6-2011

Attributing Mind to Others: The underlying mechanism of the timescale bias effect

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By

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Submitted in partial fulfillment

of the requirements for

Honors in the Department of Psychology

UNION COLLEGE

June, 2011

ABSTRACT

ZHUZHA, KSENIYA Attributing Mind to Others: The underlying mechanism of the timescale bias effect. Department of Psychology, June 2011.

ADVISOR: Bizer, George

Previous research has demonstrated that, when people speculate about the minds of others, their judgments are subject to the *timescale bias*. People seem to attribute richer mind experience to humans whose walking speed is closer to the average human walking speed than to those whose speed is faster or slower. The present study investigated if self-projection is the underlying mechanism of the bias by examining dispositional walking speed as a potential moderator of the effect. Participants were asked to watch two videos of a human walking at slow, medium, or fast speeds and then asked to speculate about the targets' mental capacities. Participants' dispositional walking speed and their beliefs about their own mental capacities were assessed. I hypothesized that, when the walking speed of an observed target is close to the dispositional walking speed of the participant, the participant would be more likely to project his or her own mental capacities onto that target. The data, however, did not support this hypothesis. Furthermore, the timescale bias effect was not replicated when targets' walking speeds were within normal range of human speed, raising a question about ecological validity of the previously demonstrated effect. Consistent with the previous findings, participants attributed more mind to the targets that were more liked and perceived to be the more similar to self. As suggested by prior research, the mechanism responsible for these differences in mind attribution to a target appears to involve the degree to which one considers and identifies target's mental processes.

Attributing Mind to Others:

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Imagine today you see Bob for the first time in your life. What do you think of Bob? In particular, to what extent do you think Bob is able to feel pain or joy? To what extent do you think he is capable of remembering or planning? More generally, what could say about Bob's mind? Or why does it even matter?

Mind & Mind Perception

However, what do we mean when we say "mind"? We all are very familiar with this notion, and its meaning seems to suggest itself. A layperson could describe mind as "the element, part, substance, or process that reasons, thinks, feels, wills, perceives, judges, etc." ("Mind," n.d., para. 1). About which agents, in that case, can we say "possess mind"? Would it be any living entity that has a brain and is cable of perceiving pain? Consequently, most would agree for example that bacteria, plants, or jelly fish do not have mind. However, is a frog or a bee capable of mind? After all, both species have a nervous system and a brain. Of course we cannot compare mental capacities of a frog to those of a human, but can we say that a frog does not have mind at all? Once some minimal mental capacity is established, in other words, an agent is *mentalized* (e.g. Frith & Frith, 2003; Kozak, Marsh & Wegner, 2006), perhaps it would be more accurate to question *how much mind* a particular agent has. When children are asked about mind in objects, for example, they may grant objects some aspects of conscious experience and refuse other (Piaget, 1929). Hence, a child may reason that a table feels if someone breaks it but cannot feel being carried. Here the child does not think in terms of the dichotomy of "can feel" or "cannot feel" but instead acknowledges possibilities in between. As speculating about mind in

terms of “all or nothing” runs into certain restrains, when trying to establish mental capacities of an agent, adults too may refer to a continuous scale (Gray, Gray & Wegner, 2007; Gray & Wegner, 2009; Morewedge, Preston, & Wegner, 2007). Therefore, in my thesis, possession of mental states likewise will be reviewed alluding to its degree rather than as a dichotomy. Therefore, instead of scrutinizing *whether or not* a frog has mind, for example, I will consider *how much* mind the frog has.

In the literature, mind is often described in terms of its attributes. Mind is said to be constituted such mental states as consciousness, intelligence, self-control, emotion, emotion recognition, purpose, belief, intention, and goal inference (e.g. Morewedge et al., 2007; Premack & Woodruff, 1978; Woodward, 1998; Oates & Sheldon, 1987; Malle & Knobe, 1997a; Piaget, 1929; Baron-Cohen, 1995; Kozak et al., 2006; Leyens, Paladino, Rodriguez-Torres, Vaes, Demoulin, Rodriguez-Perez & Gaunt, 2000). Gray et al. (2007) proposed that these mental states can be divided into two distinct mind dimensions: *agency* and *experience.* Agency is characterized by the capabilities of self-control, morality, memory, emotion recognition, planning, communication and thought. Experience dimension, on the other hand, can be described in terms of capacities for sensation (e.g. abilities to feel hunger, pain, etc.) and emotion (e.g. abilities to feel rage, pride, joy, etc.). The two dimensions appear to be independent of each other. In such a way, while participants evaluated an adult human to be highly capable of both agency and experience, they identified a five-month-old infant with high capacity for experience, but much lower capacity for agency. Furthermore, God was perceived to have much agency but almost no experience, and a frog was thought to have very little agency but some experience. Thus, if one believes that a given entity is highly capable of such mental states as thought and self-control, it does not mean that the entity will also be perceived to have as much capacity for

feelings of pain, pride, and embarrassment. Therefore, the second way in which we will consider mind is in terms of particular mental states pertaining to one of the two dimensions, agency and experience.

So how do you perceive Bob's mind and mental states? Interestingly, given appropriate cues, maybe even without awareness, you are able to make certain inferences about Bob's mental activity within seconds. Inferences of goals (e.g. Hassin, Aarts, & Ferguson, 2004; Aarts, Gollwitzer & Hassin, 2004; Poynor & Morris, 2003), intentions (e.g. Premack & Woodruff, 1978; Behner, Carpenter, Call, Tomasello, 2005), and traits (Trope, 1986; Gilbert, Pelham & Krull, 1988) have been shown to occur rather effortlessly and spontaneously. For example, Gilbert et al. (1988) argued that characterization of others, or trait inference, is a relatively automatic process and involves little cognitive effort. Furthermore, findings by Hassin et al. (2004) suggest that goal inference is an even simpler process and qualifies as automatic. In their study, after reading short scenarios, some of which implied particular goals and some did not, participants were cued with the words of implied goals that never appeared in the scenarios, and were prompted to recall as many scenarios as they could. For example, consider the scenarios *Josh's wife frequently annoys him and he thinks the time has come to call his lawyer*, with the implied goal – divorce, and *Josh calls his lawyer, who tells him that his wife annoys him frequently,* with no goal implied. *Divorce* would later serve as a recall cue. In this, as well as in similar follow-up experiments, participants recalled significantly more scenarios that implied goals than those that did not. The effect also held for a lexical decision task. After reading each scenario, participants were asked to judge whether presented group of letters was a word. For the previously stated example, in experimental trial, the probe word would again be *divorce*. The reaction time for test words was much shorter following goal-implied sentences than following

control sentences. At that, sentences were presented for only 2.5s, and 500 ms later the test word followed, demonstrating that not only that people infer goals without conscious awareness, but they do so in a very short span of time. Similarly, interpreting intentions does not seem to involve very sophisticated or effortful cognitive processes. It may be not surprising that most adult humans are well skilled at this task. However, perhaps more surprisingly, chimpanzee and 9- to18- month old human babies are also capable of identifying intentions and goals of others (Premack & Woodruff, 1978; Oates & Sheldon, 1987; Flavell, Miller & Miller, 1999; Gergely, Bekkering & Kiraly, 2002; Molina, Walle & Spelke, 2004; Woodward, 1998; Behner et al, 2005).

Indeed, humans gain awareness of other minds in early infancy (Woodward, 1998; Baron-Cohen, 1995), at about the same time as they learn object permanence (Baillargeon, Spelke & Wass, 1985), but it is important to acknowledge that object knowledge and person knowledge undergo different developmental processes (Oates & Sheldon, 1987; Molina et al., 2004). Children learn about inanimate objects and their physical properties by acting upon them. In response to their actions, objects produce certain effects (Oates & Sheldon, 1987). For example, a toy may make noise when squeezed, a piece of paper will rip when pulled apart with particular force, and a ball will jump up and down when dropped on the floor. At that, the response of an object is always passive. People, on the other hand, are agents who respond to social cues, such as crying, smiling, or babbling, and are capable of active interaction. It has been illustrated, for example, that 5- to 6- month old infants are able to distinguish between actions that should be directed at a person or an object (Molina et al., 2004). In one such study, children were habituated to a visual stimulus of a person talking to an occluded target or manipulating the target. In the test phase of the experiment, a person performed the same action as before (talking

or manipulating), but the target was revealed: in one condition it was another person, and in the other, it was a ball.

Therefore, in the *natural* condition, children saw that the person was talking to another person and grasping and manipulating the ball, and, in the *unnatural* condition, they saw that the person was talking to the ball, and manipulating the person. The results showed that, in the test phase, children spent significantly more time looking at the natural actions than unnatural. The natural and familiar actions were clearly preferred, which is common for children of that age (e.g. Mehler, Jusczyk, Lambertz, Halsted, Bertoncini, & Amiel-Tison, 1988; Jusczyk, Hirsh-Pasek, Kemler-Nelson, & Kennedy, 1992). Thus, just months into their lives, infants seem to understand that people talk to other people and manipulate objects, and not the other way around.

Although it may be questionable whether infants are able to speculate about mental states of others as early as 5 months of age (Woodward, 1998; Flavell et al., 1999), several studies have illustrated that the theory of mind (Premack & Woodruff, 1978), or in other words ability to recognize mind in others, is acquired at 9- to 18- months at the latest (Woodward, 1998; Behner et al., 2005; Gergely et al., 2002). Infants are capable of understanding that humans have intentions, for instance. One study demonstrated that 9-month-old infants appear startled when actions suddenly contradict seemingly previous intentions (Woodward, 1998). In this experiment, the infants first watched a hand reach repeatedly for one of the two toys on a display. In the test phase, the toys were switched and the hand either reached for the same toy at the new location or for the different toy but to the same location. Infants looked reliably longer when the hand reached for the different toy than in a different path for the same toy. Woodward (1988) argued that the infants inferred that the person's intention was to reach for a particular toy, and they appeared surprised when the hand's action contradicted this established intention. Likewise, 9-

month-old infants demonstrated more patience when an adult acted as trying to pass them a toy but was unable to than when the adult first acted as trying to pass the toy but then did not, resembling teasing action (Behner et al., 2005). The infants seemed to understand the experimenter's true intentions, and, hence, acted differently in response. Clearly, 9-month-old humans begin to speculate about the minds of others and are able to recognize that people have desires (Malle & Knobe, 1997a) and thoughts that underlie their behavior.

It is no accident that person knowledge endures a separate developmental process and mind theory is acquired that early in life. Interpretation of human mind seems to undergo quite a different process than understanding inanimate objects (Dennett, 1996; Baron-Cohen, 1995). For example, if one's goal is to evaluate a stone and how it will behave if thrown, assessing its physical properties, in other words taking *Physical Stance,* would probably be the most efficient technique. Analyzing a human in terms of his or her anatomy, however, would not get one very far with interpretation of intentions. Furthermore, in order to understand how a particular computer or a car works, one would adapt the *Design Stance.* As suggested by the name, it involves understanding an object in terms of its design and functions. For instance, if one has had an encounter with a computer before, he or she would know that the left double-click of a mouse can open a file, and, if the Caps Lock key is pressed, all letters typed will be uppercase. Thus, by knowing the general design of computers and functions of their parts, one can figure out how to work with a computer of a new brand quite easily. When it comes to humans, design stance can tell us about various functions of human body and how it operates. Taking this stance, one can infer that if water is splashed in person's face, his or her automatic reaction would be to close their eyes. Yet, this strategy is very limited for understanding human mind and behavior. In order to understand agent's actions and predict its behavior, one should consider agent's possible

intentions and goals. In other words, one should adapt the *Intentional Stance* towards the agent. As we are constantly surrounded by other people, this stance proves extremely useful. If your friend is in her room putting make up, you will understand that she is getting ready to go out. If your mom gazes at you with a straight face, you might infer that she is unhappy with you about something. People with autism, for example, lack this ability (Baron-Cohen, 1995). For a person unable to take the intentional stance, the world could seem chaotic and bizarre. Without aptitude to infer intentions, one would not know why people behave in a certain way and what to expect from them. At every single moment, such a person would be in for a surprise as he or she would not be able to predict the behavior of others. Thus, inferring about mental states of other agents is an exceptionally important skill that helps us navigate through daily life and successfully interact with others.

From the evolutionary point of view, this skill may have also facilitated survival of the species. Living in large groups as do humans and other primates, involves quite complex social interactions (Baron-Cohen, 1995). In order for a group to survive and prosper, its members should be capable of effective collaboration, which is partly ensured by the ability to share intentions and emotions (Tomasello, Carpenter, Call, Behne & Moll, 2005). Therefore, natural selection may have preferred individuals with better social skills (e.g. Baron-Cohen, 1995; Lewin, 1992; Leaky & Lewin, 1992). In many species, reproductive success of an individual member is often determined by his or her size and physical fitness (Lewin, 1992; Leaky & Lewin, 1992). In higher primates, however, individual strength may not be the biggest advantage. Instead, a member with more alliances and higher social standing is more likely to dominate and has higher chances of reproduction (Lewin, 1992; Leaky & Lewin, 1992).

Additional evidence that mind attribution serves an adaptive function was provided by Maner et al. (2005), who manipulated the salience of self-protective and mate-search motives. When the motives were activated, participants were more likely to attribute motive-relevant mental states to socially-relevant human targets. Once the self-protective motive was salient, participants reported seeing more anger in a black male's face. Similarly, when the mate-search motive was activated, male participants perceived greater sexual arousal in the faces of attractive females.

Furthermore, acknowledging goals and rationales behind other people's behavior plays an important role in learning by imitation (Gergely et al, 2002; Byrne & Russon, 1998). One study suggested that 14-month-old infants imitating adults' actions do so rationally rather than simply engaging in emulation (Gergely et al., 2002). Children in the experiment re-enacted an adult's behavior of switching on a light-box, using their head significantly more often if they observed the adult engaging in this behavior while her hands were free than if they observed the adult doing so while her hands were occupied. As argued by the authors, the infants, who watched the first scenario, must have inferred that there was a reason for using the head instead of hands and hence were more likely to imitate the action. Conversely, in the later scenario, it was obvious that the actor used her head because her hands were occupied, and, not having such a restraint themselves, infants were reluctant to imitate the observed actions. It seems, therefore, that making inferences about others' actions may have a particular significance in learning processes and development. It has been shown that adults likewise use inferences about goals of others to guide their own actions and behavior (Aarts et al, 2004; Byrne & Russon, 1998; Chartrand & Bargh, 1999).

Attributing mind helps us learn from our environment, understand it, and act accordingly. Thus, interpreting intentions and emotions helps us make sense of others' actions, speculate about their underlying goals, and predict future behavior. Once we have this understanding and the ability to foresee future events, we can respond appropriately, thereby playing a role of active agents influencing our environment. It has been suggested that by doing so, we satisfy *effectance motivation*, the human motive to interact effectively with our environment and control it (White, 1959; Epley, Waytz & Cacioppo, 2007; Waytz, Morewedge, Epley, Monteleone, Gao & Cacioppo, 2010). Attributing mental states to others, therefore, has to be particularly common if there is a need or incentive to understand a particular situation or predict future events (Epley et al., 2007). For example, if we hold no knowledge about a particular agent, or its behavior appears to be unpredictable, in order to understand what is going on and gain some control over the situation, we could try to take an intentional stance and infer about agent's goals in a way would makes sense to us (Higgins, 1996). Thus, sometimes we end up attributing human-like intentions and desires to animals and even inanimate objects. In a study by Waytz et al. (2010), participants read about robotic gadgets that were described as either predictable or not, and later reported how much mind the gadgets appeared to possess. Consistent with the theory, participants anthropomorphized seemingly unpredictable gadgets significantly more, suggesting that mental attributions are driven by our motivation to understand and predict our environment.

Thus, attributing mind and inferring mental states appears to be evolutionary adaptive. It helps us function in our environment effectively, comes to us naturally, and does not involve much cognitive effort. However, which identities and aspects of target's behavior do we rely on when attributing mind to targets? Let us come back to Bob. Today you saw Bob for the first time in your life as he walked down the street. Recent findings suggest that the way you think of

Bob's mental experience may depend on how fast Bob walks down the street (Morewedge et al., 2007).

Mind & Motion

Though seemingly basic, one's movement dynamic may convey tremendous information to the perceiver. We are so familiar with a walking pattern of a human that recognizing one when we see it or identifying individual gait discrepancies seems to be a quite simple task. For example, we can easily recognize the walk of a person even when we see only fragments of the person's silhouette. One study demonstrating this employed videos with point-light walkers (Johansson, 1973). Participants were shown a video in which only light-reflective patches attached to the main joints of a walker were visible. All participants were able to immediately recognize that the picture presented a walking person even when the video was distorted, when the exposure to the stimulus lasted only 1 second, and when the number of light points on walker's body was reduced down to 5. Furthermore, gait may give us information about walker's gender. In such a way, in other studies involving videos of point-light walkers, the correct identifications of target's gender were well above chance (Kozlowski & Cutting, 1977; Mather & Murdoch, 1994). Mather & Murdoch (1994) also argued that the dynamic cues of a walking pattern play the main role in gender recognition. Thus, it is not feminine or masculine body structure that seems to be important in correct recognition of point-light walker's gender. It is rather velocities in a body sway that appear to provide observers with critical information about the gender of a person walking in front of them. Finally, if familiar enough with target's gait, a person may learn to identify the target by his/her walk without any external information (Troje, Westhoff, & Lavrov, 2005). For example, most of us on several occasions probably have identified a friend, a neighbor, or a colleague from far away by recognizing his or her walk.

Findings by Troje et al. (2005) suggest that when this effect occurs, the target's walking frequency plays a greater role for recognition than body size and shape. In sum, it seems that a person's walk alone can provide an observer with significant enough information to identify the walker's gender and at times even identity. The literature suggests that, when it comes to a target's walk, gait dynamics and walking frequency may serve as important cues for recognition.

Motion, however, may also speak to a target's agency and may be indicative of presence or absence of intentions and, hence, mind. It has been aforementioned that our understanding of inanimate objects and people develops differently (Oates & Sheldon, 1987; Molina et al., 2004). In such a way, babies learn about objects by acting upon them, while they learn about humans by interacting with them and observing their agency. However, I would like to generalize the above claims to inanimate vs. animate objects (rather limiting them to humans). After all, even though not in the same way, we also interact with animals, insects, and many other entities that are able to move on its own. For example, if a person tires to catch a fly, it will try to get away from him or her. If a person pets a cat, it may purr, and so on and so forth. In addition, anything that moves on its own can cause things to happen. Of course the ability to cause events varies from agent to agent. For example, a cat can knock your favorite vase off of a table, but a fly cannot. Nevertheless, it does not mean that a fly is incapable of agency. Flies can bite and maybe even keep you awake by buzzing around your bedroom. In sum, it seems that there is something special about beings that are capable of self-propelled movement. They can be thought of as agents and, therefore, can be attributed goals and intentions. Perhaps the intention of more primitive organisms is simply survival; yet their actions (or simply pattern of motion in a case of plankton or bacteria) can be explained by this intention. Several theorists argue that self-propelled motion can be the key indicator of mind possession. Once a person establishes that an

agent exhibits signs indicative of mind, he or she may engage in further mind attribution: speculating about specific mental capacities and the amount of mind the agent may possess (Premack, 1990; Piaget, 1929; Baron-Cohen, 1995).

However, findings by Csibra et al. (1999) indicate that the establishment of self-propulsion in a target may not be a requirement for mind attribution. In other words, even if there is no evidence that a target's motion is self-initiated, a target's movement may be interpreted as goal-directed. The basic mechanism responsible for detecting agency and determining if a given target possesses intentions is known as *Intentionality Detector* (ID) (Baron-Cohen, 1995). Baron-Cohen (1995) argued that ID does consider self-propelled motion to determine if a target is an agent, but it operates by using rather loose criteria. For example, if the cause of motion is not easily established (i.e. it is unclear whether motion is internally or externally initiated), ID will classify the target as an agent by default. According to Baron-Cohen (1995), ID favors the establishment of agency for evolutionary reasons. When one's goal is survival, it is best to be on guard at all times. Hence, "it is better to spot a potential agent, and start checking its desires and goals, than to ignore it" (p. 35). Thus, if a cause of motion is somewhat ambiguous, ID may mistakenly classify a moving object as an agent.

The works of Piaget (1929) seem to support the notion that ID establishes agency by default and suggests that the mechanism becomes more selective with development. Very young infants, in the first stage of conscious attribution, may think that inanimate objects are capable of intentions. Soon this belief changes, however, and infants in the second stage seem to think of everything that moves as an agent, such as wind, sun, a bicycle, etc. In this stage, they seem not to have the capacity yet to question the source that brings a given object in motion. When an infant reaches the third stage, on the other hand, he or she seems be more likely to consider

presence of self-propelled motion when reasoning about object's agency and intentions. Consequently, even though the mechanism of ID is not perfect and is prone to mistakes, the information it seems to utilize, when determining whether a target possesses agency, is target's motion.

In fact, as research illustrates, motion may play an important part in attribution of mind, intentions, and even personality traits. In a classic study by Heider and Simmel (1944) participants, were shown a film depicting three moving geometric figures, big and small triangles and a circle. In one of the tasks, participants were asked to describe what happened in the film. Interestingly, in their reports, all participants but one spoke of geometric figures as of animated beings (people in most of the cases), once again supporting the notion that, for a human observer, self-propelled movement in objects is indicative of their agency. In another experiment, participants were asked to describe the kind of a person the big triangle, the small triangle, and the circle appeared to be. From the participants' reports it seems that the majority of them had similar perceptions each figure's personality. The big triangle was mostly described as aggressive and dominating, small triangle as courageous, and circle as timid and fearful. Thus, the participants were tentative to attribute particular characteristics to a given figure simply based on its pattern of movement relative to that of the other two figures. Furthermore, when simply asked to describe what happened in the picture, many participants actually wrote connected stories. One participant, for example, wrote in his report that there was a man (big triangle) waiting for a girl (circle). The girl, however, came with another man (small triangle). The participant then went on to describe the action in the film as a conflict between the three people. Consequently, besides indicating agency in a target, objects' movements (or something about the movements) also seem to suggest perception of the events in terms of interactions

between the objects. In the study by Bassili (1976) participants watched a video clip depicting two circles chasing each other, clarified that specifically *temporal* contingency of a chase, and not spatial configuration of the two circles, was the key cue indicating the existence of meaningful (i.e. particular to beings with intentions and mind) interaction between the figures.

As the research described above suggests, motion may provide an observer with important information about a target's intentions and state of mind. Let us take a closer look at walking as a form of movement. For a healthy human, walking is one of the most common activities in which he or she inevitably engages. It is a form of movement with which most humans are incredibly familiar. After all, all around the world, the vast majority of the people walk and observe others walk every single day. Although walking appears to be a rudimentary activity and rarely special, it may tell more about a person that one would think. As we have already seen, the walking frequency and dynamics of person's gait may serve as cues for recognition. It also appears that walking speed plays an important role in the process of mind attributions.

Egocentrism as Anchoring and Adjustment

Research by Morewedge et al. (2007) illustrated that the closer an agent's speed is to the average speed of a human, whether the agent is an animal, a robot, another human, or simply an animated "blob", the more mind perceivers tend to attribute to the agent. In other words, as people attribute mental states to other agents, they seem to demonstrate a bias based on agent's relative speed of movement—the *timescale bias*. In one of the studies, participants watched three films of a human walking at three different paces: slower-than-average, average, and faster-than-average human walking speeds. Subsequently, participants were asked to make judgments about

the target human. To assess mind attribution, participants were asked to report on 7-point Likert scale the degree to which the target appeared to have mind, to be competent, intelligent, and smart. Significantly more mind was attributed to the entities and humans moving with a speed close to the average human speed than to those moving slower or faster. The authors suspected that the most probable explanation for the phenomenon is egocentric bias (Morewedge et al., 2007; Epley et al., 2007). We must have a starting point for induction when we attempt to understand, characterize, or predict behaviors of a novel agent. If we hold no knowledge about the specific agent, in order to begin speculating about its behavior, we need to use some kind of knowledge as a base line. The idea is to compare a novel concept to something well-known to facilitate a better understanding of its structure and properties. Similarly, trying to reason about novel stimuli, people naturally tend to rely on already existing knowledge that is easily accessible and use it as a reference point (Higgins, 1996; Nisbett & Ross, 1980). What could such knowledge be? Not surprisingly, one of the most developed concepts all humans have is the concept of self (Epley, Morewedge & Keysar, 2004; Epley et al., 2007; Epley, Caruso & Bazerman, 2006; Piaget, 1929). No matter how well we may know other people, we always know ourselves better. Only if one could possess somebody else's body and, thus, gain a direct access to this person's brain, sensory organs, and thoughts, one could truly understand the other. Even as adults, we can never completely apprehend what it is like to be somebody else, in the same way, we can never grasp what it is like to be a dog or even a person of an opposite gender.

Understanding one's self is rudimentary; it develops early and serves as a basis for understanding of others (e.g. Heal, 1986; Piaget, 1929; Epley et al., 2007). In a similar manner, it has been theorized that children learn theory of mind through imitation of others (Meltzoff & Brooks, 2001). By repeating human acts, they gain understanding of mental states that the person

performing the acts is experiencing. Thus, the understanding of others comes by the way of first understanding the self. Furthermore, by imitating others and seeing others imitate them, children deduce that "others are like me" (Meltzoff & Brooks, 2001: 174). In fact, it seems to be quite difficult for a human to overcome this formed schema that others are "like me". As mentioned above, it is difficult to grasp a mental state if it is not experienced directly. Similarly, it takes some time for children to learn that others may have mental states that deviate from their own. Before this understanding develops, they tend to exhibit so-called egocentrism. Repacholi & Gopnik (1997) gave 14- and 18-month old children crackers and broccoli. As it was intended, most of the children showed preference for the crackers. In the next phase of the experiment, a child watched an adult to sample each of the foods, but, contrary to the child's choice, the adult acted to strongly dislike the cracker, but to be pleased with the broccoli. Later, the child was seated at a table with a bowl of broccoli and a bowl of crackers in front of him or her. The adult, seated across the table, turned to child, saying, "Can you give me some?" Most of 14-month-old infants exhibited egocentrism and gave the experimenter a cracker. To the contrary, a majority of 18-month old infants attended to the experimenter's preferences and handed her the broccoli. Hence, it seems that younger children have difficulty recognizing that thoughts, wishes, and preferences of others may not be the same as theirs.

Even though egocentrism decreases significantly with age, it does not disappear completely. Adults also refer to the readily accessible knowledge of self when making inferences about other agents (Epley, Keysar, Van Boven, & Gilovich, 2004; Epley & Morewedge et al., 2004; Nickerson, 1999; Barr & Keysar, 2002). In fact, it seems that adults' egocentrism is similar to the one in children, but what makes a difference is the subsequent effortful correction. Epley & Morewedge et al. (2004) used an eye-tracking device in a referential communication

task to demonstrate this phenomenon. Adults and children were asked by an experimenter, who sat across the table, to move objects from one box to another on a shelf in front of them. Some boxes were screened off by a wooden slat from the side of the experimenter in making them visible only to the participant. When asking to move objects, the experimenter at times would refer to them relative to his/her perspective. For example, the participants might have been asked to move the smallest toy car. However, the smallest toy car on the shelf would be in a box not visible to the experimenter; hence, the participant had to realize that the experimenter was actually referring to the medium-size car. On these test trials, children and adults exhibited same initial egocentric bias. The first object most of the participants looked at was the one visible only to them, and both, children and adults, gazed at the egocentric object equally fast. Nevertheless, adults made far less errors in reaching for the wrong object and were faster to look at the correct object. Thus the findings support the notion that humans never really outgrow their egocentrism, but rather become skilled at the correcting it.

So what is the egocentric bias? It appears that egocentrism is a type of “anchor and adjustment” heuristic (mental shortcut) that facilitates fast reasoning without using much cognitive resources (Nisbett & Ross, 1980; Nickerson, 1999; Epley & Keysar et al., 2004). Knowledge about one’s self is solid and easily accessible, and in many cases using this knowledge as a reference point is useful. After all, despite idiosyncrasies, all humans are alike. Thus, making judgments about another human relying on one’s own experience is quite a reliable technique. As a result, even adults use self-knowledge as a starting point for induction (an anchor), and then serially adjust accordingly using other available information about the person and the context (Nickerson, 1999; Epley & Keysar at al., 2004). The pitfall of this heuristic, however, is that the final judgments remain too close to the original anchor (Slovic &

Lichtenstein, 1979). The reason for this insufficient adjustment seems to be that people stop correcting not after they reach the best estimate possible, but after they reach only satisfactory accuracy (Epley & Keysar et al., 2004). Indeed, despite the adjustment, adults still make egocentric errors. For example, in one study, participants listened to an ambiguous message left on an answering machine, which could have been interpreted as either sarcastic or not (Epley & Keysar et al., 2004). Beforehand, however, some of the participants read a scenario which clarified the meaning of the message, and some did not. Later they were asked if a listener, who did not read the scenario, would find speaker's intention to be clear. The results revealed that informed participants overestimated the clarity of the speaker's intention. Other studies have also shown that people tend to impute their own knowledge on others and overestimate the extent to which others share their opinions and attitudes (e.g. Keysar & Bly, 1995; Keysar, Ginzel & Bazerman, 1995; Barr & Keysar, 2002; Krueger & Clement, 1994; Ross, Green & House, 1977).

In the case of the timescale bias effect, people may be attributing most mind to the targets walking at average human speed because they use themselves as a starting point of induction. However, as no other contextual information is available about the target (such as goals, intentions, personality, attitudes, etc.) or the situation, the perceiver is not able to engage in full correction of the original anchor (Gilbert et al., 1988; Trope & Alfieri, 1997; Read et al., 1990), attributing his or her own mental states to the target as a result. When speculating about a person walking down the street, the most obvious similarity cue is the speed of the target's gait. Consequently, the closer the target's walking speed is to the one of the perceiver, the stronger the egocentric bias should be, and the perceiver should be more tentative to attribute mental states to the target that are similar to their own. As I have stated before, while it is difficult to truly understand what it is like to be somebody else, humans are experts in self-knowledge as they

have direct experience with own senses and thoughts. Morewedge et al. (2007) argued that, as a result, people may tend to perceive themselves to be capable of "richer experience of mind" than others. While it seems to be so (Gray et al., 2007), in Morewedge et al.'s (2007) experiment involving humans, attribution of mind was assessed by asking participants to rate the extent "to which the target appeared to be competent, to be intelligent, to be smart, and to have mind." All of the characteristics listed are framed as favorable characteristics. It has been repeatedly shown that people tend to evaluate themselves to be better than average on desirable traits, which adheres to a positive view of self and self-esteem (Alicke, 1985; Alicke, Klotz, Breitenbecher, Yurak & Vredenburg, 1995; Paulhus & Levitt, 1987). Thus, another plausible explanation could be that people project favorable traits onto the similar targets as they tend to think that they possess desirable characteristics to the greater extent than an average person.

Regardless of this mechanism, if the timescale bias effect is explained by egocentrism, then it should be moderated by dispositional walking speed of the perceiver. In other words, people should be more likely to attribute mind to those human targets whose speed of gait is the most similar to the one of their own rather than to average human walking speed. However, even if perceivers' dispositional walking speed was assessed in the study by Morewedge et al. (2007), this effect would not have been detected as faster and slower moving human targets in this study walked with speeds that are outside of the walking speed range that one could normally observe in the geographic region where the study was administered (Inman et al., 1981; Bornstein & Bornstein, 1976). As a result, the walking speed researchers used as average would best approximate the majority of the population, hence, disregarding possible individual differences. One perhaps could argue that using normal range of human gait speed may be ineffective as differences are not easily observable. I believe, however, that even within the average walking

speed range, the differences are pronounced enough to detect. Supporting evidence is presented in the study by Jacobs & Shiffrar (2005), in which observers made fewest errors in making judgments about point-light walker's speed of gait as relative to their own, when point-light walker's speed was within the average speed range (3.5 – 4.5 km/hr) and deviated from the one of the observer by 0.5km/hr.

There is another important point in the theory describing egocentrism as an example of the anchoring and adjustment heuristic. According to Ames (2004), people should project their own mental states onto other agents only when the agents appear to be similar to themselves. Conversely, when speculating about others that appear different from the self, perhaps applying self-knowledge as an anchor may seem to be somewhat inadequate. In such a case, people may resort to a different type of knowledge that is likewise easily accessible—stereotypes. Indeed, participants, who were told that a target individual responded to given questions in a similar manner as they, were more likely to attribute their own mental states to the target than the participants who were told that no answer of the target individual matched their own. The findings also revealed that in the latter condition, participants were more likely to evaluate the target individual according to their stereotypes. For example, if the target was described to be a medical student, participants' evaluations of the target agreed with their reported beliefs about a typical med-student (Ames, 2004). Thus, I hypothesize that observers' dispositional walking speed should serve as a moderator in timescale bias effect. Specifically, when a target's walking speed is close to the dispositional gait speed of an observer, it will serve as a cue of similarity between the observer and the target. Hence the observer will be more likely to use egocentric anchoring and attribute his or her own mental states to that target. Furthermore, I hypothesize that in a case of a target walking faster or slower than a perceiver (i.e. appearing dissimilar),

when speculating about mental states of this target, the perceiver will be more likely to use stereotypes as an anchor and make inferences consistent with his/her beliefs about slow or fast walkers respectively.

Walking Speed

However, for walking speed to be a characteristic cue, certain requirements should be met. First of all, the speed with which one walks should be relatively stable throughout time. In other words, every person should have a natural tendency to walk at a certain speed rather than adapting different velocities every day. Next, there should be differences in walking speeds across people, and finally, the differences should be significant enough to be detectable.

From our daily life experiences, it seems that people really do have tendency to walk at certain speeds. Most of us can probably think of friends, co-workers or neighbors who seem to be naturally slow or fast walkers. Scientific evidence suggests that, in fact, every person has a walking speed that is natural to them (Ralston, 1958; Corcoran & Brengelmann, 1970; Inman, Ralston, & Todd, 1981). It seems that this "natural" speed yields a form of biological "Conservation of Energy" law (Inman et al., 1981). Specifically, a person's natural walking speed is the speed that is the most efficient for him or her considering the distance walked and energy spent (Ralston, 1958; Corcoran & Brengelmann, 1970). In his study, Ralston (1958) measured participants' energy expenditures when they were walking at different speeds around a track. The findings revealed that the relationship between energy expended per meter walked per kilogram of body weight (*Em = calories/meter/kg*) and walking speed (*v=meters/min*) can be represented by so called *energy cost* curve with *Em* on the y-axis and *v* on the x-axis. The curve becomes infinitely large as walking speed becomes infinitely large and as walking speed

approaches 0. In other words, if one walks extremely slowly or extremely fast, his or her energy expenditure per distance unit is very large. Thus, the distance passed is not justified by energy spent, resulting in inefficient use of resources. The energy cost curve, however, has a minimum point. This point corresponds to person's optimal walking speed at which the use of resources is the most efficient (Ralston, 1958; Corcoran & Brengelmann, 1970). Figure 4 illustrates energy cost curve produced by using average values obtained in Ralston's (1958) study. Thus, for participants of this study, optimal walking speed will fall somewhere between *v=65* and *v=85* as the *Em* curve is the most flat between these values. For every person, the curve representing relationship between energy expenditure and walking speed will follow a similar pattern as in the Figure above. However, for every person, the lowest point on the curve lies at a different speed and represents his or her individual optimal speed, which he or she will be most likely to adapt when walking (Ralston, 1958).

The next question is whether these individual differences in walking speeds are significantly divergent. Normal humans may adapt walking speeds as slow as 2.5km/hr and as fast as 6.0 km/hr, with most speeds falling within the range 3.5km/hr – 4.5km/hr (Inman et al. 1981; Jacobs & Shiffrar, 2005). Depending on a population, this range may shift towards faster or slower speeds (Bornstein & Bornstein 1976; Knoblauch, Levine & Norenzayan, 1988; Finnis & Walton, 2008; Pietrucha, & Nitzburg, 1996). For example, in certain cities with larger populations size the mean walking speed of pedestrians may reach 5.4km/hr (Finnis & Walton, 2008). Nevertheless, these are only numbers, and the more important question is whether people are able to detect differences in walking speeds. Jacobs & Shiffrar (2005) conducted a study in which participants performed a speed-discrimination task. In the first condition, standing participants observed two point-light walkers, whose gait speeds differed by 0.5km/hr, and

Energy Cost Curve[1]

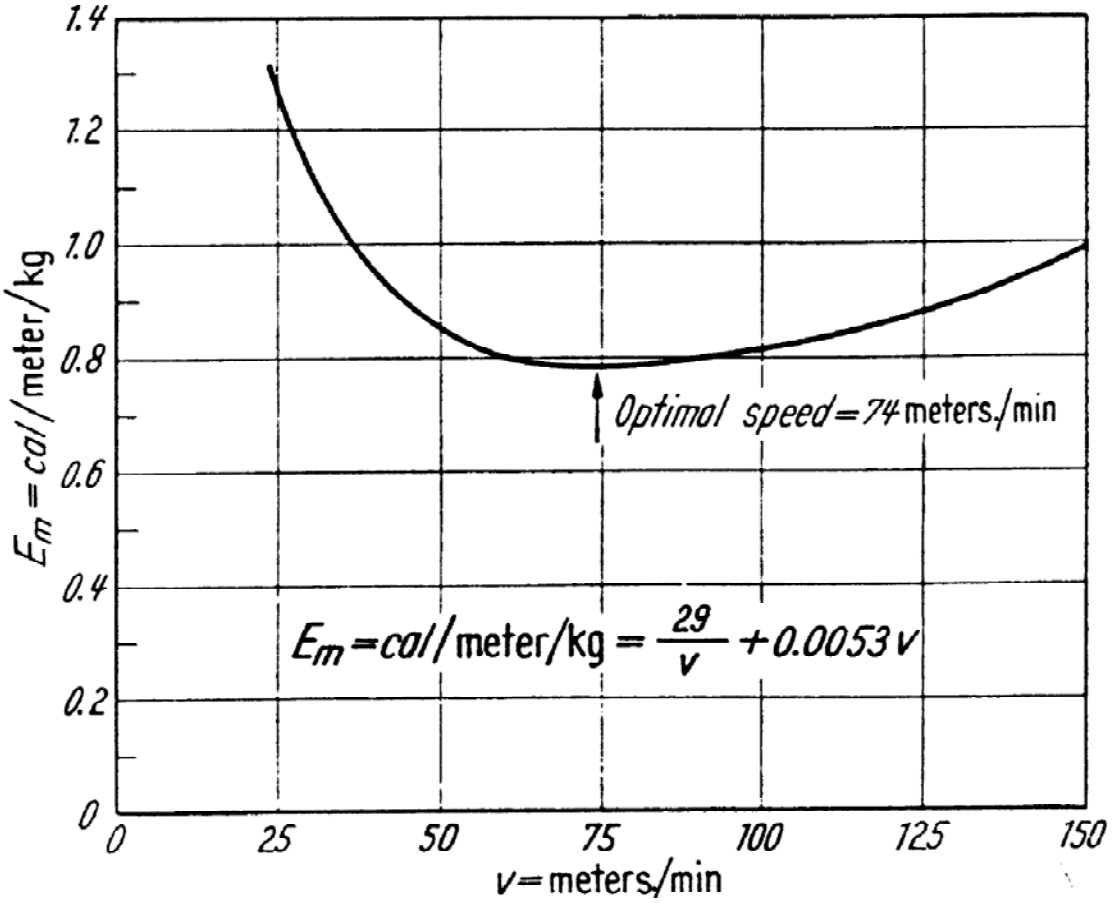

Figure 1. Relationship between energy expenditure in calories/meter/kg and speed.

discriminated between their relative speeds. In the second and third conditions, participants performed the same task while walking on a moving treadmill or pedaling on a stationary bicycle. In all three conditions, participants' accuracy in determining which point-light target walked faster and which slower was above chance. Standing participants showed the best performance but did not differ significantly from participants in the cycling condition. Walking participants had the lowest accuracy rate. Thus, from the results of this study, it seems that people are in fact capable of detecting walking speed differences as small as 0.5km/hr.

[1] *Note.* From "Energy-speed relation and optimal speed during level walking," by H.J. Ralston, 1958, Int. Z. angew. Physiol, 17, p. 281.

Consequently, every person appears to walk at a speed that is most energy efficient for him or her. This natural speed differs from individual to individual and generally falls between 2.5km/hr and 6.0km/hr. Most importantly, differences in normal walking speeds are detectable. Nevertheless, it cannot be said for certain that, when seeing a person walking, one automatically (with no suggestion or prompt) analyzes whether their own dispositional walking speeds differs from that of the observed target. However, considering timescale bias effect and significance of gait speed reviewed earlier, I speculate that the speed with which an observed target walks will serve as a similarity cue (between self and the target) and will play part in mind attribution.

Current Research

The main goal of the present research was to examine the underlying mechanism of the timescale bias effect by studying the role of dispositional walking speed in one's perception of the minds of other walking humans. The timescale bias was demonstrated by Morewedge et al. (2007), and it is based on the fact that humans walking at an average speed are attributed more mind by others than humans walking at faster or slower speeds. One of the possible processes that underlie this effect may be the egocentric bias. Thus, when observing a walking person whom the observer holds no previous knowledge about, it could be that the observer uses the self as a reference point in attempt to evaluate the mental capacities of the person observed. As a result, the observer may end up projecting his or her own mental states onto another person. However, this self-projection should occur only if the target subject to evaluation is perceived by the observer to be similar to self in one way or another. Therefore, I hypothesized that if a target's walking speed is close to that of an observer, the observer will encode the resemblance between him or her and the target and, as a result, project his or her own mental states onto the target.

If a target is perceived as dissimilar, on the other hand, using self as a reference may not be a reasonable technique. In such a case, people may resort to stereotypes. Consequently, I predicted that, if an observer's dispositional walking speed is slower or faster than the speed of a walking target, then the target will be perceived as dissimilar to self and will be attributed mind according to the observer's beliefs about mental capacities of slow and fast walkers.

However, Morewedge et al. (2007found that the targets walking with average human speed were attributed the most mind. This phenomenon can also be explained by the egocentric bias. While it is difficult to fully understand the mental experiences of another person, every person is very familiar with his or her own mental activities. Consequently, people may tend to grant themselves richer mental capacities than other people. Then, projecting his or her own mental capacities onto a target seen as alike, one may end up attributing more mind to this person than to others who are perceived as dissimilar. However, it is well known that people, particularly in individualistic societies, often tend to overestimate themselves in regard to positive characteristics and underestimate themselves in regard to negative characteristics. The four attributes that Morewedge et al. (2007) used to measure mind (intelligent, smart, competent, and possessing mind) seem to represent desirable characteristics (Paulhus & Levitt, 1987). In fact, when asked to indicate whether a positive characteristic describes them, people seem to automatically respond that it does. Conscious processes, on the other hand, inhibit this desire of self-enhancement. For example, having the motivation and sufficient mental resources, people actually tend to correct this bias and evaluate their skills and characteristics rather objectively (Paulhus & Levitt, 1987). Projection, however, happens outside of conscious process. Thus, if projection were the mechanism underlying the process of mind attribution to the targets walking at the average human gait speed, the desirability of the projected mind attributes could be the

reason why participants perceived these targets as possessing the most mind. The present study also addressed this question by assessing the desirability of all the attributes measuring mind. Thus, if people grant themselves richer mind experience as a whole, then ratings of personal mental states will not be associated with their desirability. If the extent to which attributes are seen as positive or negative does play a role, however, then people should rate themselves higher on more desirable characteristics than on the less desirable ones.

Furthermore, while Morewedge et al. (2007) used intelligence, competency, and mind possession as features of mental states, the present study explored attribution of mind in terms of mind's two dimensions: agency and experience. In addition, in Morewedge et al. (2007) participants were presented with the videos of a human walking at one of the three speeds: slower than average (1.66 - 2.41 km/hr), average (4.86 - 5.15 km/hr), or faster than average (7.31 - 8.03 km/hr). In the average condition, the target human's walking speed approximated the average walking speed in a city with a similar population size (Bornstein & Bornstein, 1976). However, in the slow and fast conditions, walking speeds of the target humans were outside the normal walking speed range (Inman et al., 1981; Raltson 1958). Thus, walking speeds that were presented in the stimuli videos can almost never be observed in a natural setting, which questions the generalizability of the effect found in the study. In may be that the differences in mind attribution to average, slow, and fast walkers do not exist when their gait speeds are within the range of normal human speed. The methodology of the present study addressed this issue. Stimuli videos developed for this study captured humans walking at slow, average, and fast speeds within the range of normal human walking speed.

Furthermore, stimuli films used in the original study, besides the target human, included other pedestrians walking down the street who were not part of the experiment, which may have

served as a confound. In another experiment by Morewedge et al. (2007), the stimulus video portrayed an animated “blob” moving down the street populated with animated pedestrians. Instead of the blob’s speed, the speed of the pedestrians was manipulated. Interestingly, participants attributed the most mind to the blob when its speed was the closest to the one of animated pedestrians. Thus, it seems that instead of considering the blob’s absolute speed, the participants perceived it in comparison to the speed with which the pedestrians moved. Since in the experiment involving humans, slow and fast walking targets moved at the speeds that were outside of normal human walking range, they may have stood out in the view of other pedestrians walking in the film. As a result, participants could have attributed the most mind to the targets walking the average speed because they walked similar to the other pedestrians and hence appeared normal. Stimulus videos of the current experiment controlled for this possible confound. Besides the target human walking down the street, there were no other pedestrians or cars moving in the films.

The present study also explored three other possible moderators of mind attribution that were not part of the original timescale bias study. One of them is the target’s likability. Kozak et al. (2006) asked participants to rate the mental capacities of a target character described in a vignette. The description of the character was either more or less favorable, thus manipulating the target’s likability. The results of the study indicated that people tend to attribute more mind to a likable person than to an unlikable person. Consequently, the present study considered likability of a walking target as a potential moderator.

Next, there is evidence suggesting that people may differ in the way in which they attribute mind to other targets as a function of their personality. According to the theory of anthropomorphism, the more a person is motivated to understand and predict the behavior of a

novel agent, the more likely he or she would be to apply available information and preexisting knowledge in attempts to analyze the target (Epley et al., 2007). In one of the studies, participants were more likely to anthropomorphize a robot seen on a video when their motivation to predict the robot's behavior was artificially augmented (Waytz et al., 2010). In the high-motivation condition, participants were offered a monetary reward for each correct response to the questions asking about the robot's subsequent actions. In the control condition, participants were not asked to predict the robot's actions nor were they offered a reward for their responses. As a result, participants who had greater motivation to deliberate about the robot's future behavior were more likely to attribute human-like mental states to the robot than the less motivated participants. The effect of motivation to predict future behavior of a target, however, has not been explored in the situations involving mind attributions to other humans. Nevertheless, according to the theory, people who are more motivated to understand and control their environment should be more tentative to search for sources that would help them speculate about the mental states of newly encountered targets. Likewise, these people should be more likely to rely on such sources as self-knowledge and stereotypes. Thus, the dispositional tendency to control one's own environment, as measured by the *desire for control* scale (Burger & Hemans, 1988) was considered as a second moderator.

Lastly, *need for closure* (Kruglanski & Mayseless, 1988; Kruglanski & Webster, 1996) is another stable personality trait that the present study assessed as potential moderators. Need for closure assesses a person's desire to have a definite answer regarding a subject as opposed to tolerance towards ambiguity. People high in need for closure aspire for fast solutions and may be more tentative to quickly form their opinions using information available at hand (Kruglanski & Webster, 1996). By the same token, such individuals could be more motivated to make fast

judgments about people they observe, making them more sensitive to various cues available that would help them succeed at the task. Thus, people scoring high in need for closure may be more likely to attend to target's walking speed and refer to this information when making assumptions about target's mental capacities.

Pilot Study: Dispositional Walking Speed

The purpose of the pilot study was to establish the range of walking speeds on the college campus where the study was conducted. Furthermore, slow, medium, and fast speeds for the target population needed to be determined in order to produce video stimuli for the study.

Method

Participants

Forty-six undergraduate students at a northeast college participated in this study in exchange for either a psychology course credit or cash compensation.

Material and Procedure

Participants were asked to fill out a short questionnaire about their political attitudes. When a participant completed the task, a researcher asked him or her to drop the filled out questionnaire in the survey box that was located down the hallway and around the corner from the lab where the experiment took place. This path generally had very little student and faculty traffic, which helped reduce possible obstacles that could have slowed down the participants. The experiment was set up in such a way that only one participant at a time walked to the survey box. The total path length was 56.5 meters. As soon as a participant stepped over the door line of the lab, a researcher pressed the start button on the *Stopwatch Collection* electronic stopwatch in

a way that was not visible to the participant. When the participant stepped over the door line coming back to the lab, the researcher pressed the stop button and recorded the elapsed time.

Results

The walking speeds ranged from 3.41km/hr to 5.64km/hr. The speeds were normally distributed with a mean of 4.39km/hr, a mode of 4.09km/hr, and a median of 4.5km/hr (Figure 2).

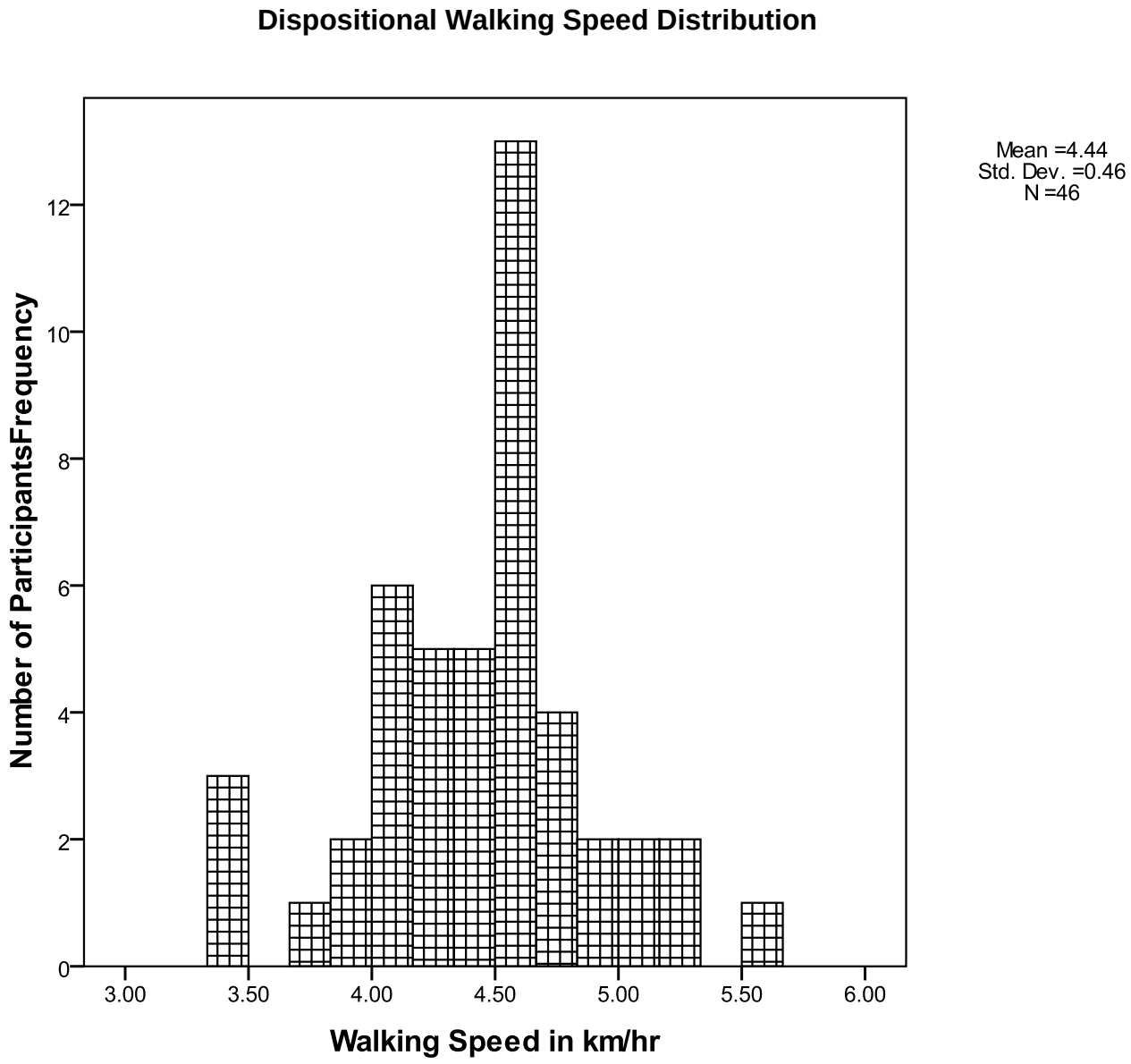

Figure 2. Distribution of dispositional walking speeds in the pilot study.

Methods

Participants

Sixty-seven undergraduate students, 21 male and 42 female, at a northeast college participated in this study in exchange for either a psychology course credit or cash compensation.

Materials

Video stimuli. Participants were shown videos of a male and female actors walking down the street at slow, medium, or fast speeds. Thus, in total six clips were created. The walking speeds of both female and male actors were adjusted to 3.92km/hr (slow), 4.66km/hr (medium), and 5.72km/hr (fast) by using *Final Cut Express* computer program. The films' durations for both male and female actors were 19sec, 16sec, and 13sec respectively. The choice of the walking speeds was based on the distribution obtained in the pilot study. All videos were filmed on one of the streets in a northeastern town. No obvious signs that were definite indicators of the specific location were visible. Besides a walking target, no other pedestrians or cars were present in the films. The length of the street segment visible was 20.7 meters.

Dispositional walking speed measure. The procedure measuring participants' dispositional speed was identical to the one used in the pilot study.

However, there could be a bias in perception of one's own walking speed. Observing another person walk, if one draws conclusions about similarity by comparing the walking speed of the person observed to their own, it may be that their perceived, as opposed to absolute, walking speed serves as the criterion for the comparison. Thus, close to the end of the survey,

participants were also asked how fast they think they walk in comparison to other students at their college. This served as an alternative measure of a walking speed.

Mind attribution scales. A scale measuring mind attribution to targets observed in the videos consisted of 19 items (Appendix A). Fifteen of them were the mind attributes that Gray et al. (2007) used: 7 of the questions pertaining to agency dimension and 8 to experience dimension. The other 4 items were mind attributes used by Morewedge et al. (2007). In addition, the scale included 12 filler items. Participants were asked to rate on a 7-point Likert scale with end points "Not at all" and "Very much" the extent to which the person in the video appeared to be capable of remembering, feeling pride, being competent, etc.

The same 19 items were used to measure perception of own mind (self-mind) (Appendix B), and stereotypical mind attributions to slow and fast walkers (Appendix C). These latter scales, however, included 20 different filler items. This was done to prevent participants from making a logical connection between these scales and the mental capacity ratings that they were asked to provide for the targets observed in the videos. For the self-mind and stereotype questionnaires, participants were asked to indicate the extent to which a given statement (e.g. has good memory, intelligent, able to feel embarrassment, etc.) was about them or about a typical slow or a typical fast walker respectively. Seven-point Likert scales with end-points "Nothing like me" and "Very much like me" or "Nothing like the person" and "Very much like the person" were used.

Perceived similarity. It was hypothesized that if the walking speed of a person in a video is close to the dispositional gait speed of an observer, this resemblance will suggest similarity between the observer and the person in the video. In order to check whether such an association had occurred, we assessed perceived similarity between self and the person in the

video. Participants were asked to indicate on a 5-point Likert scale the extent to which they agreed with each of the two statements, “The person in the video is nothing like me” and “I think that person in the video and I may have a lot in common,” the first statement being reverse coded.

Target speed recognition. Slow, medium and fast walking speeds of the targets presented in the videos differed by more than 0.5 km/hr from each other, which was shown to be as detectable speed discrepancy. However, in order to reassure that in the video stimuli designed for the present study the speed discrepancies were also detectable, a speed discrepancy recognition question was included in the survey packet. Participants were asked what they thought about walking speeds of the persons in the videos in relationship to each other. Participants could pick one of the following answer options: “A: The person in Video 1 walked faster than the person in Video 1,” “B: The person in Video 1 walked slower than the person in Video 2,” “C: The people walked at roughly the same speed,” or “D: I do not remember.”

Item desirability. To assess desirability of mind attributes, a questionnaire was created asking participants to rate how desirable each of the 19 items describing mental capacities appeared (Alicke, 1985). Bipolar 7-point Likert scale with end points “Very undesirable” and “Very desirable” was used (Appendix E).

Target likability. To assess likability of the observed walking targets, participants were asked to rate on a 6-point Likert scale how much they agree with each of the three statements, “I think I could really like the person in the first video if I met him/her”, “I think the person in the first video is a good person”, “I think I the person in the first video is a friendly person.” The statements were designed using the example of Kozak et al.’s (2006) likability assessment.

Desire for control. Desire for Control is a 20-item scale measuring the extent to which a person aspires to have control over his or her environment and life events (Burger & Cooper, 1979). Respondents indicate how each of given statements (e.g. "I'd rather run my own business and make my own mistakes than listen to someone else's orders", "I prefer a job where I have a lot of control over what I do and when I do it" describes them using 7-point Likert scale with endpoints "The statement does not apply to me at all" and "The statement always applies to me."

Need for closure. Need for closure scale measures one's need for cognitive closure. It consists of 42 statements describing either preference of clarity (e.g. "I don't like to go into a situation without knowing what I can expect from it", "I usually make important decisions quickly and confidently") or preference of open options and comfort with ambiguity (e.g. "I think it is fun to change my plans at the last moment", "When considering most conflict situations, I can usually see how both sides could be right"). Respondents are asked to rate the extent to which they agree with each of the statements using a 6-point Likert scale anchored with "Strongly agree" and "Strongly disagree". Reliability and consistency of the scale was shown elsewhere (e.g. Kruglanski & Freund, 1983; Kruglanski & Webster, 1996; Kruglanski, Webster, & Kelm, 1993).

Preexistent familiarity with video targets. Actors who walked in the current clips were students of the same undergraduate institution where the study was conducted. If a participant recognized the actors in the videos, it would create a confound. Therefore, after participants completed target mind attribution scale as well as likability and similarity scales, they were asked whether the persons they observed in the films were familiar to them.

Distractor tasks. Due to the fact that current experiment consisted of multiple lengthy measures, there was a risk that participants would be too overwhelmed and would stop paying attention. Attention depletion could result in satisficing (i.e. responding without thinking about the questions and simply satisfying a survey) and, hence, unreliable responses (Stolte, 1994). Furthermore, five scales (target mind attribution-2, self-mind-1, slow/fast walker mind attribution-2) included the same mind attribution items. Even though the scales included filler items, seeing similar questions five times in the same experiment could have appeared redundant thereby creating a greater risk that the participants would respond similarly to all scales. Thus, 4 distractor tasks were employed in the experiment. The tasks were designed to require little cognitive effort. In two of the tasks participants were presented with two images and were asked to find as many differences between them as they could in 30 seconds (Appendix D). As the time elapsed, participants were asked to report the number of differences they could count. In another task, participants were shown an image with overlapping animal contours and were asked to count as many animals as they could in given 30 seconds (Appendix D). Final distractor task was the *need for cognition* scale.

Attention check. To control for possible satisficing two attention check questions were included in the experiment. The first of these questions was included in the need for closure scale and asked participants to indicate the extent to which they agree with the following statement, “I am currently a student at a college or a university.” The second attention check questions was contained within the desire for control measure and required participants to rate the extent to which the statement “I am forty years of age or older” applied to them. Since participants of this study were undergraduate students under age of 40, incorrect responses to these questions would allow me to screen out participants who were answering the questions without reading them.

Procedure

The time slots for this study were scheduled at least 15 minutes apart from each other and accommodated one participant per slot. The researcher explained that the purpose of the current study was to investigate how people perceive others while having very little information about them. Participants were asked to read and sign an informed consent form, after which they were invited to an individual cubicle where they would complete the survey.

The participants were given a life habit questionnaire consisting of 12 questions (e.g. “On average, how many books do you read per year?”, “How often do you eat at restaurants?”) and were told that it was a pilot study for an unrelated experiment. Upon their completion, the researcher asked participants if they could do her a favor and drop their filled out questionnaire in the survey box located outside the lab. In reality, the life habit questionnaire was an excuse to have participants walk to the survey box and back so that the researcher could record their walking speed.

When the participants returned to their cubicles, the researcher told them that they will watch two short videos and fill out a reaction questionnaire after each. In both videos, participants observed a person walking down the street. In one of the videos, the person was a female and in another video it was a male. A person in a video walked at one of the three speeds: slow, medium, or fast. However, persons in the first and the second videos did not walk at the same speed. In other words, if in the first video a person walked at the slow speed, then in the second video a person walked at either medium or fast speed; and if in the first video a person walked at the medium speed, then in the second video a person walked at either slow or fast speed. The order of videos was counterbalanced in terms of actor’s gender and speeds, resulting

in 12 possible combinations of videos. Participants were randomly assigned to one of these. After watching each video once, participants were given target mind attribution, likability, and perceived similarity scales and were asked if they have seen the person in the video before.

The order of the subsequent questionnaires was as follows: need for cognition (distractor task1), recognition of targets' walking speeds discrepancies, distractor task 2, self-mind[2], need for closure, distractor task3, slow walking person stereotype, desire for control, distractor task4, fast walking person stereotype, item desirability, and demographics. As participants completed the survey, they were thanked and debriefed.

Results

Data from 2 participants were was not included in the analyses because these participants responded incorrectly to one of the attention check questions. One more participant was excluded from the analyses as an outlier since his walking speed z-score was 4.07.

Out of 64 participants, 22 were male and 42 were female. Age of the participants ranged from 18 to 25 years old with the mean age of 20. Sixty-nine percent of the participants were white, 9% were African American or Hispanic, 13% were Asian, and 9% identified themselves as other.

Dispositional walking speed was missing for two of the participants. The dispositional walking speeds ranged from 4.28km/hr and 7.62km/hr and were normally distributed with a mean of 5.44km/hr, a mode of 5.39km/hr, and a median of 5.40km/hr (Figure 3). The

[2] The order in which self-mind scale and mind attribution stereotype scales were presented was also counterbalanced.

distribution was shifted 1km/hr towards faster speeds in comparison to that obtained from the pilot study. One of the possible reasons could be that during the pilot study, participants were not given very clear instructions explaining how to get to the survey box, and as a result the participants could have been looking around and hence walked slower (Finnis & Walton, 2008).

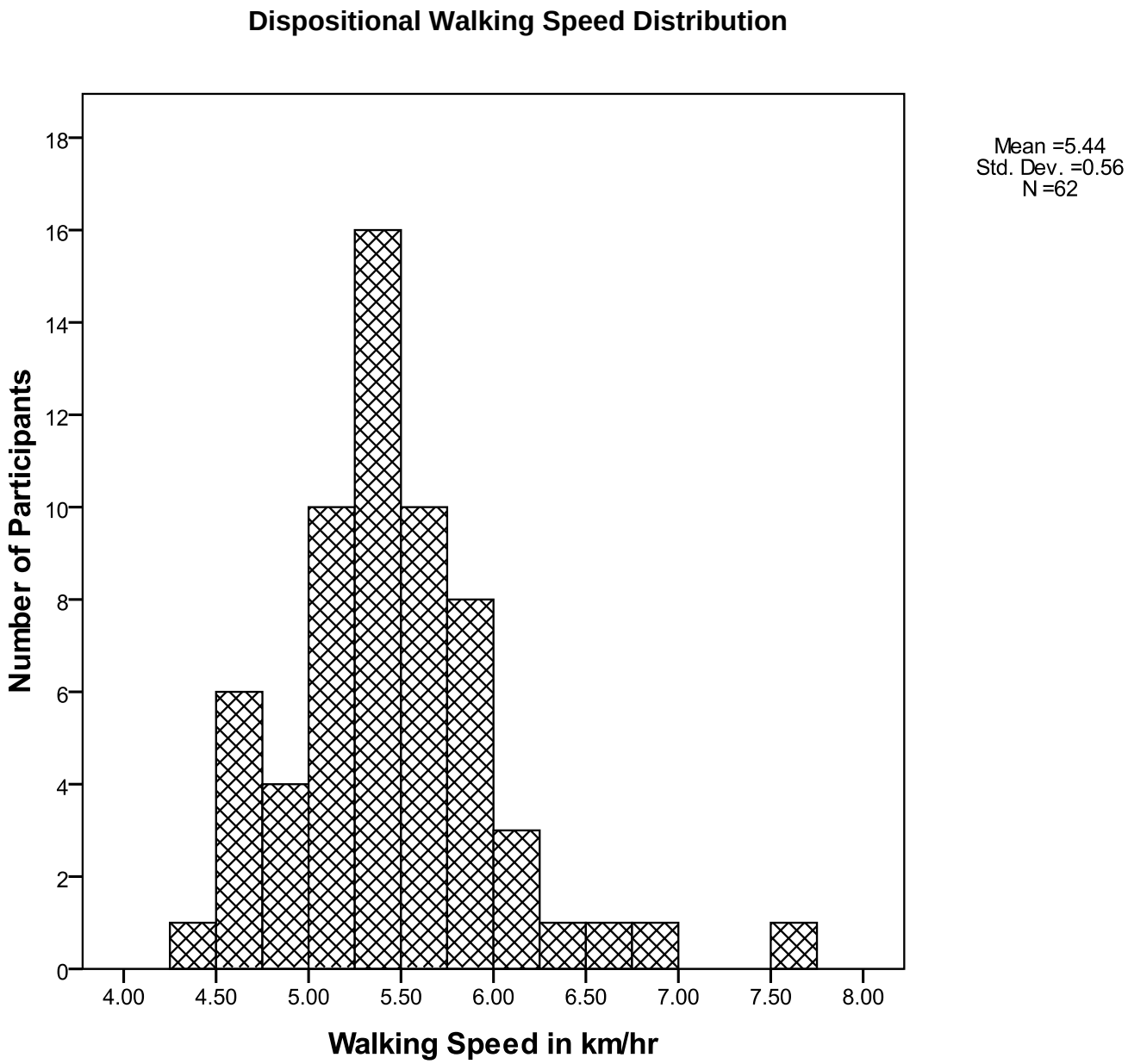

Figure 3. Distribution of participants' dispositional walking speeds in the experiment.

Data Transformation

In the following analyses, the mind attributed to a target in the first video watched was used as the criterion. Data from the second video watched was not included in the analyses[3].

A new continuous variable, speed match (*SpMa*), was created by subtracting participants' walking speed from that of the target in the video to which he or she was exposed and taking an absolute value of the difference. Hence, the smaller the SpMa score, the greater the match between participant's dispositional speed and the speed of observed target.

Note that the walking speeds of the targets in the videos were chosen based on the results of the pilot study in order to best approximate slow, medium, and fast speeds common for the location where the study was conducted. To address the hypotheses of the present research, a wide enough range of speed match between target and participant walking speeds was needed. In other words, some of the target walking speeds had to be similar to the ones of the participants and some had to be slower or faster. Despite the fact that target speeds were based on the walking speed distribution obtained in the pilot study which was distorted, the obtained speed match range was acceptable: 0 - 0.5km/hr: 17 participants, 0.5 - 1km/hr: 19 participants, 1 - 1.5km/hr: 14 participants, 1.5 - 2km/hr: 12 participants (Figure 4). The present range is satisfactory as speed differences are detectable at 0.5km/hr discrepancies (Jacobs & Shiffrar, 2005).

Reliability analyses showed that responses to all 19 items of the mind attribution scale were inter-correlated for slow, a = .94, medium, a = .91, and fast, a = .85 video conditions. Therefore, for each participant, a single score indicating mind attribution to a target was

[3] Given time constraints of this project and given that results from the first video did not appear promising in regard to the research hypothesis, results from the second video were not analyzed.

calculated by creating a mean of responses to all individual items. Similarly, composite scores were calculated self-mind (Chronbach's a = .82), typical slow (Chronbach's a = .88*)* and typical fast (Chronbach's a = .89) walkers as well as for the desirability (Chronbach's a = .90), need for closure (Chronbach's a = .66), and desire for control (Chronbach's a = .72) scales. Furthermore, responses to two questions targeting participants' perceived similarity to a target (*SimP*) they observed in the video were highly correlated, r = .68, p < .001. Thus a single score for SimP was calculated by taking a mean of the two responses.

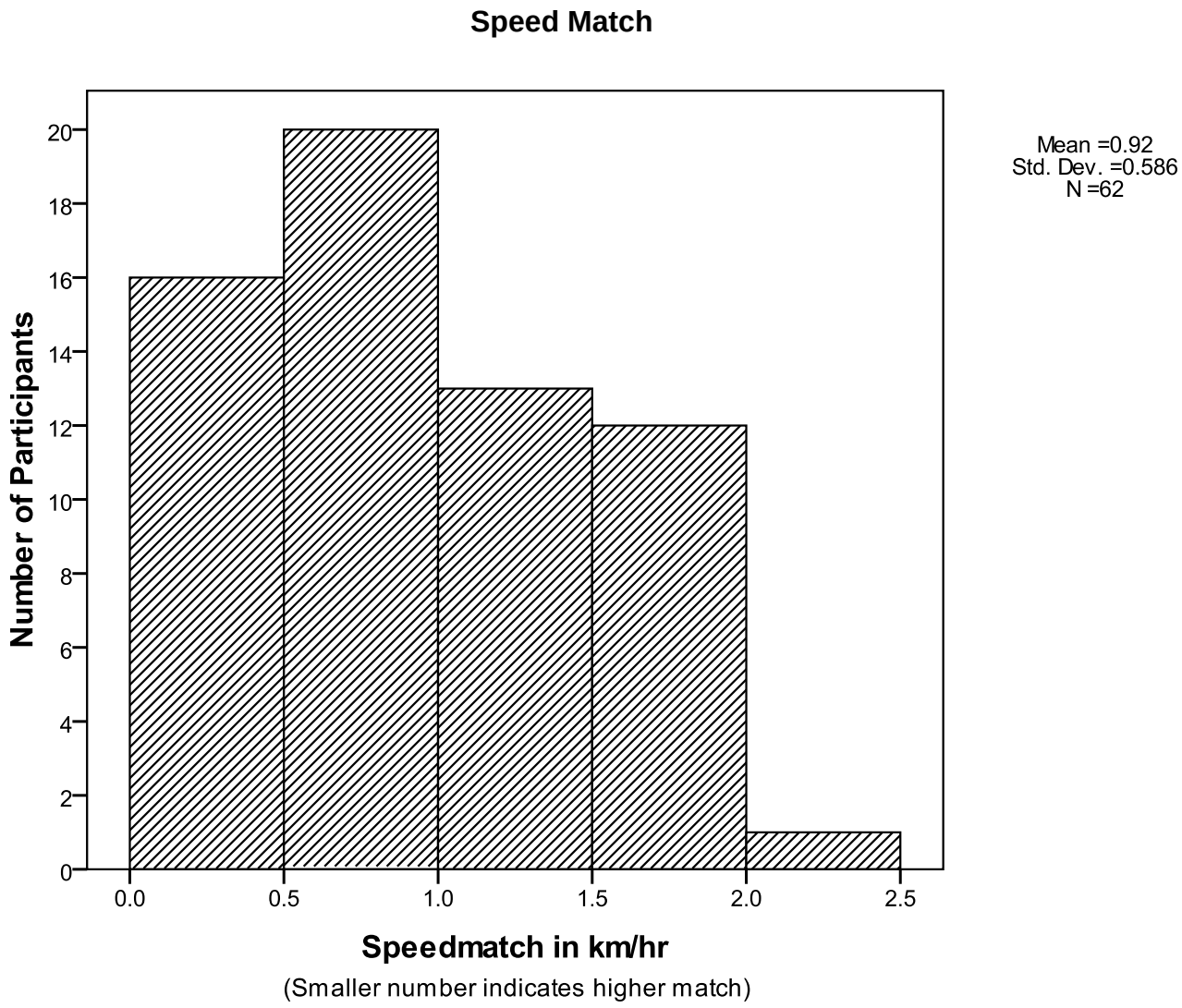

Figure 4. The degree to which a participant's dispositional walking speed matched the speed of a target the participant observed in the first video.

In addition, a new variable speed match perceived was created to capture the match between the speed with which participants thought they walked and the real walking speed of observed target in the video.

Preliminary Analyses

No participant recognized either one of the actors in the videos. Participants were generally able to correctly identify walking speed discrepancies between the targets in the first and the second videos, $t = 3.73$, $p < .001$, supporting the findings of Jacobs & Shiffrar (2005) that people are able to discriminate between differences in walking speeds deviating by as little as 0.5km/hr.

In addition, participants were mostly accurate evaluating their own walking speed in comparison to that of their peers. Actual walking speed of the participants was positively associated with their self-speed ratings, $r = .26$, $p = .04$.

Next, there seemed to be a dispositional tendency across participants to attribute high or low mind experiences. The ratings of mental capacities of a target in the video, self-mind, and imagined slow and fast walkers were inter-correlated across participants. All correlations were significant, and ranged between $r = .31$, $p = .01$ and $r = .47$, $p < .001$ (see Table 1). Thus, participants who thought that a video target possessed a lot of mind were also more likely to think that they and slow and fast walkers have a lot of mind.

Even though the ratings of self-mind were correlated with video target mind and stereotypes, I wanted to see if participants evaluated their own mental capacities as higher than those of others. For this analysis, I calculated differences between the ratings of self-mind and target mind (*TargetDiff)*, self-mind and slow walker mind (*SlowDiff*), and self-mind and fast

Table 1
Mind Attribution Correlations

		Video Target Mind	Self-Mind	Fast Walker Stereotype	Slow Walker Stereotype
Video Target Mind	Pearson Correlation	1	.314*	.470**	.412**
	Sig. (2-tailed)		.011	.000	.001
	N	64	64	64	64
Self-Mind	Pearson Correlation	.314*	1	.350**	.379**
	Sig. (2-tailed)	.011		.004	.002
	N	64	64	64	64
Fast Walker Stereotype	Pearson Correlation	.470**	.350**	1	.406**
	Sig. (2-tailed)	.000	.004		.001
	N	64	64	64	64
Slow Walker Stereotype	Pearson Correlation	.412**	.379**	.406**	1
	Sig. (2-tailed)	.001	.002	.001	
	N	64	64	64	64

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

walker mind (*FastDiff*). For each difference variable, a score above zero indicated that a participant attributed more mind to self than to the particular party, and a score below zero indicated the opposite. One-sample t-test determined that the participants indeed granted themselves more mental capacities than they granted the video target (TargetDiff $M = .64$) $t = .75$, $p < .001$; the arbitrary slow walker (SlowDiff $M = .89$) $t = 9.69$, $p < .001$; and the arbitrary fast walker (FastDiff $M = .50$) $t = 5.8$, $p < .001$. However, self-mind was not associated with the desirability of mind attributes, $r = .15$, $p = .22$ suggesting that the items' favorability was not related to participants' evaluation of their own mental states.

Furthermore, to see if there was a difference in stereotypes held about minds of slow and fast walkers, the stereotype difference (*SterDiff*) score was calculated for each participant by subtracting a mind score of the slow hypothetical walker from a mind score of the fast

hypothetical walker. Similarly to the difference variables described previously, a SterDiff score above zero indicated that the fast walker was attributed more mind than the slow walker, and a SterDiff score below zero indicated the opposite. The mean SterDiff score across participants was positive (M = .36) and differed significantly from zero, t (64) = 3.76, p < .001, suggesting that the participants tended to attribute more mind to an arbitrary fast walking person than to an arbitrary slow walking person.

Interestingly, in contradiction to findings by Morewedge et al. (2007), there was no difference between the mind attributed to fast (M = 5.14), medium (M = 5.08), and slow (M = 5.08) walking targets, F (2, 62) = .07, p = .93.

Main Analyses

According to my hypothesis, the extent to which observer's dispositional walking speed matches the speed of a walking target should predict the amount of mind the observer attributes to the target. Hence, the speed match (*SpMa*) variable is the main predictor and is included in all of the following analyses unless indicated otherwise. Likewise, mind attributed to a video target served as the criterion. Since the range of the mind attribution scores to a target in the video was very small, with most scores falling in between 4 and 6.5 on a 7-point scale, target mind attribution scores were Z transformed across participants as done by Morewedge et al. (2007).

There was no correlation between SpMa and mind attributed to a walking target, r = -0.4, p = .78. Hence, the extent to which participants' dispositional walking speed was similar to the speed of a target in the video did not predict the amount of mind attributed to the target.

Speedmatch and projection. I had predicted that if person's dispositional walking speed is similar to that of a target, he or she would project his or her own mental states onto the target. Therefore, the following analyses include mind attributed to self as a predictor.

A multivariate linear regression conducted with SpMa, self-mind, and their interaction term as predictors of mind attribution to a walking target showed that there was no significant main effect of SpMa, $\beta = .11$, $p = .93$, SelfM, $\beta = .32$, $p = .18$, or interaction, $\beta = -.12$, $p = .93$. When recognition of speed discrepancies (correct or incorrect) was included as another predictor variable, the three-way interaction speed match*self-mind*speed recognition appeared to reach significance, $\beta = 1.79$, $p = .12$. However, further regression analysis revealed that the effect seemed to emerge among participants, who did not correctly identify targets' speed differences in the videos, $\beta = -1.22$, $p = .13$, which contradicts the original hypothesis.

Introducing need for closure as a predictor variable did not produce a significant interaction of speed match*self-mind*need for closure, $\beta = -.12$, $p = .41$. Furthermore, neither desire for control nor likability of a target seemed to moderate the results. Interactions of speed match*self-mind*desire for control, $\beta = .01$, $p = .93$ and speed match*self-mind*likability, $\beta = -.18$, $p = .63$ were non-significant.

Speedmatch and stereotypes. The amount of mind attributed to a target in the video did not differ as a function of stereotype beliefs about fast and slow walkers, $F(2, 54) = .51$, $p = .60$. Thus, participants, who thought that a slow walker would generally possesses greater mental capacities than a fast walker, attributed just as much mind to a target in the video walking at slow ($M = 4.91$) speed as to targets walking at fast ($M = 5.13$) or medium ($M = 5.21$) speeds. Similarly, participants who rated a typical fast walker to have more mind than a typical slow walker did not

rate fast-walking target (M = 5.12) in the video to have more mind than targets walking at slow (M = 5.21) or medium (M = 5.03) speeds. It seems that participants' beliefs about mind experience of slow and fast walkers did not make a difference in how they perceived the mind of targets walking in the video.

Perceived similarity and projection. It was hypothesized that, if observer's dispositional walking speed is close to the walking speed of a target, the observer would perceive the target as similar to him/herself and therefore would project his or her mental states onto the target. However, the degree to which target's walking speed approximated that of a participant was not associated with the participant's perception of similarity between the video target and self, r = .02, p = .89. Thus, the degree of speed match did not seem to produce a cue of similarity between the target and the self as it was originally predicted. Consequently, to investigate whether the projection of own mental capacities occurs when target is perceived to be similar to self, instead of the speed match variable, the following regression analysis included perceived similarity as a predictor of the target mind. Self-mind served as the second predictor. However, the interaction perceived similarity*self-mind was non-significant, β = -.33, p = .82. In other words, the perceived similarity was not related to how participants evaluated the video target's mind in comparison to their own.

Perceived similarity and liking. Interestingly, perceived similarity was positively associated with the likability of the target, r = .27, p = .03 and the amount of mind the participants attributed to a video target, r = .31, p = .01. The latter was true only for the agency dimension of mind, r = .25, p = .04 but not the experience, r = .19, p = .13. Furthermore, degree to which participants reported to like a video target was positively correlated with the amount of

mind participants attributed to him/her, $r = .26$, $p = .03$, and again this association occurred only for the agency dimension, $r = .39$ $p < .01$ and not the experience, $r = -.03$, $p = .83$.

Discussion

Previous research on mind attribution suggests that when evaluating mental capacities of others, our judgment may be subject to the *timescale bias* (Morewedge et al., 2007). In particular, when confronted with a novel agent, people appear to have a tendency to attribute more mind to the agent if its speed of movement is close to the average human speed. Prior research has shown that the timescale bias exists for non-human as well as human targets. In the study by Morewedge et al. (2007), participants thought that a human target walking at the average human walking speed was more intelligent, smart, competent, and simply had more mind than those walking slower or faster. The purpose of the present study was to examine an underlying mechanism of this phenomenon and determine its moderators.

One of the possible explanations for the timescale bias effect could be egocentrism (Morewedge et al, 2007). When confronted with a novel agent, one needs a reference point in order to understand and speculate about an agent's behavior and/or mind (Higgins, 1996; Nisbett & Ross, 1980). A reasonable starting point for induction could be existing easily accessible knowledge about a similar agent. Egocentric bias occurs when one uses knowledge about the self as the reference point, which results in attributing one's own thoughts, desires, characteristics, etc. to a target in question. Thus, one of the possible explanations of the effect found in the study by Morewedge et al. (2007) could be that the people perceived the target human walking at the average speed as the most similar to them and as a result projected their own mental capacities onto the target (Ames, 2004; Watson et al, 2000). People's tendency to grant themselves with

more mental capacities than they grant others (Morewedge et al., 2007) could have resulted in the attribution of more mind to the average walking target than to the slow and fast walking targets. The reason why people assimilated best with the target walking at the average speed could have been the choice of targets' walking speeds. In the study by Morewedge et al. (2007), participants watched a video of a person walking at slow, average, or fast speeds. However, slow and fast speeds displayed in the videos were outside of the range of the normal human walking speed. As a result, it could be that the speed of the average walker approximated best the walking speeds of the participants, and they projected their mental capacities onto this target and not onto the slow and fast walkers. Thus, in order to investigate whether egocentrism and self-projection truly occur in the timescale bias effect, the present study examined an observer's dispositional walking speed as a possible moderator. It was hypothesized that the closer the target's speed is to the dispositional walking speed of an observer, the more likely the observer would be to project his or her own mental capacities onto the target. The observer's perception of similarity between the target and the self was hypothesized to be a mediator. In other words, it was thought that the resemblance between speeds would be positively associated with the perceived similarity, which in turn, would facilitate the projection.

However, it appears that one projects self-knowledge onto the novel target only if there is a reason to believe that the target is similar to the self (Ames, 2004). If this does not occur, a person should resort to another type of easily accessible knowledge, such as stereotypes, and use it as a reference point instead. Thus, the second hypothesis of the present study was that if a target's walking speed is slower or faster than the one of the observer, then the observer would attribute mental capacities to the target in accordance to the stereotypes they hold about minds of slow and fast walkers, respectively.

To test the hypotheses, participants were asked to watch a video of a person walking down the street and complete a questionnaire asking them to evaluate the target's mental capacities. The participants also reported their thoughts about their own mental capacities (self-mind) and the mental capacities of typical slow (slow walker stereotypes) and typical fast (fast walker stereotypes) walkers. Additional moderators examined in the present study were liking of a target (Kozak et al., 2006) as well as an observer's need for cognitive closure and desire for control (Epley et al., 2007).

The methodology of the present research was improved from the one used by Morewedge et al. (2007) in the following ways. In order to ensure ecological validity, all target walking speeds used in the video stimulus were within the range of the normal human walking speed. Unlike the original study, in the stimulus video, an actor walking down the street was the only moving target visible, with no other people or cars present. In addition, attribution of mental capacities was examined in terms of two separate dimensions of mind: agency and experience (Gray et al., 2007). Finally, the desirability of mind attributes was assessed to see if motive of self-enhancement plays a role in how people attribute mental capacities to the self and others, and whether favorability of the items in the mind attribution scale is the reason why people grant themselves and those similar to them with more mental capacities than others.

Mind Dimensions

In assessments of mind attribution, 7 items pertained to the agency dimension and 8 pertained to the experience. I ran Chronbach's alpha reliability tests for all scales that included mind attributes: target mind, self-mind, slow walker stereotype, fast walker stereotype, and desirability. The reliability was very high for all the scales, suggesting that at least in the case of

the present study, the agency and experience dimensions functioned very similarly. Hence, the two dimensions were combined to create a single mind attribution score for each scale and were not differentiated in most of the analyses.

Patterns of Mind Attribution

Several patterns have emerged in ways participants tended to attribute mind. First, scores of mind attributed to a video target, self, and typical slow and fast walkers were all positively associated across participants. In other words, participants appeared to have a tendency to attribute a certain amount of mind regardless of a particular target. Thus, some participants thought that all targets, including self and others, had very high mental capacities and others thought that all targets had mental capacities of a moderate level. One of the possible explanations could be differences in personal understanding and interpretation of the notion of mind (Perner, 1999). For example, some may think that any normal human should have full mental capacities such as abilities to remember and feel pain. Others may think that an average human has only moderate mental capacities, and based on individual differences, some people may have more or less mind than others. Thus, people may be using a certain anchor for their judgment of an adult human's mental capacities and then adjust accordingly. However, as in any other case of the anchoring heuristic, adjustment may not be complete, and people's ratings may remain close to the original anchor (Nisbett & Ross, 1980; Gilbert et al., 1988; Trope & Alfieri, 1997; Read et al., 1990) resulting in all mind attributions around a particular level.

Despite the participants' apparent dispositional tendency to attribute a certain level of mind, there were several differences in mind perceptions. First of all, consistent with the previous research (Gray et al., 2007), participants rated self-mind significantly higher than the

minds of a video target, a typical slow walker, and a typical fast walker. Thus, people indeed seem to think that they possess more mental capacities than others. However, this phenomenon did not seem to be a manifestation of people's general tendency to rate themselves as better than average on favorable characteristics (Alicke, 1985; Alicke et al. 1995; Paulhus & Levitt, 1987), as self-mind was not correlated with the desirability of the mind attributes. In other words, the degree to which participants perceived the items of mind attribution scale to be positive (i.e. desirable to have) did not play a role in how participants rated themselves on those items. At first glance, these results may seem to contradict our motive to self-enhance. However, Haslam et al. (2005) reported somewhat similar findings. In their study, participants rated themselves higher on the traits pertaining to human nature (i.e. traits of *humanness*) than they rated others despite positive and negative valence of the traits. Furthermore, this so-called self-humanization was not associated with self-esteem, suggesting that people attributed more humanness to self due to a motive other than endorsement of positive self-view. The authors proposed that because people have more profound understanding of their own personalities and mental states and because the traits of human nature are central to self and "essence-like," people have a tendency to self-humanize (Haslam et al., 2005). It is possible that the mind attributes used in the present study function similarly to the human nature traits. Of course, since items of the mind attribution scale were not assessed in terms of their essentiality to human nature, the statement above is only an assumption. Nevertheless, the reasoning may be similar. As Morewedge et al. (2007) speculated, perhaps people perceive more mental capacities in self simply because they have first-hand experience with their own sensations and thoughts, and hence their representations of their own mental states are more elaborate than the representations of the mental states of others (Malle & Pearce, 2001).

Participants also attributed more mind to an imagined typical fast walking person than to a typical slow walking person. Note that undergraduate students at a northeast college constituted the sample for the present study. It could be that participants associated the "typical fast walker" with a person who is fast in general. On a college campus, this association could imply a person who is always on top of his or her course work, is actively involved with extracurricular activities, and has time for rich social life. Similarly a slow walker could have been associated with a procrastinator or a person who simply "gets by". As a result of such associations, the participants may have concluded that a fast walker must have more mental capacities than a slow walker. Depending on a population and personal values, however, these associations may differ. Hence, the effect may not be replicated if the survey is conducted using a different sample. Interestingly, when watching a person walking in the video, people did not attribute any more mind to a fast walker than to a slow walker. Thus, the difference in mind attribution emerged only for hypothetical fast and slow walking people that participants were asked to imagine. Hence, even though people thought that a fast walker must have more mind than a slow walker, they did not use these stereotypes when evaluating the mental capacities of an actual person they were observing.

Self-Projection

The main hypothesis of this study was not supported. Participants' dispositional walking speed did not play a role in their perceptions of slow, medium, and fast walking people's minds. When a video target speed was close to a participant walking speed, the participants were no more likely to project their own mental capacities onto the target than when the speeds were divergent. Furthermore, if a video target speed was slower or faster than a participant speed,

speculating about the target's mental capacities, the participants did not appear to project their stereotypes about minds of slow or fast walkers, respectively.

To investigate why dispositional walking speed has failed as a moderator, I examined whether the degree of a match between target and participant speeds was associated with the participants' perceptions of similarity between the target and the self. The degree of speed match, however, was not correlated with participants' perceptions of similarity. In other words, the target's walking speed did not seem to serve as a cue of resemblance. It should be noted that most of the participants were quite accurate in evaluating their own walking speeds in comparison to that of their peers, and most of the participants were able to correctly recognize the discrepancies in walking speeds of video targets. Thus, failure of a speed match as cue of resemblance cannot be attributed to the biased perceptions of personal walking speed or the inability to recognize speed differences within the range used in the present study.

Since speed match did not facilitate perceptions of resemblance, another regression analysis was run using perceived similarity as a predictor instead. However, even when participants perceived a video target as similar to themselves, they were not more likely to project their own mental capacities onto the target than when the target was thought to be dissimilar. Other moderators examined in this study were liking of a video target and participants' dispositional need for cognitive closure and desire for control. None of these variables moderated projection of the observer's own mental capacities onto a walking target. Thus, it appears that projection of one's own mental capacities does not occur in the process of mind attribution to human targets, which further suggests that egocentrism may not be the underlying mechanism as was originally suggested.

The Timescale Bias Effect?

Interestingly, the timescale bias effect was not replicated in the present study. A video target walking at the average human speed was attributed no more mind than the targets walking at slower and faster speeds. As mentioned earlier, the video stimulus of the present study differed from the one used by Morewedge et al. (2007) in two important ways. First, in the original study, slow and fast speeds with which a target human walked were outside of the normal human speed range. In the present study, on the other hand, all speeds were within the normal range but were divergent enough for the differences to be recognizable. Thus, findings of the present study certainly put into question whether the timescale bias even exists for the normal speeds. Of course at times one could observe a person walking extremely fast because he or she is in a rush or a person walking unusually slowly because he or she does not feel well. In these cases, the observer may exhibit the timescale bias. However, in most of the situations, when a person happens to walk at a realistic speed that is simply slower or faster than average, the person's speed probably will not make a difference in how one perceives his or her mental capacities. In addition, in the study by Morewedge et al. (2007), a target human in a video was walking down the street that was crowded with other walking pedestrians. As a result, slow and fast walking targets truly stood out, and it could be that the participants attributed less mental capacities to these targets because they looked abnormal against other walking pedestrians. Thus, the only certain conclusion that can be drawn about the timescale bias effect is that it may occur when an observed person for a particular reason walks unusually fast or slow while other pedestrians on the street walk at the speeds within the normal human walking range.

Likability and Similarity

The amount of mind attributed to a video target only correlated with likability of a target and perceived similarity. These results were consistent with the findings by Kozak et al. (2006). In their study, they manipulated how likable a person in question appeared. Then they assessed positivity towards the target by asking participants to evaluate the target on liking, goodness, respect, and similarity. Responses to all items were shown to make up the positivity index. Except for the question about respect, the present study employed very similar items when assessing perceived similarity and target likability. Moreover, the ratings of similarity and likability were correlated, suggesting that liking and similarity may in fact constitute one single construct -- positivity. Kozak and colleagues (2006) found that greater positivity towards the target actually encouraged the perceiver to consider the target's underlying mental states. It seems that people were more likely to identify intentions and cognitive processes of a liked target than of a disliked target and, as a result, attributed more mind to the liked target.

Moreover, in the present study, the similarity and liking of a target were positively associated with attributions of agency but not experience. The agency dimension describes mind in terms of cognition and includes such capacities as intelligence, competency, memory, etc. The experience dimension, on the other hand, recognizes capacities for sensation and emotion and includes such items as ability to feel pain, embarrassment, pleasure, etc. These results are also a replication of the findings by Kozak et al. (2006), who reported that people were more likely to attribute intentions and cognition to the liked target, but not emotion. The differential attribution of agency and experience to a target supports the existence of two distinct mind dimensions and may imply that the identification of emotion and cognition in others occurs via different processes (Gray et al., 2007; Kozak et al., 2006; Gray & Wegner, 2009). Thus, the results of the

present study indicate that positivity towards a target was the only variable related to the amount of mind attributed to a video target. The more participants liked a target and perceived him or her to be similar to the self, the more mental capacities they tended to attribute to that target. In the end, it appears that perceived similarity does play a role, but in a different way than originally proposed. Instead of promoting projection of their own mental states onto the target, perceived similarity seems to function as a part of positivity towards the target, facilitating greater identification with the target's mental states. However, which features of a target encouraged greater positivity is inconclusive as the present results do not permit any related speculations.

Morewedge et al. (2007) did not assess liking of a target or perceived similarity in their study. It could be that the participants had greater positivity towards the target walking at the average speed than towards the other targets because he or she appeared to be the most similar to the other pedestrians and the participants themselves. It has been shown, for example, that matching behavior promotes liking (e.g. Chartrand & Bargh, 1999). Thus, it is quite possible that the average walkers were liked the best and were attributed the most mental capacities.

Limitations

There were several limitations to the present research. First of all, 19 items assessing mind attributions were presented in 6 different surveys. First participants completed 2 target mind questionnaires, one after each video they watched. Then they were asked to fill out questionnaires of self-mind, slow and fast stereotypes, and desirability. Despite filler questions in every questionnaire and distractor tasks between most of the mind attribution scales, it is quite possible that the participants noticed that the questions were repeating multiple times and, as a result, responded similarly to the remembered items. This could explain why scores on all mind

attribution scales were correlated between each other. However, failure to replicate the timescale bias effect cannot be attributed to this limitation since target mind attribution scale was presented first and could not have been contaminated by other scales. Furthermore, even though mind attribution scales were correlated, there were still significant differences in ratings of self and others. For example, the study replicated the finding that people grant themselves more mind than others and found that hypothetical slow walkers were thought to have less mental capacities than hypothetical fast walkers. In sum, even though this limitation should be considered, it did not seem to have a substantial impact on the findings.

Another possible limitation of this study could have been its extensive length. It took participants about 45 minutes to complete the entire survey. It could be that the participants were overwhelmed by the number of the questionnaires. As their mental resources were depleted, the participants could have been responding to questions to simply get through the survey without paying particular attention to the questions or responses they were providing. This effect is known as *satisficing* and describes a phenomenon when respondents provide minimally acceptable answers to simply satisfy a questionnaire (Krosnick, 2000). Manifestations of satisficing could be providing similar responses to all items in a questionnaire. Satisficing also could explain correlations between all mind attribution scales and small range in target mind attribution scores. However, since target mind was assessed first, the chance of satisficing for this questionnaire was less likely due to depletion of mental resources. It is possible, nevertheless, that this task was especially demanding since the participants were asked to provide their opinions about mental capacities of a person whom they have seen walking for a few brief seconds. Thus, difficulty of this task and perhaps not knowing what to respond could have encouraged satisficing after all. However, the current study replicated associations between the

mind attributed to a target and liking, suggesting that the current data did not completely lack validity.

One could argue that due to satisficing, all mind attribution scales were inter-correlated and that correlation of target mind with liking and similarity is just another manifestation of satisfying the survey and responding similarly to all questions. Once again, however, despite the correlations there were meaningful differences in ratings of self-mind and minds of others. In regard to correlations involving liking and perceived similarity, first of all, these two variables correlated only with the agency dimension of mind and not the experience, which is also a replication of previous findings. In addition, liking and similarity were associated only with target mind and not self-mind, slow walker mind, or fast walker mind. Thus, there is no strong evidence that the present findings were limited by the satisficing contaminated data.

Another possible limitation of the study is *social desirability.* This bias occurs when participants respond to questions in a way that presents them in a positive light (e.g. Nederhof, 1985). In this study, participants were told that the goal of the present research was to investigate how people are able to speculate about traits and characteristics of others without having much information about them. This could have led participants to think that the research was studying how people make negative judgments about others before knowing them. Being a person who prejudges others is certainly not how one would want to appear. Hence, even though the surveys were anonymous, participants may have been biased when rating the mental capacities of a video target, which could explain the small range of scores and why all target mind attribution means were above moderate level. Social desirability could potentially be the reason why the timescale bias effect was not replicated in the present study and why people attributed the same amount of mind to slow, average, and fast walkers.

Directions for Future Research

The results of the present study suggest that one's walking speed, as long as within the normal human range, does not make a difference in how others perceive a walker's mental capacities. These findings imply that the timescale bias may occur in a very limited number of real-life situations. However, it is difficult to draw any concrete conclusions based on the results of one study, especially since the current null findings could have been a result of limitations to the experiment design. Nevertheless, ecological validity of the timescale bias effect is undermined, and future research should focus on thoroughly examining the commonality of the bias in mind attributions to human targets.

Unlike the target's walking speed, the observer's positivity towards the target appears to play a key role in how the observer perceives a target's mind in terms of agency. However, what happens to the dimension of experience? Does liking and perceived similarity facilitate only more thorough identification of a target's cognitive process or may this depend on how the target is portrayed? In the study by Kozak et al. (2006), a target was portrayed as either likable or dislikable, which was achieved by describing the target's actions and interests. Since no explicit information communicating the target's capabilities to experience emotion was given, it is logical that the participants only considered cognition behind likable target's actions but left out emotion (Kozak et al., 2006). In the current study, participants observed a person walking down the street. No other information about the person was given. It could be that in this case, participants' attention likewise was called to only actions of the person; hence, only possible underlying intentions and thoughts were considered. As a result, participants may have attributed more agency to a better liked target than to a less liked target, but did not differentiate between the targets' capacities for experience. Another study showed that when a target was described as

sensitive to pain, in the subsequent evaluations, people were likely to attribute more experience to this target in general than to the one who was originally described as less sensitive to pain (Gray & Wegner, 2009: study 3a). These findings provide a hint that the type of information available about a target may make a difference in how the target's mind is perceived in terms of the two dimensions. Thus, future studies should investigate the role of positivity towards a target in the process of mind attribution when the target is described in terms of his or her emotions and sensations. If the portrait of a target focused on his or her feelings, perhaps greater liking and positivity towards a target would facilitate better identification with the target's emotions, hence promoting greater attribution of capacities for experience.

Another remaining question is whether liking and perceived similarity truly comprise one single factor of positivity towards a target. These two constructs seem to be very closely related, but could they function independently? If so, may one precede the other? Previous research has illustrated that a person's mimicry of another party's movements during their interaction facilitates greater liking of the person (Chartrand & Bargh, 1999). Hence, it could be that in mind attribution studies, perceptions of similarity between the self and a target occurs first and then promotes liking of the target. However, assume that a target is perceived as likable but dissimilar to the self. Would the liking alone still have the same effect as the positivity and promote better identification of the target's mental capacities? Hence, would greater liking of a target, without perceived similarity, result in greater mind attribution? The importance of perceived similarity and its relation to liking is still to be investigated in the context of mind attribution.

Another direction, which research on mind attribution could take, involves language and communication abilities. Dennett (1996) suggests that much of our knowledge about other minds comes from others' abilities to communicate their mental states with us. He argued that the

reason why we understand minds of other adult humans much better than minds of other mammals is because humans are able to explain to us their mental experiences in a comprehensive way. One may say that the reason we understand human minds better is because we are also human. This is of course true, but to a certain extent. A person in a coma, for example, is also a human as is a newborn. However, we can only guess what goes on in their minds and what their mental capacities are like. Similarly, if one meets an adult human who does not speak the same language, the one would have certain difficulties understanding the other person's intentions, needs, and mental states. Perhaps some basic understanding of what the person wants or tries to do could be reached, but he or she would not be understood as well as someone else who speaks the language. Thus, the target's inability or difficulty to communicate clearly may prevent the other party from acquiring a good representation of the target's mental states, which may result in attribution of less mental capacities to the target. Due to a similar bias, if such exists, people may be prejudiced towards others who have difficulties speaking, foreigners who are not fluent in a language of a host country, or even people with accents or speech impediments. While these are only speculations, the role of language in the process of mind attribution may be an interesting material for future research.

Conclusion

Previous research has suggested the existence of the timescale bias, people's tendency to attribute more mind to others walking at the average human speed than to others walking at slower or faster speeds. The present study investigated whether egocentrism and self-projection were the underlying processes of the bias. The results did not support the research hypothesis that people would attribute more mind to the targets whose walking speeds are similar to theirs as a result of projection of their own mental capacities onto the target. There was no indication

that a match in walking speeds facilitates greater perceived similarity between the target and the self, and there was no evidence of projection of one's own mental capacities onto the target.

Perceived similarity and liking of a target, however, seemed to be key determinants in how people attributed mental capacities to the target. As suggested by previous research, when people exhibit greater positivity (i.e. liking and similarity) towards a target, they are more likely to consider the target's intentions and cognitive processes, thus acquiring better representation of the target's mental states. Through this mechanism, greater positivity towards a person may facilitate attribution of more mental capacities to him or her.

Furthermore, findings of the present study suggest that, in the process of mind attribution to other humans, the timescale bias may not be a common phenomenon and may occur only in specific situations when a target's walking speed is outside of the range of the normal human speed. However, further research is needed to comprehensively investigate ecological validity of the timescale bias effect.

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Appendix A

Mind Attribution to a Human Walking Target

Now we will ask you a series of questions about the person in the video you just watched. You may find some questions difficult to answer without additional information about the person, but we ask you to give your best guess. Please do not skip any question and answer them in the order they are presented. Don't think too hard about any one question, just answer with your natural responses. We are looking for people's gut-level reactions to these questions.

Please read each question about the person in the video carefully and write the number that corresponds with your answer on the line next to each question.

1	2	3	4	5	6	7
Not at all			Moderately			Very Much

_____ How capable is the person in the video of remembering?

_____ How capable is the person in the video of exercising self-control?

_____ How capable is the person in the video of morality?

_____ How capable is the person in the video of recognizing emotions of others?

_____ How capable is the person in the video of planning?

_____ How capable is the person in the video to communicate with others?

_____ How capable is the person in the video of thinking?

_____ How smart is the person in the video?

_____ How capable is the person in the video of feeling hunger?

_____ How much mind does the person in the video appear to have?

_____ How capable is the person in the video of feeling pain?

_____ How capable is the person in the video of feeling pleasure?

_____ How capable is the person in the video of feeling pride?

_____ How capable is the person in the video of feeling embarrassment?

_____ How capable is the person in the video of feeling joy?

_____ How much personality does the person in the video have?

_____ How capable is the person in the video of experiencing consciousness?

_____ How intelligent is the person in the video?

_____ How competent is the person in the video?

Filler Items

_____ Do you think the person in the video is able of cooking French food?

_____ Do you think the person in the video is able to play soccer?

_____ How much do you think the person in the video likes action movies?

_____ How much do you think the person in the video likes to sing?

_____Do you think the person in the video can be successful in their career?

_____ How capable is the person in the video of climbing a high mountain?

_____ How capable is the person in the video of solving difficult math problems?

_____ How capable is the person in the video of acting?

_____ Do you think the person in the video texts a lot?

_____ Do you think the person in the video is social?

_____ Do you think the person in the video is a good driver?

_____ Do you think the person in the video is emotional?

Appendix B

Self-Mind

Using the scale below please indicate the extent to which each of the following descriptors applies to YOU. Please write the number that corresponds with your answer in the spaces provided.

1	2	3	4	5	6	7
Nothing like me			Somewhat like me			Very much like me

_____ Has good memory

_____ Has self-control

_____ Is moral

_____ Able to recognize emotions in others

_____ Able to plan

_____ Has mind

_____ Able to communicate well

_____ Able to think

_____ Able to feel pain

_____ Able to feel hunger

_____ Able to experience pleasure

_____ Able to feel pride

_____ Smart

_____ Able to feel embarrassment

_____ Able to feel joy

_____ Has complex personality

_____ Conscious

_____ Intelligent

_____ Competent

Filler Items

_____ Likes to study

_____ Dances well

_____ Hard-working

_____ Relaxed

_____ Enthusiastic

_____ Daydreams often

_____ Cooks well

_____ Learns quickly

_____ Plays sports

_____ Likes winter

_____ Able to give advice

_____ Able to “read between the lines”

_____ Likes action movies

_____ Likes parties

_____ Social

_____ Playful

_____ Charismatic

_____ Able to sympathize

_____ Likes cats

_____ Able to detect lies easily

Appendix C

Slow/Fast Walker Mind Attribution Stereotypes

Please IMAGINE a person who generally walks SLOWER/FASTER THAN MOST PEOPLE. Please DO NOT think of any single person in particular. Rather, please consider a "typical" person who walks slowly/fast. Using the scale provided, please give your best guess about how each of the following descriptors may apply to this person who walks slower/faster than most people. Please click the box that corresponds with your answer.

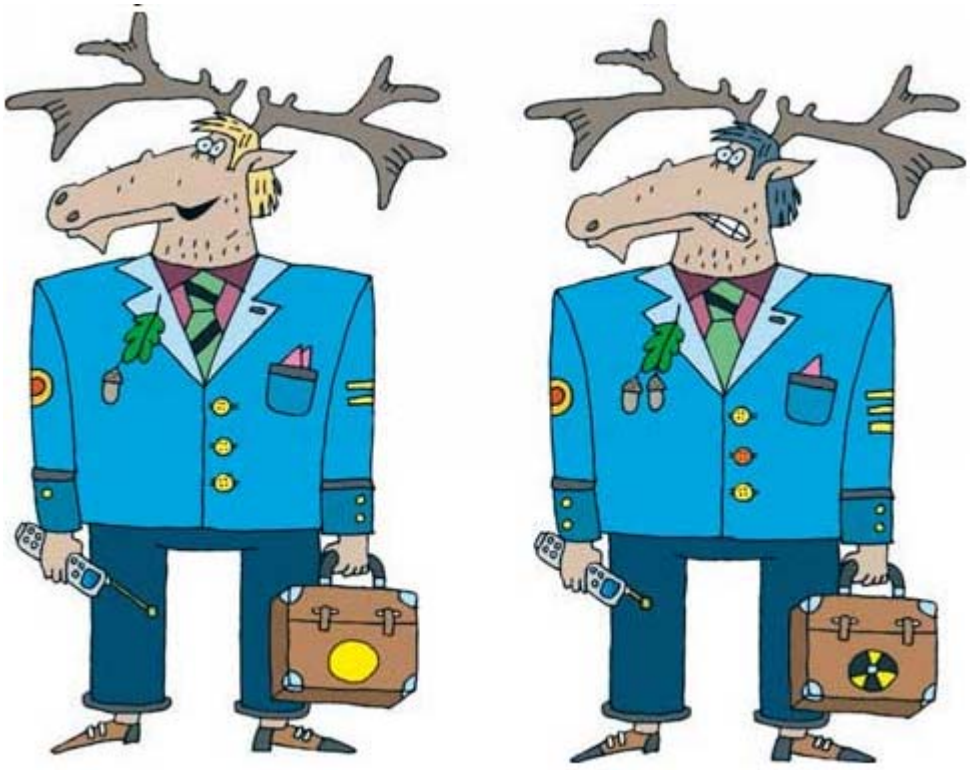
1	2	3	4	5	6	7
Nothing like the person			Somewhat like the person			Very much like the person

Items identical to those in Self-Mind scale (see Appendix B)

Appendix D

VISUAL TASK!

It's time for visual exercise! This task is called "Find the Differences." On the next screen you will see two images. Your task is to find as many differences between the two images as you can in 30 seconds. When 30 seconds elapse, the images will disappear, and you will be asked to report the number of differences you counted.



VISUAL TASK!

This is the next visual exercise. Similar to the first, this is the "Find the Differences" task. On the next screen you will see two images. Your task is to find as many differences between the two images as you can in 30 seconds. When 30 seconds elapse, the images will disappear, and you will be asked to report the number of differences you counted.

VISUAL TASK!

This is another visual exercise. On the next screen you will see contours of animals. Your task is to count as many animals as you can. As before, the screen will be presented for ONLY 30 seconds. When 30 seconds elapse, the image will disappear, and you will be asked to report the number of animals you counted.

Appendix E

Desirability Scale

Please rate desirability of each listed item by writing the number that corresponds with your answer in the space provided. A characteristic or a state is considered desirable if it is something good to have and undesirable if it is something bad to have.

1	2	3	4	5	6	7
Very undesirable	Undesirable	Somewhat undesirable	Neither desirable nor undesirable	Somewhat desirable	Desirable	Very desirable

_____ A good memory

_____ A good amount of Self-control

_____ Morality

_____ Ability to recognize others' emotions

_____ Ability to plan for future events

_____ Ability to communicate

_____ Ability to think

_____ Ability to feel pain

_____ Ability to feel hunger

_____ Ability to experience pleasure

_____ Ability to feel pride

_____ Ability to feel embarrassment

_____ Ability to feel joy

_____ Having personality

_____ Experiencing consciousness

_____ Intelligence

_____ Being smart

_____ Competence

_____ Having mind