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THESIS

Self and other in action and emotion

The relationship between self-agency and empathy

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Abstract

Background: People usually feel they cause their own actions and subsequent outcomes, which is referred to the sense of self-agency. Although self-agency is often straightforward, the attribution of agency is more difficult in social situations where other agents are present. In these situations, we need to distinguish our actions and effects from those of other people. This distinction between self and other is also necessary for our ability to empathize, because in this case we have to distinguish the other person's emotion from our own emotional state. Interestingly, several studies suggest that self-agency and empathy rely on the same mechanism of self-other distinction. Therefore, the present study investigates the relationship between self-agency and empathy.

Methods: Fifty undergraduates performed a self-agency inference task in which they were subtly primed with a matching or mismatching action-outcome before they performed an action and observed the outcome. Empathy was measured through the subscales 'Personal Distress' and 'Empathic Concern' of the Interpersonal Reactivity Index (IRI).

Results: In line with previous research, participants experienced enhanced self-agency when the outcome matched the prime than when the outcome mismatched the prime (matching effect). In contrast to our expectations, no correlation was found between this matching effect and the empathy subscales 'Personal Distress' and 'Empathic Concern'.

Conclusions: The study revealed no relationship between self-agency and empathy, which is possibly the result of methodological shortcomings. However, further research is needed to investigate the possible relation and its underlying mechanism of self-other distinction.

Keywords: self-agency; empathy; self-other distinction; perspective taking; social interaction

1. Introduction

People have the frequent experience of causing events in the world. We press a button and the TV turns on or we make a joke and people start laughing. The performance of behavior is often accompanied by a sense of self-agency, that is, the feeling that we cause our own actions and their consequences. This feeling leads us to attribute an action and its consequences to ourselves rather than to another person. It is often straightforward what the cause is of an outcome, but what if at the same time I was making a joke, someone behind me was showing a funny face? The attribution of agency is more difficult in social situations where actions can have different outcomes (e.g. laughing or crying) and other agents are present. Because different actions (e.g. making a joke or showing a funny face) or agents can elicit the same outcome (e.g. laughing), it is in these situations more ambiguous what the cause is of an outcome. Therefore, to experience self-agency we need to distinguish our actions and effects from those of other people.

Self-other distinction is also necessary for the ability to empathize, because in this case you have to distinguish the other person's emotion from your own emotional state. Research indicates that when we empathize with the other, the individual might lose track of one's own authorship. This is because during empathizing, the same brain areas are active as when we find ourselves in the situation, which suggests that we take another's perspective (Wegner & Sparrow, 2004). But a complete overlap between self- and other would induce emotional distress and confusion (Decety & Sommerville, 2003). Hence, the observer must somehow distinguish his or her feelings from those of the target. Neuroscience research has revealed specific brain areas that are devoted to distinguish between self and other and these areas have been associated with the experience of self-agency and perspective taking (e.g. Decety & Jackson, 2004; Farrer & Frith, 2002; Lamm, Batson, & Decety, 2007). Based on these findings, it seems that self-other distinction is necessary for both our ability to empathize and our sense of self-agency.

The present study is the first study that examines the relationship between empathy and self-agency that have been suggested to rely on the same mechanism, that is, self-other distinction.

There are two possible explanations for the relation between these constructs. First, it could mean that they both rely on the same mechanism of self-other distinction (i.e. spurious correlation). Alternatively, it could mean that there is a direct relationship, in which self-agency influences empathy or vice versa. However, there is no research indicating this potential influence, but several studies suggest that empathy and self-agency rely on the same self-other mechanism. This is the reason why the present study takes the first step in this field of research and expects that empathy and self-agency are related through an underlying mechanism of self-other distinction. If this is true, it broadens our knowledge that this mechanism is not domain-specific, but operates in various aspects of social behavior. This stresses the high importance of the capacity for self-other distinction in social interactions. Knowledge about the underlying self-other mechanism may therefore help us to improve our communication in everyday social interactions. To provide more insight in how we distinguish ourselves from others and how this is related to the experience of empathy and self-agency, it is important to explain how these constructs work.

Philosophers in early human history already noticed that humans are able to empathize. The term empathy is derived from the ancient Greek word 'empatheia' (passion), which is composed of 'en' (in) and 'pathos' (feeling) and is about feeling what another person feels (Singer & Lamm, 2009). The experience of empathy helps us to understand and predict other people's intentions, emotions, and motivations (Meltzoff & Decety, 2003; Singer & Lamm, 2009), which is important to know how to react to others (e.g. helping responses to other's distress). It is therefore not surprising that empathy seems to play a crucial role in moral development, motivating prosocial behavior and inhibiting aggression toward others (Hoffman, 2001; Miller & Eisenberg, 1988). Although empathy has been studied for hundreds of years, with contributions from different disciplines, the field suffers from a lack of consensus regarding the nature of the phenomenon.

In order to unify the various perspectives, empathy needs to be construed broadly. It has been defined as an affective response stemming from the understanding of another's emotional state or condition similar to what the other person is feeling or would be expected to feel in the

given situation (Eisenberg, Shea, Carlo, & Knight, 1991). Thus, empathy can represent an interaction between two individuals, with one experiencing and sharing the feeling of the other. Decety and Meyer (2008) argue that this affective sharing is one of the main components contributing to the experience of empathy. Additionally, they suggest that empathy consists of the ability to differentiate oneself from a perceived target and the ability to regulate and control emotions through a top-down process (Decety & Meyer, 2008). Figure 1 (Decety & Meyer, 2008) shows these different processes involved in empathy.

The implicit low-level process of empathy consists of affective sharing, which relies on a perception-action mechanism (Figure 1). Based on earlier perception–action models of motor behavior (Prinz, 1997), Preston and de Waal (2002) proposed a perception-action model (PAM) of empathy. This model suggests that the perception of an object's emotional state automatically activates the subject's corresponding representation, which in turn activates autonomic and somatic responses, unless inhibited (Preston & de Waal, 2002). For example, while watching someone smile, the observer activates the same facial muscles involved in producing a smile, and this creates the corresponding feeling of happiness in the observer (Adolphs, 2002; Decety & Moriguchi, 2007; Preston & de Waal, 2002). In this way, the observer automatically shares the emotional state of another individual. However, automatic sharing can imply emotional distress due to an inability to distinguish between our own emotion and that of others (Decety & Sommerville, 2003). Hence, it must be modulated by maintaining a sense of whose feelings belongs to whom (i.e. self-other awareness, see Figure 1).

In addition to the low-level process of affective sharing, executive functions in the prefrontal cortex make it possible to regulate the emotional state (Decety & Meyer, 2008; Singer, Seymour, & O'Doherty, 2004). This regulation depends on various situational and dispositional factors such as the the relationship between the empathizer and the target, characteristics of the empathizer and the situative context (de Vignemont & Singer, 2006). For example, one is likely to inhibit his or her laughing in a situation where this is inappropriate (situative context), or someone shows more

negative emotions to another person who is thought to behave unfairly (the relationship between empathizer and target). Our top-level process of regulation and control is continuously updated with information from the low-level process of affective sharing. In return, the top-level controls the low-level by providing top-down input (Figure 1). This interaction between bottom-up and top-down information processing plays a crucial role in how we deal with the affective states of others.

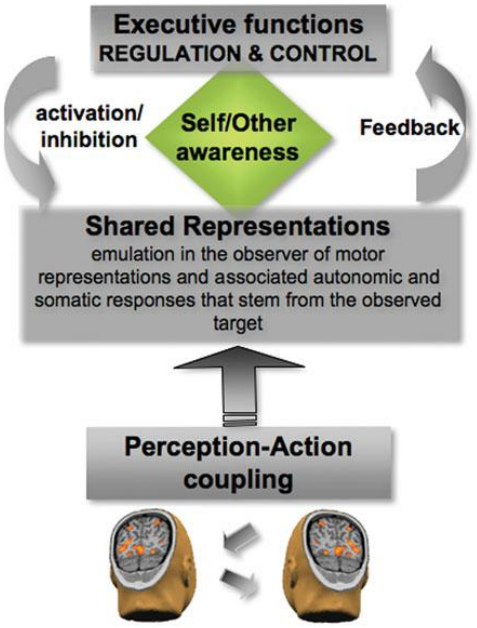

Figure 1. Schematic representation of bottom-up (i.e., direct matching between perception and action) and top-down (i.e., regulation and control) information processes involved in empathy. Reprinted from ''From emotion resonance to empathic understanding: A social developmental neuroscience account'' by J. Decety and M. Meyer, 2008, *Development and Psychopathology, 20,* 1053-1080.

A study by Lamm et al. (2007) demonstrates that both bottom-up and top-down processes interact to produce the experience of empathy. They investigated whether different forms of perspective taking (top-down) influences affective responses (bottom-up) to another's pain. Batson, Early and Salvarini (1997) suggest that there are different forms of perspective taking. You can imagine how another person perceives his or her situation and how someone feels as a result (imagine-other perspective). Or you can imagine how you would see the situation were you in the other person's shoes and how you would feel as a result (imagine-self perspective). In the study by

Lamm et al., participants watched videos of patients undergoing painful auditory treatment either by imagining that they were in the patient's place (imagine-self) or by focusing on the patient's feelings and affective expressions (imagine-other). The results revealed that imagining the perspective of the other evoked stronger empathic concern, whereas personal distress was experienced when imagining oneself to be in the painful situation. Personal distress refers to self-oriented feelings of personal anxiety and may lead an observer to relieve his or her own stress and not necessarily help the other (Batson, Fultz, & Schoenrade, 1987). On the other hand, empathic concern assesses other-oriented feelings of sympathy, which is an important instigator for helping behavior (Rameson & Lieberman, 2009).

These different affective responses to another's distress were also visible in the brain (Lamm et al., 2007). Compatible with the assumption of shared representations, a similar brain network was activated during the self- and other-perspective. But within these shared representations, the self-perspective (in comparison with the other-perspective) evoked stronger responses in brain regions coding the motivational and affective dimensions of pain (middle insula and aMCC) and the amygdala, which is known to be involved in fear-related behaviors (Lamm et al., 2007). In line with the self-reported data, these brain activations show that adopting a self-perspective in response to someone's pain, results in higher levels of personal distress than adopting a perspective of the other. These different responses to someone's affective state also demonstrate an interaction between top-down and bottom-up processes. Additionally, the process of self-other differentiation was visible within the shared representations. Adopting a self-perspective showed greater activation in the left inferior parietal lobe, whereas adopting the other-perspective elicited stronger response in the right inferior parietal lobe. This latter area seems to play a crucial role in distinguishing the self from the other (e.g., Farrer & Frith, 2002; Jackson & Decety, 2004). This suggests that only a self-other distinction is made when we adopt the perspective of the other and as a consequence we experience empathic concern rather than personal distress.

Interestingly, the right inferior parietal lobe has also been associated with self-agency (i.e.

the feeling of being causally involved in an action and its consequences) while imagining different perspectives. In a study conducted by Ruby and Decety (2001), participants were required to either imagine themselves performing a given action (imagine-self perspective) or to imagine the experimenter performing the same action (imagine-other perspective). Motor imagery can be used to examine the cognitive and neural processing involved in agency, because it involves common brain areas with actual action execution (Ruby & Decety, 2001). However, there must exist, at the neural level, a distinction between imagine-self and imagine-other perspective representation. Results indeed revealed activation of different brain networks while adopting the different forms of perspective taking. A self-perspective resulted in stronger left activation of the inferior parietal lobe, whereas adopting the perspective of the experimenter revealed stronger activation in the right inferior parietal lobe (Ruby & Decety, 2001). These findings are in line with other studies investigating self versus other produced actions (Blakemore & Frith, 2003; Chaminade & Decety, 2002; Farrer & Frith, 2002; Jackson & Decety, 2004) and self versus other perspective taking during empathizing (Ruby & Decety, 2004), which suggest that both empathy and self-agency rely on the same mechanism of self-other distinction.

This mechanism is especially important in social situations, in which we have to distinguish our actions and their effects from those of other people. But how are people able to do this? Research focuses on two processes from which self-agency can be established. The first is through the sensorimotor system, which relies on a causal link between action and the outcome. When performing a voluntary motor action, this system compares the predicted and actual sensory consequences of that action (Blakemore & Frith, 2003; Farrer & Frith, 2002). For example, when you want to grab a sandwich when you are hungry, the sensorimotor system predicts the sensory outcomes of the action (e.g., the amount of pressure needed to grab the sandwich) and compares this with the actual amount of pressure that was applied to grab the sandwich. When the predicted and actual outcomes match, an implicit feeling of agency is experienced (Blakemore & Frith, 2003; Wolpert, 1997). This implicit feeling is non-conceptual and does not involve a reflective act of

consciousness (Synofzik, Vosgerau , & Newen, 2008). Figure 2 (van der Weiden, Aarts, & Ruys, 2013) shows this sensorimotor process in the upper part of the model.

These implicit feelings of self-agency can also lead to explicit judgments of agency. Explicit judgments of agency enable people to reflect on who was the agent in a given situation, which is important for self-awareness and social interaction (van der Weiden et al., 2013). A large amount of implicit and explicit judgments of agency are experienced through the sensorimotor model. However, in ambiguous situations (where different agents are present), sensorimotor predictions are less reliable in predicting explicit judgments of self-agency. Because both self-generated and observed actions of others activate overlapping neural networks within the sensorimotor system (Schütz-Bosbach, Avenanti, Aglioti, & Haggard, 2009), it is in these situations difficult to make judgments about who caused a certain outcome. Although, it is in these situations particularly important to know who was the causal agent in a given situation, because this makes clear who is responsible for a certain outcome.

It has been proposed that in such ambiguous situations people rely on cognitive inferences rather than sensorimotor processes for the experience of agency (Wegner, 2002). This cognitive inferential process is shown in the lower part of the model in Figure 2 (van der Weiden et al., 2013). A cognitive inference is a retrospective conclusion that occurs after a certain action. Self-agency is experienced when the outcome matches with what you had envisioned. This is often accompanied with a goal to produce a specific outcome. For instance, if we have the intention to make someone laugh and act accordingly (e.g., making a joke or showing a funny face), the observation of that person laughing generally leads us to experience ourselves as the cause of this laughing.

However, research shows that self-agency experiences also arise without an explicit goal to produce an outcome (Aarts, Custers, & Marien, 2009). Specifically, unconsciously pre-activating the representation of an action-outcome (i.e. priming) before action performance also provides the feeling of self-agency over the observed outcome (e.g., Aarts, Custers, & Wegner, 2005; Sato, 2009; van der Weiden, Aarts, & Ruys, 2010; Wegner & Wheatley, 1999). This indicates that experiences of

self-agency are driven by unconscious cues from the environment. In fact, a lot of human behavior seems to be instigated outside of conscious awareness (e.g. Bargh & Chartrand, 1999; Custers & Aarts, 2010; Dijksterhuis & Bargh, 2001). In sum, these findings thus suggest that self-agency inferences can arise from both goals and primes. The current study uses primes to provide the experience of self-agency, because it is suggested that the mechanism of self-other distinction also occurs unconsciously (Decety & Lamm, 2007; jeannerod, 2003).

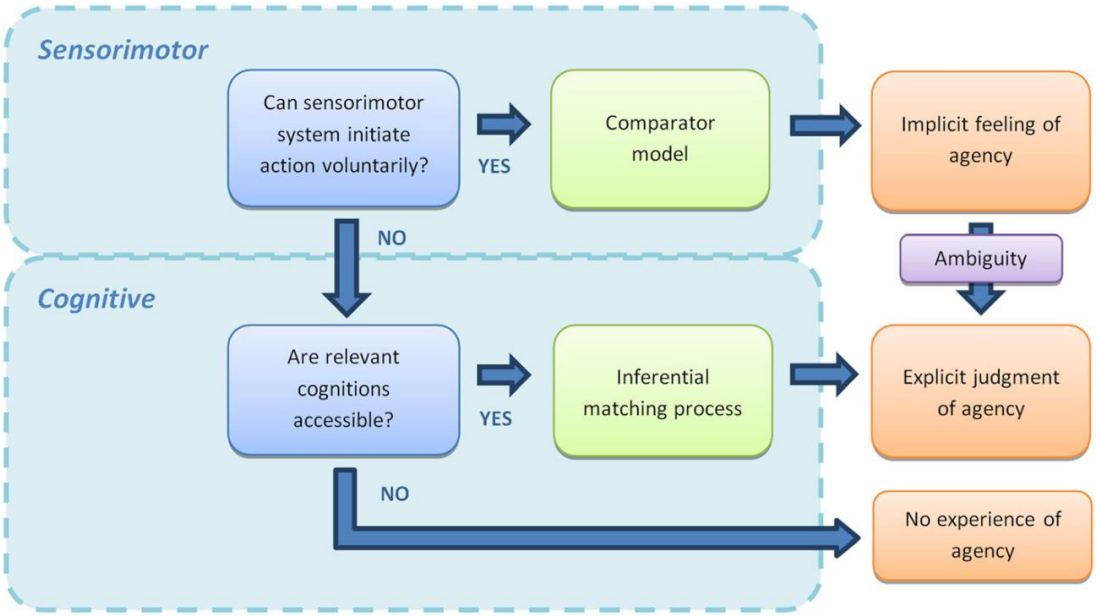

Figure 2. This model illustrates how implicit and explicit experiences of self-agency result from motor (upper part of the model) and cognitive (lower part of the model) processes. Reprinted from ‘’On The Nature of Experiencing Self-Agency: The Role of Goals and Primes in Inferring Oneself as the Cause of Behavior ‘’ by A. van der Weiden, K.I. Ruys, and H. Aarts, 2013, *Social and Personality Psychology Compass, 7,* 888–904.

The present study is going to investigate the relationship between self-agency and empathy. First of all, this study is going to replicate findings of earlier research by investigating whether priming matching and mismatching outcomes influence our experiences of agency. It is expected that the experience of self-agency is enhanced when outcomes match the prime than when outcome mismatch the prime (matching effect). Secondly, this matching effect will be correlated with the subscales ‘Personal Distress’ and ‘Empathic Concern’ of the Interpersonal Reactivity Index (IRI; Davis,

1980). The IRI measures four components of empathy: Perspective Taking, Empathic Concern, Personal Distress and Fantasy, which reflect the cognitive and affective components of empathy. The subscales 'Fantasy' and 'Perspective Taking' will not be used in this study, because they consist of items measuring both a self- and other-perspective. Therefore, they are not relevant for investigating self-other differentiation. The subscales 'Personal Distress' and 'Empathic Concern' on the other hand, are either self- or other-oriented, and have been associated with self-other distinction (Lamm et al., 2007). Therefore, it is expected that matching is positively correlated with empathic concern and is negatively correlated with personal distress. If these constructs are related, this may indicate that they both rely on the same underlying mechanism of self-other distinction.

2. Method

2.1 Participants and design

Fifty undergraduates participated in the study in return for a course credit or a small fee. No specific restrictions were held. The study included 21 males and 29 females with an mean age of M = 22,3 (SD = 3,07). A repeated measures design was used with matching (match versus mismatch) as the independent variable.

2.2 Experimental task and procedure

Participants were seated behind a computer and worked in separate cubicles on the experimental computer task. Before the start of the experiment, they were asked to sign an informed consent form. Participants learned that the purpose of the study was to examine people's feelings of personal causation and how these feelings come and go. They performed a self-agency inference task, similar to the task used by van der Weiden, Aarts and Ruys (2011). This is a kind of slot machine task that was programmed on a computer. Instead of rapidly changing fruit symbols, the self-agency task showed rapidly alternating letter sequences in the middle of the computer screen in such a way that they were just a jumble of letters. Participants were told that the letter sequences consisted of random letter combinations in which the letters 'R' and 'B' occurred. The letter 'R' in a letter sequence (e.g. MWRT) would cause the outcome word 'RED' (in Dutch 'ROOD') and the letter 'B' in a letter sequence (e.g. BTSZW) would show the word 'BLUE' (in Dutch 'BLAUW') as the outcome. On a given moment, a circle was visible above or underneath the letter strings, which indicated that participants needed to press a key as soon as possible to stop the sequence of letter strings. They were told that pressing the stop-key would cause a word (in Dutch 'ROOD' or 'BLAUW') to be selected based on their timing. Figure 3 gives a detailed example of how participants thought that their timing would select an outcome. After practicing, participants were told that the computer could also select an outcome, independently of the time of their key-press. In this way, a situation was created in which the cause of an outcome was ambiguous. In reality, the computer

randomly selected all outcomes, thus the participant never caused an outcome. After each outcome, participants indicated to what extent they felt that they had caused the selected word. This feeling of self-agency was measured on an 8-point scale (not at all me (1) – absolutely me (8)). To enhance the sense of self-agency, the words 'ROOD' and 'BLAUW' were primed between the letter strings, which were perceived unconsciously. The task consisted of 8 practice trials and 64 test trials, where half of the trials matched the previously prime and the other half mismatched it. The trials were presented in random order. The task lasted approximately 20 minutes including a pause of 30 seconds.

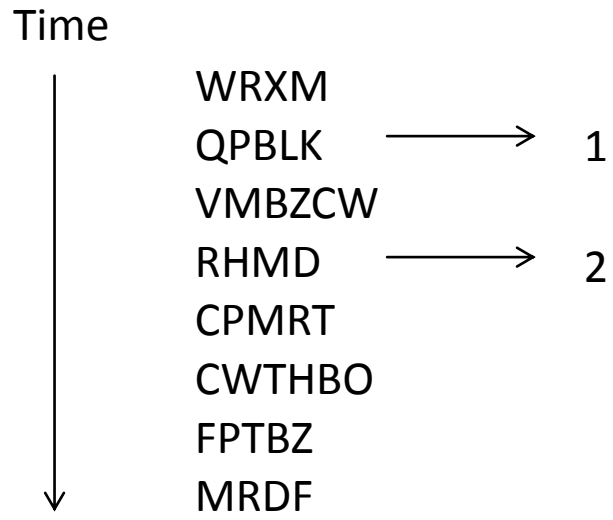

Figure 3. The given example participants were shown during task instructions in order to demonstrate how their timing would select an outcome color. Pressing on moment '1' would select the letter string QPBLK and the subsequent outcome word 'BLAUW'. Pressing on time '2' would select the letter string RHMD, which would cause the word 'ROOD'.

2.2.1. Events in a trial

Each trial consisted of four consecutive phases; a priming, masking, action and outcome phase. A schematic example of a trial is shown in Figure 4. In the priming phase of 200ms, five capitalized random letter strings preceded a prime (in Dutch 'ROOD' or 'BLAUW'). The prime and each letter string were presented for 33ms. The priming phase was repeated 8 times and lasted 1600ms. During the masking phase of 200ms, five capitalized random letter strings preceded a control prime, derived from each prime (in Dutch 'ORDO' or 'AWBLU'). This control prime diminished

the visibility of the earlier prime. The masking phase was shown 4 times, which eventually lasted 800ms. The following action phase was identical to the masking phase and was also repeated 4 times. During the action phase, participants had to respond to a stopping cue (i.e. small circle above or underneath the letter strings). This stopping cue was presented for 800ms and during this time participants had to press a key. When the participant's response exceeded this time interval, they were not able to make explicit agency judgments. This missing trial was reported as a missing value in the SPSS analysis. After the action phase, a 100ms blank screen was presented, after which participants were shown the selected outcome word for 1500ms.

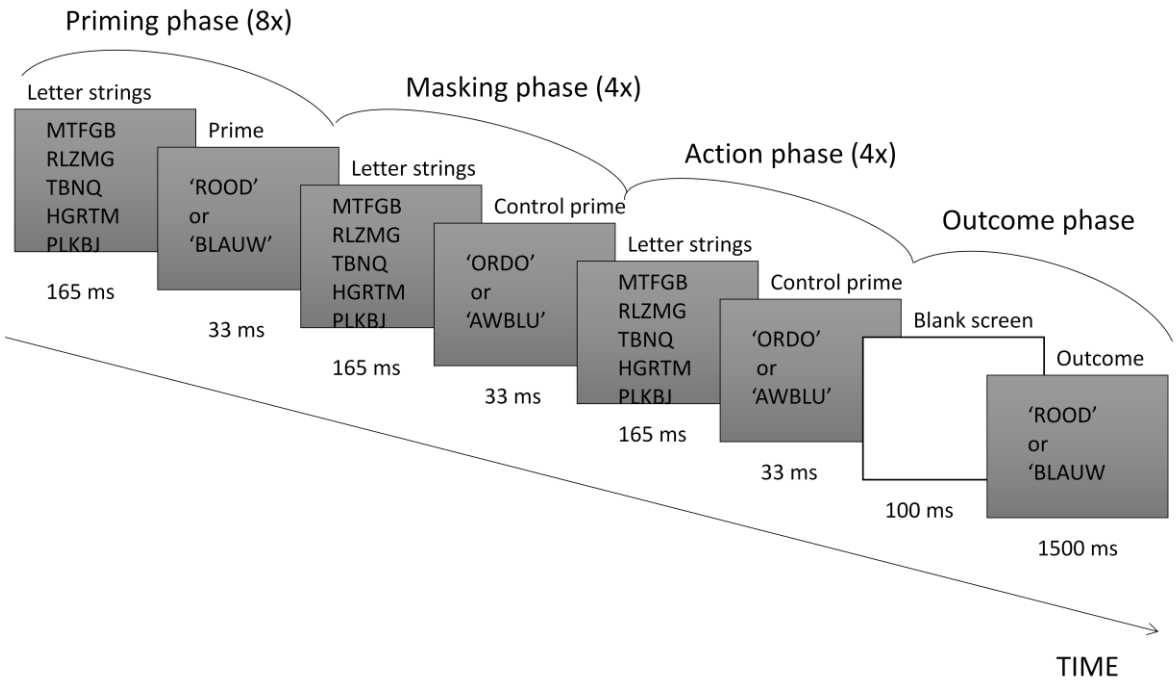

Figure 4. Schematic example of a prime trial in the self-agency task.

2.2.3. Measurement of empathy

After performing the self-agency task, the participants filled in a Dutch version of the Interpersonal Reactivity Index (IRI; Davis, 1980) on the computer. This version has been tested and showed a good internal consistency and construct validity (de Corte, Buysse, Verhofstadt, Roeyers,

Ponnet, & Davis, 2007). The IRI consists of 28 items (7 items in each subscale) that are rated on a five-point Likert scale *(A = does not describe me well to E = describes me very well*). The subscales 'Personal Distress' and 'Empathic Concern' were included in the analysis. The scale 'Personal Distress' measures self-oriented feelings of personal anxiety and distress in tense interpersonal settings. An example of an item is: 'I sometimes feel helpless when I am in the middle of a very emotional situation.' The scale 'Empathic Concern' assesses other-oriented feelings of sympathy and concern for unfortunate others. An example of an item is: 'When I see someone being taken advantage of, I feel kind of protective towards them.'

2.2.4. Debriefing

Participants were asked about the purpose of the study and how they had handled the task. Two participants saw the primes during the task and have been deleted from the analysis. None of the participants reported the true nature of the experiment. Most of them said that it was impossible to determine whether they had caused the outcome and that they relied on their feelings to make an agency judgment.

3. Results

First of all, six outliers were excluded from the dataset. Three participants reported a '1' (outcome is not caused by myself) as response to every trial. One participant contained 36 missing values as a result of delayed responses during the self-agency task and another two participants were aware of the primes during the task. The removal of these people led to a remaining dataset of 44 participants. This dataset included 20 males and 24 females with an mean age of M = 22,19 (SD = 2,96). A repeated measures ANOVA with matching (match versus mismatch) as within subjects factor was used to examine the difference between the experienced self-agency as a result of a match or mismatch prime. A main effect was found for matching $F(1,43) = 6.86$, $p = .012$, $\eta_{p2} = .138$, supporting the first hypothesis.

Secondly, a Pearson's R correlation was carried out in order to see if there is a relationship between this matching effect and the degree of the reported personal distress and empathic concern. It was expected that matching would have a negative correlation with the scores on the subscale 'Personal Distress' and a positive correlation with the subscale 'Empathic Concern'. However, no significant correlation was found between matching and 'Personal Distress' ($r = .15$, $n = 44$, $p = .33$) and 'Empathic Concern' ($r = .21$, $n = 44$, $p = .17$), rejecting the second hypothesis.

4. Discussion

The present study was the first study that examined the relationship between empathy and self-agency. In line with previous research (Aarts et al., 2005), results demonstrated that participants experienced enhanced feelings of self-agency when a prime matched the observed outcome than when a prime mismatched the outcome (matching effect). In contrast to our expectations, results revealed no significant correlations between this matching effect and the empathy subscales 'Empathic Concern' and 'Personal Distress'.

The non-significant correlations between self-agency and empathy may be due to the way empathy was measured. Although validated and widely used, self-reported questionnaires can be influenced by a variety of interfering factors. For instance, self-reports suffer from social desirable responses and showing empathy for others is generally considered socially desirable. Social desirability has indeed been positively related to the IRI (Constantine 2000; Miville et al. 1999), with desirable responding typically positively correlated with greater empathic concern. In order to exclude this factor, further research could include measurements of social desirability (e.g. Marlowe-Crowne Social Desirability Scale). Alternatively, physiological methods could be used such as the measurement of heart rate or skin conductance. It has been argued that personal distress involves empathic overarousal and appears to be linked with higher levels of physiological arousal than is empathic concern. Specifically, personal distress has been associated with higher skin conductance and heart rate acceleration than empathic concern (Eisenberg & Fabes, 1990; Fabes, Eisenberg, & Eisenbud, 1993). By means of these methods, it would be interesting to measure personal distress and empathic concern while people are actually empathizing (e.g. watching people in pain) and relate this to the matching effect of self-agency.

Another reasonable physiological measure of empathy is electromyography (EMG). By means of EMG, specific contractions of the facial muscles can be measured (Dimberg, 1982). Interestingly, a study by Lamm, Porges, Cacioppo and Decety (2008) measured EMG while taking a self- and other-perspective when witnessing the distress of others. The study used a similar design as the earlier

mentioned study by Lamm et al. (2007). EMG was recorded over two muscles involved in expressing pain. Although results revealed no difference in the activation of the musculus corrugator supercilii (frowning response) while adopting different perspectives, there was increased activity in the musculus orbicularis oculi (controlling orbit tightening) while taking an imagine-self perspective compared to imagine-other perspective. This indicates that adopting a self-perspective results in higher levels of personal distress, which is in line with previous studies (e.g. Lamm et al., 2007). Moreover, empathic concern and personal distress have been associated with different brain areas while adopting different perspectives. Hence, they could be measured through functional magnetic resonance imaging (fMRI), as was done in the study by Lamm et al. (2007). In sum, the use of physiological measurements is very useful to measure empathy in addition to a validated self-report.

Another interesting issue to explore in future research is the causal relation between empathy and self-agency. Because empathy enables us to predict other people's actions, intentions and emotions (Meltzoff & Decety, 2003; Singer & Lamm, 2009) it may influence the experience of self-agency. When we are good in predicting the intentions of others, we are probably also good in the attribution of agency, because we can specify whether the outcome matches the intention of the other person or our own. For example, if we predict that someone has the intention to reassure another person, we probably do not experience ourselves as the cause of the outcome that the other person is comforted. This is because the outcome matched the goal of the other person and not our own. However, we may experience self-agency over this outcome when we are not good in predicting the intentions of others, because in this case it is more difficult to distinguish ourselves from the other. An intriguing question that follows is: Do we experience self-agency when we obtain similar goals?

Alternatively, it could be possible that affective sharing influences the experience of self-agency about other people's emotions. Interestingly, previous research has shown that both priming facial expressions, and emotionally associated information (e.g. shouting prior to observing a fearful expression) increased the experience of self-agency about other people's emotions (Ruys & Aarts,

2012). Based on this finding, Ruys and Aarts (2012) speculate that affective sharing may also influence self-agency about other people's emotions. Aforementioned, the observation of an object's state automatically activates the subject's corresponding representation (Preston & de Waal, 2002). In this way, an automatically activated motor representation of an emotional expression may serve as input for the underlying inference process of self-agency. This suggests that people who are more likely to automatically share the emotions of others are also more likely to experience self-agency over the emotional expression of the other, even when this emotion is not caused by them.

Furthermore, it would be interesting to investigate self-other distinction in a more direct way. For example, self-other distinction can be manipulated by using two participants in the experiment. When two participants perform the same task in a parallel position, a social situation is simulated where people perform similar actions at the same time. In the study done by Ruys and Aarts (2012), participants had to tap the keys on the keyboard while varying the rhythm and the order of tapping the keys. If this action is performed simultaneously by two participants, this may interfere with the ability to discriminate between self and other produced actions (Hove & Risen, 2009). As a consequence, people may experience less or no self-agency while they have caused the outcome or they may experience self-agency when they have not caused the outcome.

In conclusion, the present study replicates findings of earlier research that subtle pre-activated outcome information influences our experience of self-agency. Although previous research suggests that empathy and self-agency rely on the same mechanism of self-other distinction, results revealed no significant correlation between these constructs. However, further investigation is needed into the relationship of empathy and self-agency and the underlying mechanism of self-other distinction. More insights in these constructs may allow us to improve social interaction skills. Also, it may help people who exhibit distortions in self-agency and empathy such as schizophrenic or autistic patients (Lombardo et al., 2010; Renes, Vermeulen, Kahn, Aarts, & van Haren, 2012). This is of great importance in today's society, in which we easily encounter a lot of people and where we need to communicate with each other in efficient ways.

References

Aarts, H., Custers, R., & Marien, H. (2009). Priming and authorship ascription: when nonconscious goals turn into conscious experiences of self-agency. *Journal of Personality and Social Psychology, 96 (5),* 967- 979.

Aarts, H., Custers, R., & Wegner, D. M. (2005). On the inference of personal authorship: enhancing experienced agency by priming effect information. *Consciousness and Cognition, 14 (3),* 439-458.

Adolphs, R. (2002). Recognizing emotion from facial expressions: Psychological and neurological mechanisms. *Behavioral and Cognitive Neuroscience Reviews*, *1*, 21-62.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462–479.

Batson, C. D., Early, S., & Salvarini, G. (1997). Perspective taking: Imagining how another feels versus imagining how you would feel. *Personality & Social Psychology Bulletin, 23*, 751–758.

Batson, C. D., Fultz, J., & Schoenrade, P. A. (1987). Distress and empathy: Two qualitatively distinct vicarious emotions with different motivational consequences. *Journal of Personality, 55,* 19–39.

Blakemore, S. J., & Frith, C. D. (2003). Self-awareness and action. *Current Opinion in Neurobiology, 13 (2),* 219-224.

Bora, E., Gokcen, S., & Veznedaroglu, B. (2008). Empathic abilities in people with schizophrenia. *Psychiatry Research, 160 (1),* 23-29.

Chaminade, T., & Decety, J. (2002). Leader or follower? Involvement of the inferior parietal lobule in agency. *NeuroReport, 13,* 1975–1978.

Constantine, M. G. (2000). Social desirability attitudes, sex, and affective and cognitive empathy as predictors of self-reported multicultural counseling competence. *The Counseling Psychologist, 28,* 857–872.

de Corte, K., Buysse, A., Verhofstadt, L. L., Roeyers, H., Ponnet, K., & Davis, M. H. (2007). Measuring empathic tendencies: Reliability and validity of the Dutch version of the Interpersonal Reactivity Index. *Psychologica Belgica, 47-4,* 235-260.

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science, 329,* 47–50.

Davis, M. (1980). A multidimensional approach to individual differences in empathy. *SAS catalog of Selected Documents in Psychology, 10,* 85.

Decety, J., & Jackson, P. L. (2004). The functional architecture of human empathy. *Behavioral and Cognitive Neuroscience Reviews, 3,* 71–100.

Decety, J., & Lamm, C. (2007). The role of the right temporoparietal junction in social interaction: How low-level computational processes contribute to meta-cognition. *Neuroscientist 13* 580–593.

Decety, J., & Meyer, M. (2008). From emotion resonance to empathic understanding: A social developmental neuroscience account. *Development and Psychopathology, 20,* 1053-1080.

Decety, J., & Moriguchi, Y. (2007). The empathic brain and its dysfunction in psychiatric populations: Implications for intervention across different clinical conditions. *BioPsychoSocial Medicine, 1,* 22–65.

Decety, J., & Sommerville, J. A. (2003). Shared representations between self and others: A social cognitive neuroscience view. *Trends in Cognitive Sciences*, *7*, 527–533.

Dimberg, U. (1982). Facial reactions to facial expressions. *Psychophysiology, 19,* 643–647.

Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. *Advances in Experimental Social Psychology, 33,* 1–40.

Eisenberg, N., & Fabes, R. A. (1990). Empathy: Conceptualization, measurement, and relation to prosocial behavior. *Motivation and Emotion, 14,* 131-149.

Eisenberg, N., Shea, C. L., Carlo, G., & Knight, G. P. (1991). Empathy-related responding and cognition: A“chicken and the egg” dilemma. In W. M. Kurtines & J. L. Gewirtz (Eds.), Handbook of moral behavior and development research (pp. 63–88). New York: Erlbaum.

Fabes, R. A., Eisenberg, N., & Eisenbud, L. (1993). Behavioral and physiological correlates of children’s reactions to others in distress. *Developmental Psychology, 29,* 655-663.

Hoffman, M. L. (2001). A comprehensive theory of proso-cial moral development. In D. Stipek & A. Bohart (Eds.), Constructive and Destructive Behavior (pp. 61–86). Washington, DC: American Psychological Association.

Hove, M. J., & Risen, J. L. (2009). It’s all in the timing: Interpersonal synchrony increases affiliation. *Social Cognition, 27*, 949-960.

Jeannerod, M. (2003). The mechanisms of self-recognition in humans. *Behavioral Brain Research, 142,* 1-15.

Lamm, C., Batson, C. D., & Decety, J. (2007). The Neural Substrate of Human Empathy: Effects of Perspective- taking and Cognitive Appraisal. *Journal of Cognitive Neuroscience, 19 (1),* 42-58.

Lamm, C., Porges, E. C., Cacioppo, J. T., & Decety, J. (2008). Perspective taking is associated with specific facial responses during empathy for pain. *Brain Research, 1227,* 153-161.

Lombardo, M. V., Chakrabarti, B., Bullmore, E. T., Sadek, S. A. Pasco, G., Wheelwright, S. J., et al. (2010). Atypical neural self-representation in autism. *Brain, 133 (2),* 611-624.

Meltzoff, A. N., & Decety, J. (2003). What imitation tells us about social cognition: a rapprochement between developmental psychology and cognitive neuroscience. *Philosophical Transactions of the Royal Society London B Biological Science, 358,* 491-500.

Miller, P. A., & Eisenberg, N. (1988). The relation of empathy to aggressive and externalizing/ antisocial behavior. *Psychological Bulletin, 103,* 324–344.

Miville, M. L., Gelso, C. J., Pannu, R., Liu, W., Touradji, P., Holloway, P., et al. (1999). Appreciating similarities and valuing differences: the Miville–Guzman universality-diversity scale. *Journal of Counseling Psychology, 46,* 291–307.

Preston, S. D., & de Waal, F. B. M. (2002) Empathy: its ultimate and proximate bases. *Behavioral and Brain Sciences, 25,* 1– 20.

Prinz, W. (1997). Perception and action planning. *European Journal of Social Psychology, 9(2),* 129–54.

Rameson, L. T., & Lieberman, M. D. (2009). Empathy: A social cognitive neuroscience approach. *Social and Personality Psychology Compass, 3,* 94–110.

Renes, R.A., Vermeulen, L., Kahn, R.S., Aarts, H. & Haren, N.E.M. van (2013). Abnormalities in the establishment of feeling of self-agency in schizophrenia. *Schizophrenia* Research, 143(1), 50-54.

Ruby, P., & Decety, J. (2001). Effect of subjective perspective taking during simulation of action: A PET investigation of agency. *Nature Neuroscience, 4,* 546–550.

Ruby, P., & Decety, J. (2004). How would you feel versus how do you think she would feel? A neuroimaging study of perspective-taking with social emotions. *Journal of Cognitive Neuroscience, 16,* 988–999.

Ruys, K. I., & Aarts, H. (2012). I Didn't Mean to Hurt You! Unconscious Origins of Experienced Self-agency over Other's Emotions. *Emotion*, 12, 132-141.

Sato, A. (2009). Both motor prediction and conceptual congruency between preview and action-effect contribute to explicit judgment of agency. *Cognition, 110,* 74–83.

Schütz-Bosbach, S., Avenanti, A., Aglioti, S. M., & Haggard, P. (2009). Don't do it! Cortical inhibition and self-attribution during action observation. *Journal of Cognitive Neuroscience, 21(6),* 1215-1227.

Singer, T. & Lamm, C. (2009). The social neuroscience of empathy. *Annals of the N Y Academy* Science, 1156, 81-96.

Singer, T., Seymour, B., & O'Doherty, J. (2004). Empathy for pain involves the affective but not the sensory components of pain. *Science 303,* 1157-1161.

Synofzik, M., Vosgerau, G., & Newen, A. (2008). Beyond the comparator model: A multifactorial two-step account of agency. *Consciousness and Cognition, 17,* 219–239.

de Vignemont, D. T. & Singer, T. (2006). "The empathic brain: how, when and why?" *Trends in Cognitive Sciences, 10,* 435-441.

van der Weiden, A., Aarts, H., & Ruys, K. I. (2010). Reflecting on the action or its outcome: Behavior representation level modulates high level outcome priming effects on self-agency experiences. *Consciousness and Cognition, 19,* 21–32.

van der Weiden, A., Aarts, H., & Ruys, K. I. (2011). Prime and probability: Causal knowledge affects inferential and predictive effects on self- agency experiences. *Consciousness and Cognitio 20,* 1865–1871.

van der Weiden, A., Aarts, H. & Ruys, K. (2013). On The Nature of Experiencing Self-Agency: The Role of Goals and Primes in Inferring Oneself as the Cause of Behavior. *Social and Personality Psychology Compass, 7,* 888–904.

Wegner, D. M. (2002). *The illusion of conscious will*. Cambridge, MA: MIT Press.

Wegner, D. M., & Sparrow, B. (2004). *The cognitive neurosciences (third edition)*. Cambridge, MA, US: MIT Press.

Wegner, D. M., & Wheatley, T. P. (1999). Apparent mental causation: Sources of the experience of will. *American Psychologist, 54,* 480 – 492.

Wolpert, D. M., (1997). Computational approaches to motor control. *Trends in Cognitive Sciences, 1 (6),* 209– 216.