

ABSTRACT

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SOCIAL ATTENTION THEORY:
A NEW LOOK AT KNOWLEDGE
FORMATION IN GROUPS

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Individuals in crowded theaters, stadiums and lecture halls know that they attend to the events on the stage, on the field, and at the podium with others. Extending the literature on social foundations of knowledge formation, Social Attention Theory posits that knowingly attending to a stimulus with one's group renders that stimulus *more cognitively accessible* in memory. The theory is tested across three studies where participants attend to stimuli such as words (study 1), goals (study 2), and time pressure (study 3) with members of their group or a control group. Across all three experiments, participants exhibited greater cognitive accessibility for the stimuli attended to with their group (i.e., similar others). Results also showed that individuals felt more social when attending to stimuli with their group, but did not feel happier, more motivated, or more alert.

SOCIAL ATTENTION THEORY:
A NEW LOOK AT KNOWLEDGE FORMATION IN GROUPS

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Chapter 1: Introduction and Overview

From living rooms to public squares, individuals are keenly interested in one another's knowledge and experiences. Recognizing this fact, psychologists have long studied the social process by which knowledge is formed (James, 1907). Indeed, more than a century of scholarship suggests that individuals' beliefs and attitudes are to a large extent rooted in their social group memberships (Asch, 1951; Festinger, 1950, 1954; Hardin & Higgins, 1996; Latané, 1996; Sherif, 1936; Turner, 1991, 1999). In particular, the social verification perspective (Festinger, 1950, 1954), the principal theoretical pillar of social influence scholarship, posits that individuals adopt those beliefs and attitudes that are shared within their reference groups. Making a similar argument, Self-categorization Theory (Turner, 1991) posits that the beliefs and attitudes that are seen as typical of one's social group are experienced as valid. As such, with considerable implications for the dynamics of social reality construction, experiences of shared beliefs and attitudes have been regarded as powerful psychological foundations upon which individuals come to understand reality—an understanding that in turn forms a basis for action (Festinger, 1950; Hardin & Higgins, 1996).

Still, despite the impressive theoretical reach of the social verification and self-categorization, these perspectives limit social foundations of knowledge formation to the *beliefs and attitudes* that are experienced as shared. This dissertation proposes that the social foundations of knowledge formation are more pervasive than these theories allow.

Both emerging and diverging from the above perspectives, Social Attention Theory posits that groups change the way in which individuals remember *stimuli* in their attentional field. Specifically, the theory proposes that the experience of attending to a stimulus with one's group results in greater cognitive accessibility of that stimulus. For instance, an individual that is attending to a word may believe that his or her group is also attending to that word. The theory posits that, knowingly attending to a word with one's group renders that word more cognitively accessible.

More formally, Social Attention Theory consists of the following four assumptions. Assumption 1: The experience of social attention on a stimulus requires that the individual *thinks* that others are attending to the same stimulus as he or she (others may not actually be attending). Assumption 2: The experience of social attention on a stimulus requires that the others attending to the stimulus are perceived to be *members of one's group*. Assumption 3: The extent to which the individual thinks that members of one's group are attending to the stimulus, the stimulus is rendered *more cognitively accessible* in memory. Assumption 4: The theory applies to *any stimulus from any sensory system* that can be represented in memory.

The dissertation proceeds as follows: First, the extant literature on the social bases of knowledge formation is reviewed, with a focus on the social verification and self-categorization perspectives (Chapter 2). Next, the theoretical rationale for social attention as a psychological mechanism of knowledge formation is presented, with a focus on the role of social attention in intra-group coordination and inter-group competition, its influence on early development and learning, and its possible neural bases in the brain (Chapter 3). To test Social Attention Theory, three studies are

described that examine the influence of social attention on the cognitive accessibility of words, goals, and time pressure (Chapter 4). Finally, the implications of Social Attention Theory for social influence scholarship as well as the psychological field in general are discussed (Chapter 5).

Chapter 2: The Social Bases of Knowledge Formation

Writing at the end of the 19th century Durkheim (1893/1984) argued that shared states “...stand radically apart from the rest of our consciousness, where other states are much weaker. They dominate us, they possess, so to speak, something superhuman about them” (p. 56). In the 20th century, the assumption that social processes underpin knowledge formation has been made forcefully by many iconic theorists (Asch 1952; Festinger, 1950; James 1907; Kuhn, 1962; Mead, 1934; Moscovici, 1976; Searle, 1995; Sherif, 1936; Vygotsky, 1978). Indeed, the notion that individual experiences of reality are socially constituted is also the linchpin of social psychological scholarship. However, despite the widespread scholarly attention to the topic, there have been surprisingly few psychological accounts of how groups influence knowledge formation. Two highly influential exceptions are the theories of Social Verification (Festinger, 1950; 1954) and Self-categorization (Turner, 1991), which together form our present-day understanding of knowledge formation in groups, are discussed next.

Social Verification Theory

Festinger (1950) argued that knowledge formation in groups is driven by the need to establish an agreed-upon corpus of knowledge upon which groups can locomote towards a valued goal. The key contribution of Social Verification Theory is to posit a specific psychological mechanism by which groups influence knowledge formation as to increase knowledge uniformity among their members.

Festinger (1950) proposed that "...a belief, an attitude is 'correct,' 'valid,' and 'proper' to the extent that it is anchored in a group of people..." (p. 272-273). Social Verification Theory suggests that because group members strive to gain and maintain a psychological experience of agreement with one another, group settings facilitate both knowledge formation within individuals and knowledge uniformity across individuals. More specifically, in their desire to reach consensus, group members internalize the beliefs and attitudes that are experienced as shared within the group.

Although Social Verification Theory details the conditions under which groups influence knowledge formation in their members (e.g., uncertainty), the theory does not address why individuals come to trust certain groups, but not others. The question of how we choose our groups is of utmost importance as according to Festinger (1950), "It is clearly not necessary for the validity of someone's opinion that everyone else in the world think the way he does. It is only necessary that the members of that group to which he refers this opinion or attitude think the way he does" (p. 273). To simply say that individuals select groups based upon their trustworthiness is to compound the problem. That is, within the framework of the social verification perspective, there is no independent way to assess the trustworthiness of a group without seeking further social verification, which of course leaves us with our original question—how do individuals decide whom to trust?

Self-categorization Theory

The most widely accepted answer to the above question was forwarded by the social identity approach which is comprised of Social Identity Theory (Tajfel & Turner, 1979) and Self-categorization Theory (Turner, 1991, 1999; Turner, Hogg,

Oakes, Reicher, & Wetherell, 1987). Because Self-categorization Theory is specifically targeted to explain group influence on knowledge formation (Turner, 1991,1999), it will be the focus of the discussion.

Self-categorization Theory posits that a person's "cognitive redefinition of the self" in a social category (Turner, 1984, p. 528) has a profound effect on cognition. Namely, self-categorization in a group leads to the experience of that group's beliefs and attitudes as one's own, since on the psychological level, that group and its beliefs and attitudes become the self (Turner, 1999). To the question of when an individual self-categorizes in a group, the theory's meta-contrast principle is the answer. The principle proposes that the individual will self-categorize into a given group when the average differences between the self and the members of that group are less than the average differences between the self and the remaining stimuli in one's frame of reference (Turner, 1999). As such, Self-categorization Theory provides a cognitively-oriented answer to why individuals adopt certain group identities and their associated beliefs and attitudes.

In sum, Social Verification and Self-categorization theories are highly complementary. While the social verification perspective introduced the notion that beliefs and attitudes that are experienced as shared with one's group are seen as valid, the self-categorization perspective detailed the cognitive machinery that helps an individual decide which group is his or her own. Both perspectives posit that knowledge formation depends on the experience of sharing *beliefs and attitudes* with one's group. Next, Social Attention Theory is compared to the scholarship reviewed.

The theory is argued to both emerge and diverge from the extant social psychological accounts of knowledge formation.

Social Attention Theory

Like the theories reviewed, Social Attention Theory is rooted in the idea that individual knowledge is socially constituted. Like the social verification perspective, the theory forwards a psychological mechanism that functions to facilitate the formation of uniform knowledge within a group, based upon which a group can locomote towards its valued goals. Also, like the self-categorization perspective, the theory posits that individual identification with a social group is of fundamental importance to knowledge formation. However, unlike both perspectives reviewed, Social Attention Theory does not account for knowledge formation in terms of shared beliefs and attitudes.

Social Attention Theory proposes a simple but powerful psychological mechanism that drives individual knowledge formation in group settings. The mechanism is based on the notion that individuals are not only aware of the beliefs and attitudes that they share with their group, but are also cognizant of the stimuli that they attend to with their group. While we know that the beliefs and attitudes that are shared with one's group are more likely to be internalized, we do not yet know whether the attentional targets that are experienced as shared with one's group are more likely to be *remembered*. Notably, Social Attention Theory does not posit that this effect is simply a result of imitating the attentional focus of one's group. Rather, it is the cognizance that *we* are attending to the stimulus which results in greater

prominence of that stimulus in memory. In the remainder of the introduction, the case for Social Attention Theory is put forth.

Chapter 3: The Case for Social Attention

Social Attention and Group Locomotion

Psychologists have argued that like biological structures, universal cognitive structures are also a result of evolution by natural selection and can be traced to the selection pressures faced by early hominids in the Pleistocene epoch (Cosmides, Tooby, & Barkow, 1992). Arguably, human cognitive mechanisms developed at a time when individual survival fully depended on participation in collaborative activities such as food gathering, game hunting, shelter maintenance and enemy repulsion (Wilson & Wilson, 2007). If individual survival was yoked to his or her group's survival, it is likely that psychological adaptations that enhanced individual attunement to the group, the level of the within-group coordination and hence the group's aptitude for inter-group competition, would afford a natural selection advantage (Sober & Wilson, 1998).

Of course, one such cognitive adaptation is forwarded by the social verification and self-categorization perspectives—that is group members' greater internalization of beliefs and attitudes that are experienced as shared. However, beliefs and attitudes comprise just a fraction of information that can be experienced as shared with one's group. Indeed, it is likely that people are more aware of the objects that they attend to in common (We see X) than the shared beliefs and attitudes about those attentional targets (We think Y about X). If group members have better memory for objects that they knowingly attend to in common, the result would be greater knowledge uniformity within the group.

In sum, if a psychological mechanism could increase knowledge uniformity across a group of individuals, it would possess a selective advantage for an organism that survives through effective intra-group coordination and inter-group competition. The social attention effect on stimuli accessibility is one such mechanism. In what follows, the case for social attention is further developed through a review of the developmental literature on joint attention behavior, and the social neuroscience scholarship on shared attentional states.

Social Attention and Development

Based on a comprehensive review of developmental research, Tomasello, Carpenter, Call, Behne, & Moll (2005) concluded that as soon as 9 months of age, infants engage in joint attention behavior, involving multiple people directing their attention toward a common activity (e.g., we are putting away toys). “During these activities, infants’ looking becomes coordinated with that of the other person triadically towards the relevant outside objects...”(p. 682).

Thus, already at this early stage of development, humans are engaged in shared activities, requiring cognitive adaptations that allow for persistent joint attention behavior (Mundy & Newell, 2007). There is a significant amount of evidence that joint attention behavior is an important antecedent to referential language ability (Carpenter, Nagell & Tomasello, 1998), as well as infant vocabulary (Morales et al., 1998). Whereas, there is substantial evidence that children with autistic learning disabilities are unable to join in with another person’s attentional focus (Leekam, Lopez & Moore, 2000). An important question then, is what are

psychological adaptations that enable infants to engage in persistent joint attention behavior?

A generally-accepted answer in the developmental literature is that infants possess a shared attention mechanism (Baron-Cohen & Swettenham, 1996); the purpose of which “...is to identify if you and another organism are both attending to the same object or event” (p. 159). As such, it appears that by 9 months of age, infants acquire a shared attention mechanism that is uniquely devoted to establishing joint attention behavior (Tomasello et al., 2005).

Moreover, given that infants are capable of joint attention behavior years before becoming aware that other people have beliefs and attitudes, the developmental literature also makes clear that there is a qualitative difference between mental representations of shared stimuli and shared beliefs. Whereas, stimuli under shared attention are experienced as *external realities* that are held in common (Baron-Cohen, 1995), shared beliefs are experienced as consensual *mental representations* of reality (Echterhoff et al., in press).

In sum, the developmental literature supports the notion that humans possess a shared attention mechanism that is devoted to processing instances of attending to an object with others. Social Attention Theory builds on the idea of the shared attention mechanism, but incorporates unique assumptions. First, unlike shared attention that involves gaze monitoring (Baron-Cohen, 1995), social attention only requires that the individual *thinks* that others are attending (Assumption 1). Also, unlike shared attention that can involve any ‘organism,’ social attention requires that the others attending to the stimulus are perceived to be members of one’s group (Assumption 2).

The Neural Bases of Social Attention

At a more basic level, social neuroscience research suggests that human brains are uniquely adapted to think socially (Saxe, 2006). Of particular interest is evidence suggesting that neural activity in the ventral region of the medial prefrontal cortex (ventral mPFC) is selectively associated with joint attention behavior (Williams, Waiter, Perra, Perrett & Whiten, 2005). In this fMRI study, adult participants were asked to either look at a ball when another person (an animated character) was looking at the ball or when another person was looking in a different direction. There appeared to be selective recruitment of the ventral region of the mPFC when the other person looked at the ball, but not when the other person looked away. Also, recent evidence showing that the ventral mPFC is selectively recruited when thinking about similar others (Mitchell, Macrae, & Banaji, 2006) suggests that the brain region involved in monitoring for shared attention is also active in the presence of similar others. These findings are consistent with Social Attention Theory's assumption that experiences of shared attention involve estimations of whether the others are members of one's group.

Interestingly, in a review of the literature, Saxe (2006) concludes that whereas the mental representations of others' beliefs are processed in the temporo-parietal junction (TPJ), mental representations of stimuli under shared attention are processed in the medial prefrontal cortex (mPFC). It appears that humans possess a specialized brain region geared for the experience of objects in common.

In sum, both developmental evidence and imaging studies suggest that experiences of shared attention are processed by a specialized cognitive mechanism.

Combined with the notion that a certain level of knowledge uniformity among group members is necessary for group locomotion and survival, it is conceivable that humans possess a psychological adaptation, rooted in the experience of shared attention, that drives knowledge formation. Next, three experimental studies test the assumptions of Social Attention Theory. More specifically, the studies test the hypothesis that knowingly attending to a stimulus with members of one's group (e.g., similar others) results in greater cognitive accessibility of that stimulus.

Chapter 4: Testing Social Attention Theory

The primary goal of the three studies was to compare the cognitive accessibility of stimuli that were attended to with one's group members versus a control group. Although the details of each study's manipulation differ, in all studies participants were randomly assigned to conditions in which they either attended to stimuli with one's group (i.e., similar others) or a control group. Importantly, the invoked social groups were minimal. That is, the primed social groups were meant to have relatively few associated attitudes and/or beliefs, which were not related to the target stimuli. Moreover, across all studies, participants were separated into different rooms, with no ability to communicate. As such, participants could not simply imitate the attentional intensity of others since they could not see them. Whereas multiple study cues reminded participants that they were attending to the stimuli with others, the participants could not observe the extent to which others attended to the stimuli.

Following the key manipulation of whether one's group was attending or not, participants were presented with target stimuli, the cognitive accessibility of which was measured through participants' psychological and behavioral reactions. Given the central assumption of the theory tested, the dependent variable of primary interest was the cognitive accessibility of the presented stimuli. For instance, in the first study, participants attended to words with others, the cognitive accessibility of which was later measured through word recognition latency (Fazio, 1989) and accuracy. In the second study, participants attended to goals with others, the cognitive accessibility of which was later measured by the degree of goal-congruent behavior. In the third study, while making a judgment, participants attended to time pressure with others,

the cognitive accessibility of which was later measured by the degree of judgmental certainty (Kruglanski & Freund, 1983). Please see figure 1 below for a summary of all 3 studies.

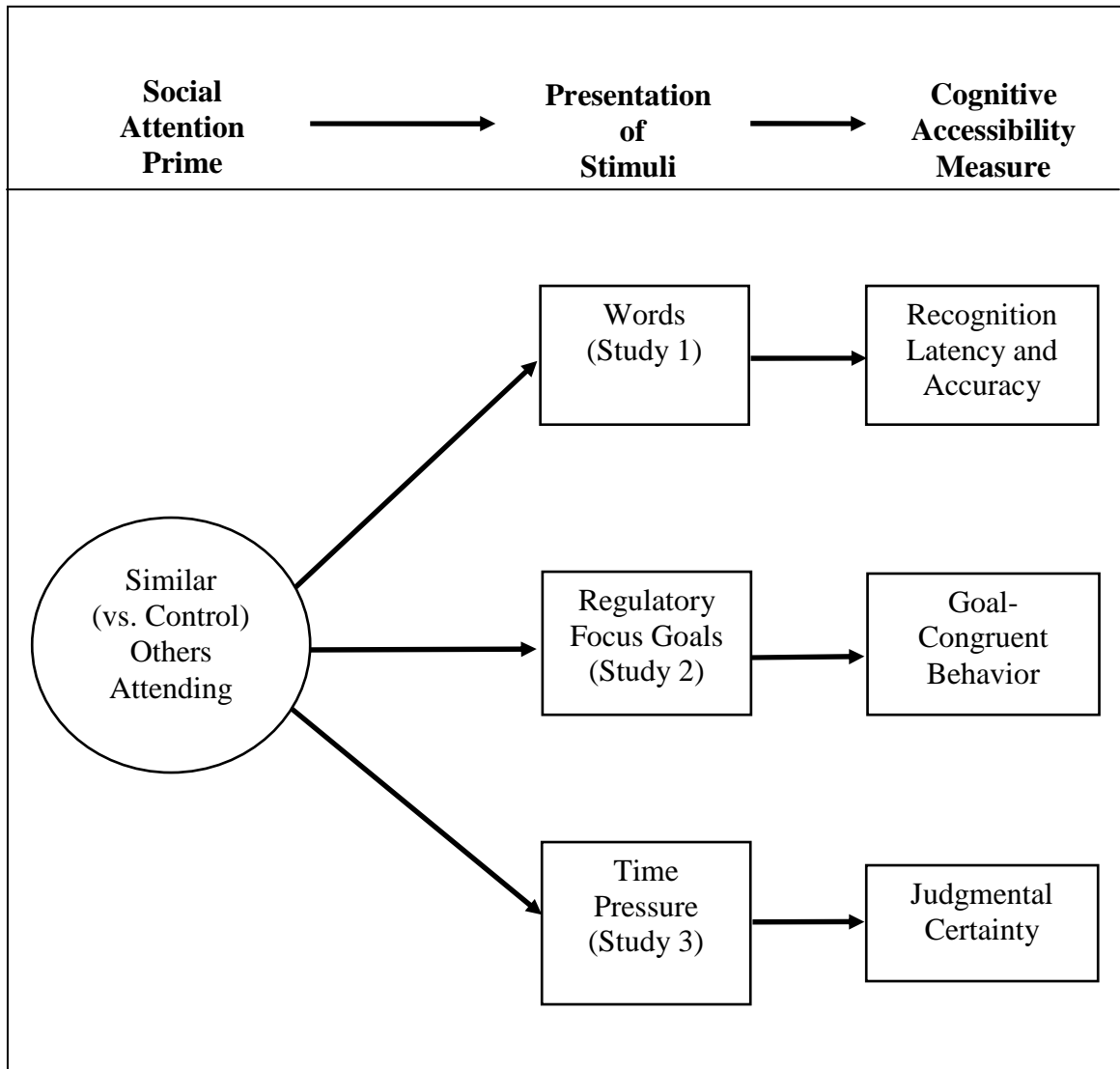


Figure 1. Summary of all studies.

The choice of the stimuli was strategic. The choice of words as stimuli in the first study allowed for a direct measure of stimuli cognitive accessibility—word recognition latency and accuracy. In the second study, goals were used as stimuli to demonstrate that social attention on goals can heighten goal-congruent behavior. In

the third study, time pressure was used as stimuli to demonstrate that social attention on certain stimuli can alter judgmental certainty, a psychological outcome of considerable importance. Overall, the three studies conducted aimed to provide convergent validity for Social Attention Theory across the psychological and behavioral domains of memory performance (Study 1), risk behavior (Study 2) and judgmental certainty (Study 3).

Study 1: Social Attention on Words

Participants and General Design. Participants were 43 undergraduates (72.1% females; mean age = 19.19 years). The first study explored the effect of social attention on the cognitive accessibility of words in a between-subjects design with two conditions (similar others attending vs. control group attending). Target word recognition latency (Fazio, 1989) as well as word recognition accuracy served as the dependent variables.

Hypotheses. It was hypothesized that participants who attended to target words with similar others (vs. a control group) would be faster to recognize the target words on second appearance (lower recognition latency) (Hypothesis 1). It was also hypothesized that participants who attended to target words with similar others (vs. a control group) would have greater word recognition accuracy (Hypothesis 2).

Procedure and Manipulations. Participants arrived to the laboratory three at a time and were placed into separate rooms, with each individual seated in front of a computer. Participants were informed that they would be asked to perform a number of different tasks, such as forming opinions and playing word games. Importantly, throughout the study, participants were made aware that the others were also attending to the stimuli presented. This was achieved in several ways: (1) pre-study instructions, (2) “waiting for others to join” screens, (3) representation of others on the screen, and (4) in-study instructions addressing participants as a group. Notably, participants were also told that no sharing of responses among participants would occur and all responses would remain confidential.

The presence of similar others attending to the stimuli (words in this case) was evoked in the following manner. Each participant was instructed to begin the study by clicking one of five colored avatars. The five avatars were identical except for the difference in the color of their outline: red, blue, green, yellow, orange (Appendix A). After choosing their avatar, participants were asked to wait until two other participants logged into the study (Appendix B). On the screen that followed, participants were asked to judge a painting, which served as a distractor task. Simultaneous with the instructions for the distractor task, participants in the similar others attending condition saw that all three participants chose identical avatar colors (Appendix C); whereas, participants in the control condition saw that all three participants chose distinct avatar colors (Appendix D). In reality, the others' avatar colors was controlled by the computer to either match the participant's color choice or mismatch it, depending on the condition of the participant.

Importantly, the above manipulation was designed to be subtle as to avoid priming psychological states that were extraneous to the theory, such as greater competitiveness, task enjoyment, and general motivation. To make sure that these psychological states did not differ across conditions, 1-item Likert items asked participants the extent to which they felt competitive, enjoyed the tasks, and felt motivated to perform the tasks.

The remainder of the study consisted of a signal detection task in which participants were briefly presented with a list of nine five-letter words which served as the signal. Participants were then presented with a second series of words, some of which they had seen (signal) and others they had not (noise) (Appendix E).

Participants were asked to identify whether each word had already appeared or was new.

Results. First, ANOVA analyses did not reveal any differences between conditions in self-reported feelings of competitiveness [$F = .50 (1, 41), p = .49$], task enjoyment [$F = .19 (1, 41), p = .66$], or general motivation to perform the tasks [$F = .04 (1, 41), p = .84$]. To test the effect of condition on speed of word recognition (speed of signal detection), we calculated participants' average time to recognize the signal correctly. A between-subjects ANOVA indicated a significant effect of condition on speed of word recognition [$F = 5.91 (1, 41), p = .02, \eta^2 = .13$] with participants in the similar other condition having faster recognition times [$n = 19; M_{ms} = 1079.25, SD_{ms} = 301.95$] than participants in the control group condition [$n = 24; M_{ms} = 1558.36, SD_{ms} = 814.12$]. An independent samples t-test (equal variances not assumed) confirmed the finding [$t = 2.66 (30.51), p = .01$] (See Figure 2 below).

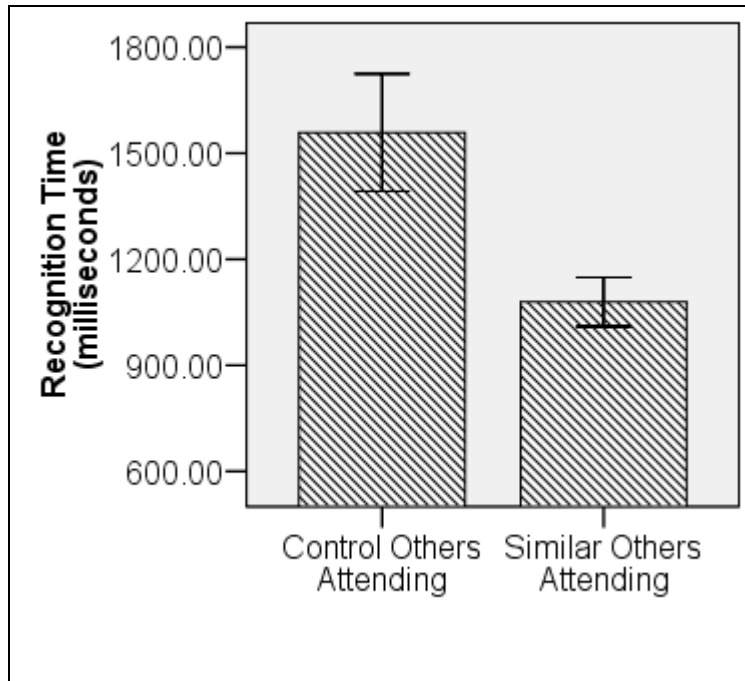


Figure 2. Study 1 target word recognition latency across conditions.

Note: Error bars represent standard errors.

To test the effect of condition on accuracy of word recognition (signal detection), we calculated d' prime (Z hit rate – Z false alarm rate) (Banks, 1970; Stanislaw & Todorov, 1999). A between-subjects ANOVA indicated a significant effect of condition on accuracy of word recognition [$F = 5.75 (1, 41), p = .02, \eta^2 = .12$] with participants in the similar other condition exhibiting greater accuracy [$n = 19; M_{d' \text{ prime}} = .68, SD_{d' \text{ prime}} = 1.20$] than participants in the control group condition [$n = 24; M_{d' \text{ prime}} = -.54, SD_{d' \text{ prime}} = 1.94$]. An independent samples t -test (equal variances not assumed) confirmed the finding [$t = -2.53 (38.97), p = .02$] (See Figure 3 below).

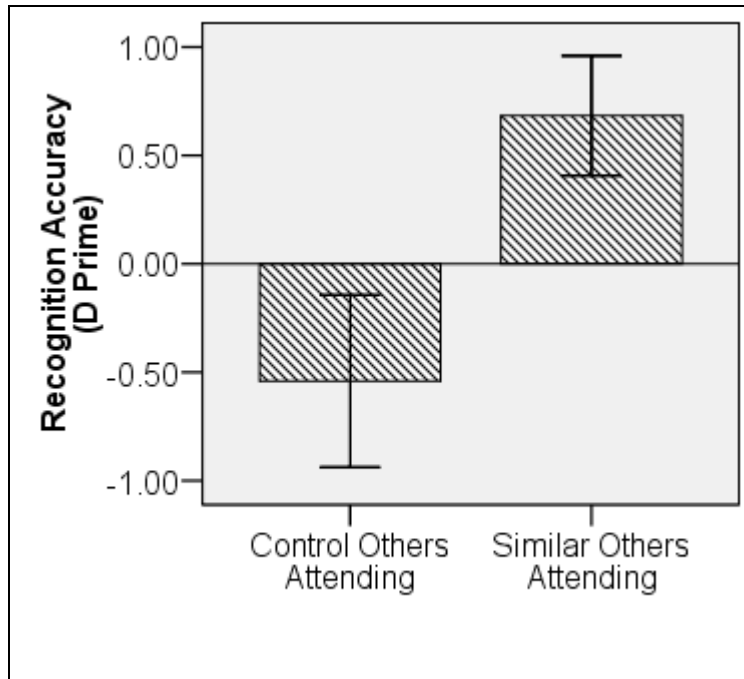


Figure 3. Study 1 word recognition accuracy across conditions.

Note: Error bars represent standard errors.

Post-hoc Analyses. A more in-depth analysis of hit rates and false alarm rates showed that the difference in the overall accuracy (d prime) between conditions was attributable to a higher proportion of hits in the similar others attending condition (Hit rate= 72%) as compared to the control group attending condition (Hit rate= 60%) [$t = -2.22$ (40.80), $p = .03$] as well as a lower proportion of false alarms in the similar others attending condition (False alarm rate = 7%) as compared to the control group attending condition (False alarm rate = 22%) [$t = 2.12$ (34.08), $p = .04$].

Discussion. In sum, the results support the hypothesis that stimuli that are attended to in the company of one's group (i.e., similar others) are more cognitively accessible or memorable. It appears that simply knowing that one's group is attending to target words heightens the words' cognitive accessibility, leading to faster and more accurate word recognition. In the next study, regulatory focus goals are used as

stimuli to demonstrate that social attention on more complex stimuli such as goals can heighten goal-congruent behavior.

Study 2: Social Attention on Regulatory Goals

Participants and General Design. Participants were 109 undergraduates (67.9% females; mean age = 19.4 years). The second study explored the effect of social attention on the cognitive accessibility of regulatory focus goals in a 2 (similar others attending vs. control group attending) by 2 (promotion regulatory goal vs. prevention regulatory goal) between-subjects design. Like the first study, the second study consisted of a signal detection task in which participants were asked to decide whether the word was previously seen (signal) or if the word was new (noise). However, unlike in the first study, the second study also presented participants with either promotion or prevention goals (Higgins, 1998). The level of behavioral risk was the dependent variable of interest as it is a well-researched outcome of regulatory focus orientation, with promotion goals leading to more risky behavior than prevention goals (for a review see Higgins, 1998). Moreover, because the regulatory focus goals were primed in the context of a word recognition task, the effect of similar others attending on word recognition accuracy was also examined.

Hypotheses. It was expected that the influence of regulatory focus goals on behavioral risk would be greater in the similar others (vs. control group) attending condition due to greater cognitive accessibility of regulatory focus goals. More specifically, given the hypothesis that the attentional targets of one's group are more cognitively accessible, we expected that participants who attended to the promotion goal (vs. prevention goal) with similar others would be more risky in their response style. Conversely, we expected that participants who attended to the promotion (vs. prevention goal) with the control group would exhibit little difference in response

style risk (Hypothesis 1). Since regulatory focus goals were primed in the context of a word recognition task, and words under social attention are expected to be more cognitively accessible, it was hypothesized that participants in the similar others (vs. control group) attending condition would be more accurate when identifying the words as previously seen or as new (Hypothesis 2). Because response bias (c criterion) and recognition accuracy (d prime) are orthogonal in signal detection tasks, both hypotheses 1 and 2 can theoretically find support. It was not expected that participants in the similar others (vs. control group) attending condition would be faster in identifying target words, since greater promotion or prevention concerns would likely hamper response speed.

Procedure and Manipulations. The initial procedure and the manipulation of similar others (vs. control group) attending was identical to that of study 1. However, unlike in study 1, before performing the signal detection task, the participants were presented with a regulatory focus manipulation (adapted from Crowe & Higgins, 1997; Levine, Higgins & Choi, 2000). Specifically, participants were first asked to look at a series of nine five-letter, nonsense words (targets) (Appendix F), which were shown one at a time for two seconds each. Next, depending on their regulatory focus condition, participants saw instructions that either primed a promotion or prevention regulatory goal:

Promotion goal: “You will be asked to identify which words you have already seen and which words are new. Your goal is to be correct at least 80% of the time.”

Prevention goal: “You will be asked to identify which words you have already seen and which words are new. Your goal is to avoid being incorrect more than 20% of the time.”

In keeping with previous regulatory focus studies (Crowe & Higgins, 1997; Levine, Higgins & Choi, 2000) the conditions used the same success criterion (at least 80% correct), but differed in the regulatory framing of that criterion (i.e., approach versus avoidance). Next, in a word recognition task, participants saw twenty nonsense words (nine targets, eleven distractors) one at a time (see Appendix F). The sequence of the words was randomized within participants. For each word, participants were asked to indicate whether the word appeared on the initial list of words or whether it was a new word.

Of primary interest was the riskiness exhibited in participants' response bias. In a comparison of response bias measures within the signal detection paradigm, Macmillan & Creelman (1990) concluded that the indexes of criterion location are appropriate representations of response bias. Indexes of criterion location are slightly different versions of calculating the proportion of correct hits plus false alarms. One of the most important features of the criterion location as a response bias measure is that it satisfies the monotonicity condition, which implies that accuracy does not impact response bias. That is as accuracy goes up (more hits, fewer false alarm rates) or down (fewer hits, more false alarm rates), the response bias (# of hits plus # of false alarms) remains the same. As such, in testing hypothesis 1, participants' behavioral risk was captured by their c criterion ($-0.5*[z \text{ hit rate} + z \text{ false alarm rate}]$) (Macmillan & Creelman, 1990). Moreover, as in study 1, participants' accuracy was captured by their d prime scores ($Z \text{ hit rate} - Z \text{ false alarm rate}$) (Banks, 1970).

Also, as in study 1, to make sure that these psychological states did not differ across conditions, 1-item Likert items asked participants the extent to which they felt competitive, enjoyed the tasks and felt motivated to perform the tasks.

Results. Three participants in the similar others attending condition were excluded from the analyses due to mistakenly believing that other participants chose different avatar colors. As such, the reported results are based on 106 participants. As in study 1, ANOVA analyses did not reveal any differences between similar vs. control group attending conditions in self-reported feelings of competitiveness [$F = .17 (1, 104), p = .68$], task enjoyment [$F = .20 (1, 104), p = .66$], or general motivation to perform the tasks [$F = .48 (1, 104), p = .49$].

A two-way interaction was expected where participants in the similar others (vs. control group) attending condition would exhibit more risky behavior in the promotion goal condition and more conservative behavior in the prevention goal condition. A 2 by 2 between-subjects ANOVA indicated that there was no main effect of social attention condition [$F = .00 (1, 102), p = .95$] or regulatory goal condition [$F = 2.87 (1, 102), p = .09$]. Albeit the latter main effect was close to significance with promotion goals eliciting more risky behavior than prevention goals. The hypothesized two-way interaction was significant [$F = 4.22 (1, 102), p = .04, \eta^2 = .044$]. As expected, promotion/prevention goals had a significant effect on behavioral risk for participants sharing attention with similar others (equal variances not assumed) [$t (43.76) = -3.06, p = .004$], with participants exhibiting more risky behavior after promotion goals [$n = 25 ; M_{c \text{ crit}} = -.19, SD_{c \text{ crit}} = .50$], than after prevention goals [$n = 22 ; M_{c \text{ crit}} = .20, SD_{c \text{ crit}} = .37$]. Promotion/prevention goals did

not impact behavioral risk for participants in the control condition (equal variances not assumed) [$t(53.76) = .24, p = .82$].

Notably, the calculation of criterion c involves a negation, which makes lower numbers representative of higher risk taking. See figure 4 below for an illustration of the results.

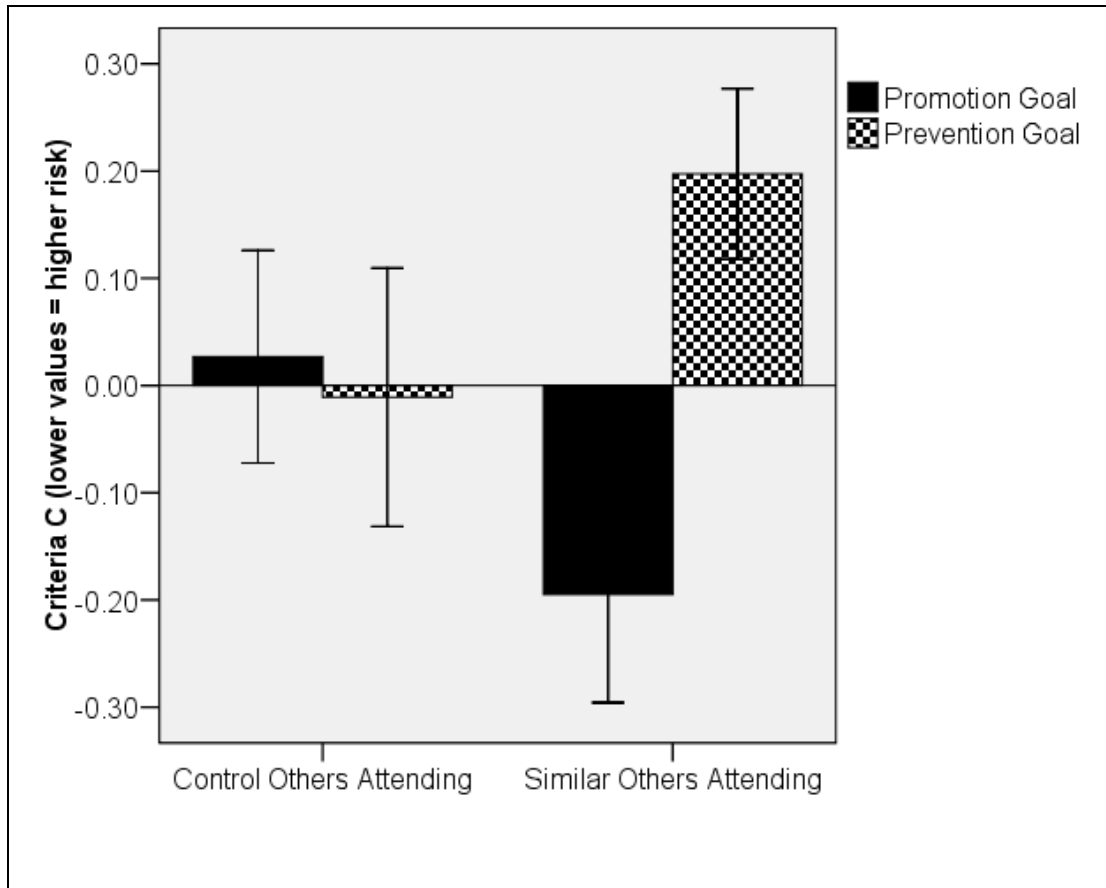


Figure 4. Study 2 Two-way interaction on behavioral risk.

Note: Error bars represent standard errors

As posited by hypothesis 2, participants in the similar others attending condition were expected to exhibit greater accuracy in the word recognition task. An independent samples t-test (equal variances not assumed) was border-line significant [$t = -1.90(103.35), p = .06$]. Participants in the similar others attending condition

were more accurate [$n = 47$; $M_{d_{\text{prime}}} = .33$, $SD_{d_{\text{prime}}} = 1.36$], than participants in the control group attending condition [$n = 59$; $M_{d_{\text{prime}}} = -.26$, $SD_{d_{\text{prime}}} = 1.86$]. No other significant effects on word recognition accuracy were found. There were no significant effects for word recognition latency.

Post-hoc Analyses. As predicted, participants in the similar others attending condition exhibited greater response biases as well as greater response accuracy. It is important to note that participants following promotion strategies in the similar others (vs. control group) attending condition should be expected to achieve greater accuracy through increasing their hit rate, not increasing their false alarm rate. This should be the case because greater accuracy with a promotion strategy can theoretically only be achieved through a higher hit rate (i.e., correct 'yes' responses). Conversely, participants following prevention strategies in the similar others (vs. control group) attending condition should be expected to achieve greater accuracy through decreasing their false alarm rate, not decreasing their hit rate. This should be the case because greater accuracy with a prevention strategy can theoretically only be achieved through a lower false alarm rate (i.e., correct 'no' responses).

Indeed, additional analyses reveal that this was exactly the case. Participants who were primed with a promotion goal in the similar others (vs. control group) attending condition had a higher hit rate [$t = 2.08$ (39.38), $p = .04$; hit rate = 96% vs. 90%], but not a higher false alarm rate [$t = -.15$ (49.80), $p = .88$; false alarm rate = 21% vs. 22%]. Note that the promotion focus in the similar others (vs. control group) attending condition does not lead to a greater false alarm rate. This can be explained

by the notion that the effect of the promotion strategy on the false alarm rate is counterbalanced by a better overall memory for the words.

Conversely, participants who were primed with a prevention goal in the similar others (vs. control group) attending condition had a lower false alarm rate [$t = -2.20$ (44.03), $p = .03$; false alarm rate = 13% vs. 21%], but not a lower hit rate [$t = .49$ (47.99), $p = .63$; hit rate = 92% vs. 91%]. Again, it is noteworthy that the prevention focus in the similar others (vs. control group) attending condition does not lead to a lower hit rate. This again can be explained by the idea that the effect of the prevention strategy on the hit rate is counterbalanced by a better overall memory for the words.

Discussion. In sum, the results support the hypothesis that stimuli that are attended to in the company of one's group (i.e., similar others) are more cognitively accessible or memorable. In a replication of study 1 findings, it appears that simply knowing that one's group is attending to target words heightens the words' cognitive accessibility, leading to greater recognition accuracy. In an important extension, however, study 2 shows that simply knowing that one's group is attending to a promotion or a prevention goal heightens the goal's cognitive accessibility as indexed by goal-congruent response behavior. Notably, participants did not have any information about what the others thought about the goals or the intensity with which the others were attending to the goals. Participants only knew that they were attending to the goals with others that were more or less similar to themselves.

In the next study, time pressure is used as stimuli to demonstrate that social attention on certain stimuli can alter judgmental certainty, a psychological outcome of

considerable importance. Also, in order to more thoroughly refute alternative explanations for the findings, participants' mood and arousal levels were gauged with established scales, administered immediately after the manipulation. Moreover, to provide further evidence that participants in the similar others attending condition experience the presence of relationally-close others, participants' sociality level (e.g., feelings of generosity, feelings of sociability) was measured.

Study 3: Social Attention on Time Pressure

Participants and General Design. Participants were 116 undergraduates (49.1% females; mean age = 19.8 years). The third study consisted of a decision-making task in which participants were asked to decide the nature of a fictitious rebel group based on the resistance tactics utilized by the group. The study explored the effect of social attention on the cognitive accessibility of time pressure in a 2 (similar others attending vs. control group attending) by 2 (high time pressure vs. low time pressure) between-subjects design. That is, during the decision-making process, the participants were presented with either high time pressure, which is thought to cause more judgmental certainty, or low time pressure, which is thought to cause less judgmental certainty (Kruglanski, 1989; Kruglanski & Freund, 1983).

Hypothesis. Given the hypothesis that the attentional targets of similar others are more cognitively accessible, we expected that participants who attended to high time pressure (vs. low time pressure) with similar others would be more certain in their judgments of the rebel group. Conversely, we expected that participants who attended to high time pressure (vs. low time pressure) with a control group would exhibit smaller differences in judgmental certainty (Hypothesis 1).

Procedure and Manipulations. Participants arrived four at a time and were put into different rooms upon everyone's arrival. Participants were informed that working on the computer, they would be asked to report opinions on different topics. Participants were also told that while everyone would be reporting into a common system, all responses would remain strictly confidential. The social context manipulation was similar to that of studies 1 and 2. However, unlike the first two

studies where each participant was joined by two others, in the third study, each participant was joined by three others. In the similar others attending condition, participants were joined by two others that matched their avatar color choice and one other that chose a different color from the rest (please see Appendix G). The inclusion of one different avatar color was meant to accentuate the similarity of the remaining avatar colors for the participant as well as make the situation more believable, since it is highly unlikely that four participants would choose the same avatar color. In the control group attending condition, each participant was joined by three others, all with distinct avatar colors (see Appendix H). As in studies 1 and 2, this manipulation was concurrent with the abstract painting task, which again served as a distractor.

Immediately following the social attention manipulation, participants answered several scales about how they felt at the time, including PANAS (Watson, Clark & Tellegen, 1988), Perceived Arousal Scale (Anderson, Deuser, DeNeve, 1995), as well as a Sociality Scale (5 items: social, sociable, generous, hospitable, unsocial-reversed) (Positive Affect $\alpha = .90$; Negative Affect $\alpha = .88$; Arousal Scale $\alpha = .92$; Sociality Scale $\alpha = .85$). The latter served as a manipulation check.

Participants in the similar other condition were expected to feel more social given the presence of their group (Tajfel & Turner, 1979).

The remainder of the study consisted of a time pressure manipulation (Kruglanski & Freund, 1983) in the context of a decision making task. The decision making task involved reading a description of a rebel group and deciding whether the rebel group is committing acts of terror or not (see Appendix I). Before reading the details of the rebel group however, depending on their time pressure condition,

participants either saw instructions that primed high time pressure or low time pressure:

High Time Pressure: “You will have only 3 minutes to decide.”

Low Time Pressure: “You can take as long as 3 minutes to decide.”

Also, in the high time pressure condition, there was a clearly visible clock that was counting up as participants contemplated their decision. The clock was absent in the low time pressure condition.

Of primary interest was the judgmental certainty exhibited by the participants, measured by the following two items (1-11 scale): “Would you be surprised to find out that your opinion is incorrect?” “Do you have any doubts about your opinion?” (reverse-scored) (Cronbach $\alpha = .82$).

Results. Participants in the similar others (vs. control group) attending condition did not feel happier [$F = 1.20 (1, 114), p = .28$], sadder [$F = .003 (1, 104), p = .96$], or more aroused [$F = .02 (1, 114), p = .90$], but they did feel more social [$F = 4.21 (114), p = .04$]($M_{\text{similar}} = 3.67$ vs. $M_{\text{control}} = 3.39$).

A two-way interaction was expected where participants in the similar others (vs. control group) attending condition would exhibit more judgmental certainty in the high time pressure condition and less judgmental certainty in the low time pressure condition. A 2 by 2 between-subjects ANOVA indicated that there was no main effect of similar others (vs. control group) attending condition [$F = .03 (1, 112), p = .87$] or time pressure condition [$F = .07 (1, 112), p = .79$]. As hypothesized, the two-way interaction was significant [$F = 5.62 (1, 112), p = .02, \eta^2 = .048$]. As

expected, high/low time pressure had a significant effect on judgmental certainty for participants in similar others attending condition (equal variances not assumed) [$t(49.11) = 2.08, p = .04$], with participants exhibiting more judgmental certainty after high time pressure [$n = 31 ; M_{\text{certain}} = 6.66, SD_{\text{certain}} = 1.96$], than after low time pressure [$n = 26 ; M_{\text{certain}} = 5.46, SD_{\text{certain}} = 2.33$]. High/low time pressure did not impact judgmental certainty for participants in the control condition (equal variances not assumed) [$t(56.51) = -1.39, p = .17$] (See Figure 5 below).

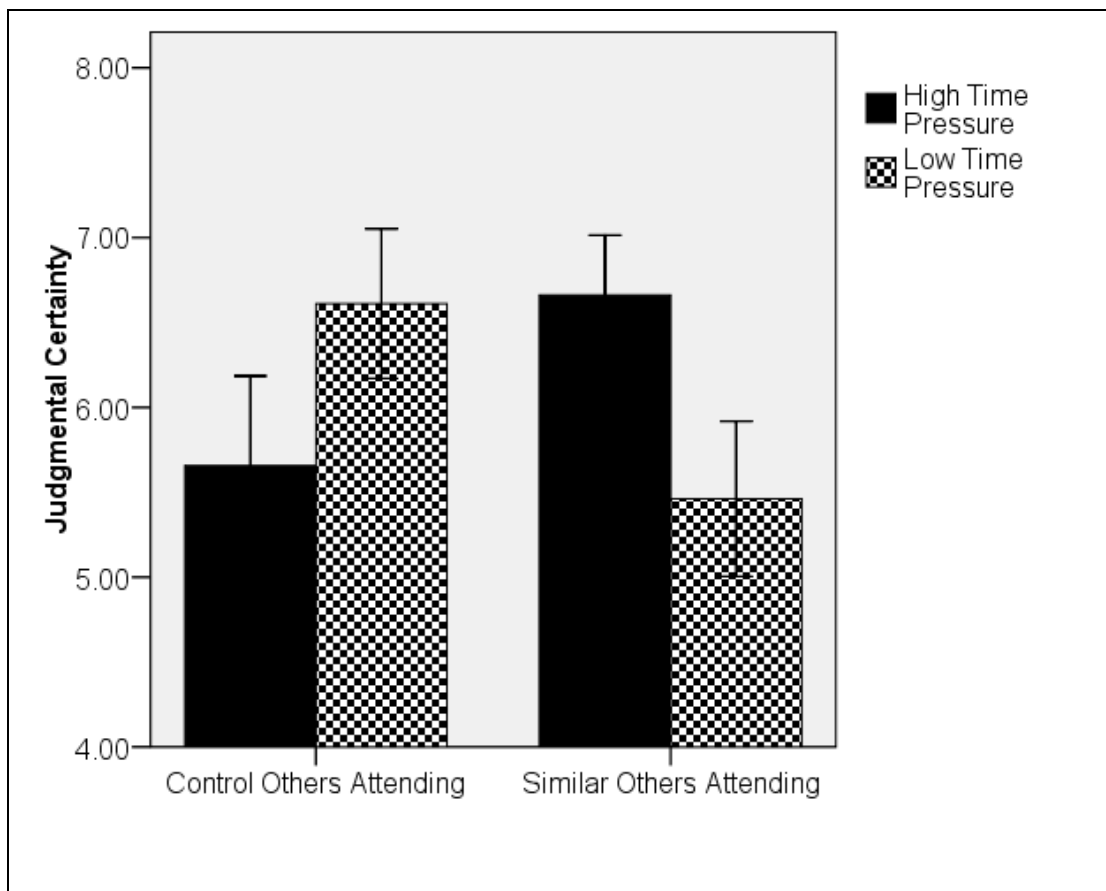


Figure 5. Study 3 Two-way interaction on judgmental certainty.

Note: Error bars represent standard errors

Notably, there were no significant main effects or interactions that predicted whether participants thought the group was engaged in terrorist resistance tactics.

That is, whereas the two-way interaction between social attention and time pressure conditions influenced participants' judgmental certainty, it did not effect the direction of the participants' judgments.

Interestingly, as can be seen on figure 5, the pattern of findings in the control group attending condition is the opposite of what would be expected by the Need for Closure Theory (Kruglanski, 1989). However, this difference is not statistically significant (equal variances not assumed) [$t(56.51) = 1.39, p = .17$].

Also of interest are the results of the measures gathered directly following the social attention manipulation (i.e., positive affect, negative affect, arousal, sociality). The results suggest that the reported judgmental certainty findings were not due to differences in affect or arousal. However, the difference in the felt sociality across conditions does suggest that participants felt relationally closer to the others in the similar others (vs. control group) attending condition.

Discussion. In sum, the results are consistent with the hypothesis that stimuli attended to with similar others are more cognitively accessible. In study 3 this was represented by the greater cognitive accessibility of high and low time pressure during decision-making as measured by participants' certainty in judgment.

Notably, in both study 2 and study 3, the presented stimuli (i.e., regulatory goals and time pressure) produced little difference in the dependent variable when the control group was attending. Although this is not directly relevant to testing Social Attention Theory, these findings are unexpected given previous scholarship (e.g., Kruglanski & Freund, 1983; Levine, Higgins & Choi, 2000). It is possible that

compared to previous research, these studies employed more subtle manipulations and offered fewer rewards for participation (i.e., credit vs. monetary payment).

Chapter 5: General Discussion

In the three studies presented, attending to simple words, regulatory focus goals, and time pressure with similar others, versus a control group, resulted in considerable differences in memory performance, behavioral risk, and judgmental certainty. In study 1, participants were faster and more accurate at recognizing words that they attended to with similar others. In study 2, participants exhibited behavioral response biases that were more in line with the regulatory focus goals that they attended to with similar others. Finally, in study 3, participants' judgmental certainty was more a function of the time pressure that they attended to with similar others. Participants attending with similar others did not report greater feelings of competition, task enjoyment, general motivation, positive affect, negative affect or arousal than participants attending with the control group. Yet, participants attending with similar others did feel more social than participants attending with the control group. As such, it appears that the manipulation was strong enough to prime the presence of one's group, but subtle enough to avoid altering important emotional and motivational states.

Given that everyday experiences are infused with far stronger in-group contexts than utilized in these experiments, it is conceivable that social attention plays a foundational role in the formation of knowledge, facilitating success in intra-group coordination and inter-group competition. While Social Attention Theory has broad implications for group functioning, it is first and foremost a theory of individual cognition and its social foundations. As such, implications for social influence scholarship as well as the psychological field in general are reviewed next.

Social Attention and Social Facilitation

Some of the earliest research in social psychology demonstrated that the mere presence of others can enhance performance (Triplett, 1898). However, evidence also accumulated for the opposite hypothesis, where the presence of others impeded performance (e.g., Hunt & Hillery, 1973). Resolving the controversy, Zajonc (1965) argued that the mere presence of others increases general arousal that may either enhance or impede performance depending on the difficulty of the task. Baron (1986) proposed an alternative explanation, arguing that the presence of others leads to attentional conflict which leads selective focusing of attention which again can either enhance or hinder performance depending on information-processing demands of the task. Other accounts of social facilitation effects are more motivational in nature, positing that greater performance in the company of others is a function of self-presentation motives, evaluation apprehension and fear of disapproval (cf. Geen, 1991).

Social Attention Theory offers another account of social facilitation that centers on the experience of sharing attention with one's group. According to the theory, attending to stimuli with one's group should result in greater stimuli accessibility, and *if* stimuli accessibility is facilitative of performance, greater performance should result. Indeed, the first study described can be interpreted as a test of the social attention account of social facilitation. Given the null arousal check findings in study 3, a difference in arousal across conditions was unlikely. Also, given that participants were not able to see one another, the observed findings cannot be explained by differences in attentional distraction due to observing others or

differences in social anxiety due to being observed by others. Although not mutually exclusive with other accounts of social facilitation, Social Attention Theory offers a novel explanation for when *certain* others may influence individual performance.

Social Attention and Social Identity

The social identity/self-categorization approach to cognition has been extremely influential in modern social psychology. The perspective has been used to shed light on such phenomena as group polarization (Mackie, 1986; Turner, Wetherell, & Hogg, 1989), crowd behavior (Postmes & Spears, 1998; Reicher, Spears, and Postmes, 1995), leader preference (Hogg, 2001; Hogg, Hains, & Mason, 1998) and of course, general social influence (Turner, 1991, 1999). Indeed, the perspective's wide-ranging explanatory power stems from a profoundly simple insight—when an individual self-categorizes in a specific group, the beliefs and attitudes that are perceived to be prototypical to that group govern behavior. The principle remains the same whether it explains the tendency to shift to the position favored by the group in group polarization research, crowd behavior, leader preference or general social influence.

In sum, according to the self-categorization perspective, individuals think and act according to the beliefs and attitudes of their active identity. How does Social Attention Theory expand the understanding of self-categorization and its power to affect cognition and behavior? Like Self-categorization Theory (Turner, 1999), Social Attention Theory posits that individual identification with a group has powerful consequences for cognition and behavior. However, Social Attention Theory makes the novel assertion that the impact of identifying with a group goes beyond activating

beliefs and attitudes. Indeed, the three studies described primed social identities (color groups) with few associated beliefs or attitudes in order to test whether attending with one's group has consequences for cognition beyond the belief and attitude activation. Even if the minimal groups primed activated certain beliefs and attitudes, it is highly unlikely that these beliefs and attitudes would systematically effect performance in study 1, behavioral riskiness in study 2 and judgmental certainty in study 3. As such, the studies suggest that the mere awareness that *we* are attending to words, goals, and time pressure, renders words, goals, and time pressure more cognitively accessible.

Social Attention and the Formation of Norms

Merriam-Webster dictionary (2009) defines a norm as “an authoritative standard” or “a principle of right action binding upon the members of a group...” As such, norms are by definition standards of behavior that “...guide, control, or regulate proper and acceptable behavior.” It is then no accident that social psychologists have been preoccupied with understanding the foundations of norm formation. Indeed, from the classics of social psychology (Asch, 1951; Sherif, 1936) to research on group polarization (Stoner, 1961) and groupthink (Janis, 1972), to more recent scholarship on shared reality (Echterhoff, Higgins & Levine, in press) and psychological foundations of culture (Lau, Chiu & Lee, 2001; Shteynberg, Gelfand, Kim, 2009), social psychological scholarship has repeatedly asked the same question: How are norms formed?

The prevailing social psychological answer, rooted in the aforementioned social verification (Festinger, 1950) and self-categorization (Turner et al., 1986;

Turner, 1991) perspectives, is the psychological readiness to accept the beliefs and attitudes of one's group members as valid. As James put it (1907), "You accept my verification of one thing. I yours of another. We trade on each other's truths" (p. 145). It is that reciprocity of acceptance that eventually creates a norm, an authoritative standard of what is correct, moral and good. How does Social Attention Theory contribute to this understanding of norm formation?

Social Attention Theory offers an account of norm formation that is not based on the internalization of shared beliefs and attitudes. The theory proposes that norm formation in groups operates on yet another psychological foundation—that of social attention. For instance, according to Social Attention Theory, in order for high time pressure to become a norm, the individual does not need to believe that his or her group internalized the high time pressure; rather, it is only necessary that the individual knowingly attends to the high time pressure with his or her group. Indeed, in the third study described, participants had no way of knowing what the similar others or the control group thought about the high time pressure prime. That is, participants in the similar others attending condition had no basis on which to believe that similar others would be more or less accepting of high time pressure than they would be personally. The participants in the similar others attending condition only knew that they were attending to the high time pressure with similar others. Social Attention Theory contends that this relatively simple attentional mechanism can result in the formation of behaviorally-guiding high time pressure norm.

Importantly, the social attention mechanism of norm formation greatly expands the number of stimuli that can be thought of as normative. Social Attention

Theory posits that any stimulus in the attentional field has the potential to become normative. For instance, as study 1 illustrates, simple words are better remembered when attended to with similar others. It is not a stretch to say that these words have become more normative due to their greater cognitive accessibility. Indeed, social groups often have explicit and implicit standards for what constitutes acceptable vocabulary. Social Attention Theory argues that simply attending to stimuli such as words with one's group heightens their cognitive accessibility, rendering them more normative or acceptable. In sum, the theory posits that physical and social environments in their entirety, can be experienced as normative.

The Social Psychology of Cognition

The extant social psychological approach to knowledge formation is rooted in the notion of cognitive consistency. A theoretical staple for social psychologists (e.g., Abelson & Rosenberg, 1958; Festinger, 1957; Heider 1946; Wyer, 1974), the topic has been given new life by more recent theorizing in the connectionist paradigm (cf. Read, Vanman & Miller, 1997). In particular, parallel constraint satisfaction (e.g., Schultz & Lepper, 1996; Simon & Holyoak, 2002; Simon, Snow, & Stephen, 2004) and cellular automata models (e.g., Nowak, Vallacher, Tesser, & Borkowski, 2000) of human cognition propose that human knowledge is a web of interconnected knowledge structures, with each knowledge structure having a degree of consistency or coherence with the rest. Essentially new knowledge is accepted to the extent that such additions bring greater coherence to the overall knowledge network (Thagard, 1989). As such, according to this perspective, the cognitive accessibility of a stimulus depends on how well it fits in with the rest of the individual's knowledge or, even

more specifically, how applicable the stimulus is to the knowledge that is accessible at the moment of stimuli consideration (Bruner, 1957; Higgins, 1996).

The connectionist perspective is highly flexible, with the ability to model social verification and self-categorization approaches to knowledge formation. For instance, in modeling the social verification perspective, it can be argued that some judgments are more readily accepted due to their greater consistency with existing beliefs about the source of the judgment (i.e., I trust X, therefore I should believe Y). Similarly, in modeling the self-categorization perspective, it can be argued that some judgments are more readily accepted due to their greater consistency with existing beliefs about the self (i.e., I am a member of group X, group X believes Y, therefore I believe Y). In sum, despite the utility of both social verification and self-categorization perspectives in understanding social influence processes, both theories can be modeled by the connectionist approach to knowledge formation.

Though generally more theoretical integration is desirable to less, the ability to account for social influence processes through the connectionist architecture gives credence to the criticism that social psychology is a cognitive psychology with social stimuli (Ickes & Gonzales, 1994). The implication being that social psychology is an applied branch of cognitive psychology, not a basic science. This concern has motivated some scholars to consider changing the level of social psychological analysis to the group level (e.g., Ickes & Gonzales, 1994; Thompson & Fine, 1999), shifting the theoretical focus from what happens within interacting individuals to what happens in-between interacting individuals. Social Attention Theory offers yet

another way forward, retaining the focus on individual cognition, but introducing a fundamentally social dimension to knowledge formation.

As discussed, according to the connectionist paradigm, a knowledge structure's degree of consistency with already existing knowledge determines its adoption. However, in the experiments presented, participants internalized stimuli in the absence of any systematically activated beliefs and attitudes. As such, participants attending to with one's group had no greater *reason* upon which to judge the stimuli as less or more consistent with or applicable to their existing knowledge.

At this point, it is important to clearly distinguish between theoretical rationale and individual reasoning. Social Attention Theory has a theoretical rationale that explains why attending to stimuli with one's group would result in greater knowledge formation. However, the theory *does not* posit that greater social attention causes the individuals themselves, as thinking agents, to have greater reasons for knowledge adoption. For instance, the theoretical rationale of inclusive fitness suggests that humans seek sexual intercourse because it leads to genetic survival; however, we would not expect individuals to have genetic survival on their minds as the *reason* for seeking sexual intercourse. Similarly, although there is a theoretical rationale for why greater social attention leads to greater knowledge formation, participants in the similar others attending condition had no greater reason for knowledge formation. That is, the presented stimuli were not more cognitively accessible because they were more consistent with or applicable to extant knowledge, but rather, the presented stimuli were more cognitively accessible because they were perceived as social.

Future Directions. Social Attention Theory opens up many avenues for future research. First, it is important to examine the processes underpinning the influence of social attention on memory in more detail. It is possible that the influence of social attention on stimuli accessibility is the result of greater attentional focus on stimuli that are experienced as shared with one's group. In other words, when individuals know that a stimulus in their attention is also attended to by their group, they intensify their attention on that stimulus. Attentional intensity was not measured in the three studies presented and can be investigated with eye-tracking technology. Alternatively, it is possible that the influence of social attention on stimuli accessibility is not mediated by greater attentional intensity. It is conceivable that the experience of sharing attention on a stimulus with one's group leads *directly* to greater cognitive accessibility of that stimulus. Imaging technologies can prove useful in investigating whether greater neural activation in the brain regions associated with shared attention (e.g., ventral mPFC) are associated with greater activation in the brain regions associated with memory (e.g., hippocampus).

Second, it is important to examine how the size of the group with whom one attends influences the cognitive accessibility of stimuli. That is, does knowingly attending to a stimulus with a larger group make it more cognitively accessible than attending to the same stimulus with a smaller group? The answer to this question may have particularly interesting implications in today's world of mass media, where individuals are routinely aware that what they see, hear and read is being simultaneously attended to by millions of others.

Third, it is important to examine how the degree of social identification with the attending group impacts stimuli accessibility. For instance, assuming that one identifies with his or her family more than his or her work group, is knowingly attending to a stimulus with one's family make the stimulus more cognitively accessible than attending to the same stimulus with one's work group? Social Attention Theory would predict that this would be the case.

Fourth, future research must examine whether the social attention effect generalizes across a wider array of stimuli. For instance, Social Attention Theory would predict that attending to mood stimuli (e.g., happy or sad faces) with one's group would drive changes in mood; whereas, attending to behavioral mannerisms (e.g., yawning, scratching) with one's group would change behavior.

Fifth, it is important to note that the social attention effect is not limited to the visual system. An individual can gain knowledge of joint attention with his or her group through any sensory modality. For instance, it would be interesting to examine whether knowingly attending to a sound with one's group (e.g., a speech accent) would make that sound more cognitively accessible, leading to accent reproduction. Overall, the influence of social attention on spoken language acquisition merits further examination.

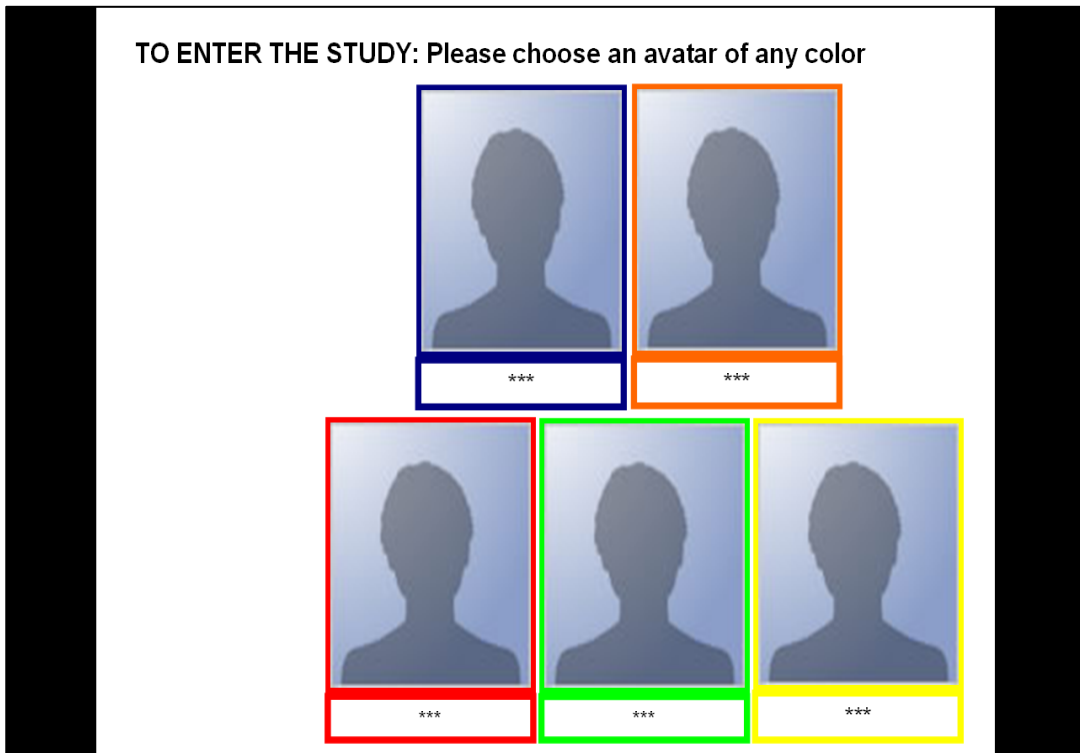
Limitations. The lack of a direct measure of social attention is a significant limitation of the studies presented. Because the experience of social attention is implicit, it is difficult to capture it through self-report measures. Asking participants whether they experienced the stimuli as social or shared is more likely to confuse them than yield meaningful data. Another limitation of the present research is the

potentially artificial nature of the similar others attending manipulation. It should be noted, however, that the subtlety of the laboratory prime utilized effectively prevented changes in motivation or arousal as well as activation of strong beliefs or attitudes. For instance, if gender-based groups were used, it is possible that the priming of the male identity would have activated a promotion orientation, while the priming of the female identity would have activated a prevention orientation.

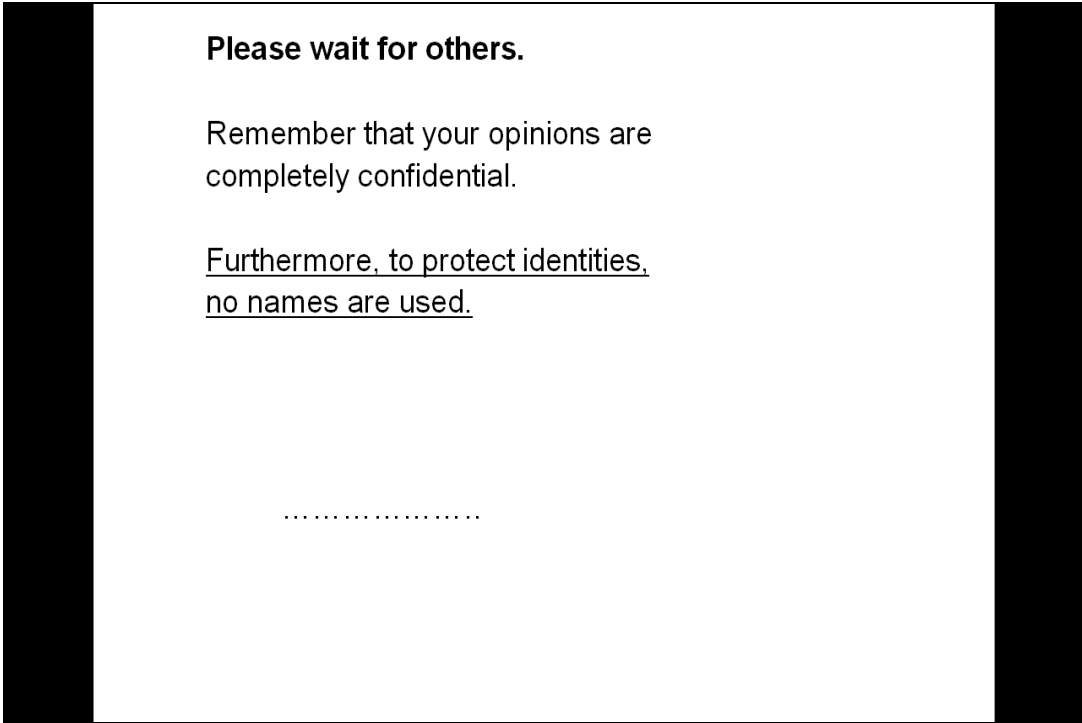
Conclusion. Social Attention Theory offers a novel approach to understanding knowledge formation that is consistent with scholarship on group-selection models of evolution and group locomotion, the role of joint attention behavior in early learning, as well as the functionally unique neurological basis of shared attention. Although no theory can be proved certain, the three studies presented support the social attention account of knowledge formation. As reviewed, Social Attention Theory has important implications for social psychological research on social facilitation, social identity, and norm formation. Also, the perspective forwarded here questions whether the formation of new knowledge is based solely on its degree of coherence with, or applicability to, existing knowledge structures. Rather, it is argued that knowledge formation rests on yet another psychological foundation, one that is rooted in the spotlight of social attention.

Appendices

Appendix A. Studies 1, 2 & 3 Initial Color Choice



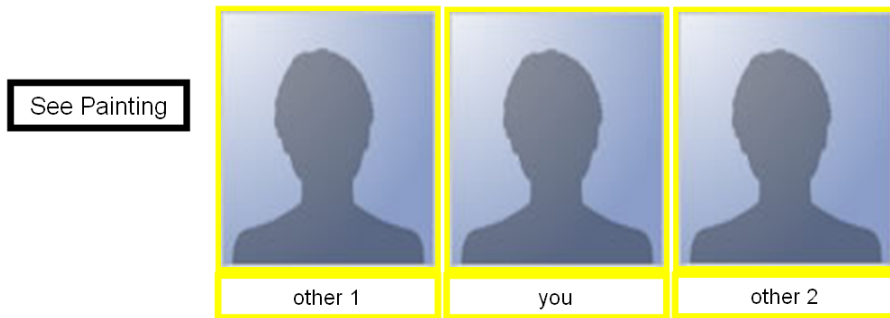
Appendix B. Studies 1, 2 & 3 Waiting to Log-in Screen.



Appendix C. Studies 1 & 2 Similar Others Attending Condition (Example).

Hello all. You will be asked to make a judgment about a particular painting. Specifically, you will be asked to decide whether you like the painting or not.

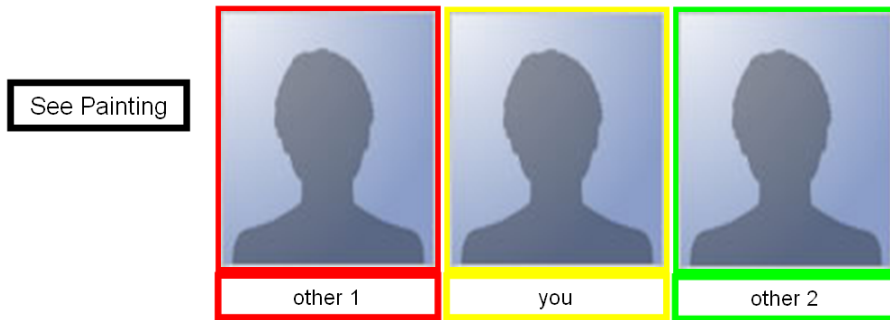
Press 'see painting' when ready.



Appendix D. Studies 1 & 2 Control Group Attending Condition (Example)

Hello all. You will be asked to make a judgment about a particular painting. Specifically, you will be asked to decide whether you like the painting or not.

Press 'see painting' when ready.



Appendix E. Study 1 target and distractor words.

Target words

1. SHEET
2. BLANK
3. FLAKE
4. SWORD
5. LUMPS
6. STEAM
7. TEETH
8. TABLE
9. STICK

Distractor words

1. SNAKE
2. BORED
3. CREED
4. CRACK
5. DEVIL

Appendix F. Study 2 target and distractor words.

Target words

1. LEMAS
2. BLORT
3. GRACK
4. KEARN
5. LERAT
6. SLABE
7. AVRAK
8. STOLD
9. BLUCK

Distractor words

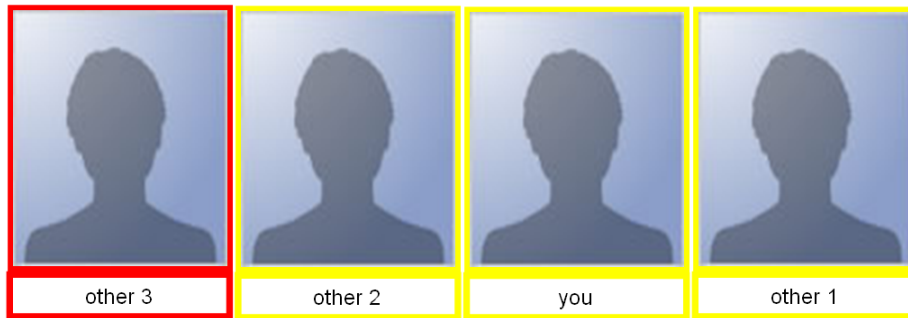
1. STROM
2. RAKIN
3. MELAS
4. VARAC
5. LETER
6. GELOB
7. FELAP
8. LUCKE
9. BADER
10. ECRAN
11. TARIC

Appendix G. Study 3 Similar Others Attending Condition (Example)

Hello all. You will be asked to make a judgment about a particular painting. Specifically, you will be asked to decide whether you like the painting or not.

Press 'see painting' when ready.

See Painting

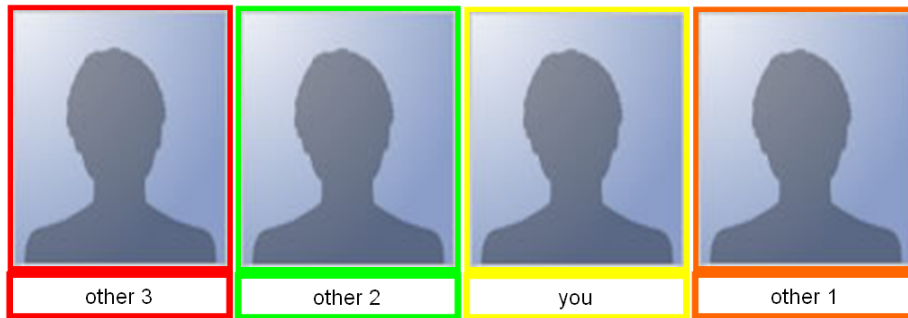


Appendix H. Study 3 Control Group Attending Condition (Example)

Hello all. You will be asked to make a judgment about a particular painting. Specifically, you will be asked to decide whether you like the painting or not.

Press 'see painting' when ready.

See Painting



Appendix I. Study 3 rebel group information.

00:00	
<ul style="list-style-type: none">• The group, which has Islamist-Ottoman roots, was formed in the late 1980s and launched an armed struggle against the Tonrovia government in 1984, calling for an independent Galag state.• Since the beginning of the conflict, more than 37,000 people have died. During the conflict, which reached a peak in the mid-1990s, thousands of villages were destroyed in the largely Galag part of Tonrovia with thousands of ethnic Galags fleeing to cities in other parts of the country.• As a result, the Galag Rebels claiming to represent the interest of the Galag, have escalated their violent campaign against what they call 'foreign intervention'. In a recent attack, 13 Tonrovia soldiers and 5 accompanying state officials were killed in an apparent ambush.• Although the Tonrovia government has recently made several negotiation attempts, the United Nations says that the government needs to do a lot more to improve the rights of the country's Galag minority.• The Tonrovia government argues that the Galag rebels are terrorists as they have started targeting politicians in the Tonrovia state. The Galag rebels argue that the targeted politicians have condoned the razing of Galag villages, making them legitimate targets for assassination.	
Are the Galag rebels committing acts of terrorism?	
Please press 'next', ONLY after you have made your decision	NEXT →

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