excluded and received no ball tosses for a 5-minute interval. Participants in the inclusion condition received ball-tosses in the same frequency during the ball-tossing game (30 % of all ball-tosses). After the ball-tossing game all participants where guided to the testing room again to fill out some psychometric measures to evaluate their experiences and the effects of the experimental procedure.

Psychometric measures

Participants completed the Basic Needs Scale (Williams, 2001), measuring their satisfaction of the four basic needs after the experiment. This questionnaire consisted of 12 items assessing the effect of the Cyberball game on: Belonging (e.g., "I felt like an outsider"), Self-Esteem (e.g., "I felt good about myself"), Control (e.g., "I felt like I had control over the course of the interaction"), and Meaningful Existence (e.g., "I felt non-existent") assessed on a 9-point-Likert-Scale. Additionally, a short 3-item scale measuring the level of aggression was used (e.g. "I'm really angry"). Moreover, a five item questionnaire assessing Social presence (Social Presence Survey; Bailenson et al., 2003) on a 4-point-Likert-Scale (e.g. "The person appears to be sentient, conscious and alive to me"). All participants completed these items immediately after the experiment. In the current study all participants had to complete a short manipulation check. A two item scale was included to measure the participants' perception of their inclusionary status directly ("I felt ignored"; "I felt excluded"), as well as they were asked to estimate the percentage of ball tosses they received from the other players.

Physiological measures

Heart rate (HR) was assessed as a marker of arousal, recorded in 60s intervals from 5 min before the Cyberball (phase of exclusion or inclusion) until 5 min after the task. A one minute baseline measure and an additional minute for the beginning of the program, as well as one minute immediately after the task were used for the HR calculations. Additionally, a time-domain measure

for heart rate variability (HRV) was used to predominantly detect changes in the parasympathetic tone of the participants when being immersed in the virtual environment. In accordance with the recommendations of the Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology (1996) the root mean square of successive differences (rMSSD) was obtained as a time-domain measure reflecting a short-time measure of HRV. The rMSSD values were calculated from beat-to-beat intervals over 3x5 min periods (experimental phases: [1] baseline incl. start of the program, [2] Cyberball with exclusion or inclusion and [3] post-baseline). High rMSSD values represent low physiological arousal, whereas low values indicate higher physiological arousal and physiological stress. To detect autonomous stress responses a wireless chest heart rate transmitter including a wrist monitor recorder (Polar RS800, Polar Electro, Finland) was used. All participants were standing in an upright position during the recordings.

Results

Manipulation check

Excluded Participants scored higher on the two items measuring the inclusionary state than participants who were not excluded from the ball-tossing game; this could be interpreted as they perceived that they were excluded ($M_{exclusion}$=5.21, $SD_{exclusion}$=2.000), $M_{inclusion}$=2.67, $SD_{inclusion}$=1.761) $t(47)$=4.673, p<0.001, d=1.38). Additionally, excluded participants reported a lower percentage of ball tosses carried out by themselves than included participants ($M_{exclusion}$=3.71, $SD_{exclusion}$=1.517, $M_{inclusion}$=5.29, $SD_{inclusion}$=1.829) $t(47)$=3.264, p<0.001, d=0.96). Moreover, participants in the exclusion group reported that they received a lower percentage/total number (M=30.09/19.70; SD=14.019/10.213) of ball tosses during the game than those in the inclusion group (M=53.67/39.54; SD=18.789/16.492; $t(47)$=4.860/4.934, p<0.001/0.001, d=1.45/1.15)

Basic need satisfaction

Considering the reported satisfaction of needs after the Cyberball game, all four scales showed significantly lower scores for the excluded participants (see Figure 2a). In detail, for the scale *belonging* results from two-factor ANOVA point towards a significant main effect of inclusionary state ($F_{1,42}$=12.713; p=0.001; *par.* η^2=0.232); however, no main effect of agency ($F_{1,42}$=0.968; p=0.388; *par.* η^2=0. 044), and no interaction effect of inclusionary state*agency ($F_{1,42}$=26.521; p=0.050; par. η^2=0. 136) were found for this scale. Comparable results can be reported for the scale *control*, showing that there is a significant main effect of inclusionary state ($F_{1,42}$=68.590; p=0.000; *par.* η^2=0. 620), yet, again no significant result for agency ($F_{1,42}$=1.114; p=0.338; *par.* η^2=0. 050) and no interaction effect of inclusionary state * agency ($F_{1,42}$=0.209; p=0.813; *par.* η^2=0. 010). Moreover, there was a main effect of inclusionary state for the meaningful existence scale ($F_{1,42}$=19.515; p=0.000; *par.* η^2=0.317), but again results do not reveal neither a main effect of agency ($F_{1,42}$=2.970; p=0.062; *par.* η^2=0.124) nor an interaction effect of inclusionary state * agency ($F_{1,42}$=0.163; p=0.850; *par.* η^2=0. 008) . Concerning the self-esteem scale results again indicate a significant main effect of the inclusionary state ($F_{1,42}$=6.853; p=0.012; *par.* η^2=0.140) of the participant, but no further effect of agency ($F_{1,42}$=1.426; p=0.252; *par.* η^2=0.064) or interaction effects inclusionary state *agency ($F_{1,42}$=0.155; p=0.857; *par.* η^2=0.007) were found.

Aggression

Excluded participants reported significantly more aggressive tendencies after the Cyberball procedure (see Figure 2b). There was a main effect of their inclusionary state ($F_{1,42}$=10.442; p=0.000; *par.* η^2=0. 199), but also a main effect of agency ($F_{1,42}$=5.089; p=0.010; *par.* η^2=0.195), indicating that participants were more aggressive when they played with an agent (p=0.025). Yet, no interaction effect inclusionary state * agency ($F_{1,42}$=0.271; p=0.764; *par.* η^2=0. 013) could be detected in the recent study.

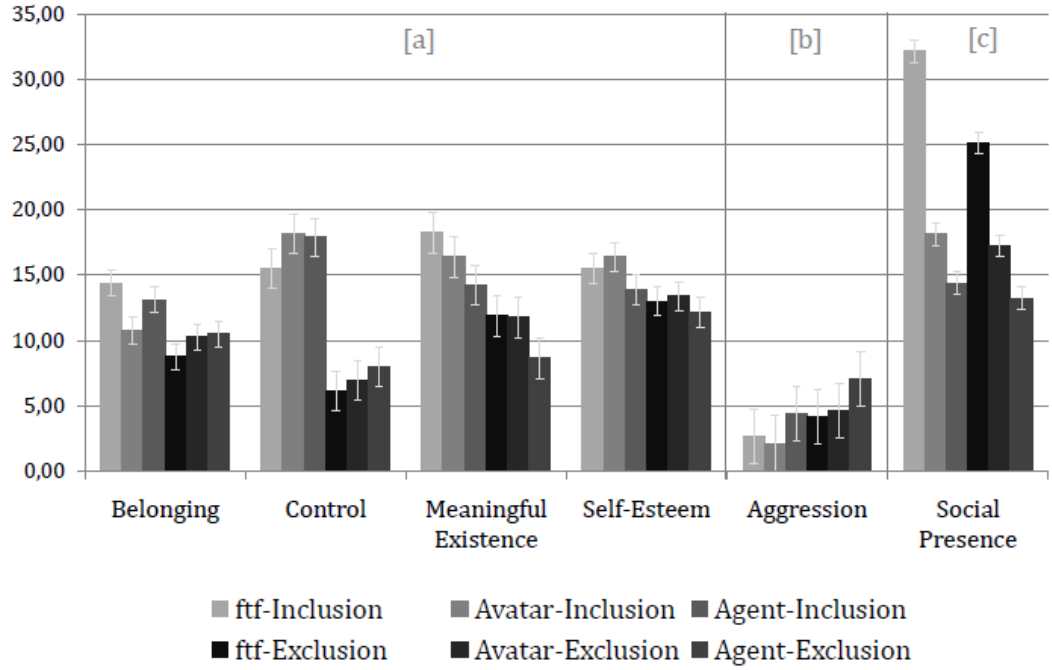

Figure 2. Effects of inclusionary state and agency on (a) social need satisfaction, (b) social presence and (c) aggression (means± SEM)

Social Presence

There was no difference regarding social presence between included or excluded participants ($F_{1,42}$=3.974; p=0.087; *par.* η^2=0.068). Nevertheless, agency had a significant influence on how participants rated their counterparts as social entities ($F_{1,42}$=26.875; p=0.000; *par.* η^2=0. 561). But according to the current results, no interaction effect of inclusionary state * agency ($F_{1,42}$=1.368; p=0.266; *par.* η^2=0. 061) was found. Moreover, a Bonferroni post hoc analysis revealed that participants playing in the face-to-face group showed significantly more social presence than participants playing with other virtual agents (p<0.001). The current results showed no significant differences between avatars and agents (p=1.000) concerning the participants' experience of social presence (see Figure 2c).

Physiological parameters

Baseline differences between the 3x2 groups were analyzed using an univariate ANOVA. Neither HR for the first minute of testing ($F_{1,42}$=2.185; p=0.74) nor rMSSD ($F_{1,42}$=0.534; p=0.749) during the baseline period did differ at a baseline level previous to the participants entering of the experimental room. Greenhouse-Geisser corrections were used to verify repeated measures results when the assumption of sphericity, indicating a heterogeneity of covariance, is violated according to the Mauchly test.

In the overall analyses of HR, a repeated measurement ANOVA revealed significant responses to stress in the total sample, which is indicated by a main effect of time ($F_{4.164,170.692}$=22.609; p=0.000; *par.* η^2=0.355). Figure 3 depicts the means and standard errors (±SEM) for each time point among all groups for HR. There were significant attenuating effects of inclusionary state ($F_{4.164,170.692}$=3.518; p=0.008; *par.* η^2=0. 079) as well as of agency ($F_{4.164,170.692}$=9.263; p=0.000; *par.* η^2=0. 311) on HR measures over time, but no three way interaction effect of inclusionary state *agency*time ($F_{4.164,170.692}$=1.410; p=0.193; *par.* η^2=0. 064) was found in the current sample. The HRV time-domain measure (rMSSD), moreover, shows a significant effect of time ($F_{1.323,\ 55.581}$ =48.,456; p=0.000; *par.* η^2=0. 536). But interestingly, rMSSD results indicate no significant effect

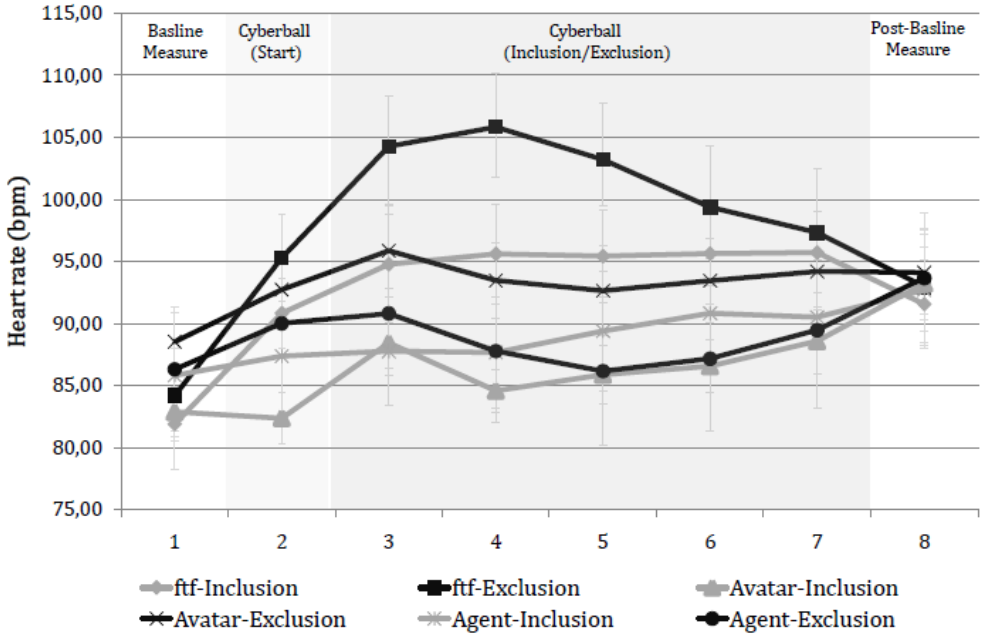

Figure 3. Effects of inclusionary state and agency on heart rate in beats-per-minute (bpm) over an 8 minutes interval (means± SEM)

of inclusionary state ($F_{1.323,\ 55.581}$ =0.486; p=0.541; *par.* η^2=0. 011) over time for the vagal tone, while agency seems to have a significant influence on HRV ($F_{1.323,\ 55.581}$ =5.233; p=0.004; *par.* η^2=0. 199). Again, there was no significant three way interaction of inclusionary state *agency*time ($F_{1.323,\ 55.581}$ =1.297; p=0.256; *par.* η^2=0. 059). Figure 4 shows rMSSD means (±SEM) according to the three experimental phases (baseline/Cyberball/post-baseline).

Discussion

This is the first study on social exclusion in virtual environments which evaluates both, the effects of inclusionary state and agency on negative outcomes and physiological stress as well as the effects of social inclusion and exclusion on social presence. The present results confirm previous studies (Kassner et al., 2012) showing that social exclusion in virtual environments decreases the participants' satisfaction of social needs (belonging, control, meaningful existence and self-esteem). Moreover, the current study takes agency as a crucial factor for how people respond to another social entity into account. Most notably, all excluded participants showed lower levels of need satisfaction independently from who excluded them. There was no effect of agency regarding the social needs of the participants in the current study. This is consistent with a former study by Zadro and colleagues (2004) showing that the traditional Cyberball paradigm provoked the same responses to social exclusion by a computer as well as by another real person. These results seem to be replicable in more mundane virtual environments. Furthermore, results from this study reveal that participants' who were excluded from the ball-tossing game reported higher levels of aggression than included participants, which is also consistent with previous findings (e.g. Geniole et al., 2011; Zwolinski, 2012). Moreover, current results indicate that participants interacting with an agent reported a higher degree of aggression after the game, which might be influenced by participants' possible attribution to the situation as a technical default. Previous research showed that this could elicit comparable distress as a social exclusion via such a system (Zöller et al., 2010). Additionally, the current experiment showed no differences in the perception of the different types of computer-mediated characters regarding the degree of social influence they exerted. Yet, there is a significant difference in the experience of social presence, when parti-

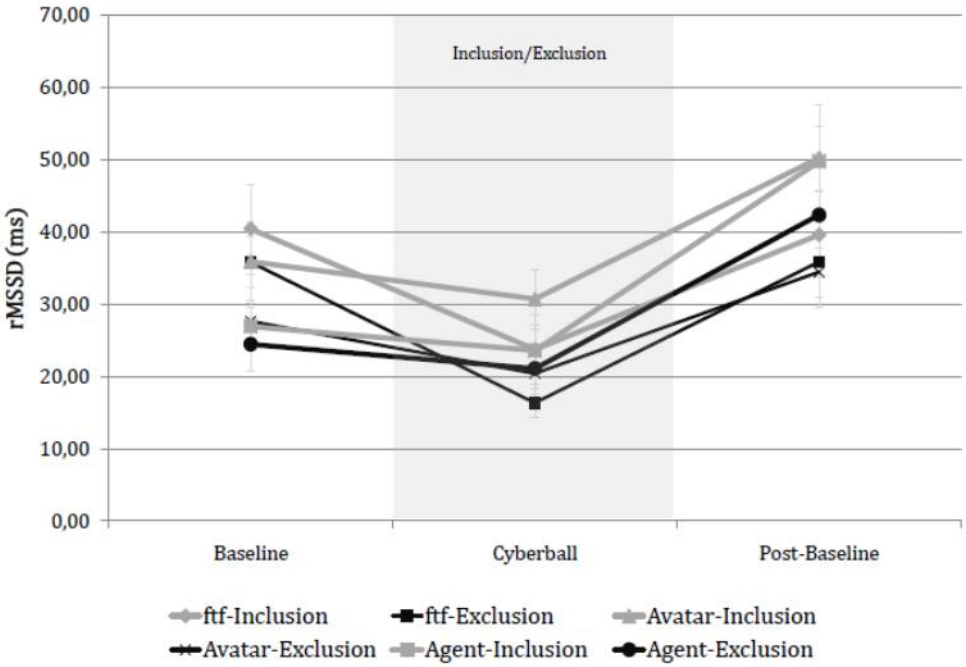

Figure 4. Effects of inclusionary state and agency on heart rate variability (time-domain rMSSD) over a 3x5 minute intervals (means± SEM)

cipants played face-to-face with the experimenters' confederates. These findings support the Media Equation concept (Reeves & Nass, 1996; Nass & Moon, 2000), which postulates that the social influence of agents is comparable to the social influence of avatars. This is based on the assumption that people respond automatically and in an unconscious way to virtual characters which are controlled by a computer like they respond to virtual characters which are controlled by other human beings. Similar to the research by Von der Pütten and colleagues (2010), which compared the Threshold model of social influence (Blascovich et al., 2002; Blascovich & Beall, 2010) and the Media Equation concept using an experimental dialog setting, the recent study has found comparable effects for a non-verbal, stressful social situation in a virtual environment. However, when investigating the interactions between humans and virtual characters as compared to the face-to-face interactions a significant difference with regards to social presence can be reported. Assuming that the face-to-face interaction had definitely more social cues and a maximum degree of behavioral realism compared to the mediated interactions via avatar and agent (with a similar degree of behavioral realism), this finding is also in line with the Media Equation concept by Nass and Moon (2000), stating that computers with more humanlike characteristics provoke more social behavior.

Concerning the participant's physiological arousal during the ball-tossing game, a significant increase from baseline over all groups has been found. Furthermore, excluded participants showed higher stress responses in HR than included participants, which indicates that social exclusion is a stressful experience (e.g. Kelly et al., 2012; Williams, 2001; 2007); thiscan be shown for all three types of agency and is in line with the results found above regarding the lowering of participants' need satisfaction after exclusion. However, participants in the two face-to-face interactions showed a significantly higher HR amplitude than participants playing with virtual characters. Furthermore, they also showed the highest HR stress response to exclusion over all three types of agency. These results for agency can also be shown for the HRV measure (rMSSD). Following this, the physiological arousal might be influenced by the presence of the others in the room, and the face-to-face interactions per se, which perhaps is linked to the immediacy of the interaction and also to the optimal experience of social presence.

In sum, social exclusion by avatars and agents seems to provoke comparable negative outcomes as social exclusion in a face-to face situation. This has some implications for studying behavior and social dynamics in MMORPGs and other online collaborative virtual environments (e.g. Second Life). Furthermore, it has been shown that physiological arousal is higher when people thought they interacted with an avatar as to when they believed the player was a computer-generated agent (Lim & Reeves, 2010); yet, agency was never compared in relation to the more complex effects of social exclusion in a virtual environment. There is some evidence that many individuals search for social support online (e.g. Cole & Griffiths, 2007; Dupuis & Ramsey, 2011), and especially MMORPGs seem to promote social acceptance for lonely and shy people, or people who want to escape from reality and get integrated in social groups inside these games (Stetina, Kothgassner, Lehenbauer & Kryspin-Exner, 2011). According to the results of the present study, it can be assumed that people who were excluded in-game possibly show comparable negative life outcomes than persons excluded face-to-face. Future studies should focus on social exclusion in-game and its long-term effects, to get a more valid view on the vulnerability of excluded people in-game. But future studies should not be limited to MMORPGs or computer games, there is also a need to investigate the effects of social exclusion in other forms of digital social interaction, like social network services (like Facebook or MySpace).

In comparison to face-to-face paradigms the Cyberball paradigm has some fundamental benefits for experimental research (e.g. Williams, 2001; 2007). The Cyberball paradigm can be standardized easily across all participants in an economic manner. Additionally, as Kassner and colleagues (2012) stated, a virtual environment paradigm of the Cyberball procedure offers researchers the ability to manipulate further aspects of social environments, such as social distance and non-verbal communication. Another benefit seems to be that uncontrollable effects of the confederates can be standardized or avoided (e.g. spontaneous mimic), and moreover characteristics and situational contexts can be changed easily. This allows the researchers to conduct more complex research with different contextual factors or to diversify social information.

Limitations

Some limitations of this study should be taken into consideration when discussing these results. First, it should be mentioned that the sample size of the current study is small and generalizations should be done with careful consideration of the sample size. Yet, the results can be considered worthwhile reporting when considering their robust effect sizes mostly ranging between medium to large effects (Cohen, 1988). Second, the present study included only female participants. Future studies should include a male sample with respect to possible gender differences as found in other studies (Blackhart et al., 2009; Stroud et al, 2002).

Conclusion

In the current study, negative outcomes of social exclusion seem to be comparable across all three types of agency. Negative effects of exclusion (need satisfaction, aggression, physiological arousal) can be found in face-to-face interactions as well as in interactions with avatars and agents. Apart from that, this study found no differences between avatars and agents regarding the amount of social presence attributed to them in the virtual environment which is in accordance with the Media Equation concept. Yet, the face-to-face group showed higher levels of social presence, which supports further assumptions of this concept explained by a higher level of behavioral realism. Concluding these findings it can be assumed that computer-mediated social interactions in virtual environments show comparable negative outcomes to social exclusions in face-to-face situations. This is important for research on social interactions within computer games and on the vulnerability of persons who were excluded in-game, but also for the development of virtual environments as ecologically valid research tools for social exclusion.

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