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MASTER'S THESIS

Titel der Diplomarbeit / Title of the Diploma Thesis

„Simulating social pain - behavioral evidences of Emotional Egocentricity Bias and Self Other Distinction in empathic processing."

verfasst von / submitted by

Philipp Stepnicka

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Abstract

In the perception of their surrounding world, humans rely on their internal representations and are therefore in a way determined to egocentrism. During social interaction, this egocentrism can lead to false assumptions about other people's emotions and in effect distort processes of empathy. It has been shown that people tend to shift their evaluation of another person's affective state towards their own. This distortion seems to occur due to deficient emotional Self Other Distinction (SOD). We created a paradigm that uses playful social interaction to reveal this emotional egocentricity bias (EEB) and to test if indeed the inability to distinct internal arousals from emotional judgements of another person is the underlying cause. Through a virtual ball tossing game we exposed participants to incongruent internal and external emotional stimuli and could reproduce the occurrence of EEB in their empathic judgements. We also let our participants observe this situation of social interplay, eliminating their emotional involvement, in which case their empathic judgements did not show any detectable bias. Therefore, our data suggests that EEB is an error, that in fact can mainly be accounted for by imperfect SOD.

Abstract (German)

In der Wahrnehmung seiner Umwelt muss sich der Mensch auf interne Repräsentanzen verlassen und ist daher stets einem gewissen Egozentrismus ausgesetzt. Während sozialen Interaktionen kann dieser Egozentrismus zu falschen Annahmen über die Emotionen anderer Menschen führen, daher Abläufe von Empathie verfälschen. Es konnte bereits gezeigt werden, dass Menschen dazu neigen diese Bewertungen der affektiven Zustände anderer in die Richtung ihrer eigenen Erregung zu verschieben. Diese Verzerrung scheint aufgrund mangelnder Self Other Distinction (SOD), also mangelnder Unterscheidung zwischen dem Selbst und einem anderen, aufzutreten. Wir haben ein Paradigma entwickelt, dass durch spielerische soziale Interaktion diesen emotionalen Egozentrismus (EEB; Emotional Egocentricity Bias) offenbaren soll, und um zu zeigen, dass dies In der Tat auf eine mangelnde Fähigkeit zurückzuführen ist interne Erregungen von den emotionalen Bewertungen eines anderen zu trennen. Durch ein virtuelles Ballspiel haben wir Probanden inkongruenten internalen und externen emotionalen Stimuli ausgesetzt und ein Auftreten von EEB in den empathischen Beurteilungen unserer Studienteilnehmer reproduzieren können. Wir haben unsere Probanden die gleiche Situation des sozialen Zusammenspiels nur beobachten lassen, dadurch in diesem Fall ein emotionales involviert sein eliminiert, und unter diesen Voraussetzungen keinen erkennbaren Bias provozieren können. Daher deuten unsere Ergebnisse darauf hin, dass EEB tatsächlich auf eine mangelnde Self Other Distinction zurückzuführen sein muss.

Content

1 Introduction

Social and cognitive science research has given a lot of attention to the exploration of empathy in recent years (Decety & Jackson, 2004; Lamm, Decety, & Singer, 2011). Its importance in everyday human life combined with its complexity and the fact that its processes and components are not easy to reveal, exploring those mechanisms offers science a lot of material worthy of extensive research. Even the term itself is not as accessible as its often effortless use in everyday language might imply. This text will essentially try to infiltrate this very phenomenon we call empathy. To initially quote the Encyclopedia Britannica seems pragmatic (Encyclopedia Britannica Online, 2015):

"Empathy, the ability to imagine oneself in another's place and understand the other's feelings, desires, ideas, and actions. It is a term coined in the early 20th century, equivalent to the German *Einfühlung* and modeled on "sympathy." (…) a spectator may, by a kind of introjection, feel himself involved in what he observes or contemplates. (…)"

In essence empathy is the ability to internally reproduce another subject's emotions and understand what another is experiencing from their point of view (Decety & Ickes, 2011). The most important specification might be, that we explicitly talk about the correct understanding and simulation of another being's emotions. Recognizing those external emotions origin, context and qualities is an important part to this process. Through this complexity and the plentitude of empathic building blocks we also constantly walk on a fine line to other terms and constructs like Theory of Mind (Premack & Woodruff, 1978), emotional contagion, perspective taking and sympathy. The complexity of these overlaps, entanglements and dependencies are merely mirroring the complexity of how the human nervous system perceives the surrounding world. But after all, these structures that receive and process incoming occurrences are not there to serve the human language, but vice versa. Hence, in the following passages the most important terms that encircle empathy shall be touched to a reasonable extend to facilitate the approach of two concepts that at the same time constitute the core of this very thesis: The phenomenon of emotional egocentricity and the concept of Self Other Distinction (*SOD*). Humans seem to use their own affective state as a reference point in the empathic evaluation of another being's emotional

sentience. This Emotional Egocentricity Bias (*EEB*) suggests a general difficulty in the distinction between affective sensations sourcing in ourselves and those perceived from another person, if those two arousals emerge simultaneously (Silani, Ruff, Lamm & Singer, 2013).

1.1 About empathy

Whilst empathy seems to be an exceptional example for the human primate's excellent social abilities, it still doesn't seem to be exclusively human. Modern science has shown, that we can expect similar occurrences in other mammal species. In several of his works the primatologist Frans B.M. de Waal (2008) describes empathic behavior in non-human primates like chimpanzees and in some publications postulates a direct evolutionary example of empathic behavior in his observations. But even in non-primates, evidences for empathic occurrences seem to be present. Orlaith et al. (2010) could report at the least behavioral outcomes of empathy in ravens, when observing that bystanders showed consoling behavior towards conspecifics after witnessing situations of conflict. In an experiment with mice, evidences occurred that might lead to the conclusion that other animals even show evidences for empathy not only on a behavioral level, but also in terms of emotional and physiological interaction. When exposed to different noxious aversive stimuli, the test animals altered their pain related behavior in regard to their observation of familiar conspecifics, that at times received comparable pain stimuli themselves (Langford, 2006). Just recently the ability to distinguish between certain emotional states, solely by looking at different facial expressions of a conspecific, has been postulated to be existent in Long-Evans Rats (Nakashima et al., 2015). The list of studies that lead to the impression that empathy, or at least respective tools and behavioral evidences, can be observed in many other mammals but ourselves, seems to be long and growing. In many cases this assumption has been questioned, but mainly because there seems to be a tendency towards trying to shift the discussion into the direction of truly altruistic behavior in concern of the highly influential Empathy-Altruism Hypothesis (Coke, Batson, & McDavis, 1978; Batson et al.,1991) or the constant effort to use human behavior as a reference point. The latter might make sense under the notion that we usually aim for a better understanding of ourselves, yet de Waals postulate that signs of empathy in

animals are evidence for an evolutionary development of this phenomenon appears conclusive (de Waal, 2008). The behavior modifying mechanisms of empathic skills can be of use for any living being that prefers the proximity of other animals. Especially animals that live in cooperating social groups should benefit from prosocial behavior, which has been shown to be connected with empathy (Eisenberg & Miller, 1987; Roberts & Strayer, 1996). On the other hand, animals certainly need to be able to read certain affective states like anger and aggression to avoid harm, although that alone does not constitute empathy. But it surely needs mentioning during an effort to understand the rising, development and evolutionary relevance for animals to read certain affective cues in general. However, retrieving specific information on certain processes seems more feasible through the exploration of empathic processes in the human animal, so we will shift our focus back into that direction.

Empathy seems to be constituted through two major components (Davis et al., 2004; de Waal, 2009; Eisenberg et al., 2006): The more apparent and, as mentioned before, even defining emotional component, but also a cognitive element, which to understand or identify has shown to be quite complicated. Those two components combined seem to result in a process, in which their succession has been disputed. Vignemont and Singer (2006) cite two schematic sequence models. The Late Appraisal Model postulates, that an incoming emotional cue leads to an affective reaction, that then will go through a follow up process of appraisal shaped by the respective emotional context. In contrast, the Early Appraisal Model gives the cognitive component a little more weight and postulates, that emotional cues and context go hand in hand and together constitute the empathic response which originates only through the cognitive appraisal process. This way it seems more obvious how empathy is distinct from sympathy or emotional contagion. Whereas the latter seems to completely lack this integrating cognitive component, in the emergence of sympathy the cognitive component does not extract the other person's emotional state, but constitutes the subject's own emotional arousal towards another person. Thus empathy imperatively contains the cognitive component of perspective taking, whilst still being distinguishable from that concept by the also emerging affective component. Based on an overview on empathic research in the neurosciences Decety and Lamm (2006) propose reciprocal processes in human empathy providing a certain variability instead of fully predetermined sequencing. Though they state that it is possible, that

empathy comes into being due to bottom-up processes (stimulus → empathic response), regulatory top-down mechanisms can regulate and control the empathic system. This likewise implies a moderating role of human cognition in empathy. Structures in the frontal cortex seem to provide such a cognitive reference system by generating meta-cognitive feedback for empathic processes, in order to overcome the limitations of our nervous system to solely depend on perceptual input to produce adequate responses. This notion is crucial in order to understand the subsequent approach of our paradigm and further comprehend the influence of egocentricity onto an actor's empathic performance. All in all, if we talk about empathy, we can state that it is a multistep process that leads to its integrated perception. Neurologically, this complexity is mirrored in the activity of numerous brain regions, that seem to be crucial in empathic processing. In 2004 Tanja Singer et al. took physical pain as a tool to provide evidence for pain-related empathic responses in the brain. Couples where recruited and in an fMRI machine the female subjects received a painful stimulus through an electrode attached to the back of their right hand. Then, still in the fMRI machine, they watched their partner's hand receiving that same kind of pain stimulus. The resulting images where matched and active areas of the sensory networks and sensory pain areas were extracted. The researchers concluded that the anterior cingulate cortex (ACC) and the anterior insula (AIC) in parts seemed to exclusively operate as affective mediators and thus most likely play an important role in human empathy. By comparing how subjects reacted to pictures that showed extremities of another person in neutral and in painful situations, researchers could likewise show that hemodynamic responses were prevalent in the ACC and the AIC when subjects were to assess how another person might feel whilst experiencing a painful stimulus (Jackson, Meltzhoff, & Decety, 2005).

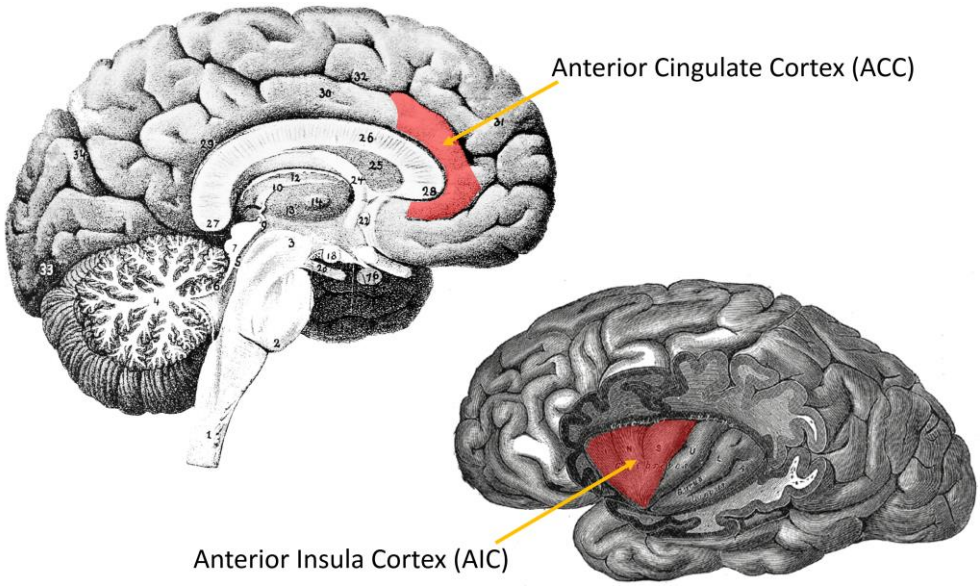

Figure 1 Localization of Anterior Cingulate Cortex (ACC) and Anterior Insula Cortex (AIC)

Lamm, Batson and Decety (2007) could also extract increased activation in the cortices of the anterior insula and in the anterior medial cingulate cortex as structures that specifically seem to play a role in empathic processing whilst watching another person expressing the perception of pain through facial expression. In 2010, Lamm and Singer could once more confirm the role of the ACC and AIC in a meta-analysis of fMRI imaging data of ten studies exploring the neural processing of the perception of pain in others (Figure 1).

1.2 Relevant Emotion Theory

We established, that empathy is highly dependent on affect and emotion. Therefore, before providing a more in-depth look upon certain components of empathy, a short excursus that sheds light upon general emotion processing seems advantageous. Emotion research is one of the biggest chapters in the research of human experience and behavior. Numerous theories exist, and until today several of those can reflect even most recent findings in emotion research. Certain models that are helpful in explaining the here presented findings and proposals about empathy shall be illustrated in this paragraph.

In the Two Factor Theory (Schachter & Singer, 1962) the existence of two basic components in human emotion perception and processing is postulated. In that, an emotional arousal (affect) is perceived and processed (cognition) through the occurrence of emotion specific cognition. This cognition is aligned through the immediate implementation of seemingly relevant cues that help in the integration of the perceived affective arousal and its outcomes. Whereas the theories' underlying experimental approach by the authors has been questioned (Marshall & Zimbardo, 1973), the existence of two major factors, a physiological and a cognitive component, withstands. Appraisal models (Lazarus, 1991) pick up the idea of a cognitive component in emotion processing, but explicitly accredit this cognitive component an aligning (appraisal) and possibly realigning (re-appraisal) purpose. Theories that describe emotion regulation seem similar (Gross & Thompson, 2007), but set an explicit focus on behavioral outcomes that emotions trigger and the appraisal of these interactions with our environment. Shifting away from the processes towards the qualities of emotion, Russel and Barrett (1999) postulate two basic orthogonally visualized levels in their arising. One level quantifies the arousal of the emotional response (Activation ↔ Deactivation) and the other the qualitative classification of that affect (Pleasant ↔ Unpleasant) (Figure 2).

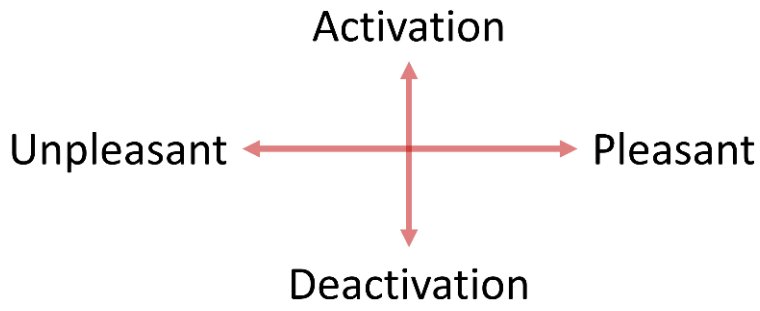

Figure 2 Two basic levels in the core affect system for emotional categorization (adapted from Russel & Barrett, 1999)

This postulate, especially the opposing character of those two levels, is very important in research that is located in the fields of emotion and also in empathy research. Stimuli that are proposed to be emotionally pleasant and unpleasant are frequently used and often different levels of emotional arousal are quantified.

1.3 Theory of Mind (TOM)

The basic concept of Theory of Mind (*TOM*) was introduced by Premack and Woodruff in 1978, meaning the imputation of mental states into oneself or others. It allows an actor to explain another's visible actions by computing those actions underlying mental representations. The authors created the term in an attempt to explore if chimpanzees shared the human's ability to willingly infer states of mind to a respective protagonist. Today the construct TOM is an inherent part in the domain of psychological research and has found particular interest in the fields of Developmental Psychology and autism research. In that, Autism Spectrum Disorder (*ASD*) has been referred to as *Mindblindness,* meaning that people with autism specifically lack the ability to perform TOM tasks (Baron-Cohen, 1997). Whilst TOM, the imputation of mental states, does not require an affective component per se, empathy crucially depends on accurate affective processing. Yet some authors claim that people with ASD show a certain inability to empathize (Charman et al., 1997; Baron-Cohen & Weelwright, 2004, Weelwright et al., 2006). Other studies find that subjects with ASD perform well in tasks that seek to test empathy (Yirmiya, Sigman, Kasari, & Mundy, 1992). Recently it has been suggested, that autism is actually not the main determinate in the ability to produce affective responses whilst empathizing (Bird et al., 2010). Actually the presence of the pathological concept of alexithymia seems to inhibit the processing of this emotional component, which advocates the idea of autism primarily affecting TOM rather than the dominant affective part in empathy. Alexithymia, sometimes paraphrased as *Emotional Blindness,* labels the inability to identify and describe one's own emotions and is indeed very prevalent in people with ASD (Hill, Berthoz, & Frith, 2004), yet autism research did not pay too much attention to this distinction when examining empathic inabilities in autism. However, originally being fairly distinct as a sole cognitive process of reproducing mental states, TOM quickly incorporated the idea that it also represents the ability to understand what another is feeling. Generally, entanglements of empathy and TOM, and even more so emotion and cognition, lead to the distinction between Cognitive TOM and Affective TOM. Still, or with this differentiation maybe even more so, Affective TOM and empathy are concepts that at least overlap. Keeping in mind the Empathy-Altruism Hypothesis, and if we solely look upon the behavioral outputs of empathy and Affective

TOM, a certain subject might help another if he is aware of that person's unpleasant emotional state. This can be either through an intrinsic drive sourcing from perceived emotional contagion, or simply through a cognitive process of knowing that his or her help might solve that other person's emotional unpleasantness, be it due to habituation, social desirability or unmoved calculation. This is worth mentioning to underline the difficulty to recognize empathy in solely behavioral experiments. But as empathy requires the internal simulation of that other person's affective state, Affective TOM still is merely the knowledge about another person's emotions, lacking the protagonist's affective arousal itself. Therefore, the term Emotional Perspective Taking might be more reflective (Schlaffke et al., 2014). It seems conclusive that empathy and TOM can be distinguished by the actors feeling of the emotion of the respective other being. Therefore, TOM still appears to be exclusively cognitive, whilst empathy, through the appraisal of its defining affective component also shares a lot of this cognitive aspect. In contrast emotional contagion describes the affective perception induced by another being, but lacks the cognitive component of that emotion's appraisal (Hatfield, Cacioppo, & Rapson, 1994). Consequently, empathy seems to describe the unconscious process of the integration of emotional contagion and TOM and all in all, any approach to conquer empathy and its underlying processes is a complex undertaking.

It becomes fairly evident, that the scientific community did through in-depth examination of empathy, emotion and other closely related and coinciding phenomena in some way alter, but definitely specify the definition and understanding of these terms in comparison to what for example the citation of the Encyclopedia Britannica constitutes concerning this matter. Research that tries to shed light upon these concepts still constantly tries to define, specify and at times has to try and deal with these interferences as well as in any way possible. The notion, that these concepts like empathy emerged in the human language long before we could for instance take a look upon functional processes inside the human nervous system, often becomes apparent along the way towards a more differentiated understanding.

1.4 The Emotional Egocentricity Bias and Self Other Distinction

Now to integrate and put all the before mentioned theoretical content into perspective, two seemingly dependent concepts that occur in empathic computing shall be discussed. Even if evidences about empathic abilities of people with ASD have been ambiguous, that the ability to empathize fluctuates between different individuals or groups has never been in doubt. We established that only a rather complex and multi-step process can lead to empathy. This complexity might vary, but the plurality of components sure leads to a variety of possible explanations for empathic inaccuracy. A fairly prevalent and specific term in this area of research has been the Emotional Egocentricity Bias (EEB) (Silani, Lamm, Ruff, & Singer, 2013; Tomova et al., 2013; Hoffmann, Singer, & Steinbeis, 2015; Steinbeis, 2016). A concept, which specifies empathic inaccuracy that exhibits a significant shift in a person's emotional judgement of another towards his own emotional arousal. Apparently people seem to implicitly use their own present internal emotional state as a reference point in the empathic perception and evaluation of external emotional cues (Silani et al., 2013). The concept of an emotionally egocentric bias in empathic judgements is a fairly new concept, that is trying to shed light upon how and why miscalculations in the effort to empathize with others arise.

In 2013, Silani et al. created a visuo-tactile paradigm that was meant to show just that bias, and through functional imaging tried to visualize the neural networks that might play a role during cognitive empathic processing that results in emotionally egocentric judgements. Participants were exposed to matched visual and sensory stimuli, that where meant to create a pleasant or an unpleasant emotional arousal. Subjects were for example touched with a piece of silk and presented a picture of a rose (pleasant), or they saw the picture of a bug while a plastic bug was put into the palm of their hand. Participants were also shown a second picture of the stimulus set which depicted a stimulus that another subject was currently exposed to. Subjects had the assignment to make judgements about their own emotional status during sequences labeled Self Judgement condition. In the second condition, called Other Judgement, subjects had to rate how the other participant felt during the exposure to a certain stimulus whilst they themselves where still visually as well as physically exposed to a second stimulus (Figure 3).

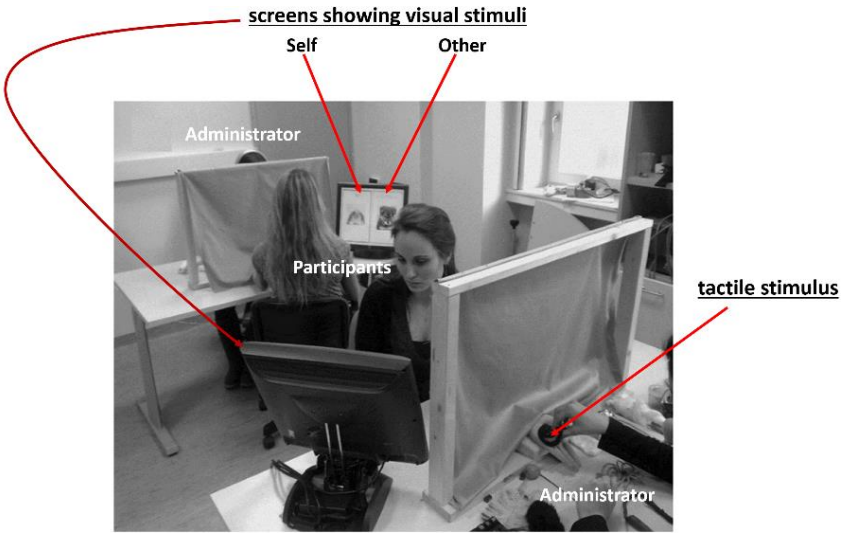

Figure 3 Setting of visuo-tactile paradigm (adapted from Silani et al., 2013)

The stimulus on the screen that showed the other participant's stimulus was either congruent to the subject's stimulus quality, or incongruent – meaning either two pleasant or unpleasant stimuli where presented (congruent), or the stimulus presented to the participant was antipodal to the one of the other participant (incongruent). Those two cases appeared in the Self as well as in the Other Judgement Condition. Right after each stimulus presentation subjects had to choose on a scale how pleasant or unpleasant they themselves (Self Judgement) or the other participant (Other Judgement) would feel. When subjects had to judge the other participant's affective quality (pleasant ↔ unpleasant) on a continuous scale, in the case of incongruent stimuli their judgement was significantly shifted towards their own stimulus induced arousal. This could show, that EEB was indeed present, and subsequently the paradigm was applied to an fMRI based experiment to identify the neural structures that are involved in this emergence of empathic inaccuracy. The activation patterns lead to the assumption, that the right Supramarginal Gyrus (rSMG) plays an important role in the brains effort to distinct internal and external emotional arousals.

In another run of the experiment the authors used transcranial magnetic stimulation (TMS) to inhibit activation in the rSMG (Figure 4). The results of those TMS-based runs of the experiment supported the hypothesis of the importance of the rSMG in SOD as the subjects did indeed show a significantly higher bias in the runs when their rSMG-activity was inhibited.

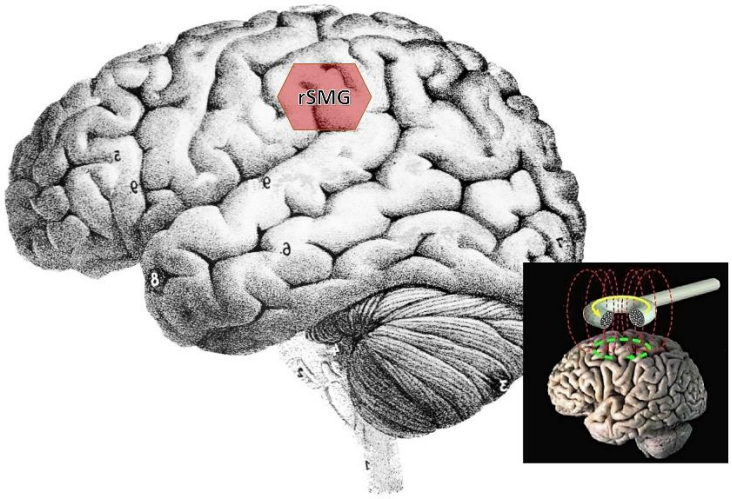

Figure 4 Localization of right Supramarginal Gyrus (rSMG) and principle of TMS-Stimulation

The idea of the paradigm (Silani et al., 2013) to use antipodal emotional arousals and use the congruency of internally and externally located sources has been adopted in further research exploring EEB and SOD. In a very similar approach the influence of stress was explored and the study could reveal differences between male and female participants (Tomova et al., 2014). Whilst female subjects did not show a stress induced decrease in the ability to distinct between emotions of the self and another, men performed worse under stress and showed significantly higher levels of EEB.

In an visuo-gustatory adaptation of the paradigm, a difference in the performance to judge the emotional reactions towards gustatory stimuli between children and adults was examined. The children's judgements resulted in significantly higher EEB scores, therefore a developmental component in SOD seems likely (Hoffmann, Singer, & Steinbeis, 2015). In summary the paradigm opened up new ways to examine emotion-cognitive processes in empathy by showing that the occurrence of EEB is rather systematic, and that the consideration of SOD as a crucial process is worthy of further research. Thus far SOD (sometimes also referred to as Self-Other Discrimination) has mostly been explored in terms of self and other body awareness and the ability to distinct between visual depictions of the self and another (Uddin, Molnar-Szakacs, Zaidel, & Iacoboni, 2006; Jeannerod, 2004; Jardri et al., 2011).

This thesis is again trying to explore the role of SOD in human empathy. But instead of using physiologically supported stimuli, a shift towards a solely social approach is attempted. Earlier research in empathy showed that pain, or the mere sight of it, is a strong emotional promoter (Morrison et al., 2004; Jackson et al., 2005; Lamm et al., 2007). In 2003 Eisenberger et al. did show that social ostracism lead to neuro-structural activation patterns that were similar to those that had been identified in the approaches utilizing physical pain. The stimulus they used was adapted from the idea to exclude a participant from a virtual ball tossing game after a phase of inclusion (*Cyberball*), which lead to an emotional state of unpleasantness in the excluded subjects (Williams, Cheung, & Choi, 2000) (Figure 4).

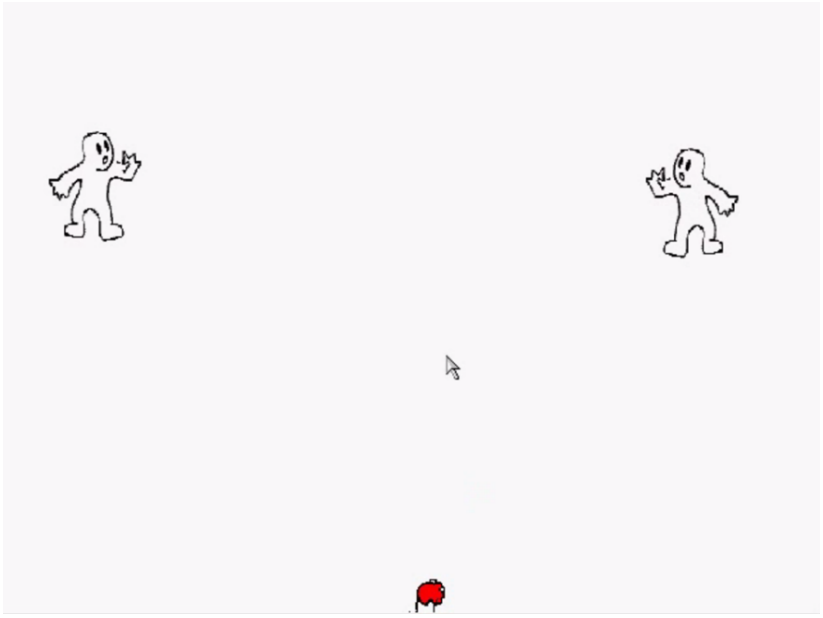

Figure 5 Original Cyberball game by Williams, Cheung & Choi (2000); the ball is tossed to another avatar by clicking on it.

1.5 Examining EEB and SOD during social interaction

Originally the idea for the Cyberball game and of a concept that could coin social ostracism was sourced from a real life experience by one of the authors, Kipling D. Williams. At first Williams used his idea in an experiment with real participants playing a face-to-face ball tossing game to observe the effects on subjects that were excluded in the game (Williams & Sommer, 1997). While the experiment could show volitional effects, the authors criticized the cumbersomeness and inefficiency of the idea, if recreated into a real life face-to-face event (Williams & Jarvis, 2006).

Therefore, the authors generated an on-screen virtual recreation of the idea. The game is provided as an openly accessible research tool (current Version: Cyberball 4.0) and gives experimenters the possibility to let a subject play a virtual three- or four-player ball tossing game. The ball is simply thrown from one player to another whilst they are standing in a triangle (3 players) or a square shape (4 players) facing each other. This way playful social interaction is simulated. When a player has the ball, pushing a certain button lets the participant decide to which other player the ball is passed next. The subject or participant sitting in front of the screen can only see his or her avatar's hand on the bottom of the screen, creating some sense of ego-perspective. All in all, the game has no goal but participation. As mentioned above, the focus did originally lie on the case of player *exclusion*, when one of the players doesn't receive the ball over a certain period of time or amount of ball throws. Through this very ostracism the excluded player is meant to be set into a negative emotional state. At the latest when the virtual version was implemented, a subject's *inclusion* of a player was meant to create a feeling of acceptance and be perceived as emotionally pleasant (Williams & Jarvis, 2006).

This very thesis will use the stimulus concept of social ostracism from the Cyberball paradigm (Williams et al., 2000), and merge it with the approach to use emotional stimulus congruency to depict EEB and identify SOD (Silani et al., 2003). The result is a paradigm that solely uses social interaction to evoke different emotional states in our subjects, allowing us to examine how participants perform in terms of EEB and SOD in an exclusively social setting. This is merely the first step towards an implementation of this idea in a series of experiments. This very step lies in the creation of new stimulus material and in building a virtual ball tossing game, that generates different emotional states and respective congruency between participants and another actor through proposedly pleasant inclusion and unpleasant exclusion. The collected data will seek to validate the paradigm and furthermore open up the possibility to use this stimulus material for fMRI based approaches. Using the paradigm with people diagnosed for high-functioning autism as well as people that exhibit high levels of alexithymia to test assumptions about the different roles of these pathologies in the cognitive and affective processes of empathy will also be possibly later on. But in essence we will try to elicit EEB and isolate insufficient SOD as its cause.

2 Research Question & Hypotheses

The goal of the study is to explore the occurrence of Emotional Egocentricity Bias (EEB) in empathic emotion judgements in a social setting and examine the role of Self Other Distinction (SOD) in its occurrence. Alexithymia levels (TAS-20 Questionnaire) and empathic skills (IRI Questionnaire) will be examined in terms of their confounding properties towards our findings.

2.1 Research Question

We are trying to evaluate if the occurrence of an emotionally egocentric bias (EEB) in socially framed empathic processing can be mainly accounted for by a failure in Self Other Distinction (SOD). If participants are emotionally aroused through a socially interactive stimulus, but also at the same time are being asked to judge another person's emotional responses towards this very situation, it is likely that they will show significant shifts in their emotional evaluations towards their own current affective state (EEB). This could mean, that participants are not able to accurately distinct their own emotion from their empathic judgement of another. To test this hypothesis, our subjects will also be asked to evaluate another person's emotions whilst they are let to observe the same social interaction without any emotional self-involvement. As SOD in this scenario is not necessary, this egocentric judgement error should not occur.

2.2 Hypotheses

2.2.1 EEB Hypothesis

H0: Emotional involvement of a subject towards a socially interactive situation does not lead to empathic judgements that are shifted towards their own emotional state.

H1: Emotional involvement of a subject towards a socially interactive situation leads to empathic judgements that are shifted towards their own emotional state.

2.2.2 SOD Hypothesis

H0: EEB is not only prevalent during a subject's emotional self-involvement, but also occurs if they are let to empathize with another from an emotionally uninvolved and solely observing perspective.

H1: EEB is only prevalent during a subject's emotional self-involvement, but does not occur if they are let to empathize with another from an emotionally uninvolved and solely observing perspective.

3 Methods

Our approach to create and validate a paradigm that seeks to explore emotional egocentricity and Self Other Distinction contained several content-related steps. First the idea to create ethically acceptable and manipulable stimulants demanded the creation of stimuli that provide ecologically valid yet versatile material. The usability in fMRI and with autistic subjects was also imperative. The second part consisted of paradigm implementation and validation for the testing of our main hypothesis. Here, due to the degree of concealment of the questioned mechanisms in empathic processing (especially SOD), numerous leverage points that could jeopardize the paradigms soundness, had to be considered. Thirdly, a number of covariates had to be collected through (e.g. gender and Alexithymia scores) questionnaires and finally all data had to be analyzed. Another essential matter to the paradigm is, that it will be used with subjects that are diagnosed with high functioning autism. However, the paradigms main purpose for this project still stays in shedding light upon the role of SOD in human emotional processing and therefore shall provide a valid explanation for emotional egocentric inaccuracy (EEB). An implementation towards an fMRI based experimental approach later on is to augment that. Thus many considerations and steps taken and explained in the following are aiming for these before mentioned goals, but also need to be kept in mind if the reader wants to understand all factors concerning the material and design described.

3.1 Material

The design of the paradigm created for this very thesis was based on a visuo-tactile experiment by Silani et al. created to detect emotional egocentricity and the ability to distinct between the affective arousal of oneself and the perceived emotion of another during empathizing (2013). The concept is that participants are exposed to different stimuli from a prepared stimulus set that elicit a certain emotional reaction, that is either pleasant or unpleasant. At the same time participants watch other subjects being exposed to a stimulus from the same stimulus set also affecting this very participant's emotional state. Now this toolset allows the creation of *Congruent* (e.g. pleasant/pleasant) and *Incongruent* (e.g. pleasant/unpleasant) situations of emotional arousals for the two participants. When the subjects were asked to judge the other participant's emotional status during the incongruent conditions a significant shift towards the participants own emotional status did occur (Emotional Egocentricity Bias). Now this very concept will be applied to the idea of a virtual ball tossing game with up to 4 players. This social interplay is meant to deliver the pleasant emotional stimulation of the participants, whereas when a subject is excluded this shall lead to an unpleasant emotional reaction (Williams, 1997). Having those two rather obverse stimulus options again provides the opportunity of creating and simulating congruent and incongruent emotional states and experiences amongst all the players similar to the visuo-tactile paradigm mentioned above (Silani, 2013). Changing any participants´ emotional gaming experience can principally happen within a couple of throws (Eisenberger et al., 2003). This is essential, as the design requires any participant to go through and observe several cycles of in- and exclusion, congruency and incongruency during our experiment to extract EEB and SOD. But instead of a simple two dimensional game with cartoon protagonists the idea was to create a visual experience closer to reality. This was done by producing videos of real people playing a ball tossing game as the main raw material. Underlining and emphasizing the social context was one goal of this idea. Likewise, it has been shown that immersion in players is higher when graphics are more realistic in computer games (Slater et al., 2009). However, these changes also came along with certain possible interferences that needed to be considered. As videos of real people where used, personal preferences, prejudices or emotional associations that might have a confounding

effect where also attempted to be avoided. Therefore, for the video shootings the actors where all sought out to look as similar as possible, meaning that main features and characteristics (e.g. hair, body type, height, skin color) where not too different in between the actors nor did any of them have any characteristics to be outstanding or too different from the others. Also, all the actors did wear similar clothes, traded places in certain phases of the video shoot and had minor changes to their appearance at desired times. The ball itself was as plain as possible and the rhythm of the throws between the actors was clocked using a metronome. This way all intervals where leveled and the duration of a certain player keeping the ball couldn't lead to distinctive judgements that would possibly confound any subject's emotional experience and evaluations. Even the operations whilst throwing and catching, any movements at all, positioning, body language and facial expressions where trained to be equal and insignificant amongst all actors. A plain white wall acted as the background. One person stood behind the camera catching and throwing the ball in front of the very bottom of the lens. Any subject that was operating the game was meant to be represented by that person and an ego perspective experience was constituted just as in the original 2D-Version of the game to increase the immersive effect. Also similar to the original version, two or three actors stood in front of the camera which together with the person behind the camera created a circle of three or four players for the ball toss. Throughout the whole project the person operating the game (hence the person behind the camera) was labelled as *Player S* for *Self*. The player that was left of Self was called *Player A*, the one in the middle *Player B* and the right one *Player C* (Figure 5). In the final game the participants will be asked to attempt to evaluate the emotional state of Player B, therefore that player was also distinguished through the label *Other*.

Figure 6 Unedited version of the videos and coding of the actors as used throughout the whole project. The player behind the camera labelled S for *Self*. Player B was also labeled *Other*.

Before the visual editing, the videos where cut into fragments that covered all possible sequencing of the ball throws between the players. This fragmentation allows assembling the videos in any desired order, so that a coherent ball tossing game can be simulated and every possible permutation of tosses between the players is practicable. All video editing was done by using Windows Movie Maker[1]. Any needed variance of a fragment that showed the ball leaving the hands of the player S until he received it again was cut. Those fragments where labelled due to the flow of the ball between the Players. A video sequence where Player S threw the ball to the left into the hands of Player A and then this actor throws it back to player S was accordingly called *SAS*. If the ball is thrown to the left once by each player until it arrived back at player S this sequence was titled *SABCS*. Each video was cut in a way that it started with the ball throw by Player S rather immediately, so that later on in the program pushing a button would conclude into a direct feedback of the protagonist. After the cutting each segment was edited to eliminate further distractors, but also to give the videos a look that was closer to what one would expect from a simple computer game. The first step was still done with Windows Movie Maker, in which the video effect *edge detection* was applied to each sequence before it was being saved as a Windows

[1] Version 2012; Build 16.4.3528.0331

Media file (resolution: 640x360). This editing step has the effect that only the main edges of rather homogenously colored surfaces are displayed. After that, each sequence was rendered once more using Corel VideoStudio Pro X8[2]. The filters *invert* and *monochrome* were applied so that the resulting videos showed white outlines of the previously detected edges on a black background (Figure 6).

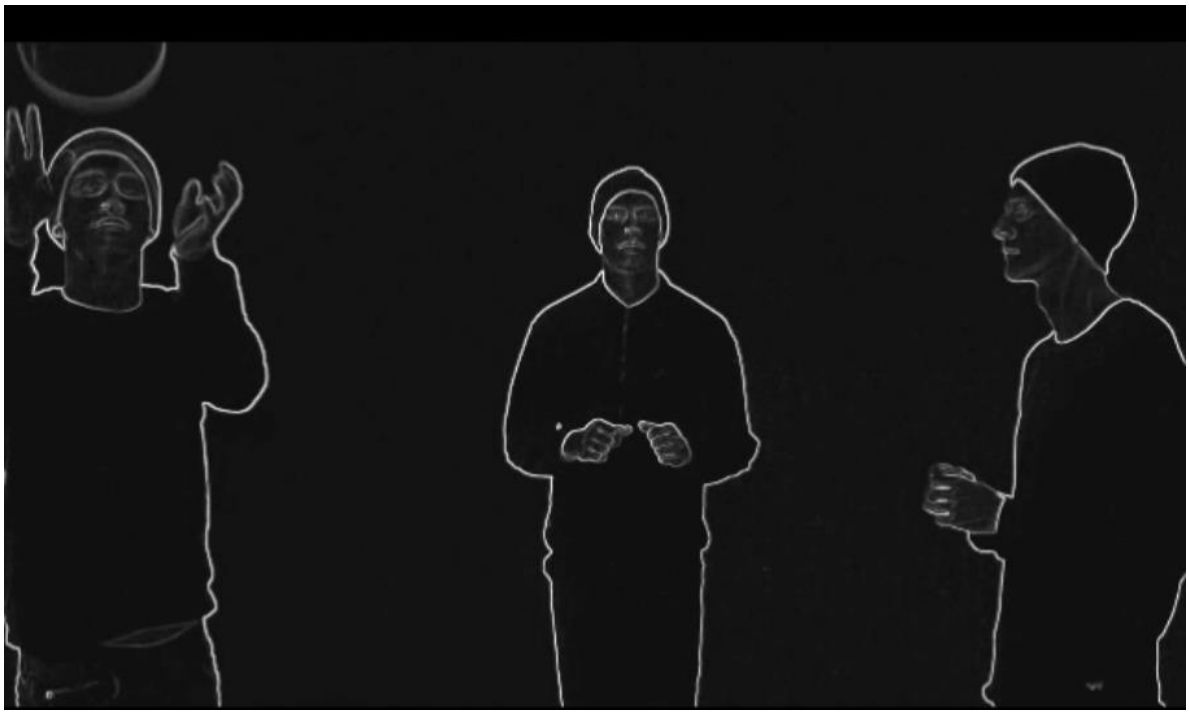

Figure 7 Edited visuals; player A avatar is passing the ball to Self (S) avatar

After all necessary video segments were tailored, the real programming process of the game began using the Cogent programming toolbox for MatLab r2010a[3]. The basic concept is, that a player can influence the order of the video snippets being played, creating an illusion of playing an interactive ball tossing game with the people seen on the computer screen. Besides that, MatLab enables the collection of other parameters such as time measurements and allowed the implementation of a visual rating scale to score the participants emotional judgements. Furthermore, the programming connected certain button presses of the arrow keys with coherent playback of a specific video sequence (Figure 7). When a player presses the left arrow key, for example, the program might play a video snippet with the person behind the

[2] Version 18.0.0.181
[3] Version 7.10.0.499

camera (Player S) throwing the ball to the player on the left (Player A) before that player then furtherly distributes the ball to another player. This way the illusion of the subjects' integration into the ball game was created. Later on, to intensify the social character of the game, the participants were told that the other people they saw on the screen were played by other participants. Whereas in reality the order of the ball tosses where determined by the video sequences the players saw being played. Therefore, the tossing patterns can be manipulated by the experimenter. In this very way, the participants (*Self*) or player B (*Other*), and at times both, can be intentionally excluded from the ball tossing game.

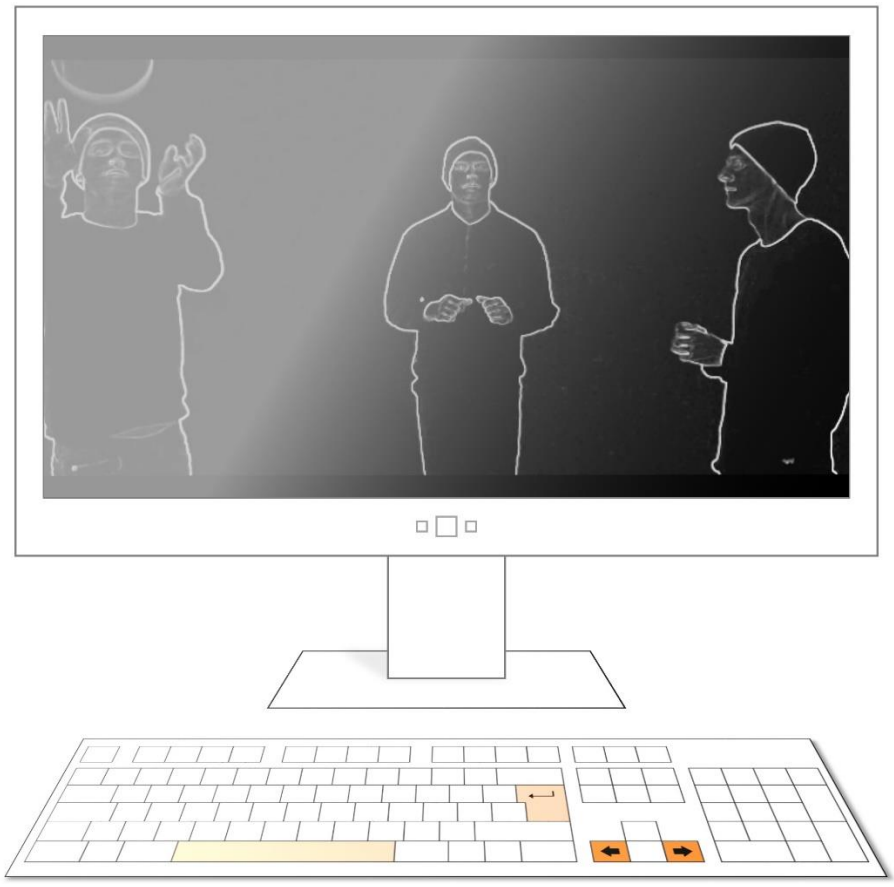

Figure 8 Setting of the game. Enter button to start the game. Arrow left and right for ball throw and to move the rating scale cursor. Spacebar to confirm the rating. The video resolution was at 640x360.

3.2 Design

As mentioned before, the game effectively exposed them to different video sequences to explore the participant's judgements and reactions towards different states of emotional self-involvement. Then these patterns are meant to create inclusion or exclusion of the subject or the avatar Other which to the participants' knowledge is controlled by another subject. After each given sequence participants were asked to rate their own emotional status, or judge how the alleged player that is controlling the avatar Other might feel. As any participant was meant to believe, that all the avatars they saw on the screen where controlled by other subjects in the room, each testing session was held with 8-10 people. Two administrators were present at all times. In the very beginning of a session all of the subjects where sitting in a circle for a short briefing about the experiments' procedures. This was not only due to its explicit purpose of desirably informing each participant about the experiment equally, but also to intensify the social character of the setting. The subjects were told, that the loading process of the game was a connecting process between all of the computers in the room. Before all participants were randomly distributed to one of the 10 computers in the room, they also received a handout which summarized all the Cyberball game conditions of the first run. This not only again to make sure everybody, especially subjects that were not very acquainted with playing games on a PC, started the game without any concern, disadvantage or uncertainty, but also to keep them constantly involved in the situation. Even whilst possible waiting periods before the game started, prior to and in-between the individual runs, of which four (Single Self Active, Single Other Passive, Double Self Active, Double Self Passive) were conducted in each sitting, subjects should not get sidetracked. Also all subjects had to start any run of the game at the same time to keep the supposed interconnectedness believable. That lead to waiting periods for those players that made faster decisions in the ball toss or their emotional evaluations. All subjects were instructed to wait quietly so that other participants where not doubting the proposed setting. To be completely sure, that each participant was focusing on their explicit tasks and to generally prepare them for their part in the upcoming sequence, a test sequence was played prior to each run. The sole focus on the experience of the game itself rather than having thoughts about what they had to do or what was about to happen was meant to be

guaranteed this way. Although all these measures make sense, it is expedient to point out that the game itself was kept to be as simple as possible. But the arrangements effectively ensured that each subject knows when to be passive and merely observe the game, and when their active participation (Passive vs. Active) was expected. A subject that wrongly expects the ball in a Passive sequence cannot neutrally judge another's emotional arousal, and a subject that does not expect the ball during the Active sequences cannot be ostracized. Before any of the game's runs, participants also had to wait for a command of the administrator so that all participants pressed the Enter key on their keyboard in a synchronized manner (Figure 7). This again to make the supposed interconnectivity believable and emphasize this aspect once more ("1, 2, 3, Enter!"). After that command the introduction screen appeared for six seconds on which the upcoming run was once more summarized. Then, also for six seconds, a white fixation cross appeared. Every sitting of the experiment started with the Single Self *Active* Condition, in which the participants saw two other "players" right and left on the screen. The subjects themselves could receive the ball from any of the other avatars and toss it to the left by pressing the left arrow key and to the right by pressing the right arrow key. After each run the screen with the continuous rating scale appeared (Figure 8). The scale is labeled *negative* on the very left, has a marker in the middle (neutral emotional state), and reads *positive* at the very right of the bar. A command on top of the rating bar asked participants to rate how their own emotional state (Self) or that of Player B (Other) after the previous run of the Cyberball game was. In the briefings before the game the participants where asked to do this as accurate as possible but also without giving it too much thought to provoke fairly instinctive decisions. The rating screen showed a red star (= rating cursor) at a random position, which could be moved through the left and right arrow keys. Participants were asked to always move the cursor even when the positioning was to their liking, to make sure the emotional and cognitive processes where always very much alike and keep them from making inattentive decisions. If a subject did not move the cursor before confirming a rating the program did not register that score. Thus in some cases scores were not available for the final analysis. After the cursor was placed as desired the choice was confirmed by pressing the spacebar on the keyboard and the game went on (with exception of the last run, after which the ending screen appeared). The program saved the subject's ratings on a continuous scale from -10 (negative or unpleasant) to +10 (positive or pleasant).

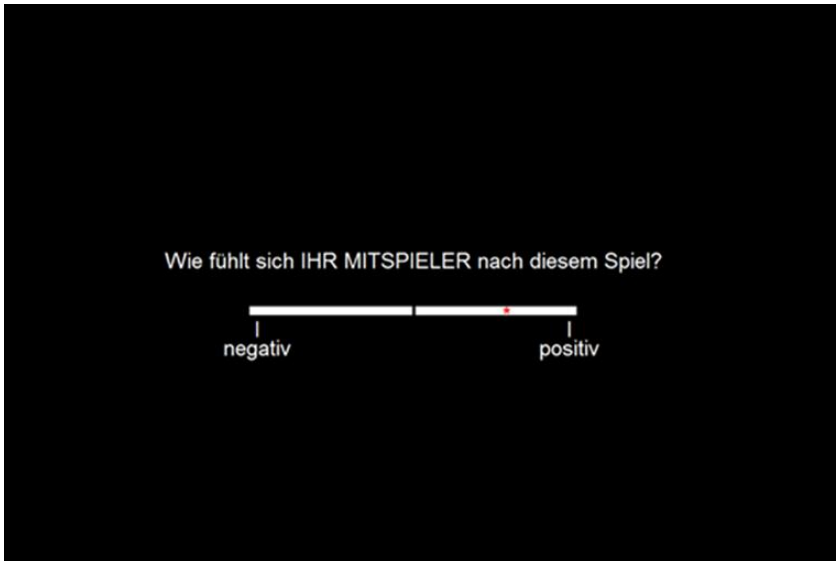

Figure 9 Screen for emotional rating (Other Condition). The program encoded the player's choices into a continuous rating result between -10 and +10 (left to right). Left and right arrow key to shift the red star (left = negative, center = neutral, right = positive) and spacebar to confirm positional choice.

In the first run of the Cyberball game the subjects were at first exposed to five cycles of "inclusion" where the ball was tossed between all players evenly and the participants themselves received the ball three times during each sequence before their judgement. After that they were excluded from the game for also five runs where the avatars the participants saw on the screen passed the ball only between themselves and never to the subject's avatar. When the run was over a black screen saying *ENDE* (German for "the end") appeared and all subjects received a handout with the specifics about the next run (same procedure before each run). After that the participants observed the Single Other Passive condition (Figure 9) in which they saw three avatars play the game with essentially the same ball tossing patterns they had just experienced. However, the participants themselves were not playing. During this run the player that was facing them was meant to be observed particularly. As prior to the first run, and before the game was restarted by an administrator, subjects were fully informed through a handout and again reminded about the main conditions on the introduction screen. After each sequence, when the rating scale appeared, the participants were asked to guess the emotional state of the alleged player controlling the Other avatar. Again this avatar was included in the game and the ball distributed evenly throughout all avatars for five runs (avatar Other receiving the ball four times before the rating screen appeared). After that, the other two avatars started to ostracize that player in the five proceeding sequences again.

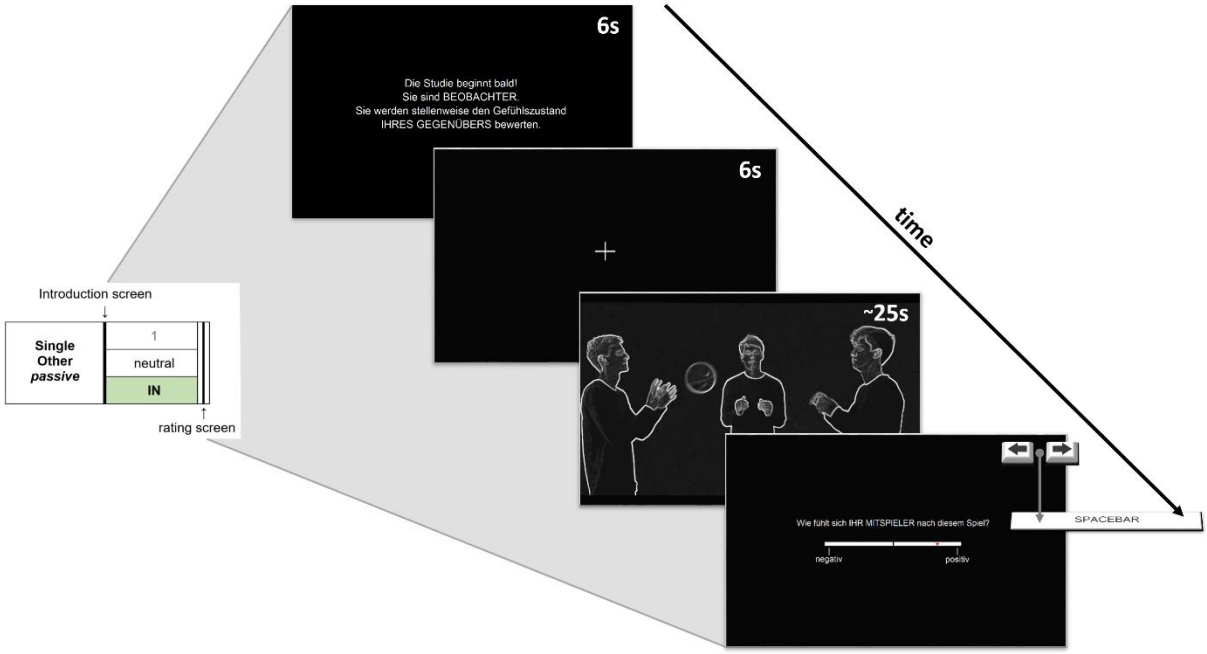

Figure 10 Game sequence example (Single Other passive). First participants see the introduction to the game sequence with all necessary information. Then they observe the ball tossing game (notice: *Passive* condition present; in *Active* condition subjects play themselves). After the sequence a rating screen with a continuous scale appears. Subjects can judge if the player facing them is in a negative or positive emotional state (middle: neutral).

As mentioned before the results that the ratings during the Single runs accumulate are not only to set a baseline for the emotional responses that our paradigm triggers, but also to validate our stimuli. Simply put, the ratings´ algebraic sign will tell us if the paradigm works in principal (negative for exclusion sequences, positive for inclusion sequences), and the extent of the ratings will show us how strong the stimuli are. Also, the first run (Single Self active) is necessary to make it possible for the participants to experience the emotions involved, before evaluating the emotional responses of another proposed player. Otherwise a solely cognitive evaluation could be triggered or certain participants might recall experiences they might have had in similar situations. Therefore, by starting with an active involvement for every subject, an even experience and emotional setting for all participants was created and each subject virtually set a quantitative baseline for themselves, but also for the emotional response towards the paradigm in general per the averaged rating scores.

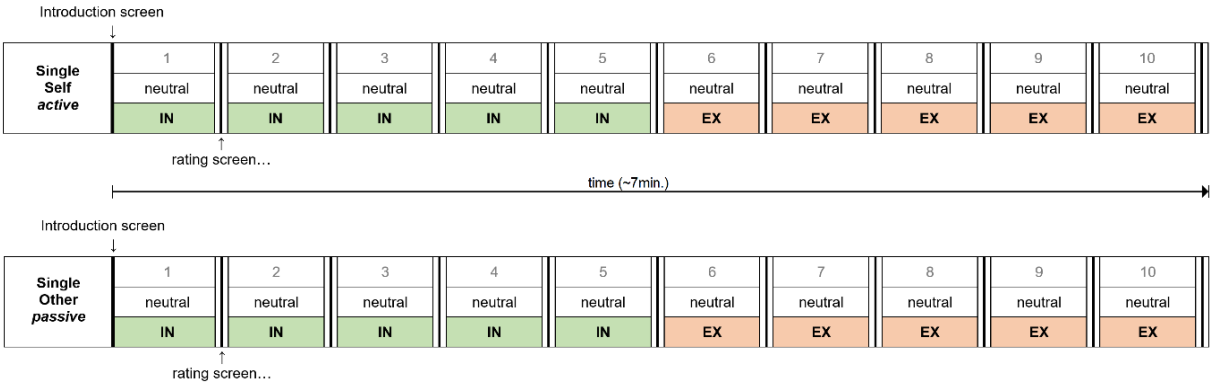

Figure 11 Single Sessions sequences. Single Self active: Subject plays the game and is first included (IN) and then excluded (EX). Single Other passive: Subject watches 3 avatars playing; at first all players are included evenly; in the last five rounds the avatar facing the subject (Other) is excluded. In the Single Sessions subjects are exposed to one single in- or exclusion stimulus.

After the subjects went through both of the Single sequences (Figure 10) one of the administrators again gave a short briefing about the upcoming changes and another certain aspect that was important to the paradigm: The subjects again received a sheet with summarized instructions before each Double sequence. This time the sheets had *Group A* written on the top. This was due to the fact that now participants were lead to believe that there were two groups. In that they were told that group A still could only throw the ball left and right, but group B (fictitious) from now on was able to use the *arrow up key* to throw the ball to the player facing them. This was because in effect none of the participants should be able to throw the ball to the player B if this avatar was meant to be excluded for the sake of the paradigm. Also, the participant's judgement of the emotional state of the player "Other" should not be influenced by possible grudges held against this alleged player for not passing the ball to them. Thus during this small re-briefing between the Single and the Double condition the administrator also made clear that two facing avatars always shared the same group.

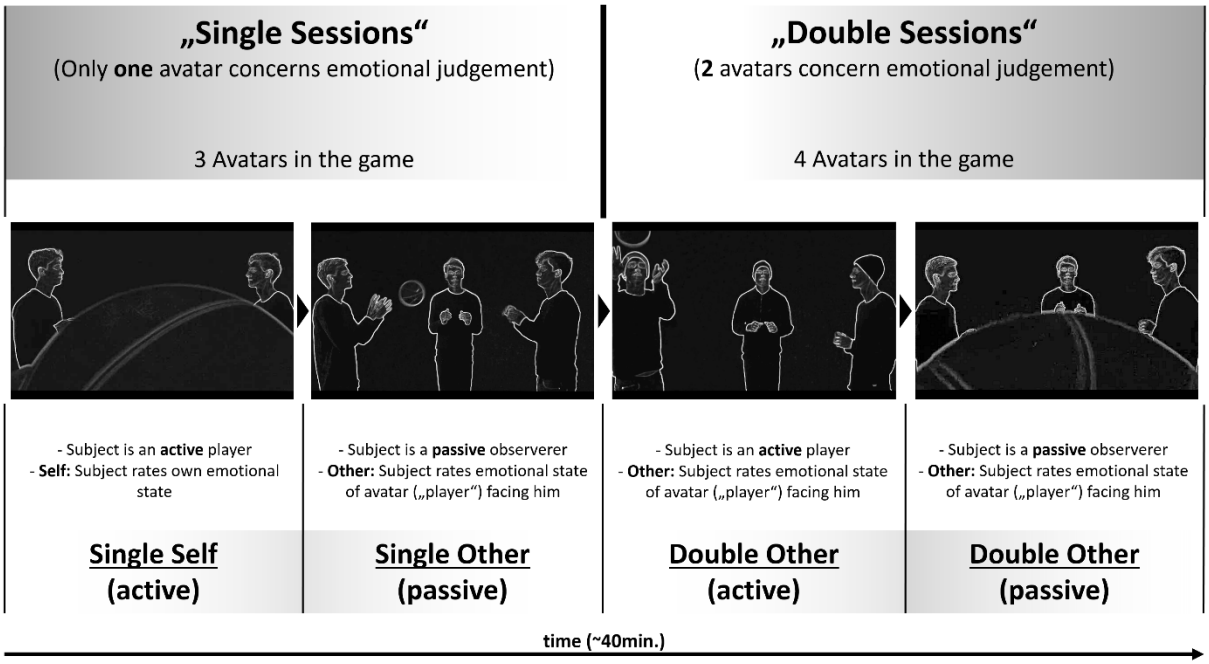

Figure 12 Stimulus sequence as Cyberball game was played by participants including main session characterizations. Equivalent to a single subject's complete cyberball game session. *Single Sessions* always before *Double Sessions*; Double Sessions in reverse order for close to 50% of all participants. The naming of each run listed in the bottom row encodes the specifics of each run; the first term describes if one or two players are emotionally relevant to the paradigm (Single or Double); followed by rating target (Self or Other); last term describes if a subject was actively playing or just an observer (Active or Passive).

The *Double Other* sequences of the game are the part that is to explore a subject's ability to make unbiased emotional judgements (EEB) and distinct their own emotional arousal from that of another (SOD). These two runs (Active and Passive) where applied according to a standard crossover design approach. Priming, sequence, learning, habituation and other effects could be excluded as causes for probable outcome differences. Also the typicality of a cross-over, that each subject implicitly functions as its own control subject was crucial. The idea behind having an active and a passive part in our game was to test if the two created scenarios show that interfering emotional states between an actor and a distinct emotional source can lead to invalid judgements and empathic inaccuracy. After all, this comparison should test the main hypothesis at question, that not only perceived interfering emotions result in emotional egocentricity but that this is due to an incapability to distinct between internal and external emotional sources. Just like in the single condition the subjects were exposed to predetermined sequences (see Figure 11 for course of all runs). The avatar Self and the avatar Other were still deliberately in- and excluded at certain times. But in the Double Sessions these two phenomena happened at the same time.

Interferences between those two experiences would lead to inaccurate or inconsistent emotion ratings. During the Double runs the participants were exposed to equivalent stimuli in blocks of two and went through seven manipulated stimulus changes (Figure 12). All in all, subjects were going through 16 rating screens in the active run as well as in the passive sequences. Each single one of the 16 game sequences of the actual Cyberball game stimulus was either visualizing a congruent or an incongruent scenario in terms of inclusion and exclusion for the two players Self and Other. The crucial difference between active and passive now was, that in the active condition the player Self was controlled by the subject him- or herself. In the passive condition however the subject was not playing at all, but was told that he or she was watching 4 other participants in the room playing the game. Thus the stimuli were virtually identical only with a very different level of emotional involvement of the subject. This way, and in coherence with our hypotheses the participants should show a significantly larger emotional bias in the active than in the passive sessions. As the passivity explicitly lacks the subject's emotional involvement, a shift towards that very emotional arousal should not arise in our data.

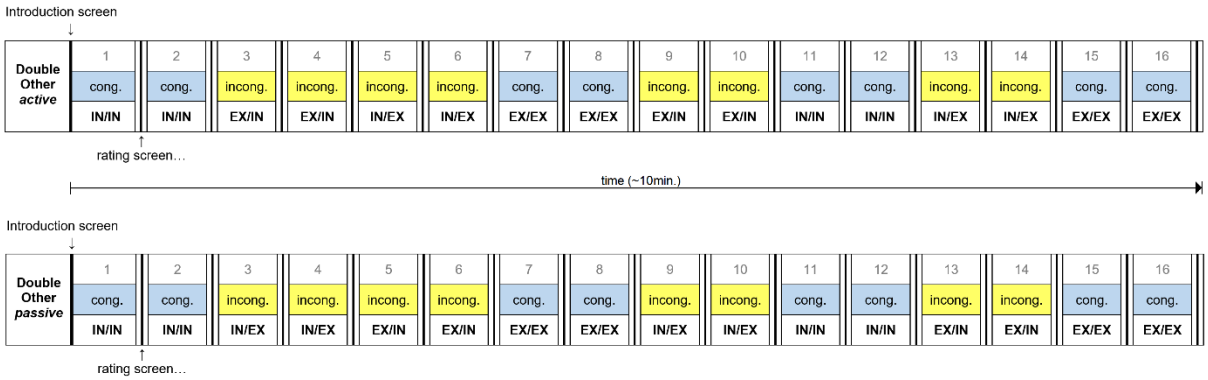

Figure 13 Double Sessions sequences: cong. = congruent, Incong. = incongruent, IN = inclusion, EX = exclusion. The bottom row describes the manipulated gameplay experience for the subject (Self) and the avatar on the screen facing the subject (Other). IN/IN means both players are included, EX/EX means both players are excluded (→ congruent), EX/IN means Self is excluded and Other is included, IN/EX means subject is included and Other is excluded (→ incongruent; note: the subject's own experience is always listed first).

3.3 Participants

As this application examines the general exploration of the role of emotional egocentricity and the process of self-other distinction, a non-probabilistic approach in terms of recruitment was legitimate. The paradigm analyzes changes and inconsistencies in each subject, hypothesizing a common phenomenon that to some extend should be prevalent in any “healthy” subject that doesn’t hold an explicable difficulty towards empathic processes or show perceptive restrictions for empathically regulated social interactivity. The participants taking part in our study where recruited in a couple of straight forward approaches using a standardized text. Flyers, posters, internet platforms and forums where used for ad placement. Also, and eventually the main recruitment tool was a platform called “LABS” provided by the University of Vienna, where potential study participants are listed, available for contact through Email. In any case the study was advertised for participants between age 18 and 55 without any neurological or psychiatric conditions. Furthermore, students of Psychology or participants that had taken part in similar studies were excluded. The gender ratio was kept to be statistically comparable later on. This resulted in 24 female and 28 male participants (N = 52). The mean age was 25 years with a range from 20 to 41 years of age. With the exception of two recruits all the participants were students. All our data was encoded and thus the participants’ anonymity was ensured. Each participant was promised a 10€ compensation, which they received directly after the experiment.

3.4 Questionnaires

All questionnaires were filled out by the subjects at the very end of the experiment, before they received their compensations. A short Questionnaire was put together by the test administrators themselves and accounted for certain valuable and potentially useful data of the participants, like gender, level of education, age and examined, if any of the participants might have general problems with operating a computer.

3.4.1 Interpersonal Reactivity Index (IRI; German version)

The IRI is a widely used questionnaire that explores a tested person´s general ability to empathize with other people (Davis, 1980). The IRI consists of 28 Items that are answered on a five-level Likert scale ranging between “describes me very well” to “doesn’t describe me well”. It is split into four subscales (see below), each of which summarizes 7 of all the 28 Items.

I. *Perspective-Taking Scale*

This scale describes the tendency to instinctively adopt another person’s psychological point of view.

Example Item (28): “Before criticizing somebody, I try to imagine how I would feel if I were in their place.”

II. *Fantasy Scale*

The *Fantasy* subscale measures the tendency of a person to transpose him- or herself imaginatively into the feelings or actions of a fictitious character in a book, movie or play.

Example Item (26): “When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me.”

III. *Empathic Concern Scale*

Empathic Concern describes how likely somebody assesses *other-oriented* feelings of sympathy and concern towards another unfortunate subject.
Example Item (20): “I am often quite touched by things that I see happen.”

IV. *Personal Distress Scale*

Here *self-oriented* feelings of personal anxiety and unease in tense interpersonal situations are measured.
Example Item (17): “Being in a tense emotional situation scares me.”

The five possible levels on the Likert scale are transformed into scores from 0 to 4 and the respective item scores add up to a subscale-specific aggregated value.

3.4.2 Toronto Alexithymia Scale (TAS-20; German version)

The TAS aims to quantify a subject´s level of alexithymia. Alexithymia, a construct that is sometimes paraphrased as emotional blindness, describes the ability of a person to recognize and describe emotions. The TAS-20 is a short questionnaire with 20 items distributed on to 3 subscales (Bagby, Parker & Taylor, 1994). Alexithymia itself is found to be prevalent in approximately 10% of the general population (Taylor, Bagby & Parker, 1999) but is not listed in the DSM-V or ICD-10.

The TAS-20 subscales:

I. Difficulty Describing Feelings (5 items)
II. Difficulty Identifying Feelings (7 items)
III. Externally Oriented Thinking (8 items)
IV. Total Alexithymia Score (All items)

The *Total Alexithymia Score (TAS)* summarizes the responses to all items. The TAS-20 seeks to categorize alexithymia through cutoff scoring:

- TAS ≤ 51 → no Alexithymia
- TAS 52 – 60 → possible Alexithymia
- TAS ≥ 61 → Alexithymia

4 Results

For all the following calculations SPSS 22 was used. All data was extracted via MATLAB. Generating tables and figures, as well as data preparation was done through Windows Office Excel 2016. For the analysis the different variables were encoded as follows: If a targeted player or avatar was included (*IN*) or excluded (*EX*) this factor was labelled as *VALENCE*. The *CONGRUENCY* indicates if Self and Other had a comparable or dissimilar experience of the game (Congruent: IN/IN, EX/EX; Incongruent: IN/EX, EX/IN). The label *CONDITION* states if the respective subject was active (*A*) or passive (*P*), in other words Player or Observer. The four different runs the subjects experienced were encoded as follows: Single Self Active = *SSA*, Single Other Passive = *SOP*, Double Other Active = *DOA*, Double Other Passive = *DOP*. For the mean comparisons and the variance analyses the ratings of the exclusion sequences were inverted.

All rating times, from the very moment when the rating screen appeared, to the point until the participants confirmed their rating by pressing the spacebar were calculated for using MATLAB. A paired-samples t-test was conducted to compare the mean rating times of the Single and the Double runs. The mean rating times in the Single runs (M = 4.39, SD = 1.30) were significantly higher compared to the Double runs (M = 3.63, SD = .96) of the game ($t(51) = -6.357$, $p < .001$).

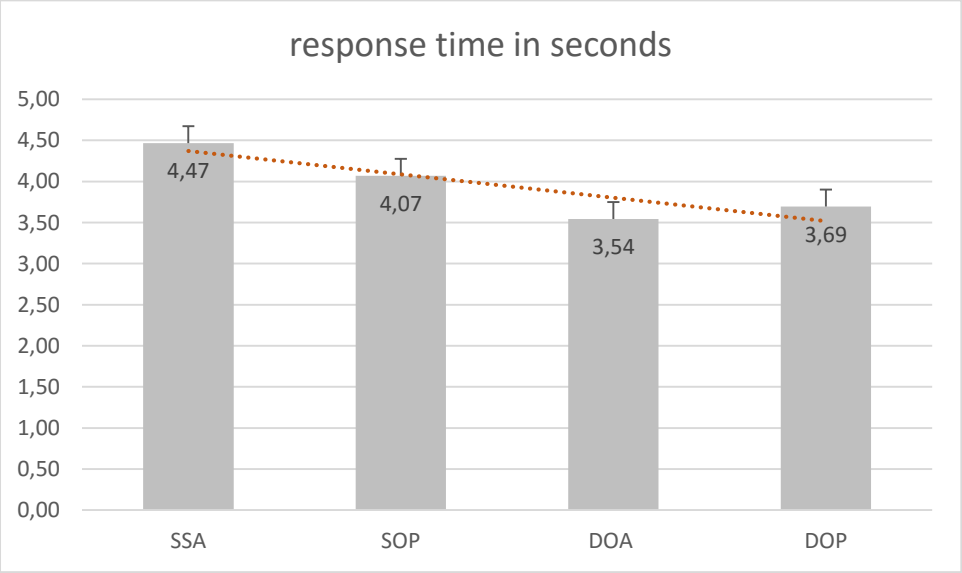

Figure 14 Response Time: From the moment the rating screen appeared until the participants rating responses (means and standard errors)

4.1 Single Sessions

Ratings of 51 subjects in the Single Self Active and 50 participants for the Single Other Passive Sessions were available for the analysis. Subjects rated their emotional state after the inclusion sequences as positive and after the exclusion experiences as negative. In the Single Self Sessions (*n* = 50) when they had to judge their own emotions (Figure 14) for the inclusive runs (*M* = 3.67, *SD* = 4.02) the averaged result was similar to that of the Single Other Sessions (*n* = 51) where subjects had to rate the emotional feedback of the proposed player Other (*M* = 3.82, *SD* = 3.48) (Figure 15). When subjects were excluded the rating of their experience was less negative (*M* = -3.13, *SD* = 5.01) than how they rated another subject's comparable exclusion experience (*M* = -4.99, *SD* = 4.80). A Wilcoxon Signed-Rank test showed this significant difference for the exclusion ratings between the two conditions (*U* = - 2.713, *p* = .007). The same test for the Inclusion ratings did not indicate significant differences (*U* = - 1.791, *p* = .073).

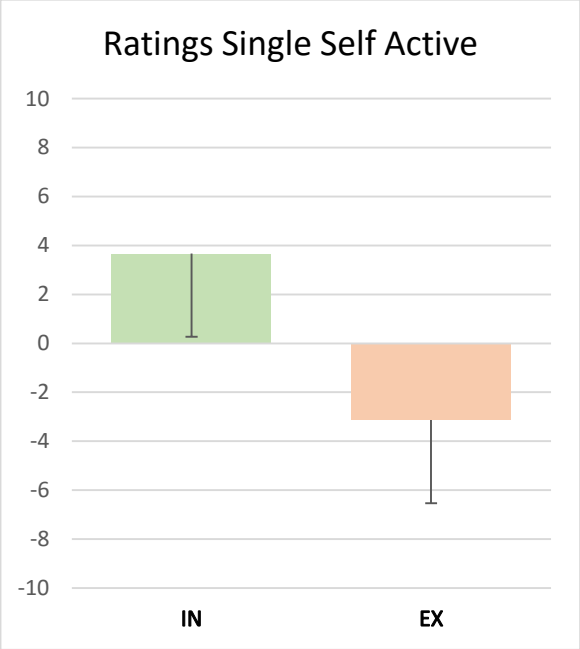

Figure 15 Mean ratings of participants own emotion (Self) without the player "Other" in the game (means and standard errors); M_{IN} = 3.67, M_{EX} = -3,13.

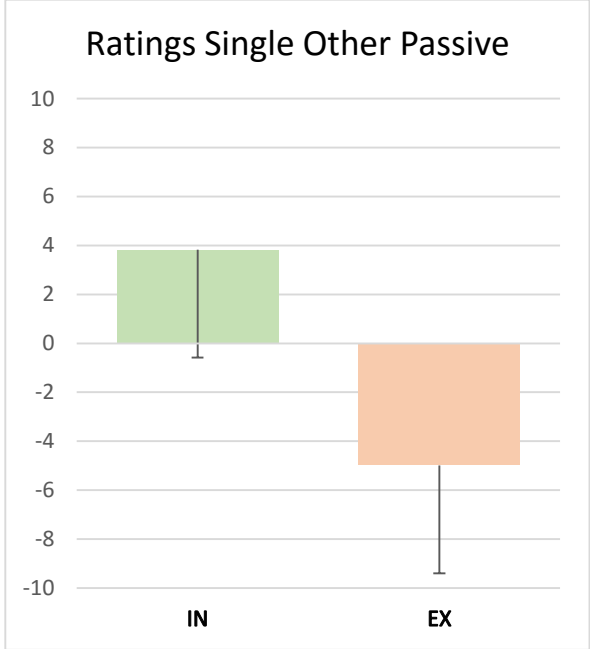

Figure 16 Mean ratings of emotions of player Other without participant taking part in the game (means and standard errors); M_{IN} = 3.82, M_{EX} = -4.99

4.2 Double Sessions

The double sessions were of a within subject factorial design with 3 factors each containing 2 levels (2 x 2 x 2) with the factors: VALENCE (IN, EX), CONGRUENCY (Congruent, Incongruent) and CONDITION (Active, Passive). The mean ratings and standard deviations for the different Double Other Active Conditions just as the number of recorded ratings (n) are listed in Table 1. Again n < N was due to the fact of an unmoved cursor thus by the program unrecorded scores.

Table 1
Descriptive statistics for the different Double Other Sequences (DOA, DOP)

Sequence	Parameters	n	M	SD
IN/IN	(Active)	52	4,97	3,43
EX/IN	(Active)	52	2,41	4,76
IN/EX	(Active)	52	-3,52	5,19
EX/EX	(Active)	52	-5,29	4,17
IN/IN	(Passive)	52	3,98	3,28
EX/IN	(Passive)	51	3,82	3,29
IN/EX	(Passive)	51	-4,89	3,83
EX/EX	(Passive)	50	-4,59	4,25

The mean scores in the Double Other *Active* runs of the game were as follows: $M_{(IN/IN)}$ = 4.97, $M_{(EX/IN)}$ = 2.41, $M_{(IN/EX)}$ = -3.52, $M_{(EX/EX)}$ = -5.29 (Figure 16). When participants were not playing themselves but only observing the game (Double Other *Passive*), the mean scores over the different Valences and Congruencies were $M_{(IN/IN)}$ = 4.05, $M_{(EX/IN)}$ = 3.82, $M_{(IN/EX)}$ = -4.89, $M_{(EX/EX)}$ = -4.59 (Figure 17).

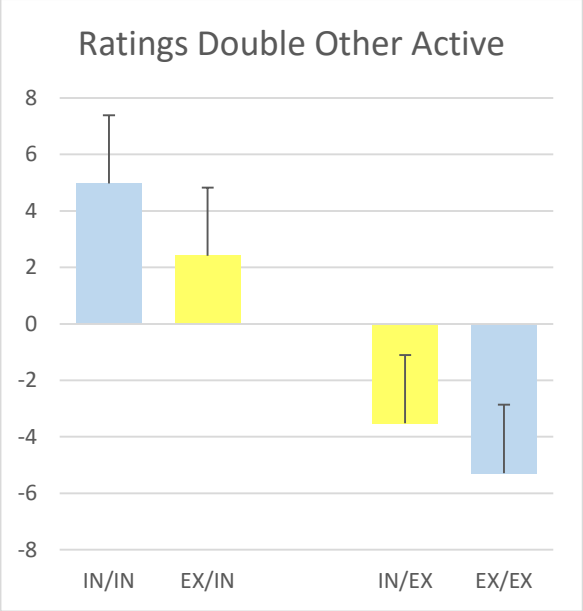

Figure 17 Rating of emotions of avatar Other whilst participants are playing as an active player (means and standard errors). Mean ratings for all cases of congruency in the Active Condition: $M_{(IN/IN)}$ = 4.97, $M_{(EX/IN)}$ = 2.41, $M_{(IN/EX)}$ = -3.52, $M_{(EX/EX)}$ = -5.29

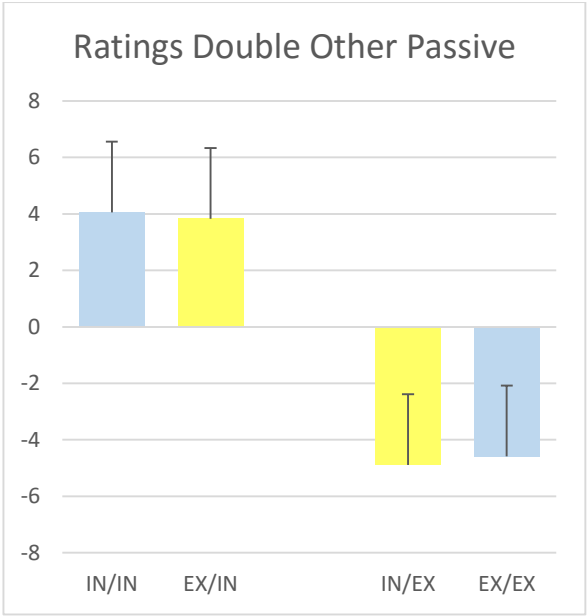

Figure 18 Rating of emotions of avatar Other whilst participants think they are watching another person playing as an active player (means and standard errors). No emotional involvement of the subject. Mean ratings for all cases of congruency in the Passive Condition: $M_{(IN/IN)}$ = 4.05, $M_{(EX/IN)}$ = 3.82, $M_{(IN/EX)}$ = -4.89, $M_{(EX/EX)}$ = -4.59

The differences between the subject's ratings of the congruent and the incongruent experience for player Self and avatar Other quantify the bias proposed by the concept of emotional egocentricity (EEB), and are visualized in Figure 18. The extent of the shift towards a more positive emotional judgement in the experienced IN/EX-sequences (compared to the EX/EX-sequences), called Inclusion Bias, was at $| M_{(EX/EX)} - M_{(IN/EX)} |$ = 1.77 for the Active and at $| M_{(EX/EX)} - M_{(IN/EX)} |$ = 0.23 for the Passive condition. A similar pattern can be seen in the Exclusion Bias, a shift of the mean ratings towards a more negative judgement in EX/IN-sequences compared to the EX/EX-sequences. Here the Active condition produces a difference of $M_{(IN/IN)} - M_{(EX/IN)}$ = 2.56 whereas in the Passive condition the difference even results in a negative value: $M_{(IN/IN)} - M_{(EX/IN)}$= -0.30.

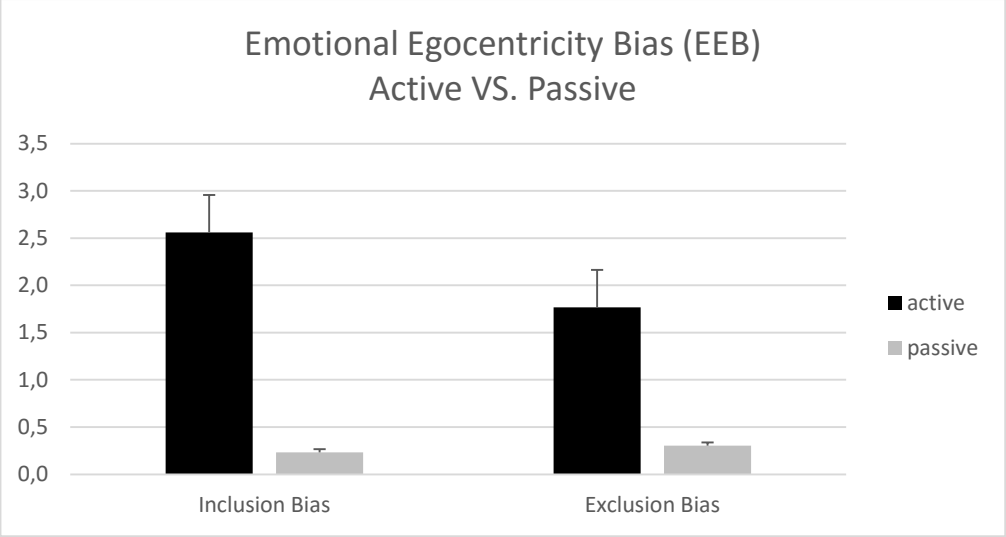

Figure 19 Emotional Egocentricity Biases (EEB): Difference of congruent and incongruent ratings of player Other (means and standard errors); bias scores for Double Other Active: Exclusion Bias (Active): $M_{(IN/IN)} - M_{(EX/IN)}$= 2.56; Inclusion Bias (Active): $|M_{(EX/EX)}| - |M_{(IN/EX)}|$ = 1.77. Bias Scores for Double Other Passive: Exclusion Bias (Passive): $M_{(IN/IN)} - M_{(EX/IN)}$= -0.30; Inclusion Bias (Passive): $|M_{(EX/EX)}| - |M_{(IN/EX)}|$ = 0.23

To analyze this emotional egocentricity bias (EEB) in the subjects' rating behavior, an ANOVA with repeated measurements (GLM) for all subjects and factors (CONGRUENCY, VALENCE, CONDITION) was conducted (2 x 2 x 2). The effect of the factor CONGRUENCY was significant (F(1,48) = 9.301, p = .004, η_p^2 = .162), meaning subjects did change their assumptions about the Other player's emotional responses, when their own emotional arousal was contrarious in comparison to the sequences that put them in a similar emotional state. Indeed the only other significant effect in the ANOVA was found for the interactive analysis of CONGRUENCY x CONDITION (F(1,48) = 15.897, p < .001, η_p^2 = .249). Therefore, our results support our main assumption, that participants will show EEB only in the Active condition, when exposed to Incongruent stimuli, but not in the Passive runs – in the Active runs of the game the emotional ratings where significantly more shifted towards their own emotional arousal then during the Passive runs. Our hypothesis, that a faulty distinction between Self and Other (SOD) is the reason for inaccurate empathic judgements (EEB) seems valid. The factor CONDITION in itself did not show significant differences, which indicates that the Active and Passive runs generated comparable rating scores (F(1,48) = .902, p = .347, η_p^2 = .018).

The same non-significance applies for all other factor effects and interactions (Table 2). A Wilcoxon-signed-rank test to analyze if the Inclusion Bias differed from the Exclusion Bias scores did not show a significant disparity (U = - .376, p = .707). Our subjects did show similar shifts towards their own pleasant (positive) or unpleasant (negative) emotional arousal when generating a biased decision in the Incongruent games sequences.

Table 2

ANOVA with repeated measures (Pillai-Spur)

Factors (2 Levels each)	F	p	η_p^2
Valence	1.314	.257	.027
Condition	0.902	.347	.018
Congruency	9.301	.004	.162
Valence x Condition	0.549	.462	.011
Congruency x Valence	0.872	.355	.018
Congruency x Condition	15.897	.000	.249
Congruency x Valence x Condition	0.001	.973	.000

Note: Valence: Inclusion/Exclusion; Condition: Active/Passive;
Congruency: Congruent/Incongruent; Level of Significance: p<0.05; F(1, 48)

4.3 Questionnaires

None of the participants stated to be unfamiliar with the use of a computer. No significant difference between the male and female participants' bias scores was prevalent: Exclusion Bias (r = .030, p = .417), Inclusion Bias (r = .190, p = .089), Mean Bias (r = .135, p = .170). The Perspective Taking scale in of the TAS-20 correlated significantly with only the Exclusion bias (r = -.246, p = .039) but not the Inclusion Bias (r = -.038, p = .394) or Mean Bias (r = -.181, p = .099). The Empathic Concern Scale showed a significant correlation towards the Inclusion Bias (r = .291, p = .018), but not the Exclusion Bias (r = -.046, p = .374) nor the Mean Bias (r = .148, p = .148).

Table 3
Bias Correlations (N=52)

		Exclusion Bias	Inclusion Bias	Mean Bias
Gender	r (Pearson)	.030	.190	.135
	Sig. (1-tailed)	.417	.089	.170
Difficulty Describing Feelings (IRI)	r (Pearson)	-.202	.104	-.066
	Sig. (1-tailed)	.075	.232	.320
Difficulty Identifying Feelings (IRI)	r (Pearson)	-.114	-.056	-.107
	Sig. (1-tailed)	.210	.346	.224
Externally Oriented Thinking (IRI)	r (Pearson)	.113	.163	.171
	Sig. (1-tailed)	.213	.125	.112
Perspective Taking (TAS-20)	r (Pearson)	-.246	-.038	-.181
	Sig. (1-tailed)	.039	.394	.099
Fantasy (TAS-20)	r (Pearson)	-.169	-.149	-.199
	Sig. (1-tailed)	.115	.146	.078
Empathic Concern (TAS-20)	r (Pearson)	-.046	.291	.148
	Sig. (1-tailed)	.374	.018	.148
Personal Distress (TAS-20)	r (Pearson)	-.097	.134	.020
	Sig. (1-tailed)	.248	.172	.444
Total Alexithymia Score (TAS-20)	r (Pearson)	-.058	.072	.006
	Sig. (1-tailed)	.341	.307	.482

Therefore, our data suggests, that participants that have high Perspective Taking scores (TAS-20) showed less biased empathic judgements when Exclusion Bias was prevalent. Subjects that scored high in the Empathic Concern scale (TAS-20) showed a higher Inclusion Bias. Neither any of the IRI, nor of the TAS-20 scales correlated significantly throughout all the found bias values. None of the registered variables could predict for the values of the Mean Bias (Table 3).

5 Discussion

Many recent studies in the area of social and cognitive sciences found evidence for emotional egocentricity in empathic judgements under certain circumstances (Silani et al., 2013; Tomova et al., 2014; Hoffmann et al., 2015; Steinbeis, 2016). A recent study by Silani et al. (2013) used incongruent and congruent emotional arousals, elicited by visuo-tactile stimulus material, and could show that EEB is indeed present when subjects had to process incongruent emotional stimuli. Consulting fMRI and TMS techniques, through the course of the experiment the authors could also show that this egocentric shift in empathic judgements may be due to a systematic faultiness in Self Other Distinction (SOD). This thesis adapted the basic idea of this experiment. Subjects tried to accurately judge another person's current emotional state, whilst perceiving congruent or incongruent emotional stimulus inputs for themselves and this other person. This time by using a newly developed adaptation of an interactive ball tossing game called Cyberball (Williams et al., 2000). This way we could produce distinctive pleasant and unpleasant emotions, and see if EEB can be reproduced, and if SOD is indeed the likely cause of this very bias.

5.1 Interpretation

5.1.1 Single sequences - Validation of the paradigm

The data collected during the Single Sessions could show that playing our version of Cyberball did put our participants in a positive emotional state as long as the ball was shared evenly with the participants. But as soon as the participants did not receive the ball anymore, and solely saw the other players sharing the ball with one another, this positive emotional feedback turned into a negative one. The same was the case when they had to judge the other proposed subject's emotional response to those stimuli – exclusion stimuli lead to negative judgements and inclusion to positive ones. An interesting difference occurred in the ratings of the Self and the Other emotions during the Exclusion sequences of the game. The subjects rated their own experience as less unpleasant than the one of the observed player. It might be, that

the players were more concerned about the other player than themselves, or that the stimulus affectively did not react that strong with our subjects, but when applying their cognitive empathic evaluation to the situation whilst seeing another person being ostracized, they still rated this event as quite unpleasant for this player. All in all, subjects had to solely base their judgements on the ball tossing patterns. Because we did not grant them any additional cues like facial expressions or body language, the cognitive and rather calculated component (how many ball throws to whom) might have had a little more weight in the end. This very fact should always be considered even in the interpretation of EEB occurrences.

5.1.2 Double Sequences - EEB Hypothesis

The detection of significant Emotional Egocentricity Biases during the Double conditions validated the usefulness of our approach all the more. Indeed, our subjects shifted their ratings of another player's emotional state towards their own. This finding illustrates human emotional egocentricity once more, and at the same time lets us accept the first of our two main hypotheses, that EEB will occur during the Double Other Passive sequences when incongruent stimuli are prevalent. Other studies before could find EEB through very different stimuli in very different situations (e.g. Silani et al., 2013). This suggests, that EEB might be a concept generalizable to all kinds of emotional situations. Furthermore, all possible interference factors, and especially the critique a solely behavioral experiment might see itself exposed to, don't deliver a conclusive explanation for the systematic differences between the ratings from the congruent and the incongruent sequences of the game. The participants, irrespective of the factor CONGRUENCY, always saw the other player being excluded or included to the same extent, the only difference being how often the subjects themselves received the ball. Therefore, the only factor that could explain the significant change in the participant's judgements, was the different congruency (Congruent, Incongruent) in our stimuli during the Double Other Active runs. The two rather distinctive biases we measured did not differ significantly. The Inclusion Bias scores, when subjects shifted judgements of the player Other's exclusion towards their own pleasant arousal, and the Exclusion Bias scores, when ratings for observed Inclusion were shifted towards the own negative arousal, did both lead to comparable

Bias scores. That the two stimuli and their resulting biases are comparable indicates, that emotions in the negative domain irritate empathic judgement just as much as emotions that are perceived as positive.

5.1.3 Double Sequences - SOD Hypothesis

Our second hypothesis, that this shift will not occur, when our subjects can judge the emotional arousal of another player whilst not playing, but are solely observing the course of the game, can also be accepted. During the Passive runs, participants did not show any significant differences in their rating behavior dependent on the CONGRUENCY factor in our paradigm. Seemingly, their own emotional arousal, and the inability to extract that very perception from the judgement of another person's emotions, is the most probable explanation for our finding of EEB in the Active runs of our game. The factor CONDITION (Active, Passive) did interfere with our data. It is very important to consider, that the stimulus appearance - the only cue participants could base their ratings on - did not change between the Active and Passive Double sequences. The only difference was our subjects' emotional involvement. All in all, our conclusion that SOD is the cause of EEB when interfering emotional arousals are present seems solid. The non-significance of all other effects and interactions in our GLM analysis of the Double sessions supports that assumption.

5.1.4 Additional results

5.1.4.1 Reaction Times

The subject's reaction times were examined for patterns that might lead to assumptions about their judgement behavior or maybe even can lead to vague conclusions about any cognitive processes. Actually, if the Double runs of the paradigm deliver more processing content (own arousal and at the same time paying attention to cues about how the other player feels) than the Single Sessions (only one emotional arousal to pay attention to – Self or Other), then one might expect at least similar rating times, if we put into account that subjects might show a learning curve for the rating process throughout the game. Actually, our data shows a significant timing decrease from the Single to the Double runs. That the latter always succeeded

the Single sequences could actually argue for a learning effect, or a more heuristic approach. But our participants apparently did not take more time to make judgements during the Double sessions. During the experiment the administrators explicitly and repeatedly asked participants to keep their ratings intuitive, yet meaningful. Therefore, the explanation that subjects solely depict a certain learning effect in their rating times seems plausible.

5.1.4.2 Inclusion Bias and Exclusion Bias scores

The means of the Inclusion Bias and the Exclusion Bias scores were not significantly different from one another. Due to the fact that the concept and postulate of EEB is meant to be a generalizable to different emotional situations and qualities, the use of a summarizing mean bias score seems wise in the examination of our questionnaire variables. The occurring similarity in the two bias outcomes might be random, but could also support the assumption that the EEB is more or less determined in its magnitude.

5.1.4.3 Gender factor

Empathy has been stated to possess a certain gender relatedness (Christov-Moore et al., 2014). Even SOD seems to exhibit gender related differences (Tomova et al., 2014). However, in our results none of our calculated biases seemed to be dependent on the gender of a subject. This might mean, that the findings of Tomova et al. for example are explicitly stress related, and that under *normal* conditions SOD is always similarly distorted when EEB is prevalent, or simply, that more data needs to be evaluated to draw certain conclusions about EEB, SOD and their dependency on the gender of a person.

5.1.4.4 The TAS-20 and the IRI Questionnaire

Concerning the TAS-20 and the IRI, the only significant correlations were found between the Perspective Taking Scale (TAS-20) and the Exclusion Bias scores, and between the Empathic Concern Scale (TAS-20) and the Inclusion Bias scores. It is noteworthy that a self-stated propensity towards perspective taking correlated with more accurate judgements when the subject had to evaluate an included player, but

not at all, when the player was excluded. If we shift the focus towards the mean Bias, this influence of Perspective Taking again is not prevalent. All in all, this could mean that judging a pleasant emotional state whilst being in a negative one is in need of more competent perspective taking than if the actualities are vice versa. Regarding the Empathic Concern scores, it seems more predictable that people which tend to concern themselves a lot with other people's circumstances, are more accurate when judging a person being ostracized. After all, being concerned is specifically not about the evaluation of a person's fortune, but misfortune. Therefore, the non-significance of that TAS-20 scale towards Exclusion Bias and the biases mean score is comprehensible. In summary it seems suspicious that none of the IRI scores correlated with any of the bias scores, but the TAS-20 could find two correlates. This at least entertains the idea, that certain symptoms in the spectrum of Alexithymia might have higher predictive value for EEB and SOD than general empathy scorings. But that postulate would need further exploration.

5.2 Limitations

Just like the paradigm of Silani et al. (2013) that could coin assumptions about EEB, SOD and the role of the right Supramarginal Gyrus, this thesis is the starting point for a multidisciplinary approach. It is planned, that fMRI and EEG data will once more test our assumptions, and an experimental group of participants diagnosed with high-functioning autism will be implemented in those further runs of the paradigm. Our findings through the behavioral data still endorse assumptions about the presumptive role of EEB and a coherent SOD as well as their causality in empathy amongst humans.

We received some feedback of our participants about the believability of the interconnectedness of the PCs in the laboratory. That the patterns of the throws were sometimes monotonous and that exclusion and inclusion were still very distinct seemed to have an influence on that. We also had to decide, if a sort of cut in the movement of the avatars before a ball toss would make the dependence of their throws onto a button press by another player more believable. But the decision fell on a more fluent visual stimulus that better depicts the reality and is less distracting. We counted

on the participants trust in our descriptions and manipulation process. Also, for some of our participants the average runtime of the game of about 40 minutes (including breaks between runs), seemed too long to keep them genuinely interested. The paradigm might be elaborate, yet the game is very simple and fairly repetitive. But this simplicity is necessary to enable a use with pathological groups, and to get reliable results the repetitiveness is quite essential. We also have to put into account, that we mainly tested students in a very customary setting. A group that is not put together ad hoc, and which is tested in an MR-Scanner (e.g.), will presumably be more excited during the paradigm altogether. Administering questionnaires about empathy and Alexithymia that rely on self-assessment after a long task concerning emotion evaluation might also not be perfect. But even less would be the testing right before the game is played, for reasons of possible priming effects. That all procedures took place in a single session was mainly due to economic motives and would not be of concern if the subjects are tested on more than one day. In some cases, subjects rated their emotions after inclusion sequences as negative as -10 and after exclusion sequences as positive as +10. That these were false rating confirmations is possible, but follow up examinations would certainly be of use.

5.3 Implications

The identification of SOD as a distinct cognitive process, necessary for well-performed empathy could open up numerous options to train certain SOD related skills for groups that show a limited social skillset. Assumptions on social incapability in ASD are still often rather indistinct concerning the underlying mechanisms of empathy (e.g. Charman et al., 1997; Hill, Berthoz, & Frith, 2004), and further specifications on certain suppositions might be useful (Bird et al., 2010). A clear distinction of empathic processes and missteps might even help coin new therapies and trainings, at the very least enrich our understanding of certain processes and disabilities. Applications of Cyberball (Williams et al., 2000) through the use of video sequences seems a very valuable tool (e.g. Novembre, Zanon, & Silani, 2014) and is more than future-proof. Technology in Virtual Reality will be getting more and more accessible in the very near future and has proven useful in psychological or psychiatric applications (Hoffmann et al., 2008; Carlin et al., 1997; Klinger et al., 2005). Refining the stimuli through further

trials and using a VR device for stimulus presentation would presumably create a highly realistic and versatile research tool for empathy and emotion research. Such a VR adaptation could also be beneficial for the overall quality of the stimuli.

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A.1 List of Figures

A.2 List of Tables

A.4 Recruitment Text

Im Rahmen einer Forschungsarbeit am Institut für Psychologie der Universität Wien werden weibliche und männliche Versuchsteilnehmer gesucht. Es handelt sich bei dem Forschungsprojekt um eine Studie, welche soziale Interaktionsmechanismen mittels virtuellem Ballspiel erforscht. Dafür suchen wir Studienteilnehmer im Alter zwischen 18 und 55 Jahren. Die Studie wird ca. 60 Minuten dauern. Es wird eine Aufwandsentschädigung von 10 Euro bezahlt.

Anforderungen:

Geschlecht: weiblich/männlich

Alter: 18 - 55 Jahre

Ausschlusskriterien

1.) Die Versuchsperson sollte bei keinem derartigen Forschungsprojekt am Institut der Psychologie bereits teilgenommen haben.

2.) Die Versuchsperson sollte keine psychischen oder neurologischen Beeinträchtigungen aufweisen.

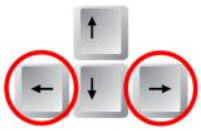
3.) Die Versuchsperson sollte nicht Psychologie studieren.

A.5 Instruction Handouts

Single Self Active Handout

Sie werden nun **2 Mitspieler** vor sich sehen. Alle Mitspieler werden Ihnen per Zufall aus dem Raum zugewiesen.

Wenn sie im Besitz des Balles sind, wählen sie intuitiv, also ohne lange zu überlegen, eine Person aus, zu der Sie den Ball weiterwerfen möchten. Dies erfolgt durch Drücken der **Pfeiltasten**:



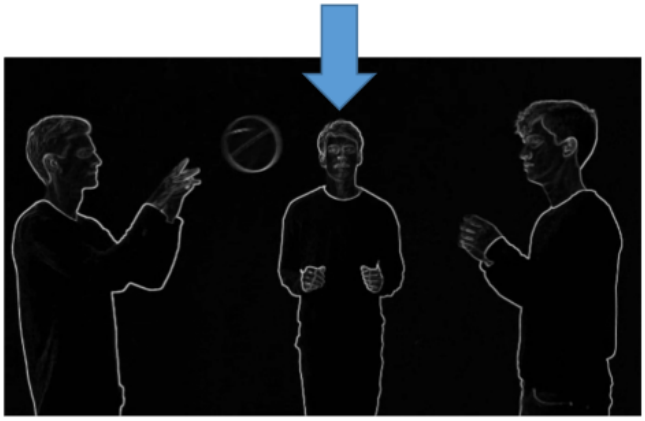
Sie werden mehrmals aufgefordert werden **Ihren eigenen** Gefühlszustand zu bewerten.
Bitte tun Sie dies so Exakt wie möglich, und nutzen Sie den gesamten Umfang der Skala.

Verschieben Sie den roten Stern mit den Pfeiltasten und bestätigen Sie mit der Leertaste!

Wenn dieser Teil des Spieles vorbei ist, sollte auf Ihrem Bildschirm **„ENDE“** stehen.

Bitte verhalten Sie sich ruhig und warten Sie auf weitere Anweisungen des Testleiters!

Sie werden nun **3 Spieler** vor sich sehen. Alle Spieler werden per Zufall aus dem Raum verbunden.



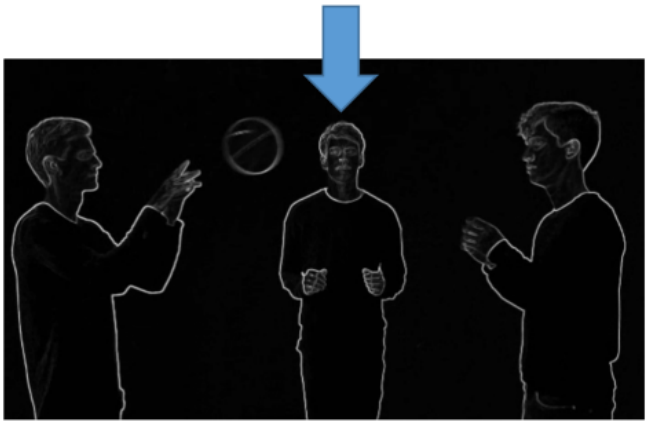
Sie werden in diesem Teil des Spieles lediglich als **Beobachter** agieren.
Beobachten Sie also das Spiel!
Sie werden mehrmals aufgefordert werden den Gefühlszustand des **gegenüberstehenden Spielers** zu bewerten. Bitte tun Sie dies so exakt wie möglich, und nutzen Sie den gesamten Umfang der Skala.

Verschieben Sie den roten Stern mit den Pfeiltasten und bestätigen Sie mit der Leertaste!

Wenn dieser Teil des Spieles vorbei ist, sollte auf Ihrem Bildschirm **„ENDE“** stehen.

Bitte verhalten Sie sich ruhig und warten Sie auf weitere Anweisungen des Testleiters!

Sie werden nun **3 Spieler** vor sich sehen. Alle Spieler werden per Zufall aus dem Raum verbunden.



Sie werden in diesem Teil des Spieles lediglich als **Beobachter** agieren.
Beobachten Sie also das Spiel!
Sie werden mehrmals aufgefordert werden den Gefühlszustand des **gegenüberstehenden Spielers** zu bewerten. Bitte tun Sie dies so exakt wie möglich, und nutzen Sie den gesamten Umfang der Skala.

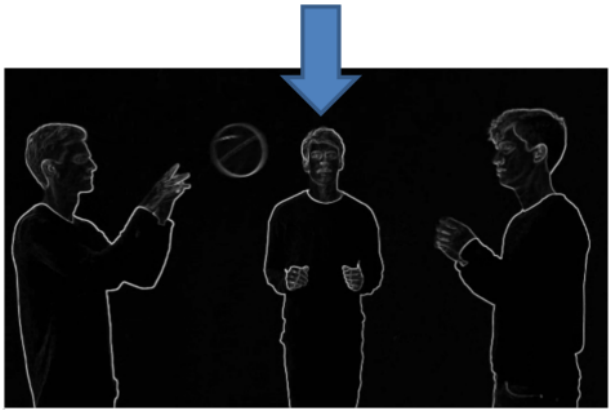
Verschieben Sie den roten Stern mit den Pfeiltasten und bestätigen Sie mit der Leertaste!

Wenn dieser Teil des Spieles vorbei ist, sollte auf Ihrem Bildschirm **„ENDE“** stehen.

Bitte verhalten Sie sich ruhig und warten Sie auf weitere Anweisungen des Testleiters!

Gruppe A (Beobachter)

Sie werden nun **3 Spieler** vor sich sehen. Alle Spieler werden per Zufall aus dem Raum verbunden.



Sie werden in diesem Teil des Spieles lediglich als **Beobachter** agieren.
Sie sehen das Spiel nun aus der Perspektive eines anderen Spielers aus diesem Raum.
Beobachten Sie das Spiel!
Sie werden mehrmals aufgefordert werden den Gefühlszustand des **gegenüberstehenden Spielers** zu bewerten. Bitte tun Sie dies so exakt wie möglich, und nutzen Sie den gesamten Umfang der Skala.

Verschieben Sie den roten Stern mit den Pfeiltasten und bestätigen Sie mit der Leertaste!

Wenn dieser Teil des Spieles vorbei ist, sollte auf Ihrem Bildschirm **„ENDE“** stehen.

Bitte verhalten Sie sich ruhig und warten Sie auf weitere Anweisungen des Testleiters!

A.6 Basic Data Questionnaire

Fragebogen zur Studie
„Beobachtbare und erlebte
Emotionen bei interaktiven PC-Simulationen“

Sehr geehrter Teilnehmer, sehr geehrte Teilnehmerin!

Wir bitten Sie um Ihre Mitarbeit im Rahmen eines Forschungsprojektes zum Thema „Beobachtbare und erlebte Emotionen bei interaktiven PC-Simulationen“. Die Beantwortung der Fragebögen nimmt ungefähr 10 Minuten in Anspruch. Wir bitten Sie, den Fragebogen ehrlich und vollständig auszufüllen. Ihre Daten werden selbstverständlich anonym und streng vertraulich behandelt! Wir bedanken uns für Ihre Teilnahme an der Untersuchung.

Der Testleiter/die Testleiterin steht Ihnen jederzeit für Fragen zur Verfügung und klärt Sie nach Ausfüllen des gesamten Fragebogens (auf Wunsch) über die Forschungsfrage und das dahinterliegende Forschungsthema auf.

ANGABEN ZU IHRER PERSON

Alter: ____

Geschlecht: ☐ männlich ☐ weiblich

Höchster Schulabschluss:
☐ Pflichtschulabschluss / Kein Schulabschluss / Keine Matura
☐ Matura / Kolleg
☐ Hochschulabschluss / Fachhochschulabschluss

1.) Haben Sie einen Computer Zuhause?
☐ Ja ☐ Nein

2.) Wie oft benutzen Sie einen/Ihren Computer?
☐ 1x im Monat oder seltener
☐ 1x in der Woche
☐ mehrmals pro Woche
☐ täglich
☐ mehrmals täglich

3.) Wie würden Sie Ihre Computerkenntnisse einstufen?
☐ überhaupt keine
☐ Anfänger/Anfängerin
☐ Fortgeschritten
☐ Experte/Expertin

4.) Wie oft spielen Sie Spiele am Computer?
☐ 1x im Monat oder seltener
☐ 1x in der Woche
☐ mehrmals pro Woche
☐ täglich
☐ mehrmals täglich

5.) Wie viel Geld steht Ihnen monatlich (Netto) zur Verfügung?
☐ 0-500 €
☐ 500-1000 €
☐ 1000-1500 €
☐ 1500-2000 €
☐ > 2000 €

6.) Wie wird Ihr Einkommen gewährleistet?
☐ Arbeit
☐ Familie
☐ Pflegegeld
☐ Sonstiges: _____

A.7 Interpersonal Reactivity Index (IRI)

Page 1/2 (IRI)

Fragebogen

Die folgenden Aussagen beziehen sich auf Ihre Gedanken und Gefühle in verschiedenen Situationen. Bitte lesen Sie sich jede Aussage sorgfältig durch und geben Sie dann durch Ankreuzen der entsprechenden Zahl an, wie gut die Aussage Sie beschreibt.

BITTE LESEN SIE JEDE AUSSAGE GENAU DURCH BEVOR SIE ANTWORTEN.
Antworten Sie dann so ehrlich und genau wie möglich. Vielen Dank.

Antwort-Skala:

BESCHREIBT MICH NICHT GUT	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	BESCHREIBT MICH SEHR GUT

1	Ich habe öfters Tagträume und Fantasien über Dinge, die mir passieren könnten.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
2	Ich spüre oft Mitgefühl und Sorge für Leute, denen es weniger gut geht als mir.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
3	Ich finde es manchmal schwierig, die Dinge vom Standpunkt eines anderen Menschen aus zu sehen.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
4	Manchmal habe ich nicht viel Mitleid mit Leuten, die Probleme haben.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
5	Ich versetze mich ganz intensiv in die Gefühle von Romanfiguren.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6	In Notfallsituationen fühle ich mich besorgt und unbehaglich.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
7	Gewöhnlich bleibe ich sachlich, wenn ich einen Film oder ein Theaterstück sehe, und ich werde selten von der Handlung mitgerissen.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
8	Ich versuche, bei einer Meinungsverschiedenheit jede Ansicht anzuhören, bevor ich eine Entscheidung treffe.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
9	Wenn ich sehe, dass jemand ausgenutzt wird, will ich ihn irgendwie beschützen.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
10	Manchmal fühle ich mich hilflos, wenn ich inmitten einer sehr gefühlsgeladenen Situation stecke.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
11	Ich versuche manchmal, meine Freunde dadurch besser zu verstehen, dass ich mir vorstelle, wie die Dinge aus ihrer Sicht aussehen.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
12	Es kommt relativ selten vor, dass ich von einem Buch oder einem Film so richtig mitgerissen werde.	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

1

13	Wenn ich sehe, wie jemand verletzt wird, bleibe ich eher ruhig.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
14	Gewöhnlich beunruhigt mich das Unglück anderer Leute nicht sehr.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
15	Wenn ich überzeugt bin, dass ich Recht habe, verschwende ich nicht viel Zeit damit, die Argumente anderer Leute anzuhören.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
16	Nach einem Theaterstück oder einem Film habe ich manchmal das Gefühl, als ob ich einer der Charaktere daraus wäre.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
17	Es macht mir Angst, in angespannten emotionalen Situationen zu sein.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
18	Wenn ich sehe, dass jemand ungerecht behandelt wird, habe ich manchmal nicht sehr viel Mitleid mit ihm.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
19	Ich kann normalerweise ziemlich kompetent mit Notsituationen umgehen.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
20	Ich bin oft ziemlich berührt von Geschehnissen.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
21	Ich glaube, dass es bei jeder Sache zwei Seiten gibt und versuche, beide zu betrachten.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
22	Ich würde mich selbst als eine ziemlich weichherzige Person beschreiben.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
23	Wenn ich einen guten Film sehe, kann ich mich sehr leicht in eine Hauptfigur hinein versetzen.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
24	Ich neige dazu, in Notsituationen die Kontrolle zu verlieren.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
25	Wenn ich böse auf jemanden bin, versuche ich normalerweise, mich für eine Weile in seine Situation zu versetzen.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
26	Wenn ich eine interessante Geschichte oder einen interessanten Roman lese, stelle ich mir vor, wie ich mich fühlen würde, wenn die Ereignisse in der Geschichte mir zustossen würden.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
27	Wenn ich jemanden sehe, der in einer Notsituation dringend Hilfe braucht, drehe ich durch.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
28	Bevor ich jemanden kritisiere, versuche ich mir vorzustellen, wie ich mich fühlen würde, wenn ich an seiner Stelle wäre.	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

Überprüfen Sie bitte noch einmal genau,
dass Sie keine Frage ausgelassen haben.
Speichern Sie dann die Datei und senden Sie sie an
clauslamm@gmail.com.Vielen Dank!

2

A.8 Toronto Alexithymia Scale (TAS-20)

Im Folgenden geht es um den Umgang mit Gefühlen. Bitte geben Sie an, wie sehr die folgenden Aussagen auf Sie zutreffen oder nicht zutreffen. Kreuzen Sie bitte *diejenige* Antwort an, die am besten auf Sie persönlich zutrifft.

	Trifft gar nicht zu	Trifft eher nicht zu	Teils/ teils	Trifft eher zu	Trifft völlig zu
1. Mir ist oft unklar, welche Gefühle ich gerade habe.	1	2	3	4	5
2. Es fällt mir schwer, die richtigen Worte für meine Gefühle zu finden.	1	2	3	4	5
3. Ich habe körperliche Empfindungen, die sogar die Ärzte nicht verstehen.	1	2	3	4	5
4. Es fällt mir leicht, meine Gefühle zu beschreiben.	1	2	3	4	5
5. Ich gehe Problemen lieber auf den Grund, als sie nur zu beschreiben.	1	2	3	4	5
6. Wenn mich etwas aus der Fassung gebracht hat, weiß ich oft nicht, ob ich traurig, ängstlich oder wütend bin.	1	2	3	4	5
7. Ich bin oft über Vorgänge in meinem Körper verwirrt.	1	2	3	4	5
8. Ich lasse die Dinge lieber einfach geschehen und versuche nicht herauszufinden, warum sie gerade so passiert sind.	1	2	3	4	5
9. Einige meiner Gefühle kann ich gar nicht richtig benennen.	1	2	3	4	5
10. Sich mit Gefühlen zu beschäftigen, finde ich sehr wichtig.	1	2	3	4	5
11. Ich finde es schwierig zu beschreiben, was ich für andere Menschen empfinde.	1	2	3	4	5
12. Andere fordern mich auf, meine Gefühle zu beschreiben.	1	2	3	4	5
13. Ich weiß nicht, was in mir vorgeht.	1	2	3	4	5
14. Ich weiß oft nicht, warum ich wütend bin.	1	2	3	4	5
15. Ich unterhalte mich mit anderen nicht gerne über ihre Gefühle, sondern lieber darüber, womit sie sich täglich beschäftigen.	1	2	3	4	5
16. Ich sehe mir lieber „leichte“ Unterhaltungssendungen als psychologische Problemfilme an.	1	2	3	4	5
17. Es fällt mir schwer, selbst engen Freunden gegenüber meine innersten Gefühle mitzuteilen.	1	2	3	4	5
18. Ich kann mich jemandem sogar in Augenblicken des Schweigens sehr nahe fühlen.	1	2	3	4	5
19. Ich finde, dass Mir-klar-werden über meine persönlichen Gefühle wichtig ist, wenn ich persönliche Probleme lösen muss.	1	2	3	4	5
20. Durch die Suche nach verborgenen Bedeutungen nimmt man sich das Vergnügen an Filmen oder Theaterstücken.	1	2	3	4	5