STEREOTYPE CONTENT: THE SPEED OF MENTAL STATE INFERENCES

by

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Stereotype Content: The Speed of Mental State Inferences

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Abstract

Humans have the unique ability to infer a rich tapestry of mental state information by observing other's behavior. Moreover, recent work by Malle and Holbrook (2012) demonstrated that the ease and speed with which people make such mental state inferences is hierarchically organized. Inferences of intentionality are the fastest inferences people make followed by desire, belief, and lastly, personality. The present work seeks to replicate this hierarchy and extend it by examining whether social stereotypes facilitate or slow mental state inferences. Utilizing the *Stereotype Content Model* (SCM, Fiske et al., 2002), the present study aimed to determine whether perceived warmth and competence would moderate the speed which people make mental state inferences. Additionally, due to the primacy of warmth, we predicted that the effect of perceived warmth be larger than the effect of competence. The present study (n = 97), manipulated three fully-crossed, within-subject factors: inference type (intentionality, desire, belief, personality), warmth stereotype (high/low), and competence stereotype (high/low). The results largely replicated Malle and Holbrook's (2012) hierarchical findings. Moreover, we show that the hierarchy is robust across levels of targets' perceived warmth and competence, which showed no significant effects. Though SCM clusters were balanced in social desirability, it may be that behaviors matched with some stereotype groups better than others, thereby muting the effect of perceived warmth and competence. Future research should aim to account for the possible relationship between social desirability and warmth, so as not to support nor refute the schema of that agent's social group.

Keywords: social cognition, theory of mind, attribution, mental state inference, stereotype, warmth, competence

Stereotype Content: The Speed of Mental State Inferences

Social cognition is a complex and multifaceted domain. Humans have an incredible ability to understand behavior not only through the observable physical motions of an action, but also the unobservable mental causes of behavior (desires, intentions, and beliefs). Moreover, humans use these mental state inferences to make predictions about others' future behavior, desires, and goals. For example, when a surgeon reaches her hand out for a scalpel, her nurse easily infers that she *wants* the scalpel and reactively hands it to her. In this case, the nurse made inferences about the surgeon's desire for an object simply from the dynamics of an intentional action (i.e., reaching). Additionally, the nurse could have made more complicated inferences, such as that the surgeon *believes* in the scalpel is the needed tool for this stage of the surgery, or, perhaps even that the surgeon has a detail-oriented *personality* to be successful at her profession. Since humans cannot directly read minds, the basis for understanding what another is thinking inferred indirectly from behavior observations and by pre-existing cognitive schemas.

These schemas allow people to use pre-existing social group attributes, such as that surgeons are highly competent, to shape interpretation of behavior and infer mental states. In contrast to the surgeon, imagine a shaman of some sort attempting to heal a patient with rituals. At least in the West, people's pre-existing stereotypes surrounding magic healing will inform perceptions of this shaman; namely, that this individual is incompetent as a healer. The mental states people infer about the shaman will reflect this perception as well as a multitude of other schematic information than is associated with such a person. Furthermore, there are different kinds of mental state inferences, some of which are more complex and take more time than others. We must turn to developmental psychology in order to fully examine the differences between these inferences.

Mental State Inferences

From an extraordinarily young age, humans have the ability to infer mental state information from behavior. At six months of age, infants understand simple goals of others in ways that reflect adult goal-attribution (Woodward, 1998). By 18 months, children can understand an adult's desire for a particular object (Moll & Tomasello, 2007), and by the 4 th year, children begin to understand others' beliefs (e.g., "Where does Sally think the marble is?") and that others' beliefs can be different from their own (Wellman, Cross, & Watson, 2001); and, by age 6 or 7, inferences about personality traits emerge (Kalish & Shiverick, 2004; Snodgrass, 1976). For example, conversations are extremely complex interactions, yet, adults and even children intuitively understand rules of turn taking. A child waiting for a swing to open up infers that the other children want to swing just as much. Conversely, the children on the swings see the child waiting and infer that the child wants to swing and intends to take a swing when one opens up.

Past research examining adult mental state inference focused on how people make inferences about specific mental states (e.g., intentionality, desire, belief, and trait) in isolation. Recently, however, Malle and Holbrook (2012) tested whether there is a hierarchy in the way people make inferences about others mind and character. Mirroring work from developmental psychology showing that children first understand intentionality, followed by desire, belief, and lastly personality (Woodward, 1998; Moll & Tomasello, 2007; Wellman et al., 2001; Kalish & Shiverick, 2004; Snodgrass, 1976). Malle and Holbrook (2012) argue that the same hierarchy exists with regard to the speed with which adults are able to make mental state and personality inferences. Specifically, Malle and Holbrook (2012) hypothesized that the following hierarchy exists in terms of likelihood and speed (fastest to slowest): intentionality, desire, belief, then

personality. In Studies 1 and 2, participants listened to a behavior and then responded to speeded yes/no questions asking if the behavior conveyed an intention, goal (desires), thought (beliefs), or personality trait. The reaction times to the probes were recorded. In terms of both likelihood and speed, the results showed intentionality and desire inferences to be equally fast, followed by belief inferences, and personality inferences were the slowest of the four. Study 3 replicated these results using video stimuli. Therefore, across multiple domains, these studies demonstrated that the complexity of the mental state inference increases the time it takes to be made. However, there are other factors besides the type of inference which also influence the overall speed. As aforementioned, social stereotypes play a role in inference making, but the relevant question is: which social factors reliably alter the speed the mental state inferences?

Warmth and Competence

In the cognitive economy of the human brain, time and energy can be saved through the generation and use of mental shortcuts. In a social context, stereotypes function as resource-saving tools that allow general assumptions to be made about groups or kinds of people at face value. For example, stereotypes for certain groups, like doctors, are that they are intelligent caring individuals; by contrast, stereotypes for other groups, like drug addicts, are that they are cold and good-for-nothing (Fiske, Cuddy, Glick, & Xu, 2002). Obviously, people make direct inferences about the mental states of others based on observed behavior; however, these inferences are also informed by other social factors such as group membership and stereotypes. For example, Ames (2004) demonstrated that participants who more closely identified with social groups (e.g., fraternity brother, medical school student, lawyer) lowered their use of stereotyping and interpreted mental states as more similar to their own (projection) when presented with ethically questionable behavior on the part of the social group member.

Fiske et al. (2002) were forerunners in modeling the systematicity that exists within the content of stereotypes. *The Stereotype Content Model* (SCM) uses two dimensions – warmth and competence – to map stereotypes. Functionally, warmth is related to the perceived intentions of an individual, whereas competence is related to the perceived ability of that individual to enact their intentions. For example, a medical doctor might be perceived as both having the morally-positive intention of healing patients (high warmth) as well as the capability to accomplish this intention via successfully diagnosing and treating patients (high competence). On the other hand, a drug addict may be perceived as both having the morally-negative intention of pursuing drugs at all costs (low warmth) and an inability to satiate their pursuit (low competence). The SCM maintains cross-cultural and cross-demographic validity, verifying that the dimensions of warmth and competence hold up no matter which context it is presented in and no matter what age, gender, race/ethnicity, etc. is presented in the content (Fiske, Xu, Cuddy, & Glick, 1999; Fisk, Cuddy, Glick, & Xu, 2002; Cuddy et al., 2009; Durante et al., 2012; Cambon, Yzerbyt, & Takimova, 2015).

Hack, Goodwin, and Fiske (2013) argue that social perceptions of warmth and competence are evolutionarily significant because they allow humans to assess threats. Members of one's in-group (non-threats) are, by default, perceived as warm. Conversely, an out-group member, who in evolutionary terms could be a threat to oneself or one's in-group, is perceived as low in warmth. In the past, predicting warmth from threat has been difficult, yielding statistically weak results (Clausell & Fiske, 2005; Cuddy, Fiske, & Glick, 2007). However, Kervyn, Fiske, and Yzerbyt (2015) identified that the past SCM studies only examined limited aspects of threat (Aktan, 2013; Aktan & Sakallı-Ugurlu, 2013); and, utilized the Integrated Threat Theory (Stephan & Renfro, 2003; Stephan & Stephan, 2000; Stephan et al., 1998) to holistically predict

warmth from both *realistic* (e.g., political, economic) and *symbolic* (e.g., values, beliefs, worldviews) forms of intergroup threat (Stephan & Stephan, 1996; Biernat, Vescio, & Theno, 1996; Stephan et al., 2002, 1998; Stephan, Ybarra, & Bachman, 1999). The results indicated that integrated measurement better and more reliably predicted warmth than past, single-aspect approaches to threat.

In line with the central importance of warmth, recent experiments demonstrate that warmth detection is faster compared to competence detection because of warmth's function for assessing group membership (Wojciszke, 2005; Abele & Wojciszke, 2007). In one series of studies, Ybarra et al., (2001) tested participants' ability to distinguish words from non-words and found that warmth-related words were identified faster than competence-related words. In a similar vein, Hack et al. (2013) recruited all White participants and showed them photos of Black and White, male and female people. Each photo was paired with either a positive (*caring*) or negative (*selfish*) warmth-related word or a positive (*clever*) or negative (*ignorant*) competence-related word. The results showed that pairing White targets with positive warmth words was significantly faster than pairing Black targets with positive warmth-related words.

The results of these studies align well with evolutionary theory in that it is adaptive to be able to quickly detect who is a friend and who is an enemy; faster processing is dedicated to the primary binary assessment: *threat? yes or no*, than the secondary fine tuning: *how much of a threat*? (Cosmides & Tooby, 1992). See Figure 1.

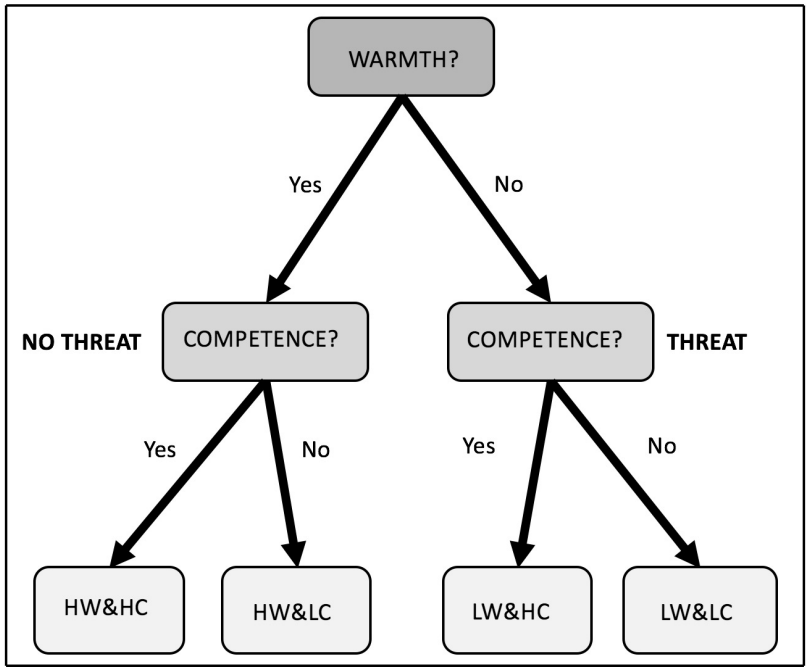

Figure 1. *Warmth and Competence Processing.*

Theoretical Integration and Predictions

The SCM's measures of warmth and competence have been applied to many domains such as socioeconomic class division (Moya, Fiske, Durante, & Tablante, 2017), employer appeal (Drevs, Gebele, & Lindenmeier, 2015), age discrimination (Farnum & Wiener, 2016), and moderating placebo effects in the context of healthcare delivery (Howe, Goyer, & Crum, 2017). Previous research has examined some associations between the content of stereotypes (e.g., consistency, power) and spontaneous trait inferences (Wigboldus, Dijksterhuis, & Knippenberg, 2003; Wang & Yang, 2017); additionally, the frequency of mental state referencing has been demonstrated to increase when conversing with an in-group member compared to an out-group member (McClung & Reicher, 2017). However, no research to date has specifically investigated the influence of stereotype content on the speed of mental state inferences.

The present study aimed to determine whether perceived warmth and competence would moderate the speed which people make mental state inferences. Three key predictions guided our

study. First, in line with previous work by Malle & Holbrook (2012), we predicted a speed hierarchy of mental state inferences whereby people would make inferences of intentionality and desire most quickly, followed by belief inferences, and finally personality inferences. Second, we predicted perceived warmth would moderate mental state inference speed. Specifically, we predicted that all mental state inferences would be speeded for targets stereotyped as being higher in warmth compared to targets stereotyped as being lower in warmth. Similarly, third, we predicted that mental state inference speed will be facilitated (i.e., faster) for targets perceived as high in competence compared to targets perceived as low in competence; however, due to the primacy of warmth (Ybarra et al., 2001; Todorov et al., 2005; Wojciszke, 2005; Willis & Todorov, 2006; Abele & Wojciszke, 2007; Hack et al., 2013), we predict that the effect of perceived warmth be larger than the effect of competence. See *Figure 2*.

	Intentionality	**Desires**	**Beliefs**	**Personality Traits**
High Warmth & High Competence	FASTEST			
High Warmth & Low Competence				
Low Warmth & High Competence				
Low Warmth & Low Competence				SLOWEST

Figure 2. *Hypothesized Speed Hierarchy of Mental State Inferences for Each SCM Cluster.*

Study 1: Norming Data

Methods

Design

The purpose of this pretest was to identify stereotype groups that were perceived as clearly belonging to each of the warmth and competence clusters of the Stereotype Content Model. The warmth scales, competence scales, and most of the stereotype groups were the same

as those used originally by Fiske and colleagues (2002). However, we added some additional groups for balancing purposes (e.g., *Atheists* was added to balance *Christians*). In total, 44 stereotype groups were used, with 11 in each cluster (see Table 1.)

Table 1.
44 groups used for norming, categorized by SCM cluster.

LW & LC	LW & HC	HW & LC	HW & HC
Homeless People	Billionaire	Housewives	Olympic Athletes
Drug Addicts	Asians	Elderly People	Medical Doctors
Obese People	Jews	Disabled People	Therapists
Prostitutes	Feminists	Blind People	Movie Stars
Fast Food Employees	Northerners	House cleaners	College Graduates
Illegal Immigrants	Wall Street Bankers	Southerners	Christians
Rednecks	Lawyers	Hispanics	Middle Class American
Welfare Recipients	Physicist	Gay men	Astronauts
Refugees	Politicians	Fashion models	Recent college grads
Alcoholics	CEOs	Poor Whites	Medical Nurses
Mentally retarded	Atheists	Buddhists	University Presidents

Participants

We recruited 226 college students (mean age = 20.11 years, *SD* = 2.93) from Appalachian State University, and compensated them with required credit for their psychology classes. Of the total sample, 178 (78.4%) were female. The majority of the sample, 206 (90.7%) were White/Caucasian, 18 (7.9%) were Latin/Hispanic, 7 (3.1%) were African/African American, 7 (3.1%) were Native American, and 5 (2.2%) were Asian/Asian American. Participants were moderately religious (*M* = 3.10, *SD* = 1.30; 1 = not at all religious; 5 = very religious) and politically moderate (*M* = 3.76, *SD* = 1.62; 1 = very liberal; 7 = very conservative).

Procedure

Participants completed the study online. Participants were presented with all 44 targets in a random order and responded to a five item warmth scale (e.g., 1 = Not *warm* at all; 5 = Extremely *warm*) and a five item competence scale (e.g., 1 = Not *competent* at all; 5 = Extremely

competent) for each target. Items in the warmth scale were how *warm*, *tolerant*, *good-natured*, *sincere*, and *moral* each target was, and items in the competence scale were how *competent*, *confident*, *independent*, *competitive*, and *intelligent* each target was. After rating all of the targets, participants completed a demographic questionnaire and were debriefed.

Results

Table 2 shows the average warmth and competence ratings for each stereotype group within each cluster of the Stereotype Content Model. Four stereotype groups were identified as having the strongest effect within each cluster. The criteria for this identification was primarily highest or lowest average warmth relative to the alignment of the respective cluster (e.g., high warmth or low warmth) and secondarily highest or lowest average competence. Medical nurses, medical doctors, therapists, and astronauts showed the greatest effect (mean warmth = 3.87, mean competence = 4.24) for the high warmth and high competence cluster (HW&HC). Housewives, disabled people, blind people, and elderly people showed the greatest effect (mean warmth = 3.70, mean competence = 3.14) for the high warmth and low competence cluster (HW&LC). Politicians, wall street bankers, CEOs, and billionaires showed the greatest effect (mean warmth = 2.62, mean competence = 4.14) for the low warmth and high competence cluster (LW&HC). Drug addicts, prostitutes, alcoholics, and homeless people showed the greatest effect (mean warmth = 2.67, mean competence = 3.00) for the low warmth and low competence cluster (LW&LC).

Table 2.
Average Warmth and Competence of all stereotype groups.

HW&HC	Warmth	Competence	HW&LC	Warmth	Competence
Movie Stars	3.05	3.84	Poor Whites	2.99	2.81
Middle Class Americans	3.36	3.58	Fashion Models	3.08	3.70
Olympic Athletes	3.36	4.22	Hispanics	3.54	3.54
University Presidents	3.37	3.93	House Cleaners	3.57	3.27
College Graduates	3.43	3.88	Gay Men	3.61	3.63
Recent College Graduates	3.46	3.84	Elderly People	3.62	3.13
Astronauts	3.48	4.30	Blind People	3.63	3.11
Christians	3.51	3.57	Southerners	3.70	3.76
Medical Doctors	3.65	4.42	Disabled People	3.72	2.95
Therpists	4.15	3.97	Buddhists	3.81	3.37
Medical Nurses	4.21	4.25	Housewives	3.82	3.36
LW&HC	Warmth	Competence	LW&LC	Warmth	Competence
Politicians	2.47	3.88	Drug Addicts	2.45	2.57
Wall Street Bankers	2.48	4.14	Alcoholics	2.52	2.77
Bilionaire	2.75	4.19	Prostitutes	2.72	3.19
CEO	2.78	4.36	Rednecks	2.98	3.47
Lawyers	2.94	4.41	Fast Food Employees	3.07	2.98
Atheists	2.96	3.55	Welfare Recipients	3.13	2.99
Northerners	3.00	3.83	Homeless People	3.20	2.85
Feminists	3.20	3.87	Illegal Immigrants	3.26	3.18
Physicist	3.27	4.28	Obese People	3.36	2.81
Asians	3.34	3.96	Refugees	3.43	3.10
Jews	3.55	3.59	Mentally Disabled	3.80	2.76

Study 2: Reaction Times

Methods

Participants

We conducted an *a priori* power analysis, assuming an effect size of $d = 0.4$, and computed the required sample size to achieve 90% power. The analysis showed a required sample of 60 participants, however, we elected to oversample in case of participants failing to complete the study.

We recruited 97 college students (mean age = 19.14 years, $SD = 1.20$) from Appalachian State University, and compensated them with required credit for their psychology classes. Of the

total sample, 70 (72.16%) were female. The majority of the sample, 74 (76.29%) were White/Caucasian, 9 (9.28%) were African/African American, 7 (7.22%) were Asian/Asian American, 5 (5.52%) were Latin/Hispanic, and 2 (2.06%) were Native American. Participants were politically moderate (M = 3.93, SD = 1.48; 1 = very liberal; 7 = very conservative) and 68 (70.1%) identified as religious.

Design

This study was modeled on Malle & Holbrook's (2012) methodology with the addition of including stereotype groups in the behavior descriptions. The study contained three fully-crossed, within-subject factors: inference type (intentionality, desire, belief, personality), warmth stereotype (high/low), and competence stereotype (high/low). We counterbalanced these three factors using a Latin square so that each participant encountered every combination twice (once within each of the two blocks of 16 trials). Each block contained the same 16 stereotype groups so that each participant was exposed to each group twice. Additionally, across stereotype groups we matched the social desirability of the behaviors that targets were described as performing: (high warmth/high competence = 3.95, high warmth/low competence = 4.00, low warmth/high competence = 3.95, and low warmth/low competence = 4.00 on a 1 = *very undesirable* to 7 = *very desirable* scale).

Materials

In this study, we only used verbal stimuli (sentences); therefore, we elected to use the program E-Prime to run the trials and measure reaction times. For reaction time responses, participants used a Serial Response Box which has a 0 millisecond debounce period and was made specifically to work within the E-Prime architecture. For qualitative responses to prompts, participants used a keyboard.

Procedure

Participants were run one at a time in a lab setting. After participants provided informed consent, the experimenter explained the experimental task. Participants received an instructions sheet which summarized the procedure. The participants read along on the sheet while the experimenter read the instructions out loud. These instructions described each part of the task, including the question ques (e.g., GOAL?) and their meanings (Did you detect the main character's goal?), examples of behavior descriptions, and how to use the SR box. Once the participants indicated that they understood the task, they were prompted to enter the E-Prime program and complete four practice trials (one for each type of question que). After the practice trials, participants were given the option to repeat the trials if they did not understand part of the program interface and were asked if they had any clarifying questions.

Afterwards, participants completed all 32 main trials in two blocks of 16 trials. The probe words for each trial were identical to those used by Malle and Holbrook (2012): INTENTIONAL? – for intentionality inferences, GOAL? – for desire inferences, THINKING? – for belief inferences, PERSONALITY? – for trait inferences. Participants viewed each stimuli sentence for 5,000 ms, identical to Malle and Holbrook's (2012) procedure. Afterward one of the four inference probes would appear onscreen for 3,000 ms, during which time participants had to make a *yes* or *no* response on the SR Box (see Figure 3). If participants did not respond within the 3,000 ms, the program moved onto the next trial, and participants were reminded to try to answer as quickly as possible. If participants responded to a probe with a *yes* response, they were immediately asked to state their specific answer (what the content of their inference was). If participants responded to a probe with a *no* response, they were prompted to move to the next trial.

After participants completed all 32 trials, they filled out a demographics questionnaire and were debriefed.

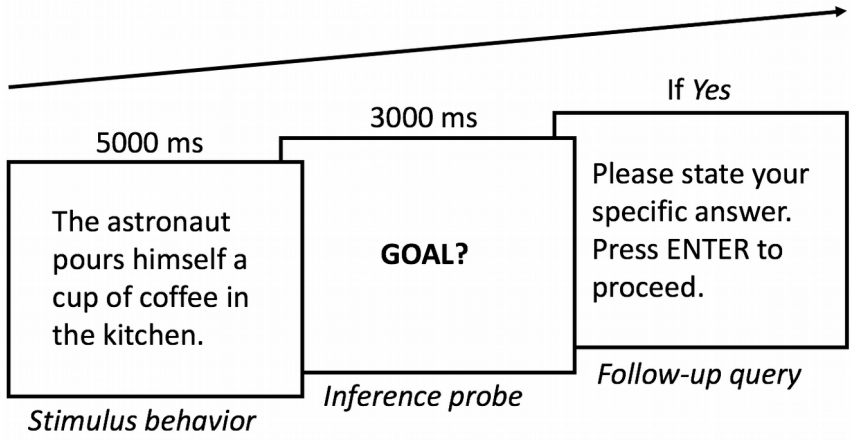

Figure 3. *The sequence of events for the computer task.*

Results

Likelihood of Inferences

A within-subjects ANOVA showed a significant effect of the mental state prompt on participants' ability to make an inference, $F(3, 297) = 71.99$, $p < .001$, $\eta^2 = .44$. Participants responded *yes* to 77.26% ($SD = 19.91$) of intention prompts, 70.61% ($SD = 22.65$) of desire prompts, 47.34% ($SD = 25.19$) of belief prompts, and 42.02% ($SD = 22.88$) of personality prompts. Planned contrasts showed that intentionality inferences were significantly more likely than desire inferences ($p = .008$), belief inferences ($p < .001$), and personality inferences ($p < .001$). Desire inferences were significantly more likely than belief inferences ($p < .001$), and personality inferences ($p < .001$). Belief inferences, however, were as equally likely as personality inferences ($p = .100$).

Speed of Inferences

A within-subjects ANOVA showed a significant effect of the mental state prompt on the participants' reaction times (RTs), $F(3, 261) = 4.05$, $p = .008$, $\eta^2 = .04$ (See Figure 4). Consistent

with our predictions, participants made inferences of intentionality (M_{RT} = 1302.05ms; *SD* = 335.52) most quickly, followed by desire (M_{RT} = 1325.69ms; *SD* = 396.67), belief inferences (M_{RT} = 1379.36ms; *SD* = 436.52), and personality inferences (M_{RT} = 1432.86ms; *SD* = 434.56). Planned contrasted showed that intentionality and desire inferences did not significantly differ from one another (p = .483), though intentionality inferences were significantly faster than belief (p = .033) and personality inferences (p = .002). Desire inferences did not significantly differ from belief (p = .201), but were significantly faster than personality inferences (p = .016). And lastly, belief and personality inferences did not significantly differ from one another (p = .277).

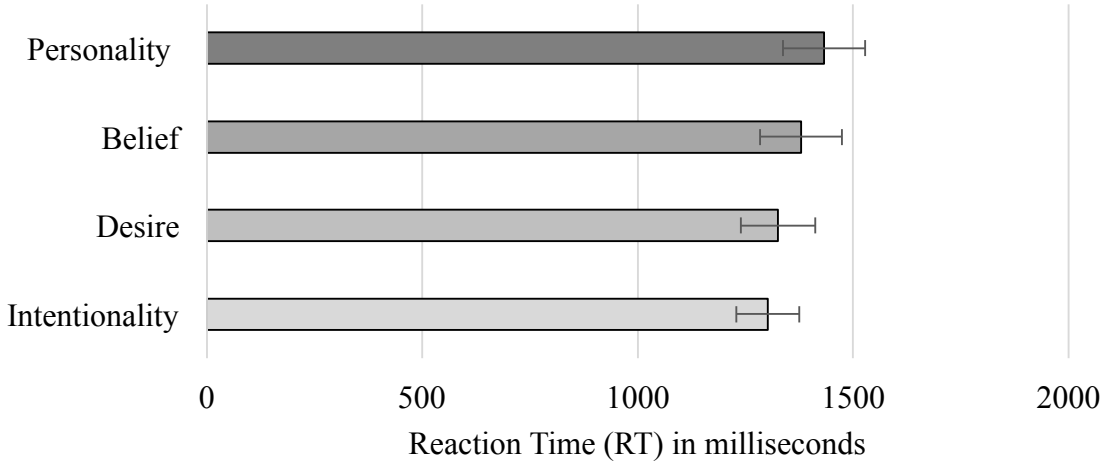

Figure 4. *Average reaction times for each type of mental state inference*.

Inferences and Stereotype Content. Warmth had no significant effect on the overall speed of inferences, contrary to the hypothesized outcomes, $F(1, 17) = 2.01$, $p = .175$, $\eta^2 = .106$. Additionally, competence showed no significant effect on the overall speed of inferences, $F(1, 17) = .065$, $p = .802$, $\eta^2 = .004$. Finally, none of the two or three-way interactions were significant (Fs > .833, ps > .482). Table 3 shows the reaction time averages for high warmth and low warmth for each inference type.

Table 3
Descriptive statistics for Study 2 reaction times.

SCM Cluster	Inference Type	Mean	Std. Deviation	N
High Warmth & High Competence	Intentionality	1319.26	389.09	18
	Desire	1371.72	520.87	18
	Belief	1221.38	496.71	18
	Personality	1532.55	448.22	18
High Warmth & Low Competence	Intentionality	1311.94	228.15	18
	Desire	1341.62	332.92	18
	Belief	1366.98	505.98	18
	Personality	1376.15	414.88	18
Low Warmth & High Competence	Intentionality	1316.83	387.30	18
	Desire	1395.78	376.34	18
	Belief	1416.81	462.28	18
	Personality	1446.62	459.88	18
Low Warmth & Low Competence	Intentionality	1351.16	367.37	18
	Desire	1295.72	361.60	18
	Belief	1531.21	351.60	18
	Personality	1509.79	436.12	18

General Discussion

The first aim of this study was to replicate the hierarchy of mental state inferences previously established by Malle and Holbrook (2012). The data from Study 2 mirrored their findings both in terms of the likelihood of mental state inferences and speed of mental state inferences. Whereas, our pattern of findings was not as clear cut as Malle and Holbrook (2012); for instance, the RT data descriptively mirror their findings, but not all of the inference types were significantly different from one another. Nevertheless, our data suggest the hierarchical structure of mental state inferences proposed by Malle and Holbrook (2012) is broadly robust and generalizable.

Moreover, whereas the original studies, presented participants with generic agents (e.g., butcher, accountant, professor), belonging to random social groups, our study explicitly examined whether stereotype content for different targets moderated the speed and likelihood of

various mental state inferences. The present Study demonstrates that the hierarchy remains consistent even when explicitly manipulating warmth and competence stereotypes of the target groups. Essentially, the likelihood and speed of mental states inferences heavily depends on the kind of inference that is being made, and this effect holds regardless of who the subject of that inference is. The results of Study 2 support the internal and external validity of Malle and Holbrook's hierarchical theory.

The second aim of this study was to extend Malle and Holbrook (2012) by examining if the stereotype membership of the subject, about which the mental state inference is being made, can further influence the speed of these inferences. Utilizing the Stereotype Content Model by Fiske and colleagues (2002), we hypothesized the perceived warmth and competence of a stereotype would impact the overall speed of inferences. Specifically, due to the primacy of warmth that has been demonstrated in previous research and its connection to evolutionary in-group membership, we hypothesized that the higher perceived warmth of a stereotype would produce higher likelihoods and faster inferences than lower perceived warmth. Also, we hypothesized that perceived warmth would have a greater overall effect on inference likelihood and speed than perceived competence. The data from Study 2 showed neither warmth nor competence had a significant effect on the overall speed of mental state inferences. Despite the null statistical finding, descriptively, mental states inferences (at least of intentionality, desire and belief) were facilitated (i.e., faster) for targets perceived as being high in warmth compared to low warmth. By contrast, variations in competence did not affect the speed of mental state inferences, suggesting that warmth is more fundamental (see Figure 5). However, as these effects did not reach standard thresholds of significance we would caution against strong inferences, and would argue that additional studies are needed to determine the extent that perceived warmth

influences mental state inferences.

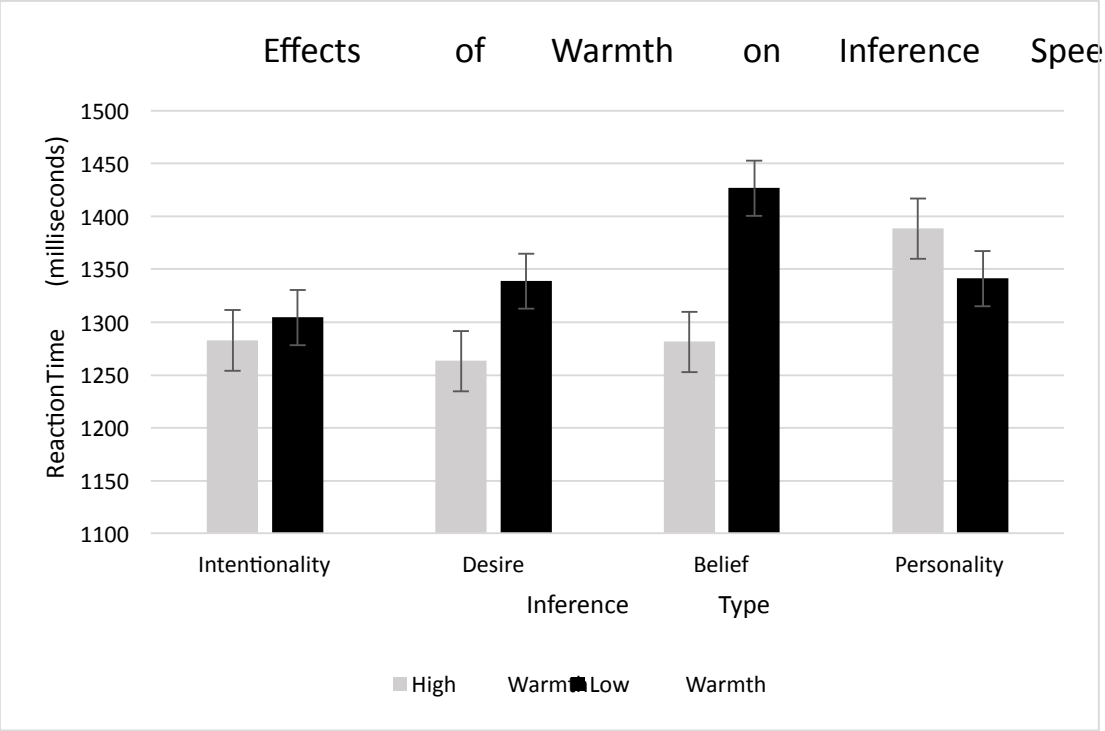

Figure 5. *Effects of Warmth on Inference Speed*.

One possible explanation for why the stereotype effects were not significant could be the perceived compatibility or contradiction of agent-behavior matching. Even though SCM clusters were distributed evenly among behaviors of equal social desirability, some behavior stimuli may have been better fit to match the preconception of the stereotype group than others (e.g., "*The redneck compares tools at the hardware store."* seems a better fit than "*The alcoholic carries the old woman's groceries across the street."*). In the first item, the action of comparing tools appears to fit the schema of the redneck; however, in the second item the action of helping an elderly person appears to not fit the schema of an alcoholic. While each social group carries particular preconceptions related to warmth and competence, so does each behavior. Future research should aim to account for the possible relationship between social desirability and warmth, as well as matching each agent with a behavior that is neutral and does not either

support or refute the schema of that agent's social group.

The way we understand mental state inferences is multifaceted. Factors such as agent-identity, type of behavior, and the outcomes of behavior are just a few that influence our perception of others. When making such an inference, the brain must prioritize data and allocate cognitive resources to analyze the most relevant information for the inference. The more complex the inference, the more factors must be taken into account and therefore the longer it takes to make. The hierarchy of mental state inferences – intentionality, desire, belief, and personality trait – provides an excellent framework to understand how inference relate to each other. Many subsections of social cognitive research can contribute to this understanding, but evolutionary functioning and agent-specific factors appear to be highly salient areas of investigation.

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