2015

CONNECTING TO OTHERS: STUDYING THE RELATIONSHIP BETWEEN SOCIAL EXCLUSION AND IMITATION

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Bachelor of Arts (Honours), Wilfrid Laurier University, 2013

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THESIS

Submitted to the Department of Psychology

in partial fulfillment of the requirements for

Master of Science, Cognitive Neuroscience

Wilfrid Laurier University

Abstract

Automatic imitation (AI) refers to the subconscious tendency we have to imitate an observed action, even when that action is irrelevant to or interferes with an action we are attempting to execute (Heyes, 2011; Brass et al., 2000). Human beings display a fundamental need to stay meaningfully connected to others, also known as the need to belong. Previous research shows that an experience of rejection can reduce one's feelings of connectedness to others (Legate et al., 2013), and that behaviours such as non-conscious mimicry (NCM) increase after being excluded as a possible means of re-affiliation (Lakin et al., 2008). It may follow that exclusion can also interfere with our automatic imitation of actions of another person. In Experiment 1, we primed participants to either recall an event where they excluded other(s), were excluded by other(s), or recall the previous day's activities. After priming, participants completed an assessment of their feelings of connectedness and then engaged in the controlled imitation task (CIT; Obhi & Hogeveen, 2013). In the CIT, participants observed on-screen movements of index and middle finger 'lifts'. Half of the presentations were biological (finger lift trials) and half were spatial control stimuli (dot simulating lift trials). Participants responded to numeric cues of '1' or '2' for an index or middle lift, respectively. Movements were either congruent (e.g. cue '1', lift '1') or incongruent to (e.g. cue '1', lift '2') the movement the participant was instructed to perform. During incongruent trials (e.g. cue '1', observe '2'), participants were to cancel their cued response in favour of producing the observed movement. This was followed with the completion of a rating indicating their need to belong. Results showed that when an observed action was incongruent with the cued response, reaction time (RT) was slowed and accuracy was reduced, but there was no significant impact of prime task upon imitation effect. In Experiment 2, the same social exclusion priming procedure was used, but participants completed the automatic imitation task (AIT). In the AIT, participants responded to numeric cues of '1' and '2' during both congruent and incongruent trials, and were instructed not to respond to the observed movements. The results from experiment 2 differed in that the slowing in RT and reduction in accuracy was only significant for finger trials, as well as a larger interference effect for finger trials than dots. As in Experiment 1, no significant impact of the prime was found on imitation. In both experiments, all participants rated their essay-writing experience as effective, yet no significant differences were found across prime groups in their connectedness scores or their need to belong rating. Overall, our findings suggest that writing about recalled experiences of social exclusion may not be enough to elicit significant changes in automatic imitative behaviours. Variations in methodological techniques may further elucidate the possible relationship between exclusion and imitation.

*Keywords***:** Automatic imitation, controlled imitation, connectedness, need to belong, non-conscious mimicry, imitation, action observation, social exclusion

Acknowledgments

I would like to thank Dr. Sukhvinder Obhi and Dr. Christian Jordan for facilitating my completion of this degree. I am especially grateful to Zeynep Barlas for mentoring me in all my academic endeavours as well as for her wonderful friendship during our time together in lab. I would also like to thank alumni from the Social Brain, Body and Action Lab for their ongoing support and assistance. Many late nights in the lab were spent in good company and with people I would consider not only colleagues but friends. Special thanks should be given to my parents Joanne and Scott for their encouragement throughout this experience, as well as the many ends to which they go to keep me happy and healthy. My final thank you is to David, who pushed me to pursue this degree and has been cheering me on ever since.

This work was supported by the Tri-Council Research Support Fund.

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General Introduction

Psychological Needs: Belongingness and Relatedness

The importance of the development and maintenance of social relationships between human beings is well recognized, having emerged in various ways and within several theories throughout the past century. Early concepts of belongingness have been proposed in such works as John Donne, Sigmund Freud, Abraham Maslow and John Bowlby. For our purposes, the belongingness hypothesis purported by Baumeister and Leary (1995) states more specifically that as a species we “have a pervasive drive to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships” (p. 497). In this sense, our ability to survive can be reduced to an underlying motivation to stay meaningfully connected to others. According to selective memory research, we even possess a unique monitoring system for the processing of social information which varies in stimuli sensitivity depending on how socially accepted we feel (Gardner, Pickett & Brewer, 2000). The need to belong has potential implications for constructs such as psychological theory, where concerns including self-presentation, group conformity, and emotional or behavioural problems may all relate to a motivation to increase or enhance one’s social inclusion. There are even implications for our understanding of societal fluctuation, as cultural changes (e.g. the shift towards corporate employment) may be better evaluated with a consideration of the driving desire to belong to a group. Thus, the need to belong it is perhaps one of the most encompassing and multi-faceted concepts available for explaining the nature of an individual (Baumeister & Leary, 1995).

More recently, the belongingness hypothesis appears to have re-emerged in the basic psychological needs account provided by the framework of self-determination theory (SDT;

Ryan & Deci, 2000). As summarized by Legate, DeHaan, Weinstein and Ryan (2013), SDT suggests that three primary psychological needs must be satisfied – autonomy, competence and relatedness – and that these three needs are inherently linked to goal-directed behaviour. Autonomy is the need to feel that one is acting in a volitional manner; competence is the need to feel that one's behaviours are both effective and successful; and relatedness is the need to feel that one is psychologically close to or connected with other beings. While the assumption of this theory is that all three needs must be fulfilled, SDT research has emphasized the importance of relatedness in the sense that relational goals (relative to selfish goals) have been found to "better satisfy psychological needs… leading to better mental health" (Legate et al., 2013, p. 584).

For the purposes of this thesis, the need to belong, relatedness and connectedness will be used somewhat interchangeably. According to Gardner et al. (2000), when levels of relatedness are either threatened or reduced, an individual should experience an increased drive to fulfill this need through "affiliation with and acceptance from others" (p. 486). Thus, a highly effective way of threatening this fundamental need to be connected to others should be through social rejection or exclusion.

Social Exclusion and the Social Reconnection Hypothesis

Social exclusion, as stated, is a direct threat to our need to feel that we belong with and connect to those around us, with well-documented interpersonal and intrapersonal effects. In terms of the satisfaction of psychological needs, Legate et al.'s (2013) study of the negative consequences of complying with ostracism (i.e. socially excluding others) has shown that the victims and perpetrators of social exclusion both experience lower levels of relatedness compared to neutral participants. Thus, both parties involved in the act (whether being excluded or excluding others) show a reduction in the connectedness they feel to those they are interacting with. By this logic, it should come as no surprise that a reduction in social ties and affiliations is also associated with various concerns including experiences of jealousy, depression, anxiety, and loneliness, as well as increased rates of both mental and physical illness (Maner et al., 2007). The implications are in some cases so severe that researchers have gone as far as to suggest that social exclusion incontrovertibly "prevents the human psyche from doing what it was designed to do" (Baumeister et al., 2007, p. 507).

In order to assess these effects, multiple procedures have been developed for studying social exclusion (for a full review, see Blackheart et al., 2009). Of the most frequently used techniques, simulated post-interaction rejections (Nezlek et al., 1997; Twenge et al., 2001) ball-tossing games (for face-to-face paradigms, see Williams & Sommer 1997; for Cyberball, see Williams et al., 2000), and imagined or recalled rejection experiences (DeWall & Baumeister, 2006; Picket et al., 2004; Leary et al., 1998) appear to be the most common. It should be noted that imagined or recalled rejection may be more "meaningfully understood and digested in ways that freshly occurring [rejections] are not", and furthermore can be heightened by having the individual write about the relived experience (Baumeister et al., 2007, p.508).

These visualization reports show equal effects to more interpersonal rejection methods mentioned above (Gardner et al., 2000; Pickett et al., 2004). For example, Pavey et al. (2011) highlighted relatedness in participants by asking them write about examples of times in which they experienced strong social connections to others, which led to a significant increase in their pro-social intentions (i.e. promoted more altruistic tendencies). Alternatively, after recalling an experience of social exclusion, individuals reported feeling physically colder in a room than those asked to recall a time of inclusion (Zhong et al., 2008).

Much of the research on exclusion has focused on the more negative valence of social exclusion effects, such as increases in aggression and emotional insensitivity, reductions in pro-social behaviours, as well as a reduction in pain sensitivity (Baumeister et al., 2007). What has been less considered in exclusion research is how social exclusion may motivate individuals to re-fulfill their psychological need to relate to others in a more beneficial fashion. According to Maner et al.'s (2007) social reconnection hypothesis, being socially excluded stimulates a "desire to reconnect with the social world" as displayed by an increased motivation to "forge social bonds with new sources of potential affiliation" (p. 42). Evidence for this compensatory interpersonal response has been shown in research focused on need satisfaction, but is also apparent in work surrounding automatic behavioural responses such as non-conscious mimicry.

Social Reconnection and Non-Conscious Mimicry

As suggested by the social reconnection hypothesis, individuals that have recently been excluded should show an increased motivation to affiliate with others due to their threatened need to belong. One highly effective way to recover from this threat is through automatic behaviours such as mimicry. Non-conscious behavioural mimicry (NCM) is known as the "tendency to mimic other individuals' behaviours without awareness or intent" (Lakin et al., 2008). Also referred to as the *chameleon effect*, NCM appears to be rooted a longstanding link between perception and behaviour where the observation of an interaction partner's behaviours increases the odds that we perform that behaviour ourselves (Chartrand & Bargh, 1999). NCM has been well-researched and the positive repercussions documented include increased feelings of liking, trust, and closeness to others, as well as increases in pro-social behaviours (Lakin et al., 2008). Mimicry is distinct from automatically imitating the actions of another person in the sense that it serves to facilitate social bonds within an interaction, as well as signaling one's acceptance within a social group (Kuhn et al., 2010; Cook et al., 2011). Thus, when an individual mimics and is mimicked in return, there is a mutual increase in the level of closeness felt by those involved in the interaction. With respect to behavioural measurement, mimicry research focuses on the frequency of action, where automatic imitation paradigms gauge the speed and accuracy with which participants respond to observed movement. Most researchers assume that mimicry and automatic imitation are linked by underlying mechanisms, and therefore "'simple' automatic imitation can be used to find out how 'complex' intentional imitation is mediated" (Heyes, 2011, p. 2). For this reason, automatic imitation can generally be considered the 'laboratory equivalent' of mimicry (Heyes, 2011).

In order to directly assess the effects of social exclusion on mimicry, Lakin et al. (2008) conducted an exclusion study with three main components. First, participants were asked to play the online Cyberball ball-tossing game with three other 'participants' (in reality, these other players were computer-animated). While playing, participants were in one of two scenarios – either they were included equally in the game and received the ball 1/3 of the time (inclusion condition), or they received the ball twice at the beginning of play and were not thrown to for the remainder (exclusion condition). Next, participants were asked to describe a series of photographs to a partner. Before doing so, the experimenter informed the participant that the partner had not yet arrived or played the ball-tossing game. As they waited, a baseline measure of the participant's habitual foot movements was assessed. The experimenter then returned with their partner (a confederate) who began making foot movements throughout the interaction. Finally, the study concluded with a questionnaire to ensure that there was no conscious awareness of the confederate's movements.

Lakin et al.'s results found that when participants had been socially excluded during the Cyberball game, they mimicked their interaction partner's foot movements significantly more than the individuals that had been included. As mimicry is typically a standard behaviour during social interactions, the increase in this interactive response specifically for individuals who had been excluded has been interpreted as an attempt to recover by "affiliating with a new individual" (p. 817). Thus, mimicking the actions of another person not only serves as an indication of one's level of social acceptance, but may additionally be used as a non-conscious means of reconnecting to others after being excluded.

As previously discussed, both victims and perpetrators experience lower relatedness after an interaction involving social rejection (Legate et al., 2013). But where victims' threatened relatedness motivates them to reconnect with another individual through behaviours such as NCM, perpetrators have shown a decreased motivation to create those same social connections. For example, after rejecting a potential job applicant, individuals were less motivated to become involved in an on-campus service organizing events where new friends could be met (Zhou et al., 2009). This reduced desire to affiliate has been interpreted through a cognitive dissonance approach by Zhou et al. (2009): because rejecting an individual conflicts with their fundamental need to relate to others, perpetrators of exclusion are therefore compelled to 'modify' this need to adhere to their actions.

Insofar as social exclusion threatens one's relatedness, an individual's resulting increase or decrease in motivation to initiate new social connections appears to rest upon the individual's role within the exclusionary act. While the effects of exclusion on NCM have been documented, there is another phenomenon related to the perception-behaviour link which has not yet been considered in this line of research. This phenomenon is known as *automatic imitation* (AI).

Automatic Imitation and Controlled Imitation

Automatic imitation is our subconscious tendency to imitate an observed action, even when that action is irrelevant to or interferes with an action we are attempting to execute (Heyes, 2011). The automatic imitation task (AIT) is a stimulus-response paradigm that has become commonplace in research surrounding the nuances of action observation and execution. Participants are typically asked to respond to movements such as index and middle finger lifts that either correspond to or 'interrupt' their own performance (Brass et al., 2000). Within the paradigm, all index lifts are given the numeric cue '1', and all middle lifts are given the numeric cue '2'. These numeric cues indicate to the participant which movement they will be required to perform for that specific trial – thus, the numeric cues represent the 'cued response'. Half of these presentations are congruent, where the observed movement corresponds with the cued response (i.e. cue '1', observe lift '1'). The other half are incongruent, where the observed movement does not correspond with the cued response (i.e. cue '1', observe lift '2').

Suppose that a participant is presented with an image of a middle lift '2' and the numeric cue '1': this would be considered an incongruent trial. The observation of the movement automatically activates the corresponding motor representation for that movement (i.e. a middle lift or '2'). This activation then 'competes' with the motor representation activated for the cued response (i.e. an index lift '1') (Brass et al., 2000; for a full review, see Heyes, 2011). Thus, if the participant intends to complete the trial successfully, they must suppress the imitative response to the observed movement (i.e. middle lift) in order to produce the cued response (i.e. index lift). On a congruent trial, the participant would be presented with an image of an index lift '1' and the corresponding numeric cue '1'. During these trials, there is only one motor representation activated (i.e. index lift), and therefore no imitative response needs to be suppressed in order to produce the cued response.

Thus, the primary measures within an AIT paradigm are the reaction time (RT), the resulting *interference effect* and the accuracy shift or error rate during incongruent trials. The RT cost is seen as the time needed to suppress the imitative response created by the other-activated motor-representation (i.e. observed movement). In other words, this is the interference of automatic imitation on a cued response. To assess the magnitude of this cost (i.e. level of interference), the RTs on congruent trials are subtracted from the RTs on incongruent trials. Higher interference is therefore interpreted as a larger automatic imitation effect, because the influence of the observed movement has a greater effect on the production of the cued response. The error rate should reflect the RTs and the interference effect, where incongruent trials show reduced levels of accuracy compared to congruent trials.

Recently, a complementary paradigm has been introduced to automatic imitation research called the controlled imitation task (CIT; Obhi & Hogeveen, 2013). Although its design is essentially identical in nature to the AIT, one instruction differs significantly. During incongruent trials, participants are asked to prepare to make the cued response; however, if the hand on-screen initiates a movement that does not match the cue, the participants are told to ‘cancel’ their response and to match the action they see. For example, if the participant is presented with the ‘1’ cue (i.e. index lift) but the observed movement is a ‘2’ (i.e. middle lift), the participant must ignore the numeric cue and produce a middle finger lift. Thus, the interference effect during an incongruent trial is reversed: when the observed movement does not correspond with the cued response, the interference effect now becomes the time needed to suppress the cued response in favour of producing the imitative one. The CIT reflects our unique ability to control self- versus other-related motor activations, and rather than measuring AI directly, it measures our ability to actively produce an imitative movement in response to the actions of another person (i.e. controlled imitation or CI; Obhi & Hogeveen, 2013).

AI is highly attuned to social beings, as both robotic and virtual effectors show reduced levels of imitation compared human actors when participants are aware they are not human stimuli (Longo & Bertenthal, 2009; Press et al., 2005). However, little is known about the modulators of the AI effect. Research regarding self-construal and motor cortical output has shown that when primed to adopt an interdependent self-construal with words such as ‘together’, ‘connected’, ‘community’, and ‘affiliation’ participants’ motor cortical output increases, facilitating the processing of observed actions. This suggests that when individuals are in a state where they think of the self as connected to others, they display enhanced levels of cortical motor activation during action observation (i.e. increased motor resonance; Obhi et al., 2011). In addition, Cook and Bird (2011) discovered that “pro-social attitudes promote imitation” (p. 601). Individuals who were primed with pro-social words such as ‘friend’, ‘sociable’ and ‘agreeable’ showed a larger AI effect (more imitation) than those primed by non-social words such as ‘selfish’, ‘disagreeable’ and ‘unpopular’.

NCM and AI share the same underlying processes of perception and behaviour, where observing the behaviour of someone else influences the production of one’s own action. Since exclusion is already known to influence NCM it is reasonable to assume that even basic motor responses to observed movement like AI/CI may be influenced by exclusion as well. This connection implies the possibility of an underlying relationship between automatic imitation, controlled imitation and social exclusion.

Social Exclusion as a Modulator of Controlled Imitation

For both victims and perpetrators, social exclusion threatens our feelings of relatedness and how connected we feel to others. Individuals who have been excluded show an increased motivation to reconnect, and previous research shows that an effective means of connecting is through NCM in a social context. Alternatively, the individuals who perpetuate the exclusion show a decreased motivation to make social connections with others. Since it is possible for social exclusion to influence an individual's level of non-conscious mimicry within a social interaction, our research is being conducted in an effort to isolate some of the processes involved in more basic forms such as automatic imitation. Is it possible that social exclusion affects the degree to which an individual imitates the actions of another person?

To preview, in Experiment 1, we asked whether recalling a past experience of exclusion would significantly influence the degree of controlled imitation as measured by the CIT. With a complementary approach in Experiment 2, we asked whether recalling a past experience of exclusion would significantly influence the degree of automatic imitation as measured by the AIT.

Experiment 1: The effects of recalled exclusion on controlled imitation

Introduction

The aim of Experiment 1 was to determine whether the controlled imitation effect as measured by the controlled imitation task (CIT) could be influenced by recalling of past experiences of exclusion. Participants engaged in a short essay writing task to recall an experience where they were either excluded by others (exclusion condition), they excluded someone else (excluding condition), or their activities from the previous day (neutral condition).

Once finished, they completed a short evaluation of their feelings of connectedness, and then performed the CIT. Participants were asked to respond to the numeric cues indicating which finger lift to perform, but were asked to cancel their response if the finger or dot on-screen performed a movement different to the one they had planned to make. The CIT was followed by a re-reading of the prime essay and a rating of the participants' current need to belong.

If connectedness is a significant modulator of automatic imitation, it was hypothesized that the exclusion condition should: (1) threaten feelings of connectedness, (2) motivate participants to reconnect to others, and (3) result in a reduced interference effect. In other words, their tendency to imitate the observed movement of the other should be enhanced, and the imitative response should be prioritized in favour of the cued response.

In contrast, it was hypothesized that the excluding condition should: (1) threaten feelings of connectedness, (2) decrease participants' motivation to connect to others, and (3) result in an enhanced interference effect. In other words, their tendency to imitate the observed movement should be inhibited, as well as their ability to perform the imitative response in favour of the cued response.

To validate the effects of this manipulation, the neutral condition that does not involve a threat to relatedness (i.e. recalls a past experience unrelated to exclusion) should not affect the interference effect. The effectiveness of the essay prime should additionally be reflected in participants' reported feelings of connectedness, with both groups involved in the exclusion having lower feelings of connectedness than the neutral condition. Finally, the need to belong was expected to be high in the excluded condition where the motivation to reconnect was salient, but low in the excluding condition where motivation to reconnect was reduced.

Method

Participants.

In total, 57 participants (39 female, 18 male) between the ages of 17 and 47 (M = 20.57 years, SD = 4.29) participated in the study. Of these participants, 3 reported left hand dominance (54 right-handed). Thirty-eight participants were awarded partial course credit for their participation, and seventeen participants received financial remuneration having been recruited through paid participant pools. One participant was removed due to an interruption during testing for a building evacuation drill, leaving a total sample of 56 participants. In the final sample, 19 participants were pseudorandomly assigned to the excluded condition, 18 participants were pseudorandomly assigned to the excluding condition, and 19 participants were pseudorandomly assigned to the neutral control group. All participants were required to provide written informed consent before participating. All research conducted was reviewed and approved by the Research Ethics Board (REB) of Wilfrid Laurier University.

Apparatus and stimuli.

The experiment was programmed using Superlab v.4.5 (Cedrus Corporation, San Pedro, CA, USA). All picture stimuli were adapted for use from the original stimuli created by Obhi and Hogeveen (2013). Experimental stimuli were separated into a series of consecutive presentations (see Figure 1 for pictorial conditions). The first presentation (Picture 1) was of a ‘neutral’ hand (baseline, resting position). The second presentation (Picture 2) presented the number cue between the index and middle finger (index lifts were coded as ‘1’ and middle lifts were coded as ‘2’). The final presentation (Picture 3) was of the movement, either an index or middle finger lift (congruent, incongruent, or baseline). There was one Picture 1 image, two Picture 2 images, and ten Picture 3 images. On baseline trials, the hand stayed in the same position for the duration of the trial. On congruent and incongruent trials, the number cue appeared, followed by a movement of either the index or middle finger. Each image was followed by the presentation of a blue 'response' image in order to provide additional time for the participants to respond. To differentiate between a controlled imitation effect and a spatial compatibility effect, a circular dot was placed on the index and middle finger nails, and its movements were generated in such a way as to appear spatially congruent to the index and middle finger lifts (refer to example in Figure 2). Thus, half of the movement images presented in a trial were finger lifts, and half were dot lifts. In addition, experimental presentations (i.e. congruent and incongruent trials) were equally divided across middle and index finger stimuli. Presentations of finger and dot stimuli were all pictorial .jpeg documents used from previous publication materials (Obhi & Hogeveen, 2013). All inferential statistical analysis was conducted using IBM SPSS Statistics 21 (IBM Corporation, Armonk, NY, USA).

Design and procedure.

Participants were seated in a small room in front of a 20" LCD monitor for the computer task component of the study. First, they were given the exclusion prime where they were asked to recall and write about a time they were either socially excluded, they socially excluded someone else, or a description of the events of their previous day. They then completed a manipulation check as well as reporting their current feelings of connectedness. These tasks were followed by the computerized CIT task, in which participants were to observe finger lifts on the screen and attempt to either execute their own movement and/or imitate the movements of the hand as required. Finally, the participants reread their essay and answered a final need to belong question before reporting basic demographic information.

Social Exclusion Prime. Upon arrival to the study, participants had been randomly assigned to one of the three essay conditions (scripts adapted from DeWall & Baumeister, 2006): socially excluded, socially excluding, or neutral control. In line with previous literature, participants were asked to mentally relive a past experience by writing a short essay. Each participant was informed that they had a 15 minute period to think of an experience, and to write about this experience in as much detail as they desired. In the exclusion condition, the narrative read as follows:

> "On this page, please write a short essay about a time when you experienced rejection or exclusion by others. Think of a time when you felt that others did not want to be in your company and when you did not feel a strong sense of belongingness with another person or group. Please choose an especially important or memorable event."

In the excluding condition, the narrative read as follows:

> "On this page, please write a short essay about a time when you rejected or excluded another person(s). Think of a time when you actively excluded someone that you did not want to be in your company and that you did not feel a strong sense of belongingness with. Please choose an especially important or memorable event."

As a control, participants in the neutral condition were instructed to recall and report their previous day's activities: "On this page, please write a short essay about the activities you performed yesterday (e.g. what you ate, where you went, etc.). Recount the different steps throughout your day from start to finish in detail".

On average, participants took 8-15 minutes to complete their essays.

Manipulation Check. The manipulation check followed the essay and was a single-item question adapted from the procedure used by Pavey et al. (2011). In order to assess the effectiveness of this essay prime, the participants were asked: “How much did recalling this experience of [excluding/being excluded/your day] put you back in that mental state?” Answers were indicated on a scale of 1 to 7 (1 = s*trongly disagree*, 7 = *strongly agree*).

Connectedness. Participants were then asked to answer a 6-item scale pertaining to their feelings’ of relatedness or connectedness with others (adapted from Pavey et al., 2011): “At the present moment...” “...I feel a bond with other people”; “...I identify with other people”; “...I care for other people”; “...I am concerned about other people”; “...I am respectful of other people”; “...I feel protective towards other people” (rated on the same scale as the manipulation check; 1 = *strongly disagree* to 7 = *strongly agree).* This measure was used to indicate relative feelings of connectedness after having completed the essay prime. In total, the manipulation check and connectedness scale combined took participants on average 1-2 minutes to complete.

Controlled Imitation Task (CIT). The experiment was a 3(Condition: excluded, excluding, neutral) X 2(Congruency: congruent, incongruent) X 2(Stimuli: finger, dot) repeated measures design. Each participant was familiarized with the task by performing 32 practice trials (4 congruent dot, 4 congruent finger, 4 incongruent dot, 4 incongruent finger, and 16 baseline). They were then exposed to 6 experimental blocks, with 48 trials per block (6 congruent dot, 6 congruent finger, 6 incongruent dot, 6 incongruent finger, and 24 baseline) for a total of 288 experimental trials excluding practice.

The sequence of events within each trial was as follows: still image of the neutral hand (800-2400 ms), cued hand (50-90 ms), movement hand (568 ms), and the final blue screen (1500 ms) to allow for delayed responses as well as prepare the participant for the next trial. The presentation for the neutral and cued hands were programmed to randomly present at various times within the aforementioned intervals in order to disrupt any timing predictions made by the participants during testing. Figure 2 illustrates the trial sequence.

Participants were instructed to respond as quickly and accurately as possible to each trial. They were instructed to use their right index and middle fingers and to use the resting position of pressing down the ‘v’ and ‘b’ keys on a standard keyboard. Participants were reminded that their responses to the stimuli would be recorded each time they released these keys to perform their ‘lift’ action. When the ‘1’ cue appeared participants were instructed to perform an index finger lift. When the ‘2’ cue appeared participants were instructed to perform a middle finger lift. However, whenever the hand onscreen performed a movement that did not match the cue presented (e.g. a ‘1’ appeared but the hand performed a middle finger lift), participants were instructed to ‘cancel’ their own prepared response and to imitate the observed movement. In addition, they were instructed to treat the dot stimuli as identical in nature to the finger stimuli and to respond similarly to the movement of both (i.e. to treat incongruent dot trials as synonymous to incongruent finger trials). The lift type (index or middle) as well as stimuli type (finger or dot) were equiprobable across all trials.

In total, the performance of the CIT paradigm took participants approximately 18-20 minutes to complete.

Need to Belong. Once the CIT was complete, participants’ essays were returned and the participants were instructed to carefully re-read their response in order to adopt the same mindset as they experienced while writing. Once completed, participants answered a final question with regards to how they felt after recalling the experience of exclusion, excluding, or of their activities from the previous day. This item was adopted from the single-item need to belong scale (SIN-B; Nichols & Webster, 2013): “I have a strong need to belong” (scored on a scale of 1 to

5; 1 = *strongly disagree* and 5 = *strongly agree).* To reiterate, participants were asked to answer in terms of their mindset after having mentally relived the situation described in their essay. It should be noted that the SIN-B was intentionally conducted *after* the imitation task (CIT) to avoid any possible predictions the participants might have made as to the purpose of the study. Lastly, participants reported basic demographic information including their age, gender, year of study, dominant handedness, and normal or corrected-to-normal vision. These written measures took roughly 1-3 minutes to be completed. In total, the study duration was approximately 45-60 minutes in length.

Following these procedures, the participants were asked whether they had any awareness of the intent of the measures or the overall purpose of the experiment. All participants were debriefed and informed of the hypothesis and purpose of the study.

Results

Data preprocessing.

Accuracy data: An exclusion criterion of 3 standard deviations (SD) above or below the mean accuracy within each condition was used to compare participants to the overall sample. A total of three participants did not meet these criteria (i.e. accuracy was below 3 SD of the response mean in at least one of the four experimental conditions) and were therefore excluded from further analysis.

Reaction time data: For reaction time data, an exclusion criterion of 3 SD above the mean response speed within each condition was used to compare participants to the overall sample. One participant did not meet this criteria (i.e. response speed was above 3 SD of the response speed mean in all four conditions), and was therefore excluded from further analysis (for a similar approach, see Obhi & Hogeveen, 2013; Liepelt et al., 2008). On an individual participant basis, outliers 3 SD above or below the mean were removed within each experimental condition (see Obhi & Hogeveen, 2013). Trials in which participants' responses were 3 SD above or below the mean per condition as well as trials without a recorded response were removed (1.48% of all trials). Outlier removal for each participant did not exceed 9% of experimental trials.

Dependent measures: There were three dependent measures used in our analysis: reaction time (RT) data, accuracy or error rate, and interference (incongruent trial RTs – congruent trial RTs). The RT data and error rate were analyzed using mixed models ANOVA. In order to assess the interference effect more quantitatively, the difference scores between congruent and incongruent trials were computed for both the dot stimuli and finger stimuli. A repeated measures ANOVA was run for the interference effects of both the finger and dot stimuli.

Reaction time.

The main analysis was a 3 (prime: excluded, excluding, neutral) by 2 (stimuli: dot, finger) by 2 (RT congruency: congruent, incongruent) mixed model ANOVA, where prime was the between-subjects factor. This reaction time (RT) ANOVA revealed a significant main effect of congruence, $F(1, 49) = 112.35$, $p < .001$. Thus, participants responded significantly faster during congruent (M = 500.275 ms, SD = 11.92) versus incongruent (M = 579.81 ms, SD = 13.39) trials, as depicted in Figure 3. There was also a main effect of stimuli, $F(1, 49) = 11.010$, $p = .002$. Participants responded more quickly to finger stimuli (M = 532.72 ms, SD = 12.47) than to dot stimuli (M = 547.36 ms, SD = 12.3). There was no significant interaction between congruency and stimuli ($p = .220$), and no significant interaction between congruency and prime ($p = .994$). Thus, prime groups did not significantly differ on RT performance.

Accuracy.

Overall, mean accuracy within the experiment was high (M = 89%, SD = .014). As shown in Figure 4 we found a main effect of congruency that complemented the RT analysis, such that participants were more accurate on congruent than incongruent trials ($F(1, 49) = 54.402$, $p < .001$). In addition, there was a main effect of stimuli ($F(1, 49) = 4.821$, $p = .033$), where participants were more accurate for dot trials (M = 89%, SD = .016) than finger trials (M = 87%, SD = .014).

The congruency by stimuli interaction was also significant ($F(1, 49) = 8.374$, $p = .006$). A paired-samples t-test was conducted and it was found that participants did show a significant accuracy reduction between congruent and incongruent dot trials $t(51) = 5.202$, $p = .000$, as well as between congruent and incongruent finger trials $t(51) = 9.061$, $p < .001$. Moreover, there were no differences in performance on congruency trials across stimuli ($p = .059$), but incongruent finger trials showed significantly more errors than incongruent dot trials, $t(51) = 2.558$, $p = .014$.

However, there was no significant interaction between congruency and prime ($p = .354$). Prime groups did not differ in terms of their accuracy during the task.

Interference effect.

The data was then analyzed with specific regard to the interference effect (IE) using a 3 (prime: excluded, excluding, neutral) by 2 (stimuli: dot, finger) mixed model ANOVA, where prime was the between subjects factor. A repeated measures ANOVA showed no effect of stimulus type $F(1, 49) = 1.547$, $p = .220$. There was no interaction between stimulus type and prime, $F(2, 49) = .770$, $p = .469$. Thus, the IE for the prime groups did not significantly differ.

Manipulation check.

The manipulation check used to assess how effective participants' found their essay-writing experience to be, with possible scores ranging between highly ineffective to highly effective on a 1 to 7- point scale. On average, participants rated the essay as being fairly successful at returning them to their previous mental state (M = 4.88, SD = 1.29). This rating did not differ significantly across prime groups, $F(2, 49) = .243$, $p = .785$; thus, all groups agreed that writing about the situation did help them relive their experience.

Connectedness.

Each participant's connectedness scores were tallied and averaged, with possible scores ranging between a low of 6 and a high of 42 (on a 1 to 7- point scale). Participants' ratings of connectedness did not differ significantly across prime groups, $F(2, 49) = 1.743$, $p = .186$. All groups reported a moderate-to-strong sense of connectedness (M = 5.20, SD = .95).

Need to belong.

Participants also reported the strength of their need to belong, with possible scores ranging between strongly disagree to strongly agree on a 1 to 7-point scale. Participants' ratings of the strength of their need to belong did not differ significantly across prime groups, $F(2, 49) = .232$, $p = .794$. All groups reported a moderate-to-high need to belong (M = 4.80, SD = 1.60).

Because participants' ratings of connectedness and need to belong did not differ significantly across any of the prime groups, they were not subject to further analyses.

Discussion

The aim of Experiment 1 was to determine whether controlled imitation could be moderated by social exclusion; in other words, our research sought to discover whether the impacts of social exclusion would impact the degree of interference measured during the CIT. Results from this study suggest that controlled imitation is not influenced by recalled past experiences of rejection, regardless of whether an individual recalls being excluded or having excluded someone else. The prime essay was not associated with any significant shift in imitative behaviours for either of the experimental groups compared to the control group with respect to their RT performance, accuracy, or IE.

It is worthwhile to note that these findings were not due to a failure or weakness in the CIT design. As noted, there was a main effect of congruence, where participants were responding significantly faster to congruent stimuli. There was also a main effect of stimuli, where participants responded more quickly to finger stimuli than dot stimuli. Finally, there was no significant interaction between congruency and stimuli, meaning that changes in participants' reaction times between congruent and incongruent trials were similar for both dot and finger stimuli. This suggests that when performing the task, participants followed the instructions given by the researcher and treated the dot and finger movements concordantly. However, the main effect of stimuli suggests that participants were responding more quickly to the biological movement of the finger, implying that this effector was more relevant to their imitative behaviour than the movements of the dot stimuli. Their accuracy was also significantly reduced during finger trials, suggesting that the inhibition of finger stimuli may have been more difficult.

To the knowledge of the researchers, the connectedness and SIN-B scales have not yet been used in conjunction with controlled imitation research, thus it is difficult to compare our findings to previous literature as an indication of whether or not the measures were effective. While the lack of significant differences in the explicit post-imitation measures were not anticipated, they are not unreasonable given the lack of impact the prime had on CIT performance. In other words, we would not necessarily predict significant group differences on the explicit measures in the event that the prime was not significantly affecting the participants, as implied by our findings.

With this understanding, it is possible that the lack of prime effect on imitation was due to the relative ineffectiveness of the priming approach chosen. While imagined or recalled rejection was shown in previous research to be an effective manipulation (Baumeister et al., 2007), it may stand that in the context of controlled imitation, participants may have been more significantly influenced by a more salient form of exclusion such as an in-lab ball tossing game where the participants were either instructed to exclude another player or were subjected to exclusion during the game.

While formulating the research design in question it was fully acknowledged that the CIT is not the only stimulus-response paradigm designed to measure degrees of imitation; rather, the CIT paradigm was created to complement the automatic imitation task (AIT). Thus, a secondary design involving the AIT paradigm was required in order to fully investigate the possible impact of social exclusion on imitation.

Experiment 2: The effects of recalled exclusion on automatic imitation

Introduction

Experiments 1 and 2 were designed concurrently to formulate a more comprehensive analysis of the impact of social exclusion on imitative behaviours. Thus, Experiment 2 was identical to Experiment 1 in nature, with the exception that the AIT paradigm was used instead of the CIT paradigm. In designing these two experiments, it was anticipated that the results from Experiment 1 and Experiment 2 would complement one another insofar as their analyses showed opposite effects for imitative responses. In other words, the hypotheses in Experiment 2 were reversed from those expressed for Experiment 1.

Thus, it was hypothesized that the exclusion condition should: (1) threaten feelings of connectedness, (2) motivate participants to reconnect to others, and (3) result in an enhanced interference effect. In other words, their tendency to imitate the observed movement of the other should be enhanced, and their ability to perform the cued response in favour of the imitative response will be reduced.

In contrast, it was hypothesized that the excluding condition should: (1) threaten feelings of connectedness, (2) decrease participants' motivation to connect to others, and (3) result in a reduced interference effect. In other words, their tendency to imitate the observed movement should be inhibited, and they will readily prioritize and produce the cued response rather than the imitative response.

As predicted in Experiment 1, the neutral condition or control group should not show an impact of prime upon the interference effect. All predictions regarding the reported feelings of connectedness and the strength of need to belong are also identical to the Experiment 1 hypotheses.

Method

Participants.

In total, 62 participants (46 female, 16 male) between the ages of 17 and 36 (M = 18.78 years, SD = 2.5) participated in the study. Of these participants, 11 reported left hand dominance (51 right-handed). All participants were awarded partial course credit for their participation. Of this sample, 21 participants were assigned to the excluded condition, 20 participants were assigned to the excluding condition, and 21 participants were assigned to the neutral control group. All participants were required to provide written informed consent before participating. All research conducted was reviewed and approved by the Research Ethics Board (REB) of Wilfrid Laurier University.

Apparatus and stimuli.

The apparatus and stimuli used for Experiment 2 were similar in nature to Experiment 1 with the exception of the sequence of the experimental stimuli, as this experimental design used the AIT paradigm instead of the CIT paradigm. The first presentation (Picture 1) was of a ‘neutral’ hand (baseline, resting position). The second presentation (Picture 2) presented the number cue and the movement simultaneously (recall: congruent, incongruent or baseline lift of finger, index or middle). There was one Picture 1 image and eight Picture 2 images. On baseline trials, the hand stayed in the same position for the duration of the trial. On congruent and incongruent trials, the number cue appeared at the same time as the movement of either the index or middle finger. Each image was followed by the presentation of a blue ‘response’ image in order to provide additional time for the participants’ to respond. The spatial control ‘dot’ lifts were also included in these stimuli. Experimental presentations were once again equally divided across middle and index finger stimuli. Presentations of finger and dot stimuli were all pictorial .jpeg documents used from previous publication materials (Obhi & Hogeveen, 2013).

Design and procedure.

The design and procedure of Experiment 1 was identical to Experiment 2 with the exception of the paradigm differences between the AIT used for the second experiment and the CIT used in the first. They were exposed to the same number of practice trials (32), as well as the same number of experimental trials excluding practice (288).

The sequence of events within each trial was as follows: still image of the neutral hand (800-2400 ms), cue and movement hand (568 ms), and the final blue screen (1500 ms). Refer to Figure 5 for a depiction of the trial sequence.

The instructions for the AIT differ from those mentioned for the CIT paradigm. When the '1' cue appeared participants were instructed to perform an index finger lift. When the '2' cue appeared participants were instructed to perform a middle finger lift. When the hand onscreen performed a movement that did not match the cue presented (e.g. a '1' appeared but the hand performed a middle finger lift), participants were instructed to 'ignore' the observed movement and proceed with their own prepared response (i.e. to the cue of '1' or '2').

In line with Experiment 1, once all procedures were completed participants were asked whether they had any awareness of the intent of the measures or the overall purpose of the experiment. The total times and durations for each measure did not differ from Experiment 1, and the full study was approximately 45-60 minutes in length. All participants were then debriefed and informed of the hypothesis and purpose of the study.

Results

Data preprocessing.

Accuracy data: An exclusion criterion of 3 SD above or below the mean accuracy within each condition was used to compare participants to the overall sample. One participant did not meet these criteria (accuracy below 3 SD of the mean in at least one of the four experimental conditions) and was therefore excluded from further analysis.

Reaction time data: For all reaction time data, outliers 3 SD above or below the mean were removed within each experimental condition. Trials in which participants' responses were 3 SD above or below the mean per condition as well as trials without a recorded response were removed (1.48% of all trials). Outlier removal for each participant did not exceed 8% of experimental trials.

Dependent measures: As in Experiment 1, there were three dependent measures used in our analysis: reaction time (RT) data, accuracy or error rate, and interference (incongruent trial RTs – congruent trial RTs). The RT data and error rate were analyzed using mixed models ANOVA. A repeated measures ANOVA was run for the interference effects of both the finger and dot stimuli.

Dominant handedness: Since 11 participants indicated their left hand dominance in Experiment 1, a repeated measures ANOVA was run with these participants removed to ensure that no experimental findings were driven by a difference in handedness. Dominant handedness was also included as a between-subjects factor to evaluate any possible changes in performance. As anticipated, dominant handedness did not account for any main effects or interactions, and these individuals were therefore included in the final analyses.

Reaction time.

Our initial analysis was a 3 (prime: excluded, excluding, control) by 2 (stimuli: dot, finger) by 2 (congruency: congruent, incongruent) mixed model ANOVA, where prime was the between-subjects factor. As shown in Figure 6, the reaction time ANOVA revealed a main effect of congruence approaching significance ($F(1, 58) = 3.132$, $p = .082$). However, there was a significant interaction between congruency and stimuli ($F(1, 58) = 6.143$, $p = .016$). A paired samples t–test was conducted to explore this interaction and it was found that the congruency effect was significant specifically for finger stimuli, $t(60) = -2.571$, $p = .013$, where participants responded significantly faster during congruent (M = 535.09 ms, SD = 48.30) versus incongruent

(M = 543.88 ms, SD = 53.65) trials. There was also a main effect of stimuli, where participants responded more quickly to finger stimuli than dot stimuli (F(1, 58) = 18.971, p < .001).

However, there was no significant interaction between congruency and prime (p = .740). Prime groups did not differ in terms of their reaction times during the task.

Accuracy.

Overall, mean accuracy within the experiment was high (M = 93%, SD = .007). As shown in Figure 7 the ANOVA revealed a main effect of congruency, such that participants were more accurate on congruent than incongruent trials (F(1, 58) = 11.375, p = .001). In addition, there was a main effect of stimuli (F(1, 58)= 16.06, p < .001), where participants were more accurate for dot trials (M = 94%, SD = .007) than finger trials (M = 92%, SD = .008).

The congruency by stimuli interaction was also significant (F(1, 58)= 4.074, p = .048). A paired-samples t-test was conducted and it was found that participants did not show a significant accuracy shift between congruent dot trials and incongruent dot trials t(60) = .536, p = .594; rather, participants' accuracy was significantly reduced during incongruent finger trials compared to their performance during congruent finger trials t(60) = 3.703, p < .001.

However, there was no significant interaction between congruency and prime (p = .938). Prime groups accuracy rates did not differ during their performance of the task.

Interference effect.

A 3 (prime: excluded, excluding, neutral) by 2 (stimuli: dot, finger) mixed model ANOVA was run, where prime was the between subjects factor. The analysis found a significant effect of stimulus type F(1, 58) = 6.143, p = .016, where a significantly larger IE was found for finger stimuli (8.74 ms) than dot stimuli (-.93 ms). There was no interaction between stimulus type and prime, $F(2, 58) = 1.304$, $p = .279$. Thus, the IE for the prime groups did not significantly differ.

Manipulation check.

The manipulation check used to assess how effective participants' found their essay-writing experience to be, with possible scores ranging between highly ineffective to highly effective on a 1 to 7- point scale. On average, participants rated the essay as being fairly successful at returning them to their previous mental state (M = 4.96, SD = 1.26). This rating did not differ significantly across prime groups, $F(2, 58) = .775$, $p = .466$; thus, all groups agreed that writing about the situation did help them relive their experience.

Connectedness.

Each participant's connectedness scores were tallied and averaged, with possible scores ranging between strongly disagree to strongly agree on a 1 to 7-point scale. Participants' ratings of connectedness did not differ significantly across prime groups, $F(2, 58) = 1.046$, $p = .358$. All groups reported a moderate-to-strong sense of connectedness (M = 5.60, SD = .98).

Need to belong.

Participants also reported the strength of their need to belong, with possible scores ranging between strongly disagree to strongly agree on a 1 to 7-point scale. Participants' ratings of the strength of their need to belong did not differ significantly across prime groups, $F(2, 58) = 1.669$, $p = .197$. All groups reported a moderate-to-strong need to belong (M = 5.32, SD = 1.17).

Because participants' ratings of connectedness and their need to belong did not differ significantly across any of the prime groups, they were not subject to further analyses.

Discussion

The aim of Experiment 2 was to determine whether automatic imitation could be moderated by social exclusion. Our experiment investigated the impact of social exclusion upon the degree of interference measured during the AIT. Results from Experiment 2 mirrored Experiment 1, and therefore we conclude that it is possible that automatic imitation is not influenced by recalled past experiences of rejection. The prime essay did not appear to cause any significant shift in imitative behaviours for either of the experimental groups compared to the control group with respect to their RT performance, accuracy, or IE.

Although there was not a main effect of congruence, the approaching significance ($p = .08$) and the significant interaction between congruency and stimuli revealed that the congruency effect was specifically present for finger stimuli trials and not for dot trials. Thus, while the results could ideally be more conclusive, a congruency effect specific to the biological effector does indicate that automatic imitative behaviours were present during the task. There was also a main effect of stimuli, where participants responded more quickly to finger stimuli than dot stimuli. In discussion of the result of Experiment 1 it was suggested that this may reflect how relevant the biological movement of the finger was to their imitative behaviour in comparison to the static dot stimuli. Their accuracy was also significantly reduced during finger trials, suggesting that the inhibition of finger stimuli may have been more difficult.

As stated in Experiment 1, the lack of significance with regards to the explicit post-imitation measures is not unreasonable given the lack of impact the prime had on AIT performance. With no significant effect of prime, group differences on the explicit measures were not anticipated.

The findings of Experiment 2, in conjunction with Experiment 1, suggest that the prime measure chosen (i.e. reliving and writing about a past rejection experience) may not have been the most effective method when assessing the impact of exclusion on imitative behaviours like those measured within the AIT and CIT tasks.

General Discussion

Overview

Experiments 1 and 2 investigated whether recalling an experience of social exclusion could significantly impact the degree of controlled imitation and automatic imitation displayed in the CIT and AIT respectively. To determine the answer to these questions, participants engaged in an essay writing task where they recalled either a time of being excluded by others, a time where they excluded someone else, or recounted their activities from the previous day. They then reported the level of connectedness they felt having written about their previous experience. Once complete, participants performed the CIT (Experiment 1) or the AIT (Experiment 2), which was composed of trials with index finger and middle finger lifts either congruent to or incongruent to the action the participant was asked to produce. Finally, participants were also asked to re-read their essay and rate the strength of their need to belong having completed both the essay and the imitation task. The results from this thesis might suggest that social exclusion may not influence imitation. However, our prime measure (adapted from DeWall & Baumeister, 2006) did not appear to have any impact on participants' performance during either the CIT or AIT tasks. Individuals who wrote about a past experience of exclusion did not display enhanced or reduced levels of interference compared to neutral participants who wrote about a previous day's activities. Thus, the more likely conclusion from these experiments is that the prime approach did not significantly impact controlled or automatic imitation.

These studies were conducted with the understanding that previous research has shown that social exclusion can influence an individual's level of non-conscious mimicry in a social context (Lakin et al., 2008). Thus, it is already recognized that social exclusion can influence imitative behaviour. We therefore hypothesized that social exclusion may impact the degree to which an individual imitates the actions of another person in not only a social interaction, but additionally in a scenario stripped of its more dynamic components (e.g. with hand stimuli only vs. an interaction partner).

While our findings were not complementary to those reported by Lakin et al. (2008), there are several explanations for why were not able to discover any clear effect of exclusion on imitative processing. As mentioned, it is possible that social exclusion's impact on imitative behaviours is significant, but this effect may be specific to interactions between two or more individuals in a social setting. By this logic, when the imitative behaviour is removed from a social environment and imitation is restricted to an isolated component of an interaction partner (i.e. a single hand performing finger movements), social exclusion may no longer significantly modulate the degree of imitation that occurs. For example, our tendency to look at and follow the gaze of others has been shown to be significantly altered by the "potential for an actual social interaction" (Risko et al., 2012, p.8). Previous research has shown that when an object is placed in a hallway, we will gaze towards the object more if a passerby looks toward it. However, if we physically face the passerby while they look at the object (i.e. are in a position more conducive to an interaction), we are less likely to look at the object (Gallup et al., 2012). By this logic, when copying the movements of a hand in the CIT or responding to the numeric cues in the AIT participants may not have felt there was potential for an 'actual' social interaction. Thus, when attempting to discover whether an inherently social phenomenon such as exclusion may impact our degree of imitation, the participants' expectation of a social interaction may significantly determine the robustness of the effects shown.

Limitations

Since the prime measure of writing about a past experience of exclusion did not show any significant impact in Experiment 1 or Experiment 2, the essay measure chosen may not have been the most effective method for our design. This conclusion is supported by the acknowledgement that no significant differences were found between the prime groups with respect to their reported levels of connectedness, or the strength or weakness of their need to belong. We selected the recalled rejection manipulation as it has been noted that a recalled experience can be understood in a more meaningful way and therefore have a larger effect on the participant than a more arbitrary exclusion by another participant or confederate (Baumeister et al., 2007). However, multiple procedures have been devised, such as simulated rejection. In this procedure, the individual meets several other participants, is given time to become acquainted with their group members, and are asked to select two group members to work with in the future. They are then 'rejected' through random assignment by being informed that no other group members selected them as a partner (e.g., see Nezlek et al., 1997; Twenge et al., 2001).

Another popular alternative approach to manipulating rejection is the computerized Cyberball procedure (Williams et al., 2000) which developed out of an in-lab ball tossing procedure wherein two confederates silently tossed a ball back and forth after actively excluding the participant several tosses into the game (Williams & Sommer, 1997). The advantage of the Cyberball as well as the recalled previous experience method used in this experiment is that both adapt well to a single-participant testing setting. However, with respect to the potential benefit of a social interaction during the imitation task, it may have been equally beneficial for the prime measure to involve an interaction partner, whether by means of a confederate or a simulated partner as in the Cyberball method. In an attempt to isolate the effect of social exclusion on imitation, it is possible that a prime measure which forced the participant to believe they were partaking in some sort of social interaction may have proved to be a more effective manipulation for our research questions.

While the current findings did not discover significant differences in connectedness between prime groups, Lakin et al. (2008) noted differences in belongingness with regards whether a participant was excluded by an in-group or out-group: “it was only when participants were excluded by female players and interacted with a female confederate that belongingness correlated with mimicry… although all excluded participants experienced belongingness threat, the participants who felt that they belonged to the excluding group… were the [ones] who mimicked the behaviours of a confederate sharing that group membership” (p. 820). Thus, it may be possible that group identification also moderates the relationship between social exclusion and imitation. By this logic, it may be that participants did not feel a sense of shared group identity with the stimuli used (i.e. the isolated hand images) and therefore were not experiencing a significant enough threat to justify a shift in their imitative behaviour.

Another possible alternative explanation is that the images of the hand lacked ecological validity. Although automatic imitation has been well-researched and use of the AIT and CIT have been previously documented (e.g., Heyes, 2011; Obhi & Hogeveen, 2013), there is a general understanding that the field of social neuroscience relies heavily on these types of static representations of ‘socially relevant stimuli’ in lieu of live social interactions (Risko et al., 2012,

p. 1). However, previous research suggests that there may be qualitative differences in the way that virtual versus live stimuli are processed. For example, unless monkeys were trained to attend to the location of a video recording of goal-directed motor acts, video stimuli failed to elicit a strong response from mirror neurons compared to the viewing of naturalistic actions (Caggiano et al., 2011).

In human research (Järveläinen et al., 2001), differences have also been found between natural and artificially replicated movements, with videotaped movements less effective at activating the motor cortex compared to live action presentations. These findings suggest that the mirror neuron system (MNS) is capable of distinguishing between real and artificial acts; therefore, there may be a higher level of ecological validity in naturalistic movement, resulting from the visual properties of a live hand versus 2D movements (Järveläinen, 2001). Simply put, "the human brain's mirroring of others… can be altered by the medium in which the other appears" (Risko et al., 2012, p. 7). Results of our experiments support the notion that static versus live interactions may be non-equivalent and therefore conclusions drawn in the former may not always readily apply to the latter.

Future Directions

The effectiveness of certain priming procedures versus others should be further examined since the prime manipulation used did not elicit any changes in reported levels of connectedness, need to belong, or in their degree of interference on the imitation tasks. As suggested, a simulated rejection experience may be successful, although difficult to integrate into the single-participant nature of the CIT and AIT paradigms. Having considered the potential of a social interaction in significantly altering effect size, it is the belief of the researchers that the ball tossing procedure may be more effective for our experimental design. Theoretically, participants would be invited into the laboratory, where two confederates would be waiting. The participant would be asked to sit with the two confederates and wait for the study to begin. The two confederates, without speaking, would begin to toss a ball back and forth between all three, but shortly into the game would overlook the participant and play between themselves. After several minutes, the researcher would re-enter the room, excuse the confederates to their testing session in another room, and begin the procedures with the participant.

One potential flaw in our rationale was undertaking the assumption in most mimicry and imitation research that these phenomena share a similar psychological and neural process, which has not been directly confirmed. However, Heyes (2011) notes that there are preliminary findings showing both are similarly impacted by social exclusion. Because of the novel nature of this thesis and the questions considered within our research, the hypothesis that social exclusion may impact the degree to which an individual imitates the actions of another person in a basic task like the CIT or AIT should not be readily abandoned.

Though the possibility of these static stimuli paradigms is that they compromise the level of ecological validity compared to a naturalistic setting, the effects displayed by NCM research still support the prediction that automatic and controlled imitation may also be influenced by experiences of rejection and exclusion. Although the timeline of the experimental designs were chosen with specific concern for participants' ability to predict the purpose of the study, it is possible that the time which passed between writing about the rejection experience and the imitation task (i.e. time spent conducting the manipulation check and connectedness rating) may have created an explicit thinking period. In this sense it may be possible that the accessibility of the mental processes involved in the rejection experience were limited, thereby reducing the overall effectiveness of the prime.

If group identification impacts the exclusionary experience as suggested by Lakin et al. (2008), future research in this area would do well to consider the possible manipulation of hand stimuli based on group identity. For example, the researcher could prime the participant with an assigned group identity (e.g. purple), and see if shifts in automatic imitation occur when participants respond to movement trials with congruent group identity (i.e. purple fingers) versus incongruent group identity (i.e. green fingers). It may remain that the relationship between imitative behaviours and social exclusion is moderated by individual differences such as group identification, group status, and need to belong (Lakin et al., 2008).

As a means of methodological improvement, Risko et al. (2012) recommend that researchers use a range of stimuli that approximate a social interaction. As discussed, the MNS in humans appears to have a reduced response to video presentations of motion compared to live stimuli action. Gaze following studies have found that even basic differences in stimuli, such as images of schematic faces versus images of real faces, can result in quantitatively different brain activations (Risko et al., 2012). The differences in real versus 'reel' stimuli in social attention research are apparent, and their non-equivalence stresses the importance of a more comprehensive method of investigation. Risko et al. encourage researchers' efforts to begin at "the level of the phenomenon of interest (e.g., real social interaction) and… systematically move toward the more simplified and abstracted level (e.g., looking at schematic faces)" (2012, p. 8). This approach would allow for more complex consideration of the social brain.

Unfortunately, this kind of adjustment would likely compromise the effectiveness of the CIT and AIT paradigms through human error in the sense that it would require a live presentation of the finger movements compared to the randomized, on-screen presentations currently used. However, the value of the Risko et al. (2012) methodological approach could still be beneficial with respect to the prime measures selected for creating the participant's experience of rejection or exclusion. Systematically comparing the social phenomenon of rejection's impact, through a range of stimuli which approximate an exclusionary scenario (simulated rejection, face-to-face paradigms, Cyberball, recalled or imagined experiences) may more successfully map the relative influence of social exclusion on low-level behaviours such as automatic and controlled imitation. In part, this success may relate to creating the expectation by the participant that a social interaction will occur, enhancing the exclusionary experience and indirectly increasing its impact on their performance during the imitative task. Thus, variations in priming techniques may further elucidate the possible relationship between social exclusion and imitative behaviours.

Conclusion

Previous literature has shown that social exclusion can influence NCM. However, studies to date have not considered whether basic motor responses to observed movement like controlled and automatic imitation may be influenced by exclusion as well. Through the use of an exclusion prime where participants relived a past experience of rejection, the impact of social exclusion on performance during an imitation paradigm was assessed. The current thesis was not able to conclude whether a relationship exists between controlled imitation, automatic imitation and social exclusion.

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Figures

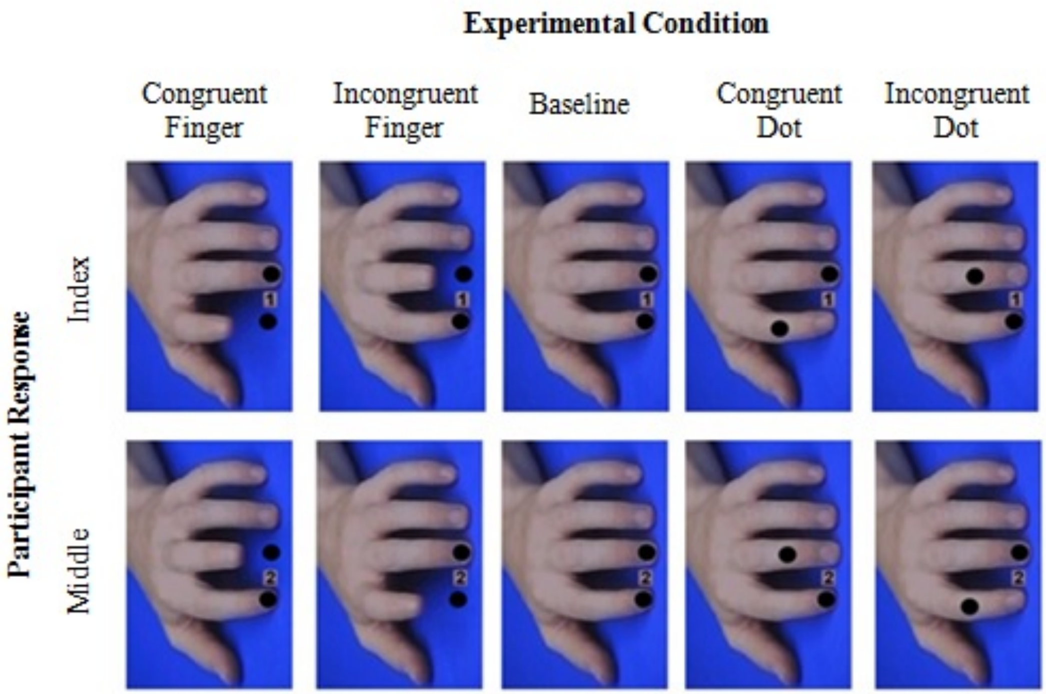

Figure 1 Types of trials in Experiment 1 and 2. Presentations were arranged so that the number of baseline trials was equal to the sum total of both the congruent and incongruent (i.e. experimental) trials. Experimental trials were equally divided across stimulus type (finger movements and dot movements) as well as participant response (index finger and middle finger).

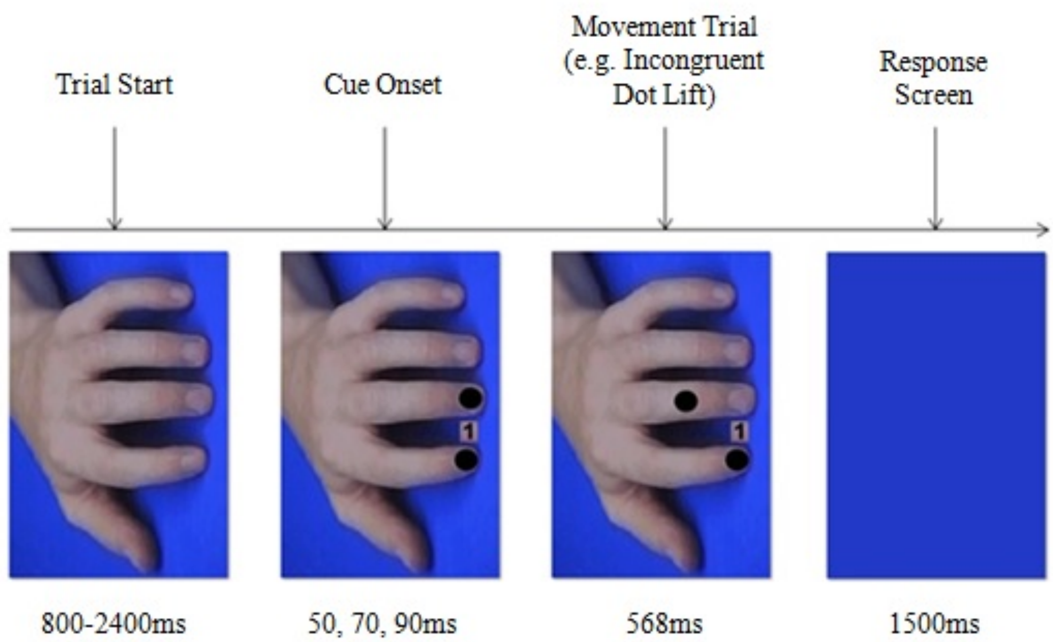

Figure 2 Trial sequence for CIT in Experiment 1. The provided depiction includes the example of an incongruent dot lift, where '1' indicates an anticipated index finger movement yet the dot performs a middle finger or '2' lift. The trial would start with a neutral hand presentation of 800-2400 ms, the cue onset would then occur for 50, 70 or 90 ms, the movement would occur for 568 ms, and would be followed by a blue 'response' screen for 1500 ms.

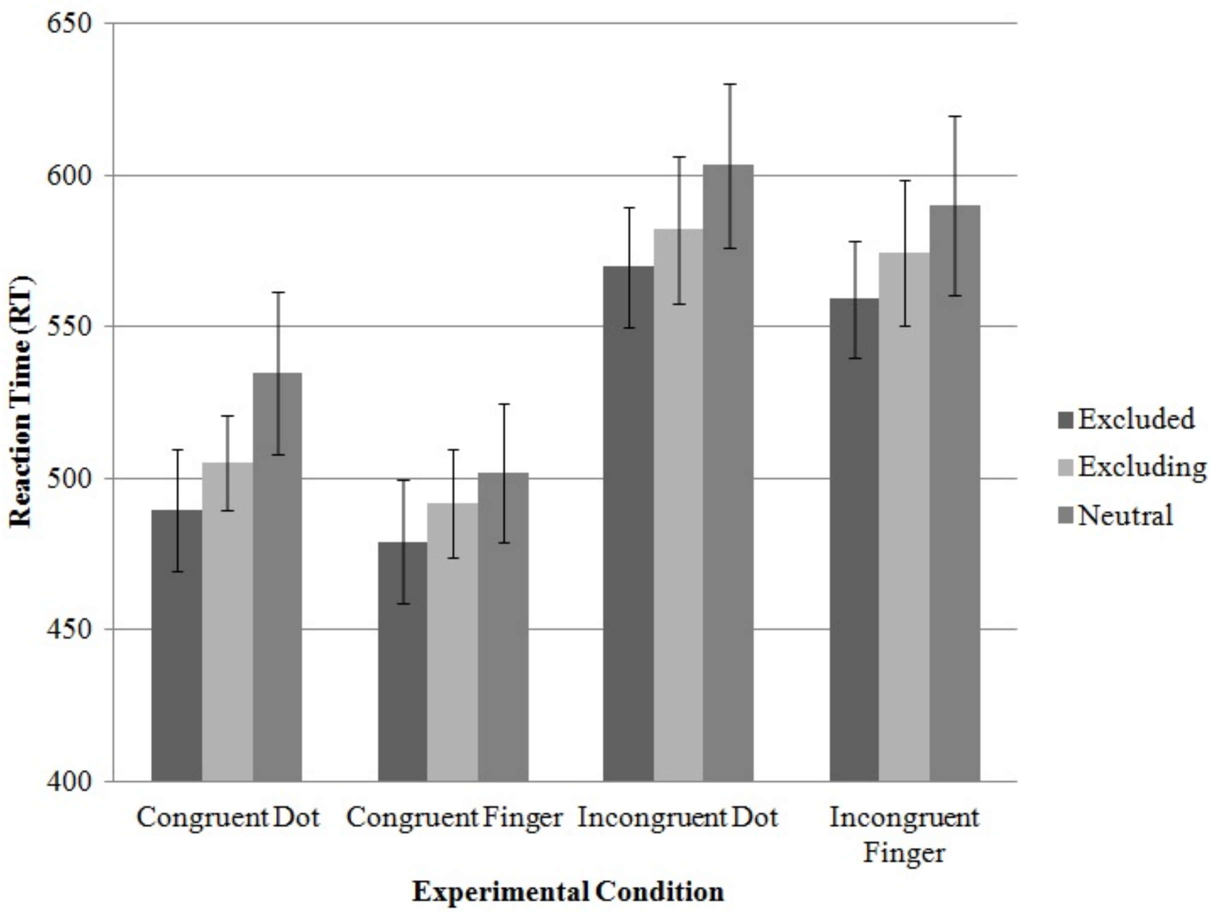

Figure 3 Reaction time data for CIT paradigm in Experiment 1. There was a significant main effect of congruence, as well as a main effect of stimuli. Participants responded more quickly to congruent stimuli, and responded more quickly to finger stimuli than dot stimuli. However, there was no significant interaction between congruency and prime (i.e. no differences between prime groups).

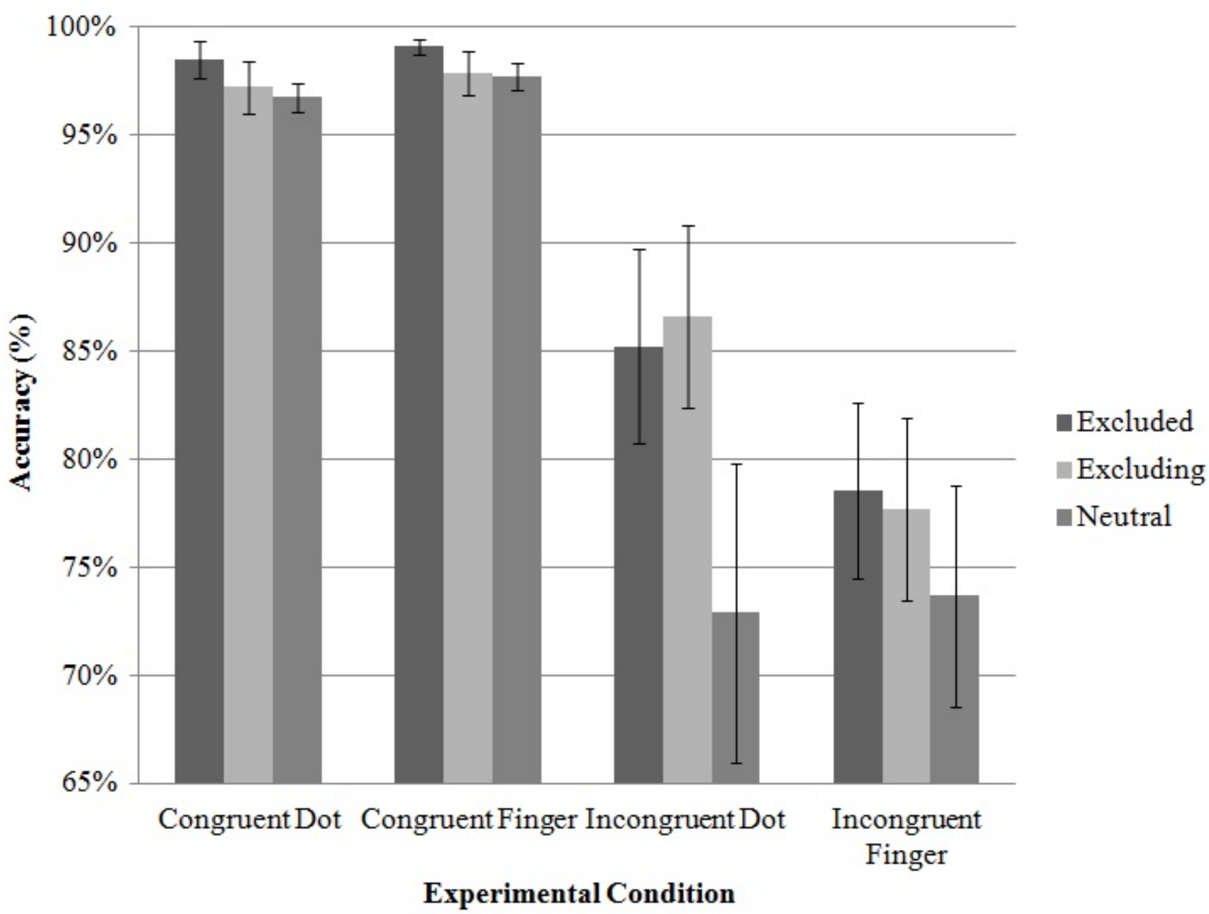

Figure 4 Accuracy data for CIT paradigm in Experiment 1. There was a main effect of congruency, with higher accuracy on congruent trials. There was a main effect of stimuli, such that participants were more accurate for dot stimuli than fingers. There was a significant congruency by stimuli interaction, and an additional paired-samples t-test found that incongruent finger trials showed significantly more errors than incongruent dot trials. However, no significant interaction between congruency and prime occurred (i.e. no differences between prime groups).

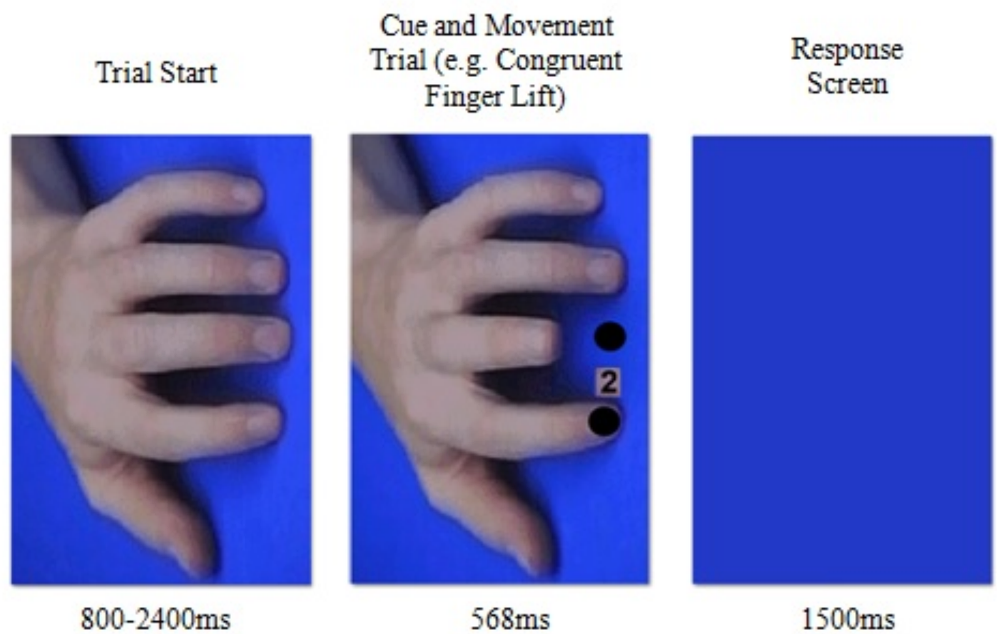

Figure 5 Trial sequence for AIT in Experiment 2. The provided depiction includes the example of a congruent finger lift, where ‘2’ indicates an anticipated middle finger movement and the finger performs a ‘2’ lift. The trial would start with a neutral hand presentation of 800-2400 ms, the cue and the movement would occur simultaneously for 568 ms, and would be followed by a blue ‘response’ screen for 1500 ms.

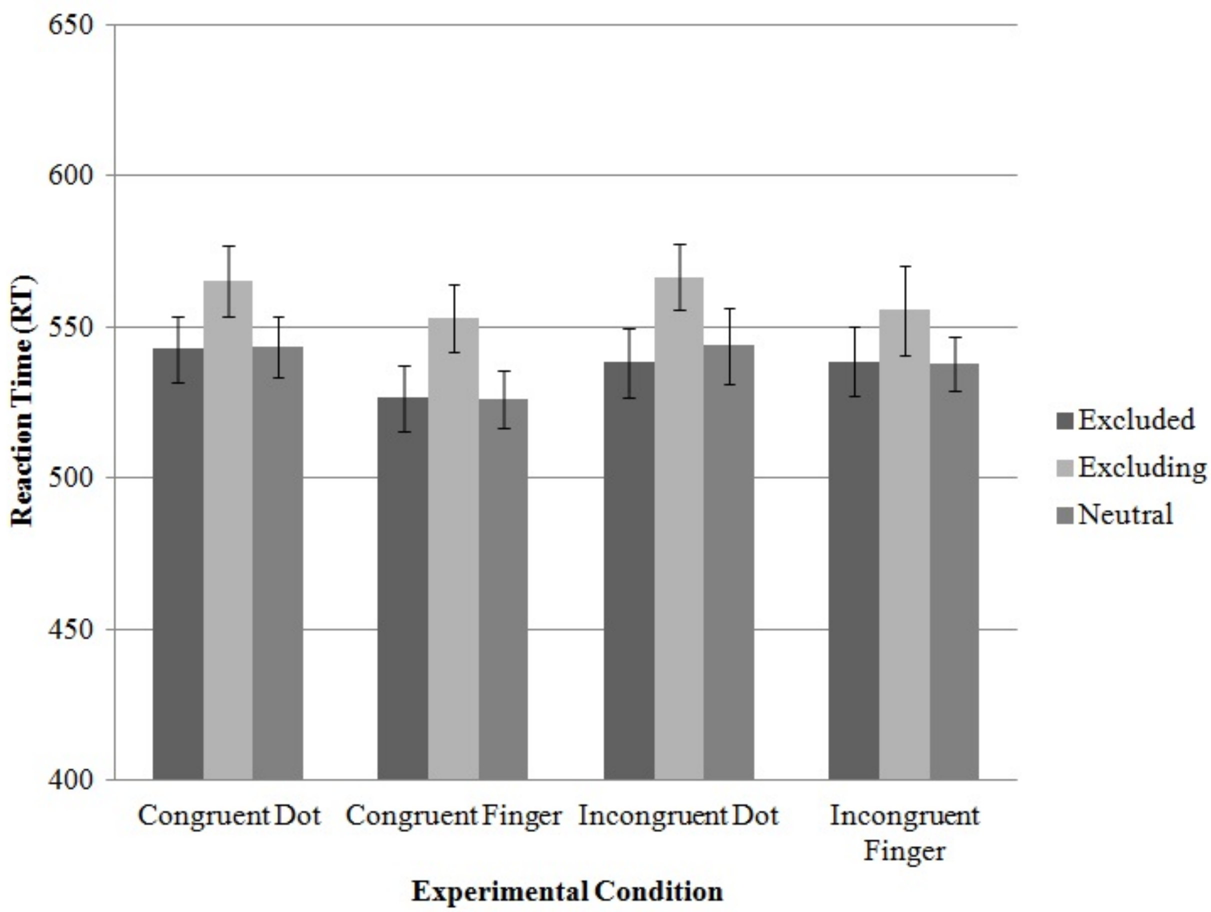

Figure 6 Reaction time data for AIT paradigm in Experiment 2. There was no main effect of congruency. Note however there was a main effect of congruence approaching significance (*p* = .08). Since there was a significant interaction between congruency and stimuli, a paired samples t–test was conducted and found that the congruency effect was significant, but specifically for finger stimuli. Thus, participants did respond significantly faster during congruent finger trials than incongruent finger trials. However, there was no interaction between congruency and prime. Prime groups RTs did not differ during their performance of the task.

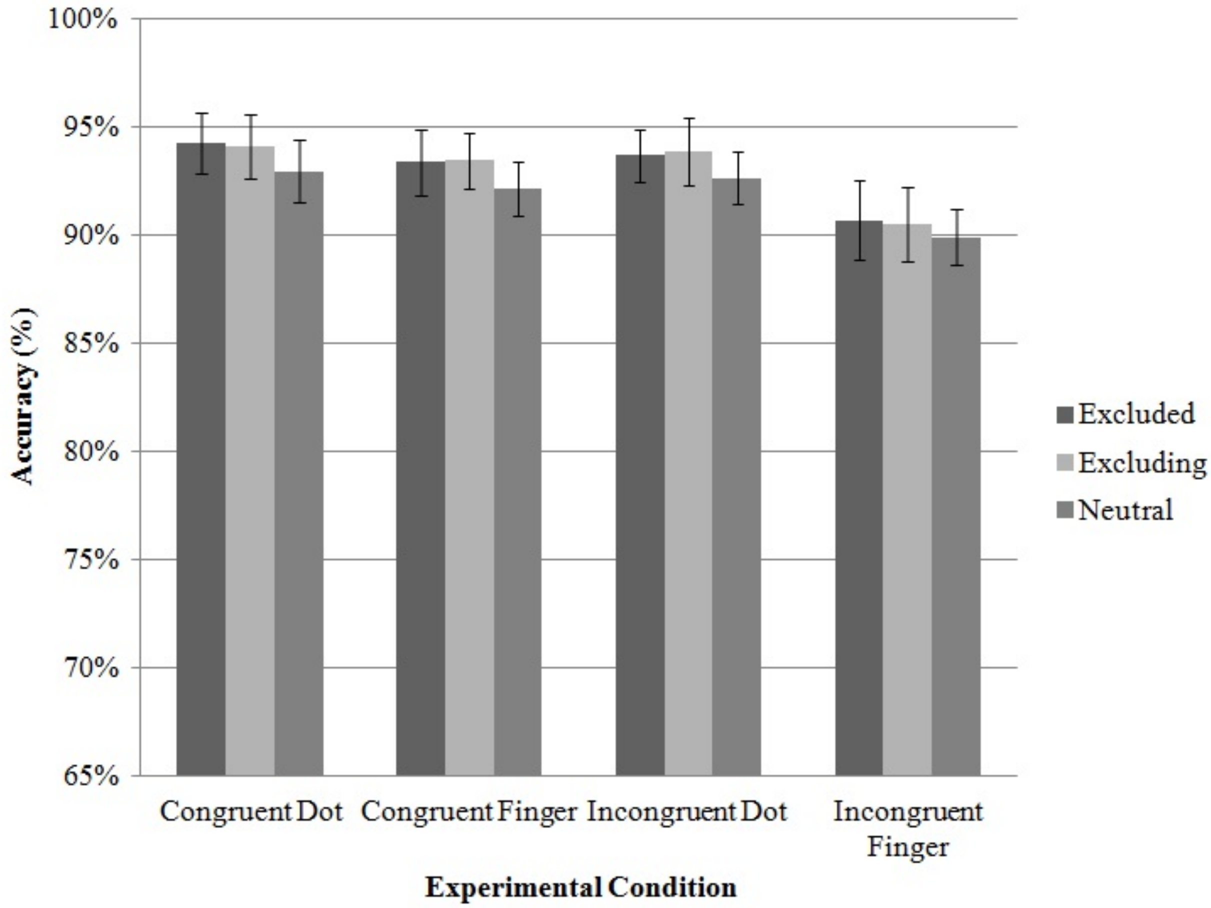

Figure 7 Accuracy data for AIT paradigm in Experiment 2. There was a main effect of congruency, with higher accuracy during congruent than incongruent trials. There was a main effect of stimuli, where participants were more accurate for dot trials. There was a significant congruency by stimuli interaction, where accuracy was significantly reduced during incongruent finger trials compared to congruent. However, there was no significant interaction between congruency and prime. Prime groups accuracy rates did not differ during their performance of the task.