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Michael H. Summers  
*Cleveland State University*

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PERSPECTIVE TAKING IN DYADIC INTERACTIONS: INFLUENCES OF  
COOPERATION AND COMPETITION ON THIRD PERSON REPRESENTATION  
OF MOVEMENT

MICHAEL H. SUMMERS

Bachelor of Science in Psychology

Baldwin Wallace College

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This Thesis has been approved  
for the Department of Psychology  
and the College of Graduate Studies by

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Thesis Chairperson, Andrew Slifkin

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Department/Date

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Ernest Park

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Department/Date

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Conor McLennan

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Department/Date

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**ABSTRACT**

Similar processes between a third person representation and a first person representation may be at work in understanding the limitations of another. These processes may lead to errors in estimating the abilities of another by anchoring those estimates to one's own abilities. A study designed to test how interactive conditions may mediate these processes. It was hypothesized that, due to an increase in interdependence, an individual would show a higher degree of difference between his or her own abilities and those of another when cooperating, compared to non-interactive conditions. It was also hypothesized that competition, due in part to a lack of diffusion of responsibility, would show significantly higher differences than those individuals cooperating. The study included a physical task designed to create conditions of cooperation, competition, and a non-interactive condition between two individuals. One individual in each condition was given weighted gloves to simulate a handicap. Following the interaction, participants estimated the amount of effort it would take for themselves and the amount of effort it would take for the other person to complete a number of simple actions that were designed to interact with the handicap by either being harder to complete, easier to complete, or no difference in effort to complete when wearing the handicap. Results

show significant differences in effort between oneself and the other only in relation to being artificially handicapped, with the handicapped individual seeing certain actions as more difficult for themselves while wearing the handicap while the non-handicapped individual sees the same actions as easier for themselves while not wearing the handicap. Also, a marginally significant interaction was observed between being artificially handicapped and interaction group with non-handicapped individuals seeing a greater degree of difference between themselves and the handicapped individual in the competitive interaction as opposed to the cooperative interaction. Results also showed many methodological problems in study design, including difficulty in creating the non-interactive condition and creating a list of actions that would be easier to complete with the handicap. Methodological issues are discussed.

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## CHAPTER I

### INTRODUCTION AND LITERATURE REVIEW

#### *1.1 Introduction*

To understand the behavior of others and effectively interact with them - to anticipate how they might react to something you say, for example - one must have insight into what they believe, think and feel and understand how these mental states relate to behavior (Mason & Macrae, 2008, p.219).

As the above quote demonstrates, the importance of being able to see a situation from another person's perspective cannot be underestimated in social situations. It is a vital component for adaptively navigating within a complex social world. Take the act of negotiation as an example: to create a successful negotiation for all parties involved, each party must be willing to understand what the other party desires, what their resources are, and what they may be willing to give up in order to achieve those desires. If any party within that negotiation cannot place himself or herself in the role of the other party, then the chances of mutual benefit decline. If we concentrate only on our own goals then the chances of any mutually beneficial compromise lessens.

While recognition of another's differing mental and/or emotional states is a complex feat of cognition in and of itself, we should also realize the importance of understanding the physical abilities and limitations of another person within social

interaction as well. As a species, humans are physical in nature as well as mental. Historically, interactions between two individuals often enough involve some degree of physicality, even if it just be talking face to face. With a long history in place that necessitated physicality in interaction, would it not make sense for some level of evolutionary importance to be placed on the ability to cognitively process the limitations of another's physical abilities? In essence it should also be important for us to know who we can rely on or how hard we will have to work when competing against another. Thus there may be a greater need to be able to mentally perceive the abilities and limitations of those other people we are cooperating with or competing against, more so than individuals we are not interacting with.

The current research was designed in an attempt to elucidate possible differences in the mental representation of another's physical abilities as a result of manipulation of the social interaction of the two individuals. Namely, it was hypothesized that by artificially creating conditions of cooperation and competition between two individuals, as well as a non-direct interaction condition between two individuals, differences in ability of one individual to mentally represent the physical abilities of a second individual would become evident. An artificial physical handicap was used to explore possible differences in cognitive representation of another person. The general hypothesis was examined: In an interaction between two people, when one has been physically handicapped, the degree of mental representation of the handicap when estimating the other's physical abilities will be influenced by the type of interaction the two individuals share. Specifically, significant differences were hypothesized to exist in handicap integration between conditions of cooperation, competition, and a non-interactive control

condition. The aforementioned significant differences were hypothesized to show that individuals operating under a competitive paradigm would rate basic movements related to the artificial handicap as either much harder if the handicap would hinder said movements or much easier if the handicap would, in fact, aid in said movements than those in a cooperative paradigm or a non-interactive paradigm. The cooperative paradigm was hypothesized to rate said movements as significantly harder or easier (again, depending on the interaction between the handicap and the movement) than the non-interactive condition

The following background information should make the reasoning behind the hypothesis clear. Starting with a definition of perspective taking, as well as a brief background on possible processes of perspective taking, we will examine how these processes may be influenced by social interaction. The discussion will include the possibilities of errors of representation of others, namely how it is possible to see another individual as similar to the self, as well as how it may be possible to overcome these errors through such interactions as direct cooperation and competition.

### *1.2 Perspective Taking*

To take the perspective of another, or to place oneself in the role of another, requires distinguishing between one's own - and another's - beliefs, values, intentions, and desires (Converse, Lin, Keysar, & Epley, 2008). One must be able to understand that the way one sees the world is not necessarily the way that another does. Even young children exhibit the ability to think about how another sees the world; research suggests that a sophisticated level of reasoning about the mental states of others is reached between the ages of three and five (Wellman & Gelman, 1993).

Before continuing, it may be helpful to review perspective taking. Overall, perspective taking itself can fall under the theory of mind which “refers to a person’s ability to understand another person’s mental states, such as beliefs, desires, and intentions; most broadly the term denotes the ability to take another’s perspective” (Hynes, Baird, & Grafton, 2006, p.374). One of the most recognizable facets about the definition of theory of mind is the ability to understand that what one knows may differ from what another knows (Converse et al., 2008); however, if we follow the broad definition of putting oneself in the perspective of another, physical ability logically comes into play as well.

Another concept regarding perspective taking is worth mentioning - secondary representation, which may involve mental simulation of another person’s perspective. Secondary representation concerns maintaining another’s perspective through mental images, even if our own perception of the situation is vastly different (Herold & Akhtar, 2008). By holding our own beliefs as to how the world works (as judged by the integration of our perceptions into a workable schema of the world) while simultaneously perceiving other viewpoints, we can come to understand the way in which another sees a situation (Herold & Akhtar, 2008). Perhaps the best example of secondary representation in regards to the current study may be a literal interpretation of “the blind man and the elephant” analogy often used in arguments of religion. If we, having full sight, come across an elephant we recognize it as an elephant. However if a blind man comes across an elephant, the spot where he comes into tactile contact with the beast may lead him to a different interpretation of what the beast is. For example, should he only grab and pull the poor creature’s trunk, he may interpret the beast as a very large and muscular snake. We

must use secondary representation of the blind man's senses to understand how such a mistake can be made. While there is no argument against the importance of understanding intention as well as other mental states, it is the actual representation of another's physical abilities that plays a crucial role in the current research.

How does perspective taking work within the physical realm? Take, for example, a study by Anquetil and Jeannerod (2007). In their study, when individuals were asked to either imagine grasping an object themselves (a first person perspective) or to imagine someone facing them grasping an object (a third person representation), very similar times to imagine the action were obtained in both conditions. Furthermore, when constraints were placed upon individuals, a difficult grasping condition in this example, the constraint, as evidenced by slower times in the imagined grasping of the object, applied equally to both the first person and the third person perspectives (Anquetil & Jeannerod, 2007). Anquetil and Jeannerod (2007) offer an explanation, stating that it is possible that "subjects in fact performed the same action from two perspectives, as if they had mentally rotated themselves so as to superimpose with the virtual subject facing them" (p. 127). According to this explanation, individuals in this study appeared to have used a first person perspective as a basis for creating a third person representation for completing the task.

When the above results are examined under Goldman's (1989) simulation theory, which Frith (2002) defines as: "the idea that we 'read' the mental states of others by imaging ourselves in their circumstances and discovering what this feels like" (p. 485)<sup>1</sup>, it

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<sup>1</sup> It should be noted that, in the same article, Frith (2002) actually proposes the opposite as true; to quote: "We start with a representation of the other person's mental state and, from that we predict what they will do" (p.485).



may be possible that participants, in essence, used themselves as the template for the abilities of the hypothetical “other” in this situation. While template might be an overstatement, the idea still occurs that, when thinking of another person in a physical sense, one whose abilities we are not able to judge, we may use our own abilities as the basis for estimating those of another person.

### *1.3 Similar processes for first person and third person representation*

Our survival in a social world is dependent, at least in part, upon our ability to separate our representations of ourselves from others (Decety & Sommerville, 2003). How does this representation of others occur? At the least, the Anquetil and Jeannerod (2007) study suggest that using another’s perspective to understand their actions may, in fact, be quite similar to representing the action as if we were to do it ourselves. Anquetil and Jeannerod (2007) are not the only ones to suggest such a similarity. Ames, Jenkins, Banaji, and Mitchell (2008) suggest that the same cognitive processes generally used for self-introspection are used when individuals attempt to take another’s perspective. Most pertinent to this study, however is that Vazire and Robins (2004), in discussing adaptive functions in argument for the development of self, argue that one uses the self as a way to predict, understand, and manipulate others, through the projection of our own conscious mental states onto others. Voland (2007) goes so far as to suggest that “one knows one’s self best and projects this knowledge onto others, to achieve a reliable understanding of others that is suitable for everyday purposes” (p. 447). While the Voland statement may go too far, there remains the suggestion that information about others utilizes the same cognitive processes as information about oneself.

Information processing theory, which is used to describe how information from constant environmental inputs flows into the processing system and eventually into memory outputs (Spink & Cole, 2007), may be of use in explanation. Spink and Cole (2007) suggest that stimuli that are not familiar to an individual would take a longer processing time as there would be little to match that information to that is already encoded within memory. It is possible that any novel information we receive may be attempted to be paired, at least initially, with self-referential information. For example, Rogers, Kuiper, and Kirker (1977) suggest that “when students encounter a list of characteristics of a psychopathological state (e.g., in an introductory psychology lecture), they tend to interpret (and attempt to remember) these by referring them to their own views of self” (p. 678). It may be that as the child grows, and gathers more knowledge about him or herself, he or she may be more able to relate to others through interpretation of his or her own previous actions and feelings, which may activate the self-schema when the child is watching another. Such can be seen in Davis, Conklin, Smith, and Luce’s (1996) suggestion that a common role-taking strategy of putting oneself in the situation of the other and asking “How would I feel? What would I think?” (p.722). Further evidence may be seen in the proposed cognitive-developmental model that states that a single conceptual system represents both our own and others goal-directed actions (Decety & Sommerville, 2004).

Evidence for the aforementioned cognitive model of single conceptual system for goal-directed actions of oneself and others (Decety & Sommerville, 2004) can be seen in neuroimaging showing activation in the same neural network during observation of the performance of others as well as self-generated actions (Anquetil & Jeannerod, 2007).

We can consider such activation part of the mirror neuron system, basic movement neurons that will show activity when observing activity or a specific behavior from another, even if one does not reproduce that action or behavior (Kosslyn & Moulton, 2009). The mirror neuron system not only represents the observed activity, but it also represents that activity as part of a goal-oriented behavior (Volland, 2007), in that it represents not only the action itself, but the end goal associated with the action (Decety & Stevens, 2009). According to neuroimaging studies, it appears that close to 90% of the same areas of the brain that are activated during an individual's actual physical motion are also activated during that same individual's visual imagining of the same motion (Kosslyn & Moulton, 2009).

If individuals take into account physical possibility and level of expertise, just as actual physical motion that is difficult and novel would take longer durations, so too would mental representations of the same physical motion show longer durations. Fitts' law, stated to be one of the most well-established theories in psychology (Grosjean, Shiffrar, & Knoblich, 2007), demonstrates the ratio of time to difficulty well. Fitts' Law states that the width of two targets and the distance between them directly relates to the time necessary to move between them as quickly and accurately as possible (Fitts, 1954). Therefore it would take a longer duration of time for an individual to accurately move his or her finger from one thin object to another when there is a fair distance between them, as compared to when the objects are thicker (thus easier to touch) or closer together. Decety and Jeannerod (1995) have demonstrated that Fitts' Law is followed for mental simulation of movement just as it is for the actual physical motion itself. For another example, Kosslyn and Moulton (2009) state that how an individual is directed to take

hold of an object has a direct effect on how long it takes for an individual to mentalize, or imagine, grasping that object. In fact, it has gone so far as to suggest that the time it takes to perform a physical movement is not significantly different from the time it takes to perform that same movement mentally (Beilock & Lyons, 2009).

If one is attempting to match novel social information regarding another's abilities, and if one is processing this information through self-referential processes, then, all things being equal, the level of difficulty one has doing a specific action should directly relate to the perceived level of difficulty another has doing that particular action. However, in most aspects of daily life, all things are seldom equal. One possible influence in the perceived difficulty of another completing a task may be the type of interaction the two individuals share.

#### *1.4 Interactions*

The crux of the current study relies on the theory that the way in which someone interacts with another person will mediate the reliance on self-information in utilizing self-information in judging the abilities of another person. The focus of this study will involve non-interactive conditions, cooperation, and competition.

##### *1.4.1 Non-Interactive Conditions*

In both developmental science and social psychology, it has been suggested that humans can, at times, view another as similar to oneself (Decety & Sommerville, 2004). While this error is not all-encompassing in all social situations, it is prevalent enough that an entire class of perspective taking errors have been identified where an individual substitutes his or her own perspective onto the other, and then fails to take into account discriminating information into their mental model (Mason & Macrae, 2008). These

kinds of errors can be seen in a study from Ramenzoni, Riley, Shockley, and Davis (2008). In the study, Ramenzoni et al. (2008), individuals were asked to estimate their own jumping ability by way of height reached, as well as the jumping ability of a confederate. After initial estimations, participants had weights placed around his or her ankles and were forced to walk for a period of time before returning to estimate jumping height again. Confederates received no weights, and thus were unencumbered. What was discovered was that the weights on the participant lowered their estimation of the confederate's jumping ability when the participant made their second estimation. In other words, participants in the Ramenzoni et al. (2008) experiment failed to take into account that the other individual had not been fitted with weights, and would not be encumbered in their jumping ability. It can be argued that they substituted their own perspective of that moment in place of the confederate's separate reality. Unfortunately, due to the natural tendency of an individual to want to see oneself, or the group one belongs to, as better than a competitor (see Turner, 1975 for a review), those different estimations may be a result of this tendency, and not a focus on heuristic use of oneself in the estimation of the other. Also there are other explanations beyond social comparison, including the degree to which the confederates in this study exhibited fatigue and boredom within their roles; unfortunately, without actual measures of such confounds reported in the article, we can only assume that such was accounted for. However, examining the mean estimates from the Ramenzoni et al. (2008) study, we do see that while estimations made by the weighted individuals for the confederate were lower compared to unweighted individuals, those estimations were still higher than weighted individual's jumping estimations for themselves. Their own hindrance appears to have been taken into account

and participants seemed to realize that they would be worse at jumping. While such a realization does not necessarily counteract this natural tendency to see oneself as better, it does highlight the possibility that heuristic use is in play and warrants investigation. As argued above, it is entirely possible that participants substituted their own perspective of that moment in place of the confederate's separate reality, relying on an "egocentric bias" (Decety & Sommerville, 2003, p.529) to form an opinion of the other's ability through judgments of their, the participant's, own abilities and processes.

This "egocentric bias" (Decety & Sommerville, 2003, p.529) is often seen in ambiguous information and ambiguous situations. Green and Sedikides (2001) show support for this bias with evidence that individuals are more likely to believe a character will act more in line with their own self-schema when information about the character is lacking.

In such evidence we can see how one may substitute one's own abilities when estimating the abilities of another, at least in what can be labeled a non-interactive condition. Only a small degree of interaction between the participant and the confederate existed in the Ramenzoni et al. (2008) study, which may have led to ambiguous, or, at the very least, vague information about the confederate. With such limited knowledge, a third-person representation may be difficult to create. If this theory holds we may often expect to see an individual substitute elements of his or her own perspective of themselves, or the situation for another person, when there is little to no interaction between the two.

There is, of course, another side to discuss. Just the fact that there is another person may be enough to modulate the degree of the engagement of the egocentric bias in

third-person representation. Take, for example, a study by Norton, Frost, and Ariely (2007). In this study, participants were shown a list of randomly selected traits, one at a time, which a supposed hypothetical individual possessed. When participants viewed the first trait shown as dissimilar to themselves, they were more likely to find fewer overall similarities with this hypothetical person (Norton, Frost, & Ariely, 2007). If a physical handicap, or lack thereof, is the first thing known about another individual, we can see how such a situation may challenge a heuristic reliance on an egocentric basis for third person representation. In other words, if the first thing we notice about a person is that he is in a wheelchair, we might not be so ready to use ourselves as a basis for the other's abilities when imagining or estimating what this person can physically do. Thus, even in a completely non-interactive condition, we would not expect a full substitution of one's own abilities in estimating another's (e.g. an individual believing "it takes me this much effort to do this, it must take him the same amount"), but perhaps an anchoring of the estimates of that other to oneself.

Complete non-interactive conditions are not the crux of social life. When interaction exists between two individuals, what difference can the type of interaction make in overcoming this possible egocentric bias in representing others? The answer may well depend on the type of interaction between the two individuals. While there are many degrees and types of interactions that could influence representation, in this study we will focus on cooperation and competition.

#### *1.4.2 Cooperation*

Cooperative interactions may be viewed as a function of group membership, in that individuals cooperating towards a single goal may be seen as individual members of

a group with a shared goal. As Toleman (1943) suggested “A common goal animating the group and giving it a feeling of mission will increase the readiness to identify” (p.143).

How does cooperation relate to perspective taking abilities? To understand, first we must briefly examine how the concept of the self works within groups.

Brewer (1991) suggests that the concept of self is not set, but can expand and contract as the situation demands. Therefore, in situations where one must see oneself as a member of a group, a more collective identity should overshadow the individual identity (Brewer, 1991). The activation of the collective self, then, should enhance the ability to access shared characteristics of oneself and the group (Brewer & Gardner, 1996). It is possible that a reliance on heuristics may lead to high degrees of attribution bias, where an individual may think “other members of the group are like me on this trait, then they should be like me on that trait as well.” It has been suggested that individuals may confuse his or her own traits, or set of traits, with those of close in-group members, or intimate relationships (Decety & Sommerville, 2003). It is possible the same thing may happen in loosely knit, ad hoc groups. These ad-hoc groups may often contain a similar level of ambiguity as seen in non-interactive conditions, especially where the participants have little knowledge, or little need of that knowledge, of each other outside the group confines. Thus, while the cognitive processes for confusing one’s traits for that of a group member’s may in fact be different between close-knit groups and ad-hoc groups, similar results may manifest themselves. It is quite possible that, due to the lack of information, an individual within such an ad-hoc group may be using a group prototype when there is not enough information on the group to create an accurate prototype. Hogg and Reid (2006) define prototype as “fuzzy sets, not checklists, of



attributes (e.g., attitudes and behaviors) that define one group and distinguish it from other groups. These category representations capture similarities among people within the same group and differences between groups” (p. 10). Hogg and Reid (2006) also state that following the “metacontrast principle” (p.10), prototypes function in a way to minimize intragroup differences compared to intergroup differences, meaning one would want to see the group one belongs to as more of a cohesive body to compare against an out-group. Without a wealth of information to rely on about the entire ad-hoc group, it is possible that one may believe oneself as representative of the group and attribute a larger degree of one’s traits to other group members than in a previously established group dynamic.

Mood may exacerbate this potential bias. Bodenhausen, Kramer, and Süsser, (1994) have shown that positive moods may increase stereotyping. It should also be noted that individuals have been shown to employ a theory of mind when in a positive state (Converse et al., 2008). If goal completion is relevant to some level of satisfaction, reaching that completion may result in positive moods and thus a larger chance of stereotyping. If there is no set group prototype to stereotype to, it is possible that individuals may default to their own traits and abilities and, to some degree, map those traits onto other group members. Thus, we can see how it is possible that cooperation may increase a likelihood of perception taking errors towards an egocentric base, especially if cooperation results in a positive mood. Of course there is also the opposite dynamic to consider, failure of goal completion may result in negative mood, and thus less chance of stereotyping. It is possible that, in a negative interaction, such as failure of

a goal, an individual may lay the blame for the dissatisfaction on the other person, thereby cognitively separating this other from himself or herself.

It is also possible that any shared characteristic of the members of a group may, by its very existence, create a dichotomy within an individual for representational purposes. Hamilton and Sherman (1996) suggest that, when processing information relevant to group members, individuals will more likely base appraisals of group characteristics on current information rather than make inferences about group attributes. Hogg and Reid (2006) continue in their review to state that group prototypes are dependant upon context and will change with situations and goals, thus if the situation changes (for example, if an ad-hoc group has reached its goal but still must remain together) characteristics of individual members of the group that were not apparent before may become more salient. Differences may become highlighted within the individual's frame of reference, where the individual may see a member of the group as "like me" in some aspects and "not like me" in other aspects. So, if there is a large difference in physical ability between individuals, such a difference may become more salient when compared to the shared characteristics of the group.

Another possible counteracting agent of egocentric bias in cooperative groups is group coordination. Achieving group goals involves group coordination, both in simple interdependence tasks (where behaviors can be mapped out before being put into action) and in more complex interdependence tasks (where behaviors are much more dependent upon the momentary situation, making plans of behavior more difficult to create beforehand) (Larson & Schaumann, 1993). It should be noted, however, that most real-world situations of group coordination fall somewhere between the proposed simple and

complex interdependence tasks (Larson & Schaumann, 1993). The more complex an interdependence task, the more an individual group member must pay attention to another group member's actions of the moment, so that the individual can adjust his or her own behavior to better complete the task at hand (Larson & Schaumann, 1993). In doing so individuals must be aware of other group member's abilities as related to goal completion, thus there may be more motivation to cognitively represent the other's abilities separately from oneself.

As we can see, cooperation may have different effects upon the how one perceives another person. When working cooperatively with another person, how one cognitively processes the abilities of that other person may be tempered towards ambiguity in more simple interdependence tasks, but, in more complex interdependence tasks, processing may be tempered towards less ambiguity. If, as Larson and Schaumann (1993) suggest, most tasks involving group coordination contain elements of both simple and complex tasks, we would expect to see an individual be less likely to rely on judgments about his or her own abilities when estimating the abilities of another as there should be less ambiguity about the other person in the cooperative action when compared to a non-interactive condition. After an initial interaction with an individual, we should see less of an anchoring effect and greater differences between estimations of one's own abilities and that of another as compared to the non-interactive situations.

#### *1.4.3 Competition*

The question "will these estimations of abilities be different between conditions of cooperation and competition?" should be asked. If we follow the social brain hypothesis, which states "the main selective pressure among primates lies on generating

social knowledge about one's cooperators and competitors and utilizing this knowledge for one's own production of strategic behavior..." (Volland, 2007, p.447), then it would seem beneficial to spare the resources to more accurately represent another and thus have a better ability to take the other's perspective equally in both cooperative and competitive interactions. However, it must be realized that competition is a different type of interaction than cooperation.

While it may be tempting to view cooperation and competition as different ends of a continuum, this is not the case. Many of the same processes are at play with both conditions of cooperation and competition. Both conditions can be expressed in terms of group membership in that an individual may see himself or herself in a group with the competitor. Both conditions can also be expressed in terms of motivation, which has been shown to increase accuracy in perception of others (Neuberg, 1999). For example, in a study asking half the participants to create an accurate impression of job applicants, thus motivating a more accurate impression formation, Neuberg (1999) found that participants formed less biased and more accurate impressions of the applicants, even when these participants were primed with negative information about the applicants before meeting them. Participants, through increased motivation, were less likely to rely on previous information or preset, established, values for their impressions (Neuberg, 1999) If we assume that one is motivated to reach a goal, and that the process of reaching the goal is either aided or hindered by others, one may be more motivated to accurately represent what that other can, or cannot, do.

Considering the above information, what must be asked is what makes competitive interactions different from cooperative interactions in the realm of perception

of abilities. Thinking in terms of direct dyadic interactions, while both individuals involved are reaching towards the same goal in both cooperative and the competitive interactions, in the competitive interaction alone individuals are looking to reach that goal quicker than the others. Now, while the above is a simplistic explanation, and it overshadows inherent drives within individuals that may lead to overt or subtle intra-group competition, it still remains that competition, as a whole, may create a new variable that is absent in the cooperative interaction that may increase motivation to further separate the representation of another from oneself.

In direct competitive arrangements, an individual may have no one else to assign blame but to him or herself for failing to reach the goal if he or she is acting alone. We may think of this in terms of the diffusion of responsibility theory, which states that group members are less likely to feel personal responsibility for negative outcomes than if that person were acting alone (Mynatt & Sherman, 1975). However, the fact that there may not be anyone else to diffuse the responsibility of failure to isn't to say that an individual will voluntarily assume the full brunt of the blame for failure. Self-serving bias, which is defined by Campbell and Sedikides (1999) as "the explanatory pattern that involves external attributions (e.g. task difficulty, luck, or uncooperative others) for outcomes that disfavor the self but internal attributions (e.g. one's own ability, effort, or determination) for outcomes that favor the self" (p. 23), will almost certainly be in play in the situation. It is merely more difficult for an individual to escape some portion of responsibility for failure in direct competitive interactions than if that individual were working as part of a group.

If we think in terms of sexual competition, out of the two representation errors, i.e., assuming potential mates will see one's sexual rivals are more or less desirable than oneself (Hill, 2007), underestimating rivals may be more devastating to achieving reproduction. However, in order to conserve resources, one would also not wish to overestimate the rival. With direct competitive interactions heaping more responsibility upon the individual, it may be that the individual will allow less heuristic use when representing a direct competitor. It may seem reasonable to extend Decety and Stevens's (2009) quote: "It is critical to know what we can physically accomplish in any given situation, be it flee, fight, eat, or hug" (p. 5) to a direct competitor. When there is any type of goal at stake, it could very well be just as critical to know what any competitor can accomplish in a given situation as well as knowledge of one's own self.

Under such a structure, an individual may be more motivated to produce an accurate representation of the rival. Does this motivation translate from competition for mates? If we examine sports psychology, we can see that competition produces other threats. For example, in a study examining self-efficacy in defeated tennis players, Lane, Jones, and Stevens (2002) showed a reduction in self-efficacy after the defeat, which can be viewed as a disruption of psychological homeostasis, or, as Burchfield (1979) defines it "the maintenance of the normal mood state of an individual at rest" (p. 662). The disruption of the previous psychological homeostasis does potentially fall under Flannery and Everly's (2000) definition of a crisis, though it may in fact be a minor crisis. Crisis or not, it remains that such an event has the possibility of knocking an individual out of a homeostatic state and creating stress (Burchfield, 1979). Thus, if an individual seeks to

avoid stress, he or she may have more motivation to accurately represent another person when that individual is in direct competition with the other.

It should also be noted that Macrae and Bodenhausen (2000) state that categorical stereotyping occurs more often when motivation is low. If Macrae and Bodenhausen's (2000) statement is true and if competition creates more motivation to accurately perceive a competitor then we would expect to see less possibility of stereotyping to one's own traits, at least when a group prototype is unavailable, even in positive outcomes.

If motivation is higher in the competitive groups, we would expect to see less reliance upon an egocentric bias in representing the abilities of another, at least for those abilities relevant to the competition. Due to a reliance solely upon oneself, and also the lack of the ability to diffuse blame should the outcome be unsatisfactory, motivation for a greater separation of one's estimates of one's own abilities and estimations of that of the competitor's may be created. A degree of separation may be a little more difficult to measure should the competitor be handicapped in some way. Recall the natural tendency of an individual to desire to see oneself, or the group one belongs to, as better than a competitor (see Turner, 1975 for a review); it may be expected that any differences seen in estimation of that other's ability would be due to that tendency, a heuristic in and of itself, and not a more detailed cognitive map of the competitor. Luckily, however, individuals should generally be more than an overarching caricature of a single trait. In a true competition, an individual must recognize that not all handicaps are complete handicaps – some may actually make certain tasks easier, such as being in a wheelchair may make one quicker if going down a moderate hill rather than walking. If a better map of another is created by an individual, then there should be less reliance on oneself for the

anchoring of estimations of that other's abilities. Thus, it could be expected that the individual would recognize the differences between himself/herself and the other and have to plan accordingly for any future actions with or against the other. In this way, the individual would be able to keep the positive evaluation of himself/herself. After an initial interaction with another individual, we should see less of an anchoring effect and greater differences between estimations of one's own abilities and that of another, even when compared to the cooperative interactions.

### *1.5 Hypotheses*

The preceding information leads to the following hypothesis:

In an interaction between two people, one of whom has been artificially handicapped with weighted gloves, the type of interaction they share will influence the degree of mental representation of the handicap. Representation of the handicap should be evident in estimations of the other person's physical abilities. In actions where having the handicap would show a negative impact, the non-handicapped individual should estimate the actions as easier for themselves to complete as compared to the handicapped individual. In actions where the handicap might actually have a positive impact, the non-handicapped individual should estimate the actions as harder for themselves to complete as compared to the handicapped individual. However, the degree of this difference should be significantly greater in situations that require a greater degree of interaction and motivation to represent the other. For example, in a non-interactive group individuals would be less motivated to accurately represent the other and thus rely more on an egocentric basis for the estimates of the other, producing an anchoring effect. Therefore, with regard to the non-handicapped individual, we would expect to see a competitive



condition showing significantly larger differences (with the estimates of the handicapped person's ability being much lower than one's self) than a cooperative condition and a non-interactive condition. A cooperative condition should show a significantly greater difference than a non-interactive condition. The non-interactive condition should show the least difference between estimates of one's abilities and estimates of the handicapped individual's abilities. The same trend of should be found for estimations of specific actions where the handicap may be an advantage, only with the non-handicapped individual seeing the actions as harder as compared to the handicapped individual. The same predicted style of results is expected when measuring estimates from individuals who have been handicapped, only in the opposite direction. In actions where having the handicap would show a negative impact, the handicapped individual should estimate the actions as harder for themselves to complete as compared to the non-handicapped individual; in actions where the handicap might have a positive impact the handicapped individual should estimate the actions as easier for themselves to complete as compared to the non-handicapped individual.

## CHAPTER II

### METHODS

#### *2.1 Participants*

A total of 54 participants (21 males and 33 females) were used in. Ages ranged from 18 to 58 (mean = 27.4, SD = 8.75). Fourteen participants were undergraduate students enrolled in an introductory psychology course at Cleveland State University who received credit towards a class requirement for their participation; the remainder of the participants was volunteers who received no compensation. Volunteers came from different educational levels (GED to Master's Degree), different occupations, and different backgrounds. However, no reliable detailed demographic data was recorded. Other than age, with the undergraduate students being younger (mean = 19.14, SD = 0.77) as compared to the volunteers (mean = 30.3, SD = 8.42), there were no differences in the patterns of data recorded from either group. Both groups of participants were collapsed into a single population.

Each individual experimental session required two participants. Due to difficulty in recruiting two naïve participants for a single session confederates were utilized in ten sessions.

Dyads were both mixed sex ( $n=16$ ) and same sex ( $n=16$ ).

As all equipment in this experiment was portable, multiple locations were used in data collection. Twenty participants were collected at Cleveland State University; all other participants were collected elsewhere. Locations for the rest of the data collected included multiple residential dwellings within central and north-eastern Ohio. All locations contained a table large enough for two individuals to complete the interaction task face-to-face and all locations were reasonably devoid of external stimuli.

## *2.2 Design*

### *2.2.1 Independent Variables*

#### *Handicapping*

In order to test the previously stated hypotheses, it was necessary for one of the two participants to be handicapped. In this case, handicapping was done artificially through the use of weighted gloves. Gloves weighed approximately four pounds each, and were created by duct-taping a two-pound dumbbell onto a two-pound weighted glove (see Figure 2). The weight allowed for a large enough degree of handicapping without fully compromising the necessary dexterity to complete the interaction task as described below. A small pilot test ( $n=5$ ) showed noticeable impact in performing the interaction task (i.e. slowing in the time of completion) at this four pound level. Due to the use of dumbbells, weights above four pounds were found to be too cumbersome and the task was found to be more difficult due to the space the dumbbells required, not solely weight

alone. The necessary space occupied by the heavier weights led to motion control problems beyond what was warranted for this study.

The use of such a handicap had the side effect of creating two distinct groups of participants – Handicapped and Non-Handicapped. Thus, Handicapping becomes the first independent variable in the analysis and a two-tier factor within the experimental design.

Fig 1: Handicapping Gloves



*Interaction-Condition Task*

Once a handicap had been created, to test the hypothesis an interaction-condition task is needed to create groups for competition, cooperation, as well as a similar non-interactive control group for the second independent variable and the three factor level of the experimental design. For this purpose, a cup stacking procedure was used.

Cup stacking in this procedure was defined as the act of a single participant, or two participants together, placing cups on top of each other in a predefined configuration using two hands. For this experiment, a specific configuration of three separate structures

was used. At the end of this configuration two pyramids each made of three cups and one final pyramid made of six cups were erected; this is called a 3-6-3 stacking configuration (Figure 2). The configuration described above was used in all three interaction groups.

Figure 2: 3-6-3 Cup Stacking Configuration



The cup stacking procedure was a between-participants manipulation, meaning that participants competed *or* participants cooperated *or* participants did not interact with each other. Task manipulation was used in the attempt to create three distinct groups of participants – Competitive participants, Cooperative participants, and Non-Interactive participants, the latter of which was to serve as a control group. The procedure was designed to allow for testing of handicap integration in perception of another by type of interaction shared.

In the non-interactive group, participants were placed at separate ends of a table. Each was given a set of cups to stack so that they could do the procedure at the same time. The procedure was explained to the participants as such: using the first of four trials

as a baseline time to measure against, participants were told to try to better his or her own time. It was explained that the other person's time and ability were not important to this part of the experiment. Participants were told they would receive feedback as to whether they did better or worse than their original time after completion. That feedback was provided at the end of the study.

In the competition group, participants were again placed at opposite ends of a table and each was given a set of cups to stack so that they could do the procedure at the same time. However, the procedure was explained to the participants under the guise of it being a competition. To create the illusion of fairness, the experimenter explained to the participants that it was not the quickest time that would win the competition, but the individual with the greatest percentage of improvement from his or her original time. Using the first of four trials as a baseline, the quickest of an individual's remaining three trials would be compared to this baseline to create a percentage of improvement. The percentage would be compared to the percentage of improvement of the other person as the form of competition. Such an action, in theory, had the object of "leveling the playing field" in each participant's mind so that the handicapped participant was not always set up to lose; this way, the handicapped participant could have the slowest best time, but still have the best percentage of improvement. Participants were informed that the actual percentages would be calculated while the experiment was finished, thus the winner would be declared at the end. The comparing of percentages rather than actual time was done to create ambiguity as to who had won throughout the rest of the experiment. It must be noted that this entire calculation of percentages and the declaration of an actual winner was just an experimental ruse to convince the participants to compete against each

other. It was the condition of competition, not the actual winner that was important to this experiment<sup>2</sup> and such was explained to participants during debriefing.

In the cooperation group, participants built the cup configuration as a team of two people. Participants stood side by side and each was allowed only to use one hand. The person on the right would only use their right hand while the person standing on the left would only use their left hand. For this study, such a configuration will be referred to as a “two-person-as-one model.” Participants were told they were competing against a preset best time and if they beat that time they would win the competition as a group. However, participants were not told what this best-time was<sup>3</sup>, retaining ambiguity as to whether or not they successfully completed the task. Again, the use of the preset time was an experimental ruse to convince the participants to cooperate with each other. It was the condition of cooperation, not whether the participants won, that was important to this experiment, as was explained to participants during debriefing.

It can be argued that all three iterations of the cup stacking procedure utilized some degree of competition. In the Non-Interactive Group, participants were competing against themselves; in the Cooperative Group participants were competing against a preset time; and there was direct competition between participants in the Competition group. However, the concern was how the participant viewed their relationship with the other participant (or confederate as the case may have been), and this constant overall use of some degree of competition somewhat stabilized conditions across groups.

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<sup>2</sup> However, if one is interested, the actual equation used to create percentage of improvement scores was (baseline time – quickest time of the three remaining trials)/baseline time.

<sup>3</sup> The experimenter feigned that he could not remember the time and he had it written down in the other room or in another notebook, and would retrieve it while the participants completed the other parts of the experiment.

Interaction Group becomes the second independent variable in the analysis, and a three-tier factor within the experimental design.

#### *Task Manipulation Check*

While it was believed that the experimental paradigm described above would be successful in the creation of a Non-Interactive, Cooperative, and a Competitive Group, a manipulation check was used, consisting of a brief survey of three Likert Scale statements for each participant to rate on a scale of 1 (strongly agree) to 4 (strongly disagree). The statements are as follows: *I felt I had to cooperate with the other person*; *I felt I had to compete against the other person*; *I felt no desire to cooperate with or compete against the other person*. In this way, it is possible for participants to rate how they viewed the interaction they shared; it was expected that should the interaction manipulation prove valid, significant differences would be seen between interaction groups. For example, it was expected that the Cooperation Group would provide a significantly higher rating (with “higher” meaning more agreement) to the statement *I felt I had to cooperate with the other person* than both the Competition Group and the Non-Interactive Group. The same was expected with each group with its corresponding statement. Survey responses would allow for a quick analysis, using a series of One-Way ANOVAs with interaction groups as the independent variable and responses as dependent variables, as to whether the groups were effectively created.

While it would be easier to analyze the manipulation’s effectiveness by having the participant choose only one of the above statements instead of having them do a Likert rating on all three, such a paradigm would work best if cooperation and competition were mutually exclusive. As argued in section 1.4.3, it is believed that they are not, and a more



complex check should create a better picture of any subtleties in the participant's view of the experimental task.

With Handicapping and Interaction Groups as independent variables, we create a 2(Handicap Group) X 3 (Interaction Group) experimental design.

### *2.2.2 Dependent Variables*

#### *Effort Inventory*

In order to show how one person perceives another's physical ability, and how it differentiates from the perception of their own abilities, and thus giving us a reasonable way of measuring mental integration of the aforementioned handicap, a measure was created specifically for this study – the Effort Inventory, a Likert-scored survey that was completed after the Interaction Group Manipulation. For this survey, each participant was asked to imagine a series of tasks, and then rate how much effort they would likely have to expend to complete the tasks, as well as how much effort the other participant in the study session would likely have to expend on the same task. Participants were asked to rate the individual tasks on a scale of 1 (little to no effort) to 5 (a lot of effort). By judging ratings for themselves, as well as ratings for the other person, the degree of integration of the handicap into schemas of the other should show in estimations of effort needed to complete simple tasks. This inventory consisted of nine simple tasks that were designed to interact with the handicap in three ways.

First, three tasks were designed to be relatively harder to complete with the weighted gloves, thus creating a “Harder with Weights” category of answers. This category consisted of the following tasks: *holding your hand above your head*, *eating with a spoon*, and *brushing your teeth*. It should be noticed that these items required

using one's hands to fight against gravity; as such, once weighted, more energy would be need to be expended to complete the task. It was expected that, should a Non-Handicapped individual be relying less on an egocentric bias in this estimation, they would rate the Handicapped individual higher in the continuum of effort (i.e., a higher number, such as 4 or 5), while they rated themselves much lower on the spectrum (i.e., a lower number, such as 1 or 2). If, however, this Non-Handicapped individual was relying more on judgments of the one's own abilities for the other the Handicapped individual should be seen as more similar to themselves in estimations of effort. If the arguments made in the first chapter are correct, we would expect to see a significantly larger difference between the Non-Handicapped individuals' estimations of his or her own abilities and the estimations of the Handicapped individual's estimations in the Competition Group as compared to the Cooperation Group, as well as significantly larger differences in the Cooperation Group as compared to the Non-Interactive Group. The inverse should be true for the Handicapped individuals' estimations (i.e., a higher rating for oneself and a lower one for the Non-Handicapped individual when not relying on use of heuristics).

Three tasks of the Effort Inventory were designed to be relatively easier to complete with the weighted gloves, thus creating an "Easier with Weights" category of answers. *Bending at the waist and reaching down for your toes, pulling a lever downwards, and flattening a Styrofoam cup against a table* comprised that category. All three of those items, upon examination, revolved around moving one's hands towards the pull of gravity; as such, once weighted, one's hands would be more inclined to fall and thus less energy should, in theory, be expended. With those items, it was expected that

should a Non-Handicapped individual be relying less on heuristic use in this estimation, they would rate the Handicapped individual lower in the spectrum of effort (i.e., a number such as 1 or 2), while they rated themselves much higher in the spectrum (i.e., a number such as 4 or 5). If, however, this Non-Handicapped individual was relying more on use of heuristics in their estimations of the Handicapped individual, these estimations should be closer to the estimations of oneself than not (i.e., both should be higher numbers). If the arguments made in the first chapter are correct, we would expect to see a significantly larger difference between the Non-Handicapped individuals' estimations of his own abilities and the estimations of the Handicapped individuals' estimations in the Competition Group as compared to the Cooperation Group, as well as significantly larger differences in the Cooperation Group as compared to the Non-Interactive Group. The inverse should be true for the Handicapped individuals' estimations (i.e., a lower rating for oneself and a higher one for the Non-Handicapped individual when not relying on use of heuristics).

Finally, the final category of Effort Inventory tasks was designed to show no difference in effort expenditure whether an individual was handicapped by the gloves or not. The three items that comprised this category were: *reciting the ABC's backwards*, *stomping your feet while sitting*, and *counting to 100 by 5s*. None of these three tasks actually involved the use of one's hands; as such, no difference in energy expended to complete these tasks should be attributable to the handicap used in this experiment. Similar numbers would be expected between the individuals, regardless as to whether they were Handicapped or Non-Handicapped, in all interaction groups. This category was

added as a check. If there are no outside influences other than the interaction group and the use of the artificial handicap, similar ratings should be evident.

All nine tasks were chosen by a small pilot test ( $n=10$ ), during which participants were given a list of fifteen tasks and asked to think about each task with regard to whether they would be harder to complete while wearing four-pound weighted gloves, easier to complete while wearing four-pound weighted gloves, or if the four-pound weighted gloves would make no difference on how easy or difficult the task would be. Only tasks that received unanimous agreement across all pilot participants were used in creating the Effort Inventory. All nine of the tasks were put in random order when drafting the Effort Inventory.

Participant ratings served multiple purposes in the analyses.

First, self-ratings were used as a manipulation check. Since the experiment involved use of both individuals who wore the gloves and those that did not, by examining the scores of effort from the handicapped individual, it was possible to see if the use of the gloves had an effect on the estimation of how much effort the tasks would need in the expected way. It was expected that the Harder with Weights category of items should show significantly higher scores from the Handicapped group while the Easier with Weights should show significantly higher scores from the Non-Handicapped group, while there should be no discernable difference between Handicap groups on the No Difference with Weights category.

Second, by examining the difference between the self-scores and the other-scores, we can see integration of the handicap, or lack thereof in perception of the other individual's abilities, where ability can be assumed by the amount of effort needed to

complete a task (such that less effort would assume greater ability). Minor data manipulation was needed. For all participants, a new score was created – a “Difference between scores on the self and scores from others on the effort inventory” score, or, more succinctly, a “Difference Score”. This “Difference Score” was created by subtracting the score for “the other person” from the score for “you”, creating a new score range of -4 to 4. In this new range, negative numbers reflected that the participant felt that the other person in the study would have had to put more effort into doing the action while positive numbers indicated that the participant felt that the other person would have had to put in less effort than himself/herself for the action. A score of zero indicated that the participant felt the amount of effort would have been the same between himself/herself and the other person. It is this Difference Score that became the dependent variable in the overall analysis of the hypothesis. By examining this difference, based on the interaction group an individual was in (Competition, Cooperation, or Non-Interaction), we should see significant differences. That is, there should be a significantly larger difference between estimations of oneself and the other in the Competition Group as compared to the Cooperation Group. There should also be a significantly larger difference between estimations of oneself and the other in the Cooperation Group as compared the Non-Interactive Group.

### *2.2.3 Demographics*

A brief demographic questionnaire was utilized, collecting data such as age, height, and weight. Data was to be utilized as a method for possible explanations in case outliers appeared in the data patterns, should such outliers appear.

### *2.3 Procedure*

Participants were randomly assigned to the Competition Group, the Cooperation Group, or the Non-Interactive Group by the experimenter before the experimental session. The random assignment of condition order was established before data collection began. Both participants arrived to the study session at the same time. Once both participants were present, they were asked to read through and sign consent forms. With consent garnered, one participant was fitted with the weighted gloves, effectively handicapping their arm movements. The experimental procedure was then explained to the participants, telling them that there were three parts to the study. It was explained to participants as such: first participants would need to do the cup stacking procedure; this procedure would then be followed by some paperwork involving a brief survey, demographics, and the Effort Inventory. The Effort Inventory outlined tasks that participants were told would be completed in the third part of the experiment and asked participants to rate, beforehand, how much effort they thought it would take to complete these tasks; finally the third part of the experiment was to be the actual completion of the tasks on the Effort Inventory. It was also explained that the weighted gloves would be used in the first and third part, emphasizing this fact in front of both participants.

After this explanation, participants were then asked to participate in the control, competition, or cooperation conditions involving cup stacking. In both cooperation and competition conditions, participants were told they would not know whether or not they won the task until the end of the experiment. Once this task was completed, Handicapped participants were told they could take the gloves off to rest while they filled out the paperwork, but they were reminded again, in front of the non-handicapped person, that

they would have to put the gloves back on to complete the tasks of the third section. Participants were then separated and asked to fill out the demographic questionnaire, the interaction manipulation check survey, and the effort inventory. Once completed, participants were brought together and debriefed that there was no actual third part to the study and they didn't actually have to do the tasks outlined on the effort inventory. Participants were then dismissed.

## *2.4 Data Analysis*

### *2.4.1 Manipulation Checks*

Before any hypothesis testing, it was necessary to double check the validity of all the methods and manipulations used in the experiment. This was especially important as many of the methods have been untested in previous literature and, while small pilot tests have shown evidence of validity, these methods have not been tested on a larger scale.

Checking the validity of the task group manipulation (Competition, Cooperation, and Non-Interactive) was accomplished by use of participant answers on the Task Manipulation Check Survey. Three One-Way ANOVAs were planned to compare the scores on each of the questions on the scores on each of the questions on the Task Manipulation Check Survey on the three different levels of Interaction Group. The hypothesis for this was that the Task Manipulation Check Survey scores were dependent on Interaction-Condition Group. It was expected, for example, that the Cooperation Group would provide a significantly higher rating (with higher meaning more agreement) to the statement *I felt I had to cooperate with the other person* than both the Competition Group and the Non-Interactive Group. The same was expected with each group and its corresponding statements (*I felt I had to compete against the other person* and *I felt no*

*desire to cooperate with or compete against the other person*). For this analysis, Interaction Group would be the independent between-participants variable and contain three levels (Cooperative Group, Competitive Group, and Non-Interactive Group). The Likert scale answers to each of the three questions on the Task Manipulation Check Survey would be the dependent variable for each separate ANOVA.

Checking that the handicap had the desired effect on the items of the Effort Inventory was also necessary. This was accomplished by use of the Self Scores on the Effort Inventory. To do this, a series of nine independent samples *t* tests was planned, using the hypothesis of the Self Scores on the Effort Inventory for each item as dependent on the Handicapping Group. What this meant was that whether an individual was fitted with the handicapping gloves or not would determine their estimates of their own ability to do the tasks on the Effort Inventory. It was expected that the Harder with Weights category of items should show significantly higher scores from the Handicapped group while the Easier with Weights should show significantly higher scores from the Non-Handicapped group. The differences seen in the *t*-tests should highlight individuals in the Handicapped group were seeing the Easier with Weights items as actually easier, the Harder with Weights items as harder, and the No difference with Weights items as actually showing no impact from the handicap. Since these tests involved only one's estimations of one's own abilities, Interaction grouping was not taken into account.

A more in-depth check of the Effort Inventory was planned after this initial check. A factor analysis was to be used to identify the similarity in the rates of variance between items in an effort to simplify data analysis. The idea behind the Effort Inventory is that items on it should be attributable to three different conditions ("No Difference with



Weights”, “Harder with Weights”, and “Easier with the Weights”), each condition taking three of the items. So, if all three items are “Harder with weights” and participants are seeing them as “Harder with weights” then we should see the responses varying in a similar pattern between those three items. This translates into the factor loading score, where items with similar variance show higher loadings on individual factors.

#### *2.4.2 Hypothesis Testing*

If all the manipulation checks returned with the expected results, the analysis used to for hypothesis testing design would be the 2 X 3 design mentioned in section 2.2, utilizing the Handicapping Group and the Interaction Group as independent variables. Handicapping Group would contain two levels – participants who have been handicapped and participants who have not been handicapped. Interaction Group would contain three levels – Cooperative Group, Competitive Group, and Non-Interactive Group. Both Handicapping Group and Interaction Group would be between-participants. The three categories of scores on the Effort Inventory (Easier, Harder, No difference with the weights) would be the dependent variable of the analysis. The MANOVA should reveal an interaction between the handicap and type of interaction.

Unfortunately, as the analyses show, manipulation checks did not return with the expected results. Due to the non-significance of the aforementioned manipulation checks, both the Non-Interactive Group and the Easier with Weights Category of items from the effort inventory had to be dropped from the analyses. With these subtractions, the experimental design used for analysis resulted in being a 2 X 2 design. Handicapping Group and Interaction Group were still used as independent variables. Handicapping Group still had the same two levels as listed in the previous paragraph. Interaction Group,

however, was cut down to two levels, analyzing data only upon the Cooperative Group and the Competitive Group. Both variables were still between-participants variables. Scores on the Effort Inventory were dependent variables with analysis only focusing on the two remaining categories – Harder with Weights and No Difference with Weights. A MANOVA was still utilized for the analysis.

## CHAPTER III

### RESULTS

#### *3.1 Participants*

##### *3.1.1 Demographics*

When relying on a convenience sample it is often difficult in creating equal groupings of sex and age across conditions. This was the case with the current experiment. Table I (below) shows a breakdown in demographics across groups.

Table I: Breakdown of Sex and Age by Interaction Group

	Non-Interactive			Cooperative			Competitive		
	sex	number	mean age	sex	number	mean age	sex	number	mean age
Non-Handicapped	male	1	19.00	male	3	37.00	male	3	27.67
	female	8	29.00	female	6	27.83	female	6	29.17
Handicapped	sex	number	mean age	sex	number	mean age	sex	number	mean age
	male	4	25.00	male	3	20.67	male	7	30.00
	female	5	27.00	female	6	23.83	female	2	21.50

##### *3.1.2 Confederates*

Due to the difficulty in locating two naïve participants for a single session, confederates were relied on for multiple trials. While regrettable this is sometimes unavoidable. In the current experiment, confederates were used a total number of ten

times. Confederates were situated so that they were used an equal number of times across handicapping groups. Table II (below) shows a breakdown into which conditions confederates were utilized.

Table II: Confederate Use

<b>Interaction Group</b>	<b>Handicapped Group</b>	<b>Number Used</b>
Non-Interactive	handicapped	3
	non-handicapped	3
Cooperative	handicapped	1
	non-handicapped	1
Competitive	handicapped	1
	non-handicapped	1

A series of independent samples *t*-tests, utilizing confederate usage as an independent variable and all recorded variables of interest as dependant variables, revealed no differences in the patterns of data between the sessions where confederates were used and sessions where no confederates were used was recorded. Those participants who interacted with a confederate were added into the general subject population.

### *3.1.3 Dyads*

Sixteen mixed sex dyads and sixteen same sex dyads were used. In an effort to continue random assignment of condition orders, these dyads were not counterbalanced across groups. Table III (below) shows a breakdown upon how many individuals were involved in mixed sex dyads across conditions.

Table III: Mixed-sex Dyad Use

Interaction Group	Dyad	Number or Participants
Non-Interactive	Mixed-Sex	8
	Same-Sex	10
Cooperative	Mixed-Sex	9
	Same-Sex	9
Competitive	Mixed-Sex	12
	Same-Sex	6

A large scale MANOVA was utilized with all variables of interest as dependant upon whether the dyad was mixed-sex or not. No main effect for mixed-sex dyad use witnessed (Pillai's Trace value of 0.73,  $F(27,16) = 1.58, p = 0.170$ ). All dyads were collapsed into a single population.

### 3.2 Manipulation Checks

Before testing the hypothesis, the validity of the data acquired was examined.

#### 3.2.1 Interaction-Task Manipulation

In order to check that the Interaction Task truly created separate groups (a Cooperation Group, a Competition Group, and a Non-Interactive Group), three one-way ANOVAs were used with the participant responses to the three category statements from the Task Manipulation Check Survey (i.e. *I felt I had to cooperate with the other person*, *I felt I had to compete against the other person*, and *I did not feel as if I had to cooperate with the other person or compete against the other person*) as dependent upon the interaction group (Non-interactive, Cooperative, Competitive) the participant was in. For clarity's sake, scores were reversed so that higher scores showed higher agreement with

the statement. Breakdown of the individual question results are shown in Table IV (below).

Table IV: Interaction Condition Statements Check ANOVA

	<i>F</i>	<i>p</i>	Partial Eta Squared
Cooperative Condition Statement	$F(2,51) = 17.35$	0.00	0.50
Competitive Condition Statement	$F(2,51) = 21.46$	0.00	0.64
Non-Interactive Condition Statement	$F(2,51) = 1.41$	0.163	0.07

Bonferroni Post-Hoc tests show the Cooperative Interaction Group to have answered significantly different from the Competitive Interaction Group and the Non-Interaction Group on the level they agreed with the statements “I felt I had to cooperate with the other person” and “I felt I had to compete against the other person” ( $p < 0.01$  on both statements) but not on the statement “I did not feel as if I had to cooperate with the other person or compete against the other person” ( $p = 1.00$  compared to Competition and  $p = 0.179$  compared to the Non-Interaction Group). The Competitive Interaction Group did not differ significantly from the Non-Interaction Group on any statements ( $p > 0.10$  on all statements). See Table V (page 41) for the means and standard deviations for all groups on all statements.

The significance differences between the Competitive Group and the Cooperative Group on their respected task questions indicate that the manipulations that defined both

the Cooperative and the Competitive Groups were successful. However, the Non-Interactive manipulation does not appear to have been successfully implemented in the experiment. Possible reasons for this will be discussed in the Discussion Section.

Since the Non-Interactive Group failed to materialize in the expected way, any analysis featuring that group cannot be interpreted in a way to either support or refute the hypothesis. As such, this group must be dropped from hypothesis testing.

Table V: Means and Standard Deviations for task manipulation check

<b>Task Manipulation Check</b>		
Non-Interactive Category		
Statement	Mean	Standard Deviation
Non-Interactive Group	2.28	0.96
Cooperative Group	1.72	0.96
Competitive Group	1.94	0.64
Cooperative Category		
Statement	Mean	Standard Deviation
Non-Interactive Group	2.11	1.02
Cooperative Group	3.72	0.46
Competitive Group	1.94	0.87
Competitive Category		
Statement	Mean	Standard Deviation
Non-Interactive Group	3.11	0.90
Cooperative Group	1.44	0.51
Competitive Group	3.5	0.62

### 3.2.2 Handicap Manipulation Check

In order to judge that the use of weighted gloves had the intended effect of making some physical tasks more difficult and some easier, a series of independent sample *t* tests was run on the Self-Score for the Effort Inventory. These responses became the dependent variable of this series of analyses. For this series of analyses, participants

were separated into two groups – Handicapped (i.e., those participants who wore the gloves) and Non-Handicapped (i.e., those participants who did not wear the weighted gloves). While averaging scores across the categories of items (i.e. “No Difference with Weights”, “Harder with Weights”, “Easier with Weights”) may lessen the amount of data worked with for this analysis, it was felt that since the Effort Inventory is an untested instrument, each item needed to be examined individually. Tables VI and VII list the pertinent results.

Table VI: Means and Standard Deviations for items on the Effort Inventory

	Non-Handicapped Group		Handicapped Group	
<b>"No Difference with Weights"</b>	Mean	Standard Deviation	Mean	Standard Deviation
Stomping your feet while sitting	1.52	0.89	1.41	0.69
Counting to 100 by 5s	1.89	1.25	1.41	0.89
Reciting the ABC's backwards	4.52	1.05	3.96	1.37
<b>"Harder with Weights"</b>	Mean	Standard Deviation	Mean	Standard Deviation
Holding your hands over your head	1.33	0.55	2.19	1.24
Eating with a spoon	1.33	0.73	2.04	1.32
Brushing your teeth	1.52	0.98	2.04	1.09
<b>"Easier with Weights"</b>	Mean	Standard Deviation	Mean	Standard Deviation
Bending at the waist and reaching down for your toes	2.22	1.16	2.33	1.39
Pulling a lever downwards	1.41	0.75	1.63	0.97
Flattening a Styrofoam cup against a table	1.89	0.98	1.56	0.85



Table VII: *t*-values and significance levels for Handicap check on the Effort Inventory

<b>"No Difference with Weights"</b>	<i>t</i>	<i>p</i>
Stomping your feet while sitting	$t(52) = 0.51$	0.612
Counting to 100 by 5s	$t(49.91) = 1.63^*$	0.11
Reciting the ABC's backwards	$t(48.70) = 1.67^*$	0.101
<b>"Harder with Weights"</b>	<i>t</i>	Significance Level
Holding your hands over your head	$t(35.98) = -3.26^*$	0.002
Eating with a spoon	$t(40.76) = -2.43^*$	0.02
Brushing your teeth	$t(52) = -1.84$	0.071
<b>"Easier with Weights"</b>	<i>T</i>	Significance Level
Bending at the waist and reaching down for your toes	$t(52) = -0.32$	0.75
Pulling a lever downwards	$t(52) = -0.95$	0.349
Flattening a Styrofoam cup against a table	$t(52) = 1.34$	0.186
*Corrections in df have been used where violations in Equality of Variances existed.		

In the No Difference with Weights category of items, no significant differences were found between the Handicapped and Non-Handicapped participants for all three items. This was expected.

In the Harder with Weights category of items, two of the three items showed significant differences: "Holding your hands over your head" ( $t(35.98) = -3.25$ ,  $p = 0.002$ ) and "Eating with a Spoon" ( $t(40.76) = -2.42$ ,  $p = 0.020$ ). The third item, "Brushing your teeth", showed a  $p$  value that neared but did not cross the threshold for significance

( $t(52) = -1.84, p = 0.07$ ). While only two of the three items showed actual significance, means reveal that participants in the Handicapped Group viewed all three items as more difficult (see Table VI above for actual means).

Contrary to expectations, the items labeled as “Easier with the Weights” showed no significant differences between the two groups for any of the three items. Refer to Table VI for actual means and standard deviations for both groups on all items; also see Table VII for all  $t$  values and  $p$  levels.

What those results show is that Handicapped participants did see themselves as having to expend more effort on the “Harder with Weights” items than the Non-Handicapped participants; however, the Handicapped participants did not see themselves as having to expend more effort on the “Harder with Weights” items as compared with the “No Difference with Weights” items. Both results were expected. The “Easier with Weights” category of tasks, however, showed no significant differences between groups, which was not expected based on pilot testing of the Effort Inventory. The lack of significant differences hints at problems either with the handicapping or with the Effort Inventory itself. If the participants that were handicapped did not see the “Easier with Weights” items as being less effortful than non-handicapped participants, any analysis based on this category of tasks becomes incredibly hard to interpret, if not impossible. Before making such judgments, however, a factor analysis was conducted.

### *3.2.3 Effort Inventory Check*

In light of the above issue apparent with the “Easier with Weights” category, a Principle Components Factor Analysis was run on the newly created variable of “Difference Score” (see Chapter 3.2.4 to see how this score was created) in order to

check if the validity of the Effort Inventory. The Kaiser-Meyer-Olkin measure of sampling adequacy was .0.66. Significance was seen in Bartlett's test of sphericity ( $\chi^2(36) = 261.37, p = .00$ ). Initial eigen values showed a three-factor solution for explaining a cumulative total for 74% of the variance. A four factor solution only explained an additional 10% of variance. Since the three factor solution was in line with the theory of three separate grouping of items in the Effort Inventory, this was chosen as the final solution. A Varimax rotation was utilized in this analysis in order to make interpretation as easy as possible.

Should the Effort Inventory be valid, each of the different grouping of items ("No Difference with Weights", "Harder with Weights", and "Easier with the Weights") would load highly into three separate factors, with each of the grouping factor's individual items showing similar variance with the other items in the grouping. This is not what happened.

The "Harder with Weights" items loaded highly into a single factor (rotated loadings of 0.91 for "Holding your hands over your head", 0.95 for "Eating with a spoon", and 0.95 for "Brushing your teeth") as expected, with no cross-loading. Also, two of the "No Difference with Weights" items ("Stomping your feet while sitting" and "Counting to 100 by 5s") created a single factor by themselves with no real cross loadings, which also bodes well for the idea behind this category and, at least, these two items' representation of the category.

Unfortunately, it is the "Easier with Weights" category where problems are readily apparent. While "Bending at the waist and reaching down for your toes" and "Pulling a lever downwards" both load onto the same factor, their loadings are much lower (0.59 and 0.67 respectively) than the previously mentioned items on their

respective factors. This may not be a problem in and of itself; however the fact that those items load onto the same factor as “Reciting the ABC’s backwards”, which has a much higher loading (0.809), is a problem. These loadings lead one to suspect that there is an unforeseen confound behind the variance of these items, a variable besides these items being supposedly “Easier with Weights”. Evidence of such a mystery variable is further seen in the fact that “Flattening a Styrofoam cup against a table” loaded similarly on all of the rotated factors (-0.50 for the first factor, 0.48 for the second factor, and 0.41 for the third factor).

All together, putting the items into three factors accounted for 73.996% of the variance observed. See Table VIII for factor loadings and percent of variance each individual factor accounted for.

These results show problems with the theory behind the creation and selection of items for the Effort Inventory, notably within the category of “Easier with Weights”. With the uncertainty in what may be influencing these results, it becomes necessary, for the sake of clarity of what results can be gathered, to drop all problem items (“Reciting the ABC’s backwards”, “Bending at the waist and reaching down for your toes”, “Pulling a lever downwards”, and “Flattening a Styrofoam cup against a table”) from hypothesis testing.

Table VIII: PCA Factor Loadings and Percentage of Variance\*  
 The larger factor loadings are shaded for each factor.

Effort Inventory Item	Factor 1	Factor 2	Factor 3
Stomping your feet while sitting	0.06	0.95	0.06
Counting to 100 by 5s	0.04	0.89	0.05
Reciting the ABC's backwards	-0.06	0.04	0.80
Holding your hands over your head	0.91	0.13	0.15
Eating with a spoon	0.95	-0.03	0.17
Brushing your teeth	0.95	0.00	-0.03
Bending at the waist and reaching down for your toes	0.03	0.309	0.59
Pulling a lever downwards	0.30	-0.10	0.67
Flattening a Styrofoam cup against a table	-0.50	0.49	0.40
Percentage of variance	33.05	22.59	18.35

\* Numbers listed are values after Varimax Rotation.

### 3.3 Hypothesis Testing

With the Factor Analysis failing to support the basic premise of the Effort Inventory for all variations of how the added weight would interact with the groupings of items, and with the apparent problems in creating a Non-Interaction Group, it becomes clear that the proposed hypothesis cannot be adequately tested with the current set of data. Those issues in the data would make any conclusions regarding the Non-Interactive Group and/or a full understanding of how the handicap would lessen effort on various actions highly suspect. While these issues of failure are important and may shed light on other, underlying processes (which will be examined in the Discussion Section), they

unfortunately come at the cost of the hypothesis as a whole. Utilizing only those manipulations that showed relative success, analyses must be made on only two categories of interaction, Cooperation and Competition, and with only two categories of items, “Harder with Weights” and “No Difference with Weights”.

### *3.3.1. Data Reduction.*

Rather than running a MANOVA on every individual item on the effort inventory, it seemed more prudent to sum those items that came out as expected in the previous factor analysis into their overall categories. Two composite scores were created, one score for those three items that would be “Harder with Weights” (“Holding your hands over your head”, “Eating with a spoon”, and “Brushing your teeth”) and one score for those two items that came out as expected in the “No Difference with Weights” (“Stomping your feet while sitting” and “Counting to 100 by 5s”).

### *3.3.2 Analysis*

The previous manipulation check already showed a significant difference on the “Harder with Weights” items, between those individuals who were handicapped and those who were not. A MANOVA was run on the composite scores “Harder with Weights” and the “No Difference with Weights” items respectively as dependent variables. Interaction Group membership (Competitive vs. Cooperative) and Handicapping Group (Handicapped vs. Non-Handicapped) became the independent variables. This allows for any interaction between the independent variables to be observed.

The MANOVA test revealed no significant interaction between Handicapping and Interaction Groups, with a Pillai’s Trace a value of 0.12 and an  $F(2,31)$  of 2.06,  $p=0.144$ ,

and a partial eta squared of 0.12. Analysis revealed no significant results for Interaction Condition with a Pillai's Trace a value of 0.11 and an  $F(2,31)$  of 1.93,  $p=0.162$ , and a partial eta squared of 0.11. Analysis did reveal a significant result for Handicapping, with Pillai's Trace revealing a value of 0.38 and an  $F(2,31)$  of 9.61,  $p=0.001$ , and a partial eta squared of 0.38; those who were handicapped showed a larger degree of difference between estimations of themselves and the other on the "Harder with Weights" category of items, with the handicapped individuals seeing the grouping of items as harder for themselves, as compared to the non-handicapped individuals. Individual ANOVA values are listed below in Tables IX and X for each category of Items ("Harder with Weights" and "No Difference with Weights"). See Tables X and XI for individual means and standard deviations for each of the Handicapping Groups (Handicapped and Non-Handicapped). Figures 3 and 4 plot the means.

It is of interest, however, that in the "Harder with Weights" Category summation, a near significant interaction existed between Handicapping and Interaction Condition (Table IX, above). The effect size lies within the moderate range; it is possible a larger sample size may reveal a truly significant interaction.

The analysis results do not support the hypothesis. The Interaction Condition does not appear to significantly affect the scores on the Effort Inventory. However, Handicapping does appear to have a significant effect on the Effort Inventory, with Handicapped individuals seeing the Harder with Weights items as necessitating a higher expenditure of effort on their, the Handicapped individual's, part.

Table IX: Harder with Weights MANOVA results

"Harder with Weights"	<i>F</i>	<i>P</i>	Partial Eta Squared
Handicapping x Condition	$F(1,32)= 3.84$	0.059	0.11
Interaction Condition	$F(1,32)= 2.57$	0.119	0.07
Handicapping	$F(1,32) = 19.84$	0.000	0.38

Table X: No Difference with Weights MANOVA results

"No Difference with Weights"	<i>F</i>	<i>P</i>	Partial Eta Squared
Handicapping x Condition	$F(1,32)= 0.20$	0.658	0.01
Interaction Condition	$F(1,32)= 1.80$	0.189	0.05
Handicapping	$F(1,32) = 0.20$	0.658	0.01

Table XI: Means and Standard Deviations of the Handicapped Group for the Cooperative and the Competitive Group.

Category	Cooperative Group		Competitive Group	
	Mean	Standard Deviation	Mean	Standard Deviation
"No Difference with Weights"	0.22	0.44	0	0.50
"Harder with Weights"	1.67	2.69	2	3.04

Table XII: Means and Standard Deviations of the Non-Handicapped Group for the Cooperative and the Competitive Group.

Category	Cooperative Group		Competitive Group	
	Mean	Standard Deviation	Mean	Standard Deviation
"No Difference with Weights"	0.11	0.33	0.00	0.00
"Harder with Weights"	-0.67	1.41	-4.00	3.61



### 3.3.3 Data Trends

While the statistical analyses do not support the hypothesis, trends shown in the graphs provide marginal support the hypothesis. While graphical data should be taken with a grain of salt, especially in a sample as small as this one, the current data does show non-significant support for the hypothesis. Figures 3 and 4 represent graphical interpretation of the means.

In the Handicapped Group (see Figure 2), the competitive group does see a larger degree of difference between themselves and the other person than compared to the cooperative group on the “Harder with Weights” score, even if it is not anywhere near the level seen in the Non-Handicapped Group. This is in line with the hypothesis. In the “No Difference with Weights” category score, for both the Handicapped and Non-Handicapped Groups (see Figure 2 and Figure 3), the Cooperative Group did see a larger difference between themselves and the other person than in the Competitive Group. While this was not specifically predicted, it is also in line with the hypothesis, where an individual would be more aware of the degrees to which a handicap would affect a person; in this category there should be no effect.

However, as previously mentioned, these are non-significant results, and while increasing the sample size would increase the chances that such small differences would be found to be significant, as it stands at the moment this is only conjecture. In fact, with the estimated effect sizes for Interaction Condition lying in the low to moderate range, it is doubtful that true significance would be found. With these results, it is reasonable to assume that explanations other than the proposed hypotheses could account for the results. This will be discussed in the Discussion Section. .

Figure 3:

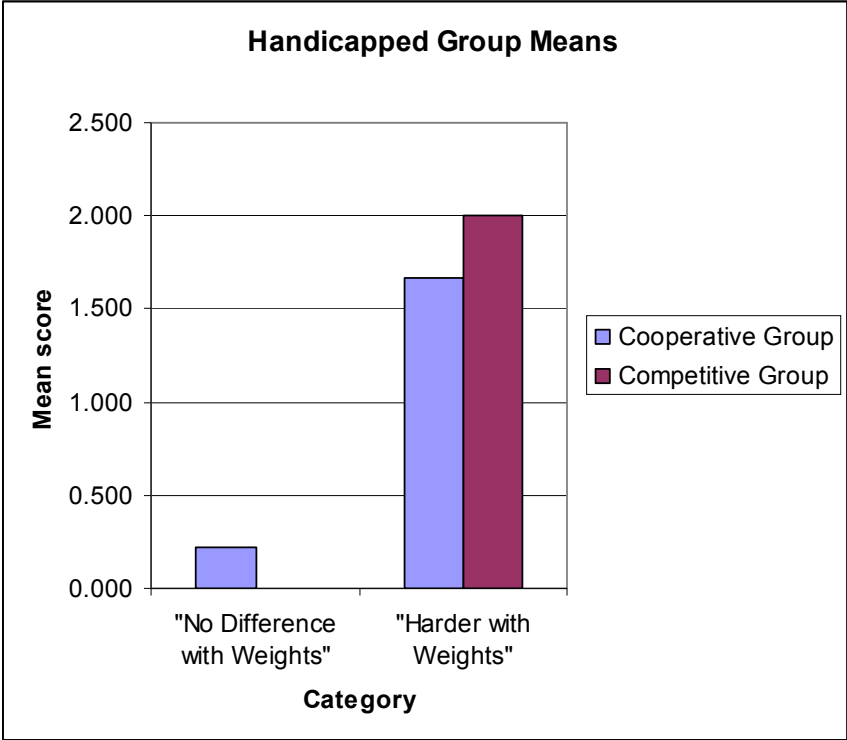
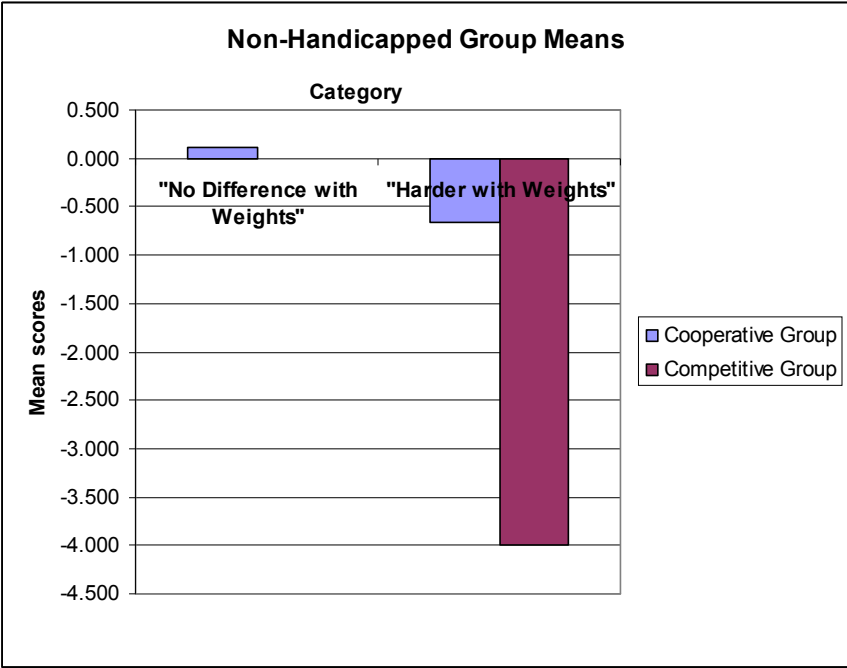


Figure 4:



### 3.4 Additional Findings

#### 3.4.1 Sex Differences

One ancillary finding of note in this experiment has been differences between sexes on answers to the Task Manipulation Check Survey Questions. Sex differences exist in the rate of reported Competition across two of the three Interaction Condition groups. A two-way MANOVA, with answers to the Task Manipulation Check Survey Questions as dependent on both Sex and Interaction Condition, found no interaction between Sex and Interaction Condition (Pillai's Trace:  $F(6,92) = 1.68$ ,  $p = 0.135$ , partial eta squared = 0.10), but did find main effects for both Interaction Condition (Pillai's Trace:  $F(6,92) = 18.43$ ,  $p = 0.00$ , partial eta squared = 0.40) and for Sex (Pillai's Trace:  $F(3,46) = 4.57$ ,  $p = 0.007$ , partial eta squared = 0.23). Since Interaction Condition has already been discussed at length above (see section 4.2.1 for those results), there is no need to reiterate the facts here. Individual ANOVA results for each Task Manipulation Check Survey Question are listed below in Table XIII. Table XIV represents means and standard deviations. Figure 5 provides plots the group means.

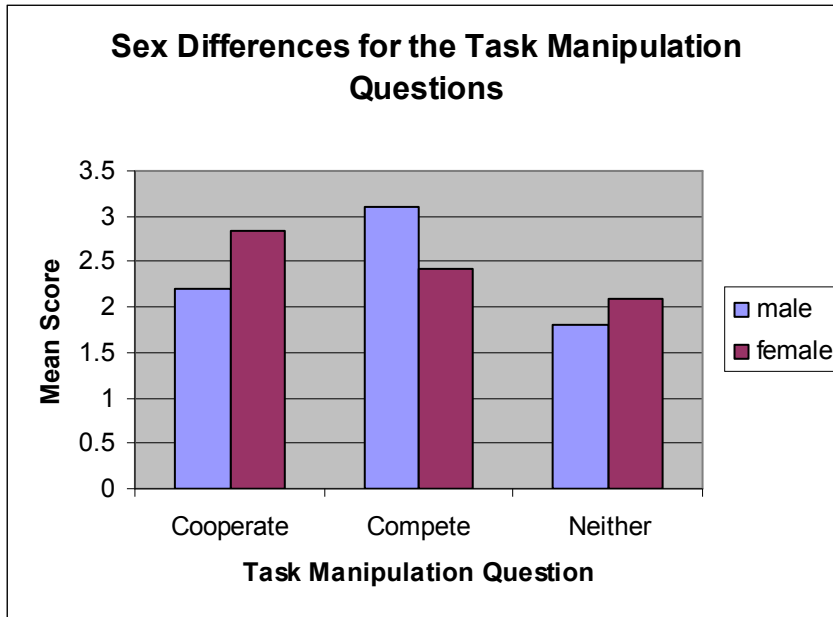
Table XIII: Interaction Condition Statements Check ANOVA for Sex Differences

Task Manipulation Check Survey Question	$F$	$p$	Partial Eta Squared
Cooperation Condition Statement	$F(2,48)=4.95$	0.031	0.09
Competition Condition Statement	$F(2,48)=7.03$	0.011	0.13
Non-Interactive Condition Statement	$F(2,48)=1.08$	0.324	0.02

Table XIV: Means, by Interaction Groups, for males and females to the Task Manipulation Check Survey Questions

			Question		
			Cooperate	Compete	Neither
Condition	Control	male	2.00	3.80	2.00
		female	2.15	2.85	2.38
	Cooperation	male	3.67	1.67	1.67
		female	3.75	1.33	1.75
	Competition	male	1.40	3.60	1.80
		female	2.63	3.38	2.13

Figure 5



The data in Figure 5 shows that males were significantly more likely to answer that they felt a stronger desire to compete against the other person than females, as well as a weaker desire to cooperate with the other person when compared to females.

### 3.4.2. Age Differences

Another ancillary finding relates to age differences. Due to the large range of ages of participants (18 to 58 years of age), it was brought to the attention of the experimenter that differences in responses on both the Task Manipulation Survey and the Effort Inventory may have been a function of age rather than perception or Interaction Condition. Analyses reveal that, with one exception, this is not the case.

A large scale MANOVA was run with the following variables as dependent upon age: all three Task Manipulation Check Questions, the “Harder with Weights” and “Easier with Weights” summation scores (those used in hypothesis testing above), and difference scores on all nine items of the Effort Inventory. To control for handicapping, absolute values were used. In order to clean and ease interpretation of the data, the experimenter tallied the number of participants falling into five age categories, where each category spanned a decade. The breakdown of participants by category is listed below in Table XV.

Table XV: Number of Participants in Age Group

Age Range	Number
19 years old or younger	11
20-29	25
30-39	13
40-49	3
50-59	2

MANOVA revealed no overall significance. (Pillai’s Trace = 1.03,  $F(48,164) = 1.19$ ,  $p = 0.214$ ). However individual 1-Way ANOVA results revealed significance on one item in the Effort Inventory: “Reciting the ABC’s Backwards” ( $F(4,49) = 3.71$ ,  $p = 0.10$ , partial eta squared = 0.23). Bonferroni Post Hoc tests reveals that those individuals

aged 50-59 showed higher absolute value differences than all other age groups. Given that “Reciting the ABC’s Backwards” should, in theory, not interact with the handicap, the means for actual differences were examined as well as the absolute differences. See Table XVI for the means.

While these data is interesting, and while the effect size for the resulting difference in “Reciting the ABC’s Backwards” is fairly high, we should be reminded of the non-significance of the overall MANOVA, and, more so, the large difference in the sizes of the populations. As there were only two participants aged 50 or over, even in a population of only 54 individuals, it can hardly be labeled representative to people aged 50 to 59 as a whole. In a larger sample size, those differences may disappear entirely. It should also be noted that both individuals over the age of 50 were paired with individuals much younger (ages 33 and 29 respectively). When faced with different age groups, it is difficult to speculate what, if any, differences would manifest based on only two data points.

Table XVI: Mean and Standard Deviations for Difference Scores for “Reciting the ABC’s Backwards”

Age Range	Mean Difference Scores*	Mean Difference Scores Standard Deviations	Mean Absolute Value Difference Scores	Mean Absolute Value Difference Scores Standard Deviations
19 years old or younger	-0.18	0.41	0.18	0.41
20-29	0.32	0.85	0.56	0.71
30-39	0.38	1.19	0.85	0.90
40-49	0.00	0.00	0.00	0.00
50-59	2.00	1.41	2.00	1.41

\*Positive values correspond to the participant believing that the other person in the study would need to expend less effort to complete the task; negative values correspond to believing that the other person in the study would need to expend more effort to complete the task

## CHAPTER IV

### DISCUSSION

#### *4.1 Interpretation of Results*

##### *4.1.1 Evaluation of Hypotheses*

The preceding experiment was used to test the following hypotheses: In an interaction between two people, one of whom has been artificially handicapped with weighted gloves, the type of interaction they share will influence the degree of mental representation of the handicap. Representation of the handicap should be evident in estimations of the other person's physical abilities. In actions where having the handicap would show a negative impact, the non-handicapped individual should estimate the actions as easier for themselves to complete as compared to the handicapped individual. In actions where the handicap might actually have a positive impact, the non-handicapped individual should estimate the actions as harder for themselves to complete as compared to the handicapped individual. However, the degree of this difference should be significantly greater in situations that require a greater degree of interaction and motivation to represent the other. For example, in a non-interactive group individuals

would be less motivated to accurately represent the other and thus rely more on an egocentric basis for the estimates of the other, producing an anchoring effect. Therefore, with regard to the non-handicapped individual, we would expect to see a competitive condition showing significantly larger differences (with the estimates of the handicapped person's ability being much lower than one's self) than a cooperative condition and a non-interactive condition. A cooperative condition should show a significantly greater difference than a non-interactive condition. The non-interactive condition should show the least difference between estimates of one's abilities and estimates of the handicapped individual's abilities. The same trend of should be found for estimations of specific actions where the handicap may be an advantage, only with the non-handicapped individual seeing the actions as harder as compared to the handicapped individual. The same predicted style of results is expected when measuring estimates from individuals who have been handicapped, only in the opposite direction. In actions where having the handicap would show a negative impact, the handicapped individual should estimate the actions as harder for themselves to complete as compared to the non-handicapped individual; in actions where the handicap might have a positive impact the handicapped individual should estimate the actions as easier for themselves to complete as compared to the non-handicapped individual.

The hypotheses were marginally supported by the data. Data trends did show differences in the scores between the Cooperative Group and the Competitive Group in the Handicapped Group for the "Harder with Weights" category and in both the Handicapped and Non-Handicapped Group for the "No Difference with Weights" category, and these differences were in the direction predicted by the hypothesis. The



analysis did not support the hypothesis. The Interaction Condition did not appear to significantly affect the scores on the Effort Inventory. Handicapping, as was expected, did show significant differences between handicapping groups on the “Harder with Weights” category of items, with handicapped individuals seeing the item in that category as harder for themselves, as compared to the non-handicapped individuals.

Unfortunately, without a reliable category of items that are “Easier with Weights” to judge from, nor a valid “Non-Interactive Group” to add into analysis, there are no firm conclusions that can be made about the hypotheses. There are multiple possible methodological explanations as to why we obtained the current set of results. Before these methodological explanations, however, there are other results that need to be recognized

#### *4.1.2 Evaluation of Interaction of Handicap and Interaction Group*

There was a near significant interaction between Handicapping and Interaction Group on the “Harder with Weights” category ( $p = .059$ , partial eta squared at 0.107), with the non-handicapped participants seeing a much larger degree of difference between themselves and the handicapped individual in the “Harder with Weights” category of items. With the moderate effect size, it is possible that, with an increased sample size, the interaction may have reached significance.

This interaction may be a result of social comparison and the natural tendency of an individual to see want to see oneself or the group one belongs to as better than a competitor (see Turner, 1975 for a full review). If, as the current hypothesis suggested, individuals paid more attention to the other individual in the competitive arrangement, and thus would have a better understanding as to how a handicap would affect other

actions, we should have seen equal significance in both the Handicapped and Non-Handicapped group, which were not witnessed. Within the Handicapped group mean scores were only within a 0.5 unit difference, as compared to the nearly 3.5 unit difference in the Non-Handicapped group (see means in Tables 11 and 12). The ratios are far from equal. In this case it is possible that the reality of the artificial handicap was augmented by a desire to see oneself better than the other person. In the Non-Handicapped Group, the desire to see oneself as better may have resulted in these participants making greater higher estimations of their own abilities or greater lowered expectations of the individual within the handicapped group. Within the Handicapped Group, this desire to see oneself as better may have counteracted the reality of the handicap, making participants feel that the degree the handicap would affect their actions was smaller than it was. Even though the handicapped individuals would have to supply more effort in those “Harder with Weights” actions than the non-handicapped individuals, their hypothetical innate superiority would lessen the degree of effort increase. This seems like a plausible explanation for the current data.

#### *4.1.3 Evaluation of Sex Differences*

Analysis showed differences between males and females in their responses to whether they felt they had to cooperate or compete with the other individual within their dyad. Data show that males were significantly more likely to answer that they felt a stronger desire to compete against the other person than females, as well a weaker desire to cooperate with the other person when compared to females.

Other studies have shown higher degrees of competitive behavior in males as compared to females starting as early as kindergarten age (Weinberger & Stein, 2008).

Given the age range of the current population, it suggests that this trend continues well into middle adulthood. However, given that this was a self-report and even though no interaction was found between Sex and Interaction Condition, the sample size and research design was not created specifically for generating data to support that suggestion. As such it remains only a suggestion and an avenue of future research.

#### *4.1.4 Evaluation of Age Differences*

Analysis further showed age differences in the difference scores between individuals in the dyad on the single item “Reciting the ABC’s backwards” on the effort inventory. Individuals of fifty years of age or over saw the item as significantly more difficult for themselves as compared to the other individual within the dyad when compared to other age groups. While there may be multiple explanations for why the results show what they do, due to the small sample size of individuals fifty or over (n=2), and no other cognitive variables recorded, such explanations would only be speculation without theory.

#### *4.2 Methodological issues*

As stated earlier, it is possible that methodological confounds could have resulted in the lack of significant support for the hypotheses. While it is not certain that the hypotheses would have been supported had there been no issues with the methodology of the study, the fact that these confounds exist may have had an impact on the results.

##### *4.2.1 Interaction Condition*

###### *Non-Interaction Group*

One of the most obvious issues in the study revolved around the creation of a Non-Interactive Group. The results from the Brief Survey showed that while participants

in the Non-Interactive Group significantly differed from participants in the Cooperative Group when rating both the “I felt I had to cooperate with the other person” and “I felt I had to compete against the other person” statements, these Non-Interactive Group participants did not differ significantly in their responses from the Competitive Group participants. No significant differences were shown between all groups of participants in their rating of the statement “I did not feel as if I had to cooperate with the other person or compete against the other person”. Simply put, while both the Cooperative Group and the Competitive Group achieved the expected results, the Non-Interactive Group came closer to the Competitive Group on ratings of all statements. The question must be asked as to why this was.

The most probable explanation is that the situation was not properly explained to the participants. While an examination of the means show differences between the Competitive Group and the Non-Interactive Group in the hypothesized direction on their Task Manipulation Check, these differences are small enough to just be a byproduct of noise. With these results, the current experimental procedure for creating a two-person non-interactive situation should be reexamined. Even though participants in this non-interactive condition were told that they were not interacting during the task, (i.e. that they were not trying to beat or tie or encourage the other participant), perhaps the situation could have been highlighted more during the initial briefing. Written instructions may have been utilized to augment the oral ones. After all, Heffer et al. (1997) found that more appointments and time spent with a pediatrician were related to greater recall of instructions, suggesting that more exposure relates to better retention. At the least, perhaps more oral exposure would have been better suited to the task. On the

other hand, more exposure has the drawback of possibly creating a forced dynamic. In an ideal situation, an equal amount of time should be spent to set up each of the interactive conditions, and if we were to take the extra time to explain the non-interactive rules to the participants, then we must recognize that between-group imbalance in attention.

It may also be noted that by attempting to make the physical activity in this study into something that is both challenging and enjoyable for the participants, participants may have inadvertently primed for competition. While unintentional, it is more than possible that the participant saw the task as a kind of game. Under this belief, competitive priming would have been an understandable, if regrettable, side effect.

While the above explanations of methodological issues are the most salient ones, there is one more explanation that should be examined, the nature of social representation itself. Those individuals in the non-interactive condition were much more likely to see their cup stacking task as more competitive in nature than they were to see it as either neutral or cooperative in nature. It could be that by having both participants in the same room at the same time and by adding the weighted gloves, two separate groups were automatically created. Recall the natural tendency of an individual to see want to see oneself, or the group one belongs to, as better than a competitor (again, see Turner, 1975 for a full review). If one wants to be better, then it is possible one might naturally feel the need to prove oneself as better, and thus compete. There is some anecdotal evidence. The experimenter, once the procedure was completed and all data recorded, asked a small sample of participants why they answered the way they did on the Brief Survey. The most telling answer, given by a male participant was, "I want to be better than him," (Participant 501H, personal interview, September 18<sup>th</sup>, 2010). As this response occurred

during what was supposed to be a non-interactive condition, it shows a mindset of competition. With regard to the goals of the current experiment, such a mindset is troubling.

Perhaps, if the procedure is used again, it might be more suitable to ask participants for a small essay regarding how they viewed the other person in the study. While the use of a survey is quick and painless in both the collection and analysis of the data, basing results solely upon survey data lacks the depth that could be mined from a qualitative essay. Future research should consider such use. At the very least, future research should be aware of the possible issue and create a more detailed survey to better pick apart the underlying motivations.

#### *Cooperation*

While efforts were made to create all conditions of the interaction task as equal as possible, there remains an issue of coordination differences across the three groups of Competition, Cooperation, and Non-Interaction. Specifically, in the Cooperation group, by each individual using only one hand (left or right), individuals had to work as one physical being instead of working together as a team. It is likely that coordination demands were higher on individuals than was intended. However, without a measure of coordination in the study design, there is no way to quantify the degree to which the increased coordination demands affected the results. Also, by using the two-person-as-one-model (see section 3.2.1 – *Interaction Condition Task* for a description), different hands were used by different participants. Whether the participant used his or her right or left hand was not recorded in the data; such information could have been useful in lessening the ambiguity of the results.

By using the two-person-as-one-model in the Cooperative condition and using each individual acting alone in both the Competitive and Non-Interactive conditions, the interactive paradigm was effectively changed for the Cooperative Group. While the data shows that the Cooperative Group did feel more of a need to cooperate than the other two groups under the current interaction model, it is possible that the cost of creating the feeling of cooperating resulted in variable data that may be difficult to accurately interpret.

If the current study were ever to be reexamined, a different method of creating a cooperative group should be implemented. To make conditions more stable across group, forgoing the two-person-as-one-model for cooperation and replacing it with a both members of the dyad working together to build the 3-6-3 cup structure with both hands is recommended. Such a method should decrease the variability across conditions and also allow for equal use of both hands by both participants. Also, it is recommended that some measure of coordination demands be used in the study to act as a possible mediating factor.

#### *Difficulty of task*

By accident, participants would knock over their stack of cups during the interaction task. When accidents such as this happened, timing did not stop and participants were forced to restart and complete the task while time continued to elapse. Such accidents happened across all three conditions; however, there was no formal measurement of the number of accidents that occurred. The fact remains that, at times, the task appeared more difficult to some participants than to others. It is possible that the participant's view of the task may have had some effect on the results as well. Difficulty

may have related to task satisfaction. While the above is merely speculation, it should be investigated.

If the current study were to be reexamined, a measure of participant's difficulty in completing the task should be included. A self-reported measure can be useful in such cases, but a more objective measure might be warranted. In that case, it is recommended that the times of completion be recorded to account for potential confounds in the main results. In the current study, times were not recorded beyond the need of each individual experimental session. If records had been kept, it may have been found that shorter or longer times mediated the degree of difference a participant saw between his or her own abilities and the abilities of the other.

#### *4.2.2 Effort Inventory*

The Effort Inventory is an untested instrument created for the study. In retrospect, it was naïve to expect that, based on the results of a small pilot study, the data from a decent number of participants could neatly be distilled down to three categories equally representative of an effort action (i.e. "Easier with Weights", "Harder with Weights" and "No Difference with Weights"). The Factor Analysis illustrates the problems with the Effort Inventory well.

As seen by the factor loadings, the "Harder with Weights" items ("Holding your hands over your head", "Eating with a spoon" and "Brushing your teeth") load high onto a single factor with only relatively low loadings on that same factor by other items of the Inventory. As the items show similar variance across participants, these tasks have the potential of being kept as they are if the Effort Inventory is to be rewritten.



The “No Difference with Weights” category shows decent results with regard to what it was intended to measure. Both “Stomping your feet while sitting” and “Counting to 100s by 5s” resulted in relatively large loadings on a single factor with no cross-loadings and no other item of the Inventory near their levels on that same factor. “Reciting the ABC’s” backwards, however, does not load onto this factor. The lack of loading with its hypothesized counterparts will be discussed shortly.

The concept of the “Easier with Weights” category shows significant problems. If the Effort Inventory is to be kept for future use this category needs rewritten entirely. One major problem was that the item “Flattening a Styrofoam cup against a table” loaded similarly across all three categories in the Factor Analysis. Based on the relatively low loadings (within the 0.40 to 0.50 range, refer to Table IV) and the near equal cross loading, it appears that participants did not know what to make of this item. While during the pilot test this item was unanimously labeled as “Easier with Weights”, it should be noted that instructions for the pilot test were to label the items as “Easier, Harder, or No Different” with weighted gloves. Those instructions may have primed the pilot participants to think about the items in a certain way, which may have made more obtuse actions easier to imagine. It is possible that this item may have been overly complicated to imagine, which is contrary to the idea behind the Effort Inventory. The same might be true of the item “Pulling a lever downwards”, despite it’s moderate loading on the third factor (0.67, again refer to Table VI). While it is not impossible, it is unlikely that many of the participants encounter levers on a day to day basis.

Instead of the third proposed factor of the Factor Analysis loading the three “Easier with Weights” items, what we see loading are the following items “Reciting the

ABC's backwards", "Bending at the waist and reaching down for your toes", and "Pulling a lever downwards". Those items may all be linked, not by whether or not an individual is wearing weights, but by the actual individual him or herself. "Bending at the waist," for example, may be rated more on the body type of the individual in question instead of whether or not their hands are heavier. Unofficial exit interviews with some participants offer anecdotal evidence. As one participant stated "I'm too fat to do that," (Participant 211, personal interview, July 25<sup>th</sup>, 2010). Pulling a lever downwards estimates may have also been based more on body type than on weighted hands. Should an individual be more athletic and muscular in nature, he or she might find the action to be easier than a hypothetical 80 pound weakling. Of course, the apparent ease of the task might also be dependant upon what type of lever and individual pictured – whether it is large or small, rusted or in precise working order.

While estimates on "Reciting the ABC's backwards" should not be affected by body type, it can easily be affected by estimates of one's own or the other person's intelligence. The perceived differences in body type and intelligence will be briefly addressed in the next subsection. However, should the Effort Inventory have worked in the way it was meant to, those differences should not have played a large part in the variance of the scores.

The basic idea behind the Effort Inventory was to create a list of easy to imagine items, falling under the larger categories of "Easier", "Harder", or "No Different" with weights. The "Harder" category succeeded by taking everyday actions that the participant could imagine. The "No Difference" category partially succeeds. "Stomping your feet while sitting" and "Counting to 100 by 5s" are both simple tasks that can be easily

imagined (though it may have been better to change “Counting to 100 by 5s” to “Counting to 100 by 10s”, based on participant reactions). “Reciting the ABC’s backwards” however, is not an everyday task, nor, judging by the laughter that occurred when many participants read this item<sup>4</sup>, an easy one. The “Easier” category shows the most difficulty in translating the pilot test results to actual usage. “Flattening a Styrofoam cup against a table” and “Pulling a lever downwards” may both be considered as obtuse items that may not always be encountered in everyday life. “Bending at the waist and reaching down for your toes” may be more affected by body type than weights. Should the inventory be kept, the entire category would need reworked. Perhaps it would be better to have a directly contrasting item for each item in the “Harder with Weights” category. For example, to contrast “Holding your hands over your head” an item like “Standing and keeping your arms down at your sides” could be included. Such a method would create a more direct dichotomy between actions that may be easier to interpret.

Perhaps a lesser problem with the Effort Inventory is that it is all based on prospective action of the self and the other. It might be beneficial to have each participant perform the action associated with each item, instead of just thinking about doing it themselves before rating the effort the other person would have to the same item. Such procedural changes would have the added benefit of simplifying the data without the need of manipulation. By asking the participant to rate, on a scale of -5 to 5, the difference in effort the other person would have to exert, the scores could be used directly in analysis.

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<sup>4</sup> Again, this is based on anecdotal evidence retrieved from the experimenter’s memory. No data on laughter were actually recorded.

### *4.2.3. Participants*

#### *Physical differences*

Another possible confound is the widely varying degree of participants. The way the Effort Inventory is set up, it assumes that pairs of participants will be relatively similar in abilities, body type, and intelligence levels. Such similarity does not prove to be the case in actual practice, especially when relying on a convenience sampling that makes use of volunteers and undergraduate students. When a two-hundred and fifty pound participant is paired with a one-hundred and forty-five pound participant, obvious differences in abilities become apparent, even without the introduction of the weights. While doing so can add to external validity, physical differences between participants have a negative impact on the internal validity of the study. It becomes necessary to ask how much of the difference in ratings are a part of the handicap and how much is part of the large difference in size between participants. While innate physical differences between participants is not as large a problem as those evidenced in the Effort Inventory, it should be addressed before any further study is undertaken. As is often the case with psychological studies in the academic world, it is difficult to control who and how many will participate while still gathering enough participants to make the study worthwhile. Even going outside of traditional recruitment may yield similar results if one relies on a sample of whoever is willing to volunteer for a psychological study.

#### *Prior knowledge*

One more issue with participants is that of prior knowledge of the other member of the dyad. Due to the fact that the experiment utilized convenience samples (again, either of volunteers or of undergraduate students who needed participation for a course

requirement), often when two individuals would participate in the experiment together, they were previous friends with prior knowledge of the other and their abilities. In theory, prior knowledge could be controlled with a more rigid sign up procedure; however, in practice it is doubtful that there would have been enough participants to make it worthwhile as a study unless some larger form of compensation than course requirement was involved. When utilizing the population of undergraduates, it was found that simply requesting two participants at a time led to a small number of participants who were willing or able to participate in an experimental session<sup>5</sup>. The use of confederates through much of the data pool helped minimize this possible confound and data show no significant difference between individuals paired with confederates and individuals paired with another naïve participant.

If the study is to be reexamined, it is suggested that confederates be used for all sessions. The use of confederates will decrease the variability in conditions of collecting data and, through the use of a single confederate for males and a single confederate for females, same sex dyads will be created with ease. While the current study found no difference between the same sex and the mixed sex dyads on any data of interest, it is recognized that uniformity in dyads would decrease the number of possible confounds. Confederates will also make data collection simpler by only relying on one participant at the time.

#### *4.2.4 Procedure order*

The procedure order may also need to be examined. In the current study, participants performed the interaction task, then filled out demographics, then answered

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<sup>5</sup> It should be noted that many who did sign up for a session ignored this request and were asked to leave in the end, without data being gathered.

the Task Interaction Manipulation Survey, then provided estimates for both their own and the other's estimated amount of effort needed to complete the items on the Effort Inventory. Two main issues should be examined regarding the current procedure.

First, by ordering the procedure as it was, not only did this create time for memory loss between the Interaction Task and the Effort Inventory, but it may have also inadvertently primed participants to think about themselves while filling out the demographics and could have affected participant's estimates while answering the Effort Inventory. It may make more sense in the future to collect demographic data before participants meet each other or, at the very least, before the Interaction Task.

Secondly, the way the Effort Inventory was displayed for the participants involved a spreadsheet with the action items listed with two columns beside it, one for estimates of the self and one for estimates of the other (see Appendix C). It may be more beneficial to the scientific process to separate estimates for oneself and estimates for the other into two separate sheets. These sheets should be counterbalanced across participants. With such a procedure, any accidental priming of the participant to think about either himself or herself or to think about the other would have less of a chance of being manifested in the data.

#### *4.3 Importance of the Work*

It may be that the use of too many untested methods to support the hypotheses was a little too ambitious for the study at hand. Multiple issues were identified. It is unfortunate that these flaws resulted with no firm support or refutation of the hypotheses to be made, however it is only by implementing the methodology that we realize where the flaws within it lie, as well as possible ways of strengthening it.

It may still be argued that the ability to take another's perspective is important for social interaction. While putting oneself in the physical frame of another may not open the doorway to a new era of love and peace with one's fellow man, it is a step in the ability to understand another person. Understanding could be especially important if the other person is handicapped in some way. By understanding one's limitations, and potential for action, it is possible that understanding of one's behavior may start following suit. Other studies have suggested that taking the perspective of another person allows an individual to have a better chance of understanding and anticipating the reactions and behavior of that person (Block-Lerner, Adair, Plumb, Rhatigan, & Orsillo, 2007). While understanding and anticipating others in would not equate to empathy by themselves, they may help an individual along that path. By understanding the behavior of another person, it may be possible to more easily develop a sense of kinship with that person. At the very least Block-Lerner et al. (2007) suggest that perspective taking creates an advantage for developing stronger interpersonal relationships.

A stronger interpersonal relationship can, in theory, lead to lower levels of violence. Mohr, Howells, Gerace, Day, and Wharton (2007) suggest that the ability to take the perspective of another may affect anger responses by inhibiting their rise to provocation. Mohr et al. (2007) explain that inhibiting provocation could happen in two ways: by the individual being able to maintain a "high level of cognitive functioning when aroused by interpersonal provocation" (p. 509) and by the perspective taking ability leading a better attribution of the situation, thereby lessening the chances of blame being linked to any provocation (Mohr et al., 2007). Admittedly, this is more than a simple, step by step progression, but it is believed that this study has helped the progression.

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## APPENDICES

APPENDIX A

Basic Demographic Information and Health Questionnaire

Adapted from Slifkin (2008).

Age \_\_\_\_\_ Date of Birth \_\_\_\_\_

Weight \_\_\_\_\_ Height \_\_\_\_\_

Hand Dominance \_\_\_\_\_ Sex \_\_\_\_\_

Do you wear corrective lenses? Yes No Are you wearing them today? Yes No

Do you have any neurological or psychiatric disorders? Yes No

If yes, please explain:

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Are you taking any medication?      Yes                      No

If yes, please explain:

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Do you have any difficulties using either of your two hands?      Yes                      No

If yes, please explain:

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## APPENDIX B

### Interaction Task Manipulation Check

Instructions:

**Please rate how true of you the following statements are.**

**1. I felt I had to cooperate with the other person**

- Completely Agree*
- Agree*
- Disagree*
- Completely Disagree*

**2. I felt I had to compete against the other person**

- Completely Agree*
- Agree*
- Disagree*
- Completely Disagree*

**3. I did not feel as if I had to cooperate with the other person  
or compete against the other person**

- Completely Agree*
- Agree*
- Disagree*
- Completely Disagree*



APPENDIX C

## Effort Inventory

Instructions: In the third part of this study you and the other person in this study will be asked to perform many of the following actions. Please read each of the items carefully and take a twenty seconds to imagine yourself or the other person actually performing these upcoming actions. Please use the below scale to rate how much effort you believe it will take for each of you to perform these actions. Remember, the individual wearing the weights previously will be wearing them again for this part of the study.

1	2	3	4	5
no effort -----a lot of effort				

Action		You	The Other Person
1	Stomping your feet while sitting		
2	Holding your hands over your head		
3	Counting to 100 by 5s		
4	Bending at the waist and reaching down for your toes		
5	Eating with a spoon		
6	Pulling a lever downwards		
7	Reciting the ABC's backwards		
8	Flattening a Styrofoam cup against a table		
9	Brushing your teeth		