Conscious awareness of self-relevant information is necessary for an incidental self-memory advantage

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Abstract

Co-presenting an item with self-relevant *vs*. other-relevant information under a non-self-referential encoding context can produce a memory advantage. The present study examined the relative contributions of conscious *vs*. unconscious processing of self-cues to this incidental self-memory advantage. During encoding, the participant's own or another person's name was presented supraliminally or subliminally prior to the presentation of each target word. Consistent across two experiments, we found better memory for words preceded by the own name *vs*. another name but only when the names were presented supraliminally. The masked priming effect produced by the own name in Experiment 2 suggests that the absence of a self-memory advantage following subliminal name presentation was unlikely due to subliminal self-processing being too weak. Our findings suggest that conscious awareness of self-cues is necessary for an incidental self-memory advantage. Potential qualitative differences between conscious *vs*. unconscious self-processing mediating the impact of self on memory are discussed.

Conscious awareness of self-relevant information is necessary for an incidental self-memory advantage

1. Introduction

A sense of 'self' constitutes a central feature of human experience that provides stability and continuity to subjective experiences across time and space (Neisser, 1988). The pivotal role of self in human everyday functioning is evidenced by the many empirical efforts to chart its influence on cognition and behavior. In particular, since the demonstration of a memory advantage produced by relating new information to the self at encoding (self-reference effect [SRE], Rogers, Kuiper, & Kirker, 1977), understanding the role of self in memory has been one of the major focuses. Typically, the SRE has been observed in self-referencing paradigms in which people are explicitly asked to process stimuli in relation to themselves. For instance, the most widely used trait-evaluation task requires people to judge whether personality-trait words are descriptive of themselves or another person at encoding, and words judged in relation to the self are later better remembered than those judged in relation to someone else (e.g., Conway & Dewhurst, 1995; Ferguson, Brendan, & Carlson, 1983; Kuiper & Rogers, 1979). The SRE has been attributed to enhanced elaboration and organization of incoming information afforded by the use of well-established, highly organized self-concept/knowledge at encoding (Conway & Dewhurst, 1995; Keenan & Baillett, 1979; Klein & Loftus, 1988).

Notably, subsequent studies moved beyond explicit self-referencing paradigms to examine the impact of self on memory in more naturalistic, everyday contexts in which the self creates associations with external stimuli in the absence of explicit self-reflection or evaluative appraisal of the stimuli's self-relevancy (Cunningham, Turk, MacDonald, & Macrae, 2008; Turk, Cunningham, & Macrae, 2008; Van den Bos, Cunningham, Conway, & Turk, 2010). Of most importance for the present study, Turk et al. (2008) showed that simply co-presenting a target stimulus with a self-relevant cue under a non-evaluative, relational encoding context can produce a SRE. In their study, participants were presented with a self-relevant (one's own name or face) or an other-relevant (name or face of another person) cue simultaneously with a personality-trait word, and their task was to judge the location of each word in relation to the cue (i.e., above or below the cue). A subsequent memory test revealed better recognition of words that were presented with the self-relevant cue compared to those that were presented with the other-relevant cue. Turk et al.'s finding suggests that the explicit self-reflection or evaluative appraisal of self-relevance is not necessary for the SRE but rather a mere incidental association between the self and a stimulus at encoding is sufficient to elicit the SRE. Recent studies replicated this non-evaluative, "incidental" SRE not only for target items themselves (i.e., item memory) but also for contextual features associated with the items (i.e., source memory, Johnson, Hashtroudi, & Lindsay, 1993) (Cunningham, Brebner, Quinn, & Turk, 2014; Kim, Johnson, Rothschild, & Johnson, 2018). The incidental SRE is suggested to be underpinned by automatic attentional responses to self-relevant information (i.e., "attention-capturing" capacity of self-cues; e.g., Bargh, 1982; Gray, Ambady, Lowenthal, & Deldin, 2004; Moray, 1959) that promote enhanced encoding of stimuli co-occurring with the self-relevant cues in the environment (Cunningham et al., 2014; Turk et al., 2008; Turk et al., 2011; see Turk et al., 2013, for the role of attention during encoding in the emergence of the SRE; see Gronau, Cohen, & Ben-Shakhar, 2003; Kawahara & Yamada, 2004; Kim et al., 2018, for the role of task context in determining the likelihood of a self-advantage in attention and memory). Indeed, as suggested elsewhere, one of the major functions of the self-system may be to ensure that information of potential relevance to the self is preferentially attended and retained (Cunningham, Brady-Van den Bos, Gill, & Turk, 2013; Turk et al., 2008).

A recent revival of research interests in self-related biases in cognition has witnessed several demonstrations of the “prioritized” processing of self-relevant information in unconscious stages of information processing hierarchy (for self-face: Geng, Zhang, Li, Tao, & Xu, 2012; Pannese & Hirch, 2010, 2011; for self-name: Alexopoulos, Muller, Ric, & Marendaz, 2012; Maoz, Breska, & Ben-Shakhar, 2012; Pfister, Pohl, Kiesel, & Kunde, 2012; Tacikowski, Berger, & Ehrsson, 2017; for self-associated geometric shapes: Macrae, Visokomogilski, Golubickis, Cunningham, & Sahraie, 2017; Sui & Humphreys, 2017; but see Noel, Blanke, Serino, & Salomon, 2017; Stein, Siebold, & Van Zoest, 2016; Tacikowski & Ehrsson, 2016). For instance, when rendered invisible within a continuous flash suppression paradigm, self-relevant stimuli such as one’s own face or self-associated geometric shapes were associated with reduced suppression times (i.e., faster breaking into awareness) compared to other-relevant stimuli (Geng et al., 2012; Macrae et al., 2017). When presented briefly below conscious awareness, one’s own name but not other names facilitated the detection of a target stimulus subsequently appearing in the same location (i.e., the cueing effect), suggesting that attention was preferentially attracted by subliminal self-relevant cues (Alexopoulos et al., 2012). In addition, subliminal presentation of one’s own name was found to elicit stronger skin conductance responses (SCRs), a measure of autonomic arousal often assumed to index attentional orienting (Öhman, 1979), compared to other non-self-relevant names (Maoz et al., 2012).

The presence of the “self-prioritization effect” at both the conscious and unconscious stages of information processing raises an important question of how conscious and unconscious factors contribute to the incidental SRE. So far, the incidental SRE has only been demonstrated under conditions in which the participants were fully aware of the presence of the self-relevant information (Cunningham et al., 2014; Kim et al., 2018; Turk et al, 2008). Thus, it remains unknown if and the extent to which unconsciously processed self-relevant information influences subsequent memory for target items presented in close spatiotemporal proximity. Is conscious awareness of the self-relevant cues in the external environment necessary for the self-system to give rise to a self-memory advantage? Or, is unconscious processing of the self-relevant cues sufficient to elicit a self-memory advantage? Addressing these questions is important because it can (a) help elucidate the relative contributions of early, awareness-independent self-processing *vs*. relatively late, awareness-dependent self-processing to the incidental SRE and (b) potentially suggest a boundary condition for the impact of self on memory.

Following the design of Turk et al. (2008), in two experiments, we presented self-relevant (one's own name) or other-relevant (another person's name) information that was immediately followed by a target word to which the participants made a location judgment. Critically, the names were presented supraliminally (i.e., with no mask) or subliminally (i.e., with forward and backward masks). A subsequent surprise memory test assessed participants' recognition memory for the target words. In the supraliminal, unmasked name condition, we expected to observe a SRE, replicating previous findings (Cunningham et al., 2013; Kim et al., 2018; Turk et al, 2008). In the subliminal, masked name condition, we predicted two different patterns of results: (a) if awareness-dependent processing of self-relevant information mainly contributes to the incidental SRE, then the magnitude of the SRE would be attenuated or even eliminated compared to that observed in the supraliminal name condition, producing an interaction between "name identity" (self-name *vs*. other-name) and "masking" (unmasked *vs*. masked) factors. Alternatively, (b) if awareness-independent processing of self-relevant information mainly contributes to the incidental SRE, then the magnitude of the SRE would be equivalent to that observed in the supraliminal name condition, producing a main effect of "name identity" in the absence of a "name identity" x "masking" interaction (see Tacikowski & Ehrsson, 2016 for similar logic).

2. Experiment I

2.1. Materials and Methods

2.1.1. Participants and Design

Seventy undergraduate students (47 females; mean age = 19.10 [± 1.11]) participated in this study.[1] All participants were native English speakers with normal or corrected-to-normal vision and normal color perception. Participants provided informed consent and were compensated with course credit or payment in accordance with the human subject regulations of Wesleyan University. Two additional participants were excluded from analysis due to poor performance on the encoding task (below 50% accuracy, $N = 1$) and an incomplete collection of data due to computer malfunction ($N = 1$).

The experiment had a 2 (Name Identity: Self-name or Other-name) x 2 (Masking: Unmasked or Masked) mixed factorial design, with Name Identity as a within-subjects factor. The participants were randomly assigned to masking conditions ($N = 35$ each).

2.1.2. Stimuli

A total of 120 personality-trait words taken from Anderson (1968) were divided into 3 lists of 40 words each that were matched for word length, syllable length, likeability and meaningfulness. Two lists served as critical "old" items that were presented in the encoding phase. The assignment of critical lists to the Self-name or Other-name condition was counterbalanced across participants. A random half of the critical words in each Name Identity condition were presented at the top of the screen, and the other half were presented at the bottom of the screen. The remaining list served as "new" items in the subsequent memory test.

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[1] For both Experiments 1 and 2, the sample size was predetermined based on a small-to-medium effect size (Macrae et al., 2017; Pfister et al., 2012) using G*Power 3 (f = .17, a = .05, power = 0.8) and counterbalancing constraints.

The name stimuli consisted of each participant's own full name and the name of a gender-congruent familiar celebrity (i.e., Angelina Jolie or Hugh Jackman).

2.1.3. Procedure

2.1.3.1. Encoding phase

Figure 1A depicts the schematic view of a trial sequence for the Unmasked and Masked conditions. For both conditions, each trial began with a 500-ms fixation cross that was followed by a name presented in the center of the screen in black upper-case letters (48-point Palatino font) and then a target word presented for 2 s either at the top or bottom of the screen in red lower-case letters (48-point Arial font). In the Unmasked condition, the name was presented for 400 ms, immediately preceded by a 100-ms blank interstimulus interval (ISI). In the Masked condition, the name was presented for 33 ms, immediately preceded by a 100-ms forward mask and immediately followed by a 367-ms backward mask. The forward and backward masks were different from each other and each consisted of a random string of 18 upper-case letters (48-point

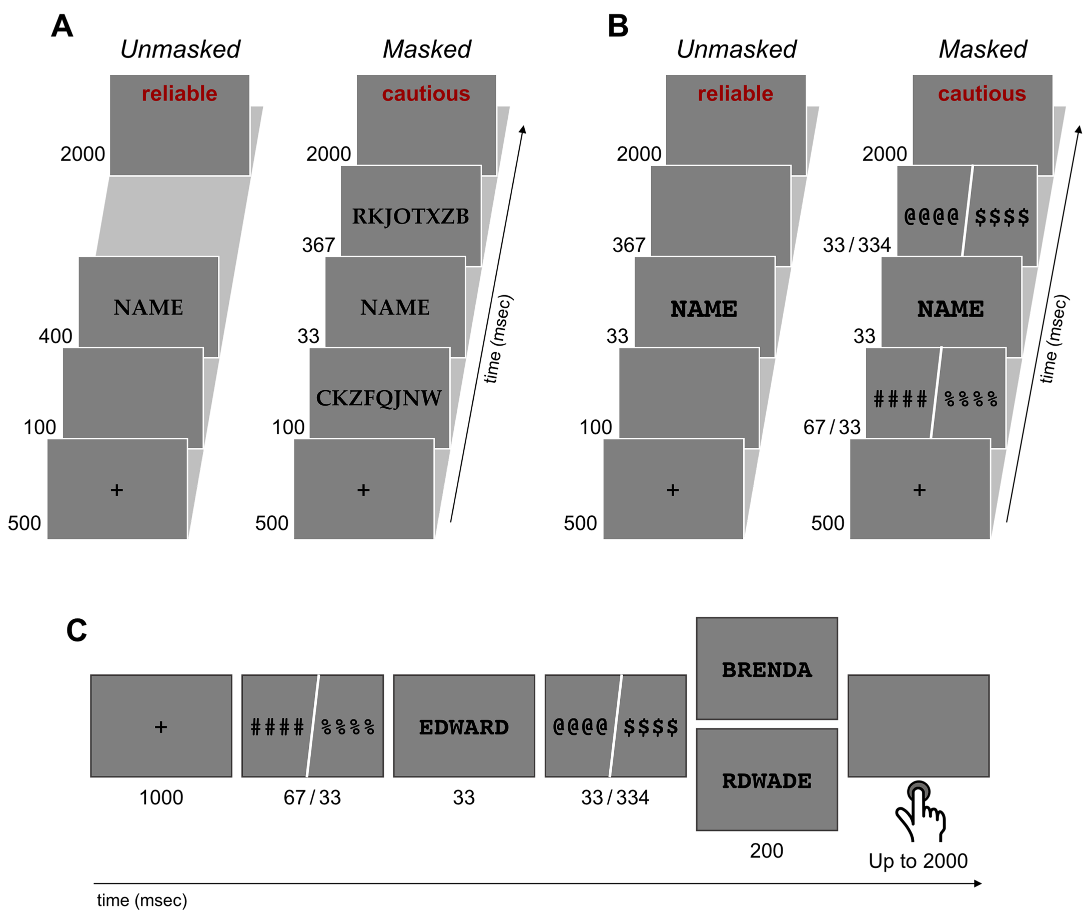

Figure 1. Schematic view of a trial sequence. (A) Encoding phase of Experiment 1. (B) Encoding phase of Experiment 2. (C) Masked priming phase of Experiment 2. Numbers represent presentation durations in milliseconds (ms).

Palatino font). In both the Unmasked and Masked conditions, participants performed a location judgment task in which they indicated whether each word appeared above or below the immediately preceding name (in the Unmasked condition) or letter strings (in the Masked condition) by a button press. The 40 Self-name and 40 Other-name trials were randomly intermixed in both conditions.

2.1.3.2. Memory test

Immediately following the encoding phase, participants took a surprise memory test. The 80 old words from the encoding phase along with 40 new words were presented individually in a random order in black lower-case letters (48-point Arial font). For each word, participants were asked to indicate whether or not they had seen the word in the preceding phase (old/new recognition) within 4 s.

2.1.3.3. Name visibility test

Following the memory test, the participants in the Masked condition were informed about the presence of their own or someone else's name in between the random letter strings. Then, the participants underwent a forced-choice visibility test designed to assess their ability to consciously identify the names. The visibility test was exactly the same as the encoding phase except that the participants were asked to decide, for each trial, whether the name was their own or someone else's while ignoring the target word. Participants responded by pressing one of two keys assigned to the "my name" and "not my name" responses, respectively. They were encouraged to guess if unsure.

After the experiment, participants completed a post-experimental questionnaire that assessed their awareness of the experimental hypothesis and whether they anticipated a memory test. None of the participants correctly guessed the experimental hypothesis or gave the ratings of 5 or higher on the memory anticipation scale from 1 ("not at all") to 7 ("very much").

2.1.4. Statistical Analyses

Relying on null hypothesis (H_0) significance testing, the classical frequentist statistics provide a measure of confidence in rejecting the H_0, but not a measure of confidence in H_0 itself. With frequentist statistics, therefore, nonsignificant findings (i.e., null results) are inherently ambiguous as they could reflect either (a) limitations in statistical power when a true difference actually exists (i.e., Type II error) or (b) equivalent performance across conditions/groups (Barchard, 2005). In order to quantify the confidence in the presence or absence of any effects of interest, in the present study, we adopted a Bayesian approach (Jeffreys, 1961; Rouder, Morey, Verhagen, Swagman, & Wagenmakers, 2017) in addition to the conventional frequentist analyses. The Bayes Factor (BF) expresses an odds ratio of evidence for *vs*. against H_0, providing readily interpretable information about the relative likelihood of the alternative hypothesis (H_1) *vs*. H_0. The BF is written as BF_{10} when the evidence favors H_1 and as BF_{01} (i.e., $1/BF_{10}$) when the evidence favors H_0. To interpret the strength of evidence of a BF, we used the following rule-of-thumb classification scheme as a point of reference (Jeffreys, 1961; Kass & Raftery, 1995): No evidence when BF = 1, "weak" evidence when $1 < BF \leq 3$, "substantial" evidence when $3 < BF \leq 10$, "strong" evidence when $10 < BF \leq 30$, "very strong" evidence when $30 < BF \leq 100$, and "decisive" evidence when BF > 100.

We used JASP statistical software (JASP Team, 2018, version 0.8.6) to compute the BFs for all statistical analyses with Cauchy priors set at default (for t-tests: $r = 0.707$; for analysis of variance [ANOVA]: $r = 0.5$, 1, and 0.354 for fixed effects, random effects, and covariates, respectively; Rouder et al., 2017; Rouder, Speckman, Sun, Morey, & Iverson, 2009; Wagenmakers et al., 2018). For a Bayesian ANOVA, we manually set the number of samples to 500,000 to reduce the Monte Carlo sampling error. For the Bayesian ANOVA results, we first report the preferred model (i.e., the model with the highest posterior model probability *vs*. the intercept-only null model) to emerge from the analysis. We then report the $BF_{Inclusion}$ value for each factor in the model (i.e., a main effect or an interaction effect), which indicates the likelihood of the data under models that included a given factor compared to matched models stripped of the factor (i.e., Bayesian model averaging).

2.2. Results

2.2.1. Masked Name Visibility

The performance on the name visibility test was analyzed in terms of sensitivity index, d-prime (d') (Wickens, 2002). This index was calculated by subtracting z-score-transformed false-alarm rates (the proportion of trials in which one's own name was misidentified as someone else's name or vice versa) from z-score-transformed hit rates (the proportion of trials in which one's own and someone else's names were correctly identified). One-sample t-test revealed that d' ($M = .086$, $SD = .474$) was not significantly different from zero (i.e., chance-level performance), $t(34) = 1.07$, $p > .2$. This nonsignificant difference was corroborated by the result from a Bayesian one-sample t-test that provided substantial evidence for the H_0, $BF_{01} = 3.25$. In addition, the hit rates for the Self-name ($M = .493$, $SD = .115$) did not significantly differ from the hit rates for the Other-name ($M = .539$, $SD = .161$), $t(34) = 1.27$, $p > .2$, $BF_{01} = 2.62$, and neither significantly differed from the chance-level accuracy rate of 0.5, all ts < 1.5, all ps > .1, all BF_{01}s > 2.20. Taken together, these findings indicate that the masks were highly effective in preventing one's own and other names from access to conscious awareness.

2.2.2. Target Word Old/New Recognition

Participants' hit rates and false-alarm rates were calculated by computing the proportion of "old" words correctly recognized as old and the proportion of "new" words incorrectly identified as old, respectively (Table 1). The corrected hit rates were calculated by subtracting the false-alarm rates from the hit rates and were submitted to a 2 (Name Identity: Self-name or Other-name) x 2 (Masking: Unmasked or Masked) mixed-model ANOVA.[2] There was no significant main effect of Masking, $F(1, 68) = 1.21$, $p > .2$, but a significant main effect of Name Identity, $F(1, 68) = 24.15$, $p < .001$, $\eta_p^2 = .26$, with better recognition memory for words preceded by the Self-name ($M = .270$, $SD = .130$) than those preceded by the Other-name ($M = .221$, $SD = .112$). Importantly, this effect was qualified by a significant Name Identity x Masking interaction, $F(1, 68) = 13.12$, $p = .001$, $\eta_p^2 = .16$. As shown in Figure 2, simple effects

[2] For both Experiments 1 and 2, a parallel set of frequentist and Bayesian analyses using d' as the dependent measure produced exactly the same pattern of results.

Table 1. *Mean proportion (standard error) of hits and false-alarms as a function of Name Identity and Masking for target old/new recognition in Experiment 1*

	Unmasked		Masked	
	Self-Name	*Other-Name*	*Self-Name*	*Other-Name*
Hit	.541 (.021)	.456 (.020)	.509 (.028)	.496 (.029)
False-Alarm	.238 (.023)		.271 (.030)	

Note. There were no separate false-alarm rates per each Name Identity condition as there was a single pool of "new" items.

analyses revealed that in the Unmasked condition, the words preceded by the Self-name (M = .303, SD = .136) were better recognized than those preceded by the Other-name (M = .218, SD = .111), $t(34) = 5.39$, $p < .001$, $d = 0.91$, 95% CI of difference = [0.053, 0.117]. In contrast, in the Masked condition, recognition memory for words preceded by the Self-name (M = .237, SD = .118) *vs*. the Other-name (M = .224, SD = .114) did not significantly differ, $t(34) = 1.06$, $p > .2$.

These results were complemented by a 2 (Name Identity) x 2 (Masking) Bayesian mixed-design ANOVA. The overall preferred model, extremely favored over the intercept-only Null model (BF_{10} = 20019.97, ± 0.98%), included main effects of Name Identity and Masking, as well as a Name Identity x Masking interaction. The inclusion of a main effect of Name Identity

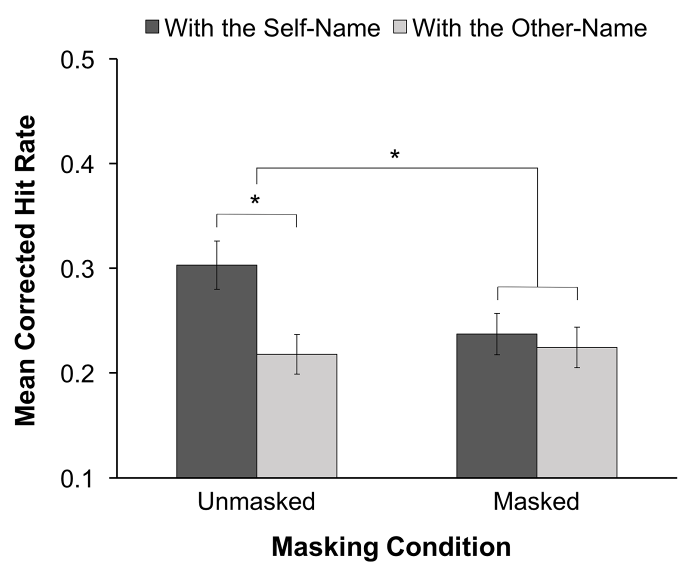

Figure 2. Memory performance in Experiment 1: Recognition memory for target words as a function of Name Identity and Masking. Error bars represent standard error of the mean (SEM). Asterisks indicate statistical significance at $p < .025$.

($BF_{\text{Inclusion}}$ = 736.24) and the interaction between Name Identity and Masking ($BF_{\text{Inclusion}}$ = 47.58) was very strongly favored. The analysis provided weak evidence against the inclusion of a main effect of Masking ($BF_{\text{Inclusion}}$ = 0.59). Bayesian paired-samples t-tests revealed that in the Unmasked condition, decisive evidence was found for better recognition of words preceded by the Self-name *vs*. the Other-name, BF_{10} = 3615.39. In contrast, in the Masked condition, substantial evidence was found that recognition memory for words preceded by the Self-name *vs*. the Other-name did not differ, BF_{01} = 3.29.

In sum, the results of Experiment 1 showed that supraliminal but not subliminal presentation of one's own name produced an incidental SRE, suggesting that conscious rather than unconscious processing of self-relevant cues mainly contributes to an incidental self-memory advantage. However, a number of methodological aspects in Experiment 1 prevent drawing a strong conclusion that unconscious processing of self-relevant cues is insufficient to produce the incidental SRE. First, Experiment 1 did not include a task that would demonstrate the presence of subliminal self-name processing per se. Consequently, the absence of an incidental SRE in the masked name condition could mean that subliminal processing of the self-name was simply too weak or did not occur at all. Although previous studies demonstrated unconscious priming effects with masked prime durations at or shorter than 33 ms (e.g., for letters and words: Dehaene et al., 2001; Van Opstal, Reynvoet, & Verguts, 2005; for self-name: Pfister et al., 2012; Tacikowski et al., 2017), a clear demonstration of the presence of subliminal self-name processing in the present experimental paradigm is necessary to provide solid evidence that unconscious self-processing is insufficient for the incidental SRE to emerge.

Second, the masked and unmasked conditions were not matched in terms of name presentation duration (400 ms *vs*. 33 ms) and the point of "reference" based on which the locations of target words were judged during the encoding phase (above or below the 'name' *vs*. 'letter strings'). These differences may have at least partly contributed to the observed different patterns of memory performance between the conditions by allowing more elaborate processing of, and/or greater top-down attention to the self-relevant/other-relevant cues in the unmasked condition compared to the masked condition.[3] Consequently, the results of Experiment 1 alone cannot provide strong support that conscious awareness of the self-relevant/other-relevant cues per se is critical for the emergence of the incidental SRE.

These issues were addressed in Experiment 2 by (a) incorporating a masked priming task to test for the presence/absence of subliminal self-name processing and (b) matching all methodological aspects between the masked and unmasked conditions except for the presence/ absence of visual masks. Additionally, in Experiment 2, we adopted a within-subjects design to compare memory performance across different conditions within the same individuals.

3. Experiment II

3.1.Materials and Methods

[3] We thank the reviewer for pointing out this possibility.

3.1.1. Participants and Design

Fifty-two undergraduate students (31 females; mean age = 20.44 [± 1.24]) participated in this study. All participants were native English speakers with normal or corrected-to-normal vision and normal color perception. Participants provided informed consent and were compensated with payment in accordance with the human subject regulations of Wesleyan University. Five additional participants who anticipated the subsequent surprise memory test were excluded from analysis.

The experiment had a 2 (Name Identity: Self-name or Other-name) x 2 (Masking: Unmasked or Masked) factorial design, with both Name Identity and Masking as within-subjects factors.

3.1.2. Stimuli

A total of 136 personality-trait words taken from Anderson (1968) were divided into 5 lists (4 lists of 24 words each and 1 list of 40 words) that were matched for word length, syllable length, likeability and meaningfulness. The four 24-word lists served as critical old items that were presented in the encoding phase. The assignment of critical lists to 2 x 2 combinations of Name Identity and Masking conditions was counterbalanced across participants. A random half of the critical words in each of the Name Identity x Masking combinations were presented at the top of the screen, and the other half were presented at the bottom of the screen. The remaining 40-word list served as new items in the subsequent memory test.

The Self-name and Other-name stimuli consisted of each participant's own first name and a gender-congruent first name of a personally unknown "other" (i.e., the participant indicated that he/she did not know anyone with the same name prior to the beginning of the experiment) that were matched for length (i.e., number of letters).

For the masked priming task (see *3.1.3.3. Masked priming task* below), 4 first names ("BRENDA", "EDWARD", "LUCY", "PAUL") and 4 non-words ("RNDAEB", "RDWADE", "YUCL", "AUPL") served as target stimuli. Masked primes consisted of the Self-name, the Other-name, two additional non-words ("ECVOSL", "IEBR"), and the target stimuli themselves.

3.1.3. Procedure

3.1.3.1. Encoding phase

Figure 1B depicts the schematic view of a trial sequence for the Unmasked and Masked trials. For both trial types, each trial began with a 500-ms fixation cross that was followed by a name presented for 33 ms in the center of the screen in black upper-case letters (48-point Courier font) and then a target word presented for 2 s either at the top or bottom of the screen in red lower-case letters (48-point Arial font). In the Unmasked trials, the name was immediately preceded by a 100-ms blank ISI and immediately followed by a 367-ms blank ISI. In the Masked trials, the name was immediately preceded and immediately followed by 100-ms forward and 367-ms backward masks, respectively. The forward mask consisted of a rapid succession of 67-ms of hash (#) signs and 33-ms of percent (%) signs, and the backward mask consisted of a rapid succession of 33-ms of 'at' (@) signs and 334-ms of dollar ($) signs (all in 48-point Courier font). The number of signs in each array of the masks were matched for the number of letters in the name (e.g., 4 hash signs for 4-letter names). For each trial, participants were asked to indicate, by a button press, whether each word appeared above or below the center of the screen regardless of the identity of the immediately preceding stimulus. There were a total of 96 trials (i.e., 24 trials for each of the Name Identity x Masking combinations) that were presented in a random order.

3.1.3.2. Memory test

The procedure for the memory test was the same as in Experiment 1, except that there were 96 old words and 40 new words.

3.1.3.3. Masked priming task

We used a modified version of Pfister et al.'s (2012) name *vs*. non-word masked priming task. As depicted in Figure 1C, each trial began with a 1-s fixation cross, followed by a 33-ms prime, followed by a 200-ms target. Both primes and targets appeared in the center of the screen in black capital letters (48-point Courier font). The target was preceded by a prime that was either among the potential targets (i.e., 4 first names and 4 non-words; target primes), one of two additional non-words (i.e., novel non-word primes), or, crucially, the Self-name or the Other-name (i.e., novel name primes). The prime was immediately preceded and immediately followed by forward and backward masks, respectively. These masks were exactly the same as those used during the encoding phase (i.e., rapid succession of different signs) except that each array of signs had a minimum of 6 signs in order to cover the 6-letter target primes. For each trial, participants were asked to decide as fast and as accurately as possible whether the target was a name or a non-word while ignoring the prime. Participants had up to 2 s to respond by pressing one of two keys assigned to the "name" and "non-word" responses, respectively. The key assignment was counterbalanced across participants. Participants completed 2 blocks of 128 trials each ([8 targets x 8 target primes] + [8 targets x 4 novel primes x 2]). In each block, the trials were randomly intermixed. Before the actual task, participants had a chance to practice the task to ensure that they understood the instructions.

3.1.3.4. Name visibility tests

Following the masked priming task, participants performed two forced-choice visibility tests. The first test was regarding the masked priming phase and the participants had to decide, for each trial, whether the prime was their own or someone else's name while ignoring the target. This visibility test was exactly the same as the masked priming phase except that it only included the self-name prime and other-name prime trials (32 trials each for a total of 64 trials). The second test was regarding the encoding phase. This visibility test was exactly the same as the encoding phase except that the participants had to decide, for each trial, whether the name was their own or someone else's while ignoring the target word. In both tests, participants responded by pressing one of two keys assigned to the "my name" and "not my name" responses, respectively.

After the experiment, participants completed a post-experimental questionnaire. None of the participants correctly guessed the experimental hypothesis. Data from 5 participants who gave a rating of 5 or higher on the memory anticipation scale from 1 ("not at all") to 7 ("very much") were excluded from analysis.

3.2. Results

3.2.1. Masked Name Visibility

As in Experiment 1, the performance on the name visibility tests was analyzed using *d'* (z-score transformed hit rates – z-score-transformed false-alarm rates). For name visibility for the masked priming phase, one-sample t-test revealed that *d'* (M = 0.065, SD = .458) was not significantly different from chance level, $t(51) = 1.03$, $p > .3$, $BF_{01} = 4.01$. In addition, the hit rates for the Self-name (M = .501, SD = .222) and those for the Other-name (M = .528, SD = .196) did not significantly differ, $t(51) < 1$, $p > .6$, $BF_{01} = 5.84$, and neither significantly differed from chance level, all ts < 1.02, all ps > .3, all BF_{01}s > 4.06.

For name visibility for the encoding phase, as can be expected, one-sample t-test revealed that *d'* for unmasked names (M = 3.96, SD = .580) was significantly above chance level, $t(51) = 49.25$, $p < .001$, $d = 6.83$, 95% CI of difference = [3.797, 4.120], $BF_{10} = 1.17 \times 10^{41}$. The hit rates for the unmasked Self-name (M = .979, SD = .035) and the unmasked Other name (M = .970, SD = .044) did not significantly differ, $t(51) = 1.14$, $p > .2$, $BF_{01} = 3.61$, and both were significantly above chance level, all ts > 77.3, all ps < .001, all BF_{10}s > 5.62×10^{50}. In contrast, *d'* for masked names (M = .076, SD = .413) was not significantly different from chance level, $t(51) = 1.33$, $p > .1$, $BF_{01} = 2.90$. The hit rates for the masked Self-name (M = .496, SD = .168) and the masked Other-name (M = .534, SD = .139) did not significantly differ, $t(51) < 1.04$, $p > .3$, $BF_{01} = 4.00$, and neither significantly differed from chance level, all ts < 1.75, all ps > .086, all BF_{01}s > 1.61.

Taken together, these results indicate that the masks were highly effective in hindering conscious awareness of one's own and other names during both the masked priming and encoding phases.

3.2.2. Masked Priming

Accuracy rates for all trial types were very high (mean accuracy rates between 95.04% and 96.81%), suggesting that participants had no problem complying with the task instructions. Error trials (4.21%) and correct trials with response times (RTs) deviating more than 2.5 *SD*s from the mean of a given design cell (calculated separately for each participant; < 2.89% for all analyses) were excluded from analyses. Following Pfister et al. (2012), the analyses were done in two steps: First, we analyzed the entire RT dataset to validate the employed priming paradigm. Then, we compared the magnitudes of priming effects produced by the Self-name, Other-name, and Target-name (i.e., the names that served as visible targets; e.g., BRENDA) primes for Name targets.

A 2 (Prime Type: Name or Non-word) x 2 (Target Type: Name or Non-word) repeated-measures ANOVA performed on the entire RT dataset revealed no significant main effect of Prime Type, $F(1, 51) < 1$, $p > .6$, but a significant main effect of Target Type, $F(1, 51) = 31.92$, $p < .001$, $\eta_p^2 = .39$, with shorter RTs for Name targets (M = 343.76, SD = 64.55) than for Non-word targets (M = 361.00, SD = 62.00). Critically, there was also a significant Prime Type x Target Type interaction, $F(1, 51) = 52.17$, $p < .001$, $\eta_p^2 = .51$. As shown in Figure 3A, simple effects analyses revealed that for Name targets, RTs were shorter following Name primes (M =

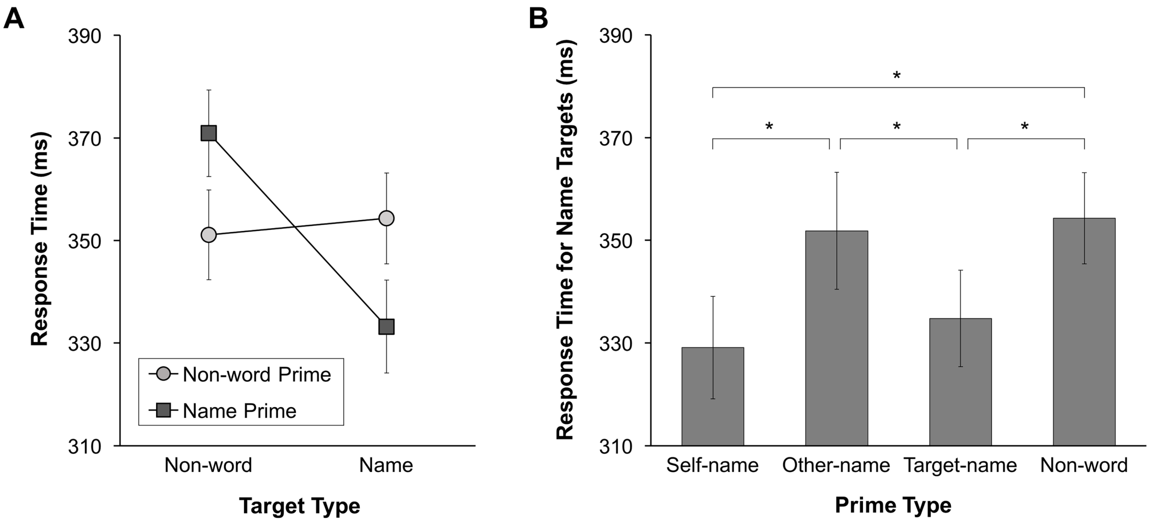

Figure 3. Masked priming performance in Experiment 2: (A) Response time as a function of Prime Type and Target Type. (B) Response time for Name targets as a function of different primes types. Error bars represent SEM. Asterisks indicate statistical significance at FDR-corrected $p < .05$.

333.22, $SD = 65.21$) than following Non-word primes ($M = 354.31$, $SD = 63.88$), $t(51) = 6.73$, $p < .001$, $d = 0.93$, 95% CI of difference = [14.799, 27.374], $BF_{10} = 8.87 \times 10^5$. In comparison, for Non-word targets, RTs were shorter following Non-word primes ($M = 351.09$, $SD = 63.18$) than following Name primes ($M = 370.91$, $SD = 60.83$), $t(51) = 6.15$, $p < .001$, $d = 0.85$, 95% CI of difference = [13.353, 26.284], $BF_{10} = 1.21 \times 10^5$.

Based on these priming effects, we further analyzed the differential contributions of the Self-name, Other-name, and Target-name primes to the congruency effect for Name targets. Multiple comparisons were corrected using the false discovery rate (FDR) approach (Benjamini & Hochberg, 1995) with the critical value for FDR set at 0.05. As shown in Figure 3B, the Self-name prime ($M = 329.11$, $SD = 72.05$) as well as the Target-name prime ($M = 334.78$, $SD = 67.64$) facilitated responding to Name targets compared to Non-word primes ($M = 354.31$, $SD = 63.88$) (Self-name prime: $t(51) = 4.39$, $p < .001$, FDR-adjusted $p < .001$, $d = 0.61$, 95% CI of difference [13.666, 36.724], $BF_{10} = 375.55$; Target-name prime: $t(51) = 4.65$, $p < .001$, FDR-adjusted $p < .001$, $d = 0.64$, 95% CI of difference [11.092, 27.955], $BF_{10} = 844.70$). In addition, the RTs for Name targets following the Self-name prime *vs*. Target-name primes did not significantly differ, $t(51) < 1$, $p > .3$, FDR-adjusted $p > .4$, $BF_{01} = 4.36$.

In comparison, the RTs for Name targets following the Other-name prime ($M = 351.83$, $SD = 82.05$) were significantly longer than those following the Self-name prime or the Target-name prime (*vs*. Self-name prime: $t(51) = 2.70$, $p = .010$, FDR-adjusted $p = .018$, $d = 0.37$, 95% CI of difference [5.696, 39.741], $BF_{10} = 3.73$; *vs*. Target-name prime: $t(51) = 2.20$, $p = .032$, FDR-adjusted $p = .049$, 95% CI of difference [1.484, 32.609], $BF_{10} = 1.37$). In addition, the RTs for Name targets following the Other-name prime *vs*. Non-word primes did not significantly differ, $t < 1$, $p > .7$, FDR-adjusted $p > .7$, $BF_{01} = 6.17$.

Replicating the findings of Pfister et al. (2012), and in line with previous findings of preferential processing of self-relevant information at unconscious stages of information processing hierarchy (e.g., Alexopoulos et al., 2012; Maoz et al., 2012; Tacikowski et al., 2017), these results provide evidence for subliminal processing of one's own name.

3.2.3. Target Word Old/New Recognition

Table 2 shows hit rates and false-alarm rates. A 2 (Name Identity) x 2 (Masking) repeated-measures ANOVA performed on the corrected hit rates (hit rates minus false-alarm rates) revealed neither a significant main effect of Masking, $F(1, 51) = 2.84$, $p > .09$, nor a significant main effect of Name Identity, $F(1, 51) = 3.19$, $p > .08$. Importantly, there was a significant Name Identity x Masking interaction, $F(1, 51) = 14.37$, $p < .001$, $\eta_p^2 = .22$. As shown in Figure 4, simple effects analyses revealed that for unmasked trials the words preceded by the Self-name ($M = .319$, $SD = .150$) were better recognized than those preceded by the Other-name ($M = .271$, $SD = .149$), $t(51) = 3.86$, $p < .001$, $d = 0.53$, 95% CI of difference = [0.023, 0.074]. In contrast, for masked trials, recognition memory for words preceded by the Self-name ($M = .264$, $SD = .145$) *vs*. Other-name ($M = .279$, $SD = .140$) did not significantly differ, $t(51) = 1.20$, $p > .2$. These results were corroborated by a 2 (Name Identity) x 2 (Masking) Bayesian repeated-measures ANOVA. The overall preferred model, substantially favored over the intercept-only Null model ($BF_{10} = 4.94$, ± 0.55%), included main effects of Name Identity and Masking, as well as a Name Identity x Masking interaction. The analysis provided very weak evidence for the inclusion of a main effect of Masking ($BF_{\text{Inclusion}} = 1.14$) and a weak evidence against the inclusion of a main effect of Name Identity ($BF_{\text{Inclusion}} = 0.43$). Yet, the inclusion of the interaction between Name Identity and Masking ($BF_{\text{Inclusion}} = 10.04$) was strongly favored. Bayesian paired-samples t-tests revealed that when the names are unmasked, strong evidence was found for the better recognition of words preceded by the Self-name *vs*. Other-name, $BF_{10} = 77.58$. In contrast, when the names were masked, substantial evidence was found that recognition memory for words preceded by the Self-name *vs*. Other-name did not differ, $BF_{01} = 3.35$.

Table 2. *Mean proportion (standard error) of hits and false-alarms as a function of Name Identity and Masking for target old/new recognition in Experiment 2*

	Unmasked		Masked	
	Self-Name	*Other-Name*	*Self-Name*	*Other-Name*
Hit	.581 (.026)	.532 (.026)	.526 (.026)	.541 (.025)
False-Alarm	.262 (.020)			

Note. There were no separate false-alarm rates per each of the Name Identity x Masking combinations as there was a single pool of "new" items.

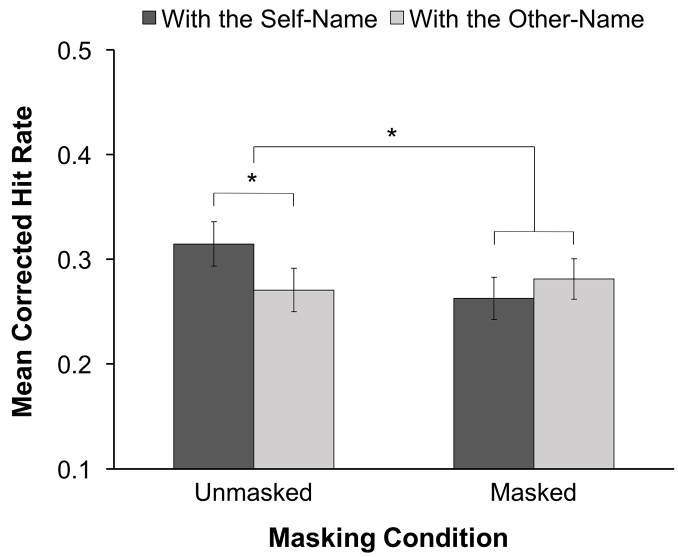

Figure 4. Memory performance in Experiment 2: Recognition memory for target words as a function of Name Identity and Masking. Error bars represent SEM. Asterisks indicate statistical significance at $p < .025$.

4. Discussion

The present study aimed to examine the relative contributions of conscious *vs*. unconscious processing of self-relevant information to the incidental SRE. The participants were presented with their own or someone else's name supraliminally or subliminally immediately prior to the presentation of the to-be-processed target words. In both Experiments 1 and 2, when the names were presented above conscious awareness, we found a clear memory advantage for the target words preceded by one's own name compared to those preceded by another person's name, replicating previous findings of an incidental SRE (Cunningham et al., 2014; Kim et al., 2018; Turk et al., 2008). Critically, when the names were presented below conscious awareness, we found no significant memory differences between the target words preceded by one's own name *vs*. another person's name, with substantial statistical evidence for the H_0 (i.e., no SRE). The finding of the priming effect produced by one's own name in the masked priming task in Experiment 2 provided evidence against the possibility that the absence of an incidental SRE in the subliminal, masked name condition is due to subliminal self-name processing being too weak or nonexistent.

The failure to find a SRE in the masked name condition indicates that processing of self-relevant cues below conscious awareness is not sufficient for an incidental self-memory advantage to emerge. Instead, the presence of self-memory advantage appears to critically depend on conscious awareness of self-relevant cues in the environment. The fact that conscious *vs*. unconscious processing of self-relevant information differentially affected the mnemonic fate of the target stimuli presented in close spatiotemporal proximity to the self-relevant information suggests that conscious and unconscious self-processing modes may be qualitatively different and associated with different downstream consequences on memory and cognition.

One possibility is that although self-relevant information can be processed preattentively (Sui & Humphreys, 2017) and attention itself can be attracted unconsciously by subliminal self-relevant cues (e.g., Alexopoulos et al., 2012), preferential attention drawn to a subliminal self-relevant cue itself might be short-lived and fail to “spill over” to a spatiotemporally adjacent stimulus at least not in as much as to enhance the encoding of the stimulus. Indeed, typical masked priming studies have shown that the influence of unconscious stimuli disappears quickly within approximately half a second (Greenwald, Draine, & Abrams, 1996; Mattler, 2005; but see Sweeny, Grabowecky, Suzuki, & Paller, 2009). According to recent theories of visual awareness (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006; Lamme, 2006; Lamme & Roelfsema, 2000), unconscious processing occurs early during an initial fast feed-forward phase of stimulus processing whereas conscious processing occurs later during recurrent processing in which stimulus information is shared across lower- and higher-level brain regions via feedback connections. The present findings suggest that an incidental SRE does not originate during the early feed-forward phase of processing. Instead, recurrent processing involving coordinated activity among lower-level sensory regions and higher-level fronto-parietal regions appears to be required for self-relevant cues to guide subsequent deployment of attention to spatiotemporally adjacent stimuli. Further support for the qualitative differences between conscious and unconscious self-processing comes from a recent neuroimaging finding (Tacikowski et al., 2017) showing that neural correlates of unconscious self-processing (i.e., activities in posterior sensory cortices) are neuroanatomically distinct from those associated with conscious self-processing (i.e., activities in the hippocampus and medial frontopolar-retrosplenial areas). In particular, given the acknowledged role of the hippocampus in the encoding of episodic memory (Eichenbaum, Yonelinas, & Ranganath, 2007; Squire, 1992), the finding that the hippocampus was selectively engaged during conscious self-processing well coincides with the present findings of a SRE only in the unmasked name condition.

Drawing a clear line between the processes that are automatic and those that are not is by no means a simple task (e.g., Bargh, 1992; Logan, 1985; for review, see Moors & De Houwer, 2006). Yet, it is generally assumed that whereas both consciously and unconsciously perceived stimuli can trigger automatic processes (e.g., Hommel, 2000), unconscious perception can ensure that processing occurs “automatically” in the absence of any contribution of awareness-dependent intentional/strategic controlled processes (Jacoby, 1991, Koivisto, 1998). Therefore, another possibility is that an incidental self-memory advantage observed with the supraliminal name presentation is based on strategic/controlled or other forms of awareness-dependent processes rather than *only* on fast, automatic attentional responses to the self-relevant cues. For instance, upon conscious recognition of one’s own and another person’s names, participants might try to learn whether the names predict responses to target words. As a consequence, the participants might process both the meaning of the names and that of a target word in *relation* to each other despite the fact that semantic processing of neither the names nor the target words was relevant to the location judgment task at hand. Given the central position of one's own name in self-concept/identity (Kang, 1972; Watson, 1983) and the nature of target words (personality-trait words) used, the self-name trials then might serve, at least occasionally, as explicit self-referencing trials in which the participants processed target words in relation to themselves. Although previous findings of relatively smaller magnitude of a SRE following a non-evaluative location judgment task compared to an explicit self-referential task (i.e., trait evaluation task) suggest that the incidental SRE is unlikely to be mainly driven by spontaneous explicit self-referential processing (Turk et al., 2008), neither the present study nor previous studies (Cunningham et al., 2014; Kim et al., 2018; Turk et al., 2008) can conclusively exclude the possibility that awareness-dependent, strategic relational semantic processing may contribute to the incidental SRE. Future studies may enhance our understanding of the impact of self on memory in everyday contexts by elucidating the specific encoding processes (e.g., increased chance of activating related semantic information, longer perceptual fixation on the item, etc.) that confer a memorial advantage for information presented with self-relevant compared to other-relevant cues in the environment.

It is worth noting that past research has shown that unconscious processing can be influenced by top-down task-sets (e.g., Eckstein & Perrig, 2007; Martens, Ansorge, & Kiefer, 2011; Nakamura, Dehaene, Jobert, Le Bihan, & Kouider, 2007) in that participants can flexibly change their analysis of the subliminal primes in accordance with changing target categorization requirements and task instructions. For example, the nature of the task (i.e., to categorize the target words as positive or negative *vs*. as animate or inanimate) determines the presence or absence of the priming effects from the same subliminal prime words (Eckstein & Perrig, 2007), and the top-down instructed task-set changes the neural processing route taken by the subliminal prime words (Nakamura et al., 2007). In the present study, the encoding task required participants to specifically attend to the location of each target word, which did not bear any relevance to the personal/affective significance of the self that is assumed to underlie the self-prioritization effect (Bargh, 1982; Gray et al., 2004). Would different kinds of encoding tasks that directly tap the unique personal/affective quality of self-relevant information (e.g., a valence judgment task) enhance unconscious self-processing, thereby producing an incidental SRE? This interesting possibility awaits future investigation.

Finally, it needs to be mentioned that the present study included only the participants' own names as self-relevant stimuli. Holding the central position in one's self-concept/identity (Kang, 1972; Watson, 1986), one's own name is arguably one of the most self-relevant stimuli in the environment. Even 4-5 month-old infants recognize the sound pattern of their own names (Mandel, Jusczyk, & Pisoni, 1995; Parise, Friederici, & Striano, 2010), and one's own name is among the first lexical items that children learn to write and read (Levin, Both-De Vries, Aram, & Bus, 2005; Villaume & Wilson, 1989). In addition, people encounter their own names numerous times throughout their lifetime through various modalities. As such, one's own name can serve as a strong test case by which to evaluate the relative contributions of conscious *vs*. unconscious self-processing to the emergence of an incidental self-memory advantage.

Nevertheless, replication of the present findings using different types of self-relevant stimuli (e.g., one's own face, date of birth, hometown) is clearly desirable to provide further evidence for the differential mnemonic consequences of conscious *vs*. unconscious self-processing.

In summary, the present study showed that conscious but not unconscious processing of self-relevant information produces a self-memory advantage arising from mere incidental associations between the self and external stimuli. The present findings suggest that the processes set in motion by subliminal self-processing may be qualitatively different from those involved when self-relevant information is clearly visible. By demonstrating the dependence of the incidental SRE on conscious awareness of self-relevant information, the present study suggests a boundary condition under which the self exerts its influence on memory.

References

Alexopoulos, T., Muller, D., Ric, F., & Marendaz, C. (2012). I, me, mine: Automatic attentional capture by self-related stimuli. *European Journal of Social Psychology*, *42*, 770-779. doi:10.1002/ejsp.1882

Anderson, N. H. (1968). Likableness ratings of 555 personality trait words. *Journal of Personality and Social Psychology*, *9*, 272-9. doi:10.1037/h0025907

Barchard, K. A. (2015). Null hypothesis significance testing does not show equivalence. *Analyses of Social Issues and Public Policy*, *15*, 418-421. doi:10.1111/asap.12095

Bargh, J. A. (1982). Attention and automaticity in the processing of self-relevant information. *Journal of Personality and Social Psychology*, *43*, 425-436. doi:10.1037/0022-3514.43.3.425

Bargh, J. A. (1992). The ecology of automaticity: Toward establishing the conditions needed to produce automatic processing effect. *American Journal of Psychology*, *105*, 181-199. doi:10.2307/1423027

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society*, *57*, 289-300. Retrieved from http://www.jstor.org/stable/2346101

Conway, M. A., & Dewhurst, S. A. (1995). The self and recollective experience. *Applied Cognitive Psychology*, *9*, 1-19. doi:10.1002/acp.2350090102

Cunningham, S. J., Brady-Van den Bos, M., Gill, L., & Turk, D. J. (2013). Survival of the selfish: Contrasting self-referential and survival-based encoding. *Consciousness and Cognition*, *22*, 237-244. doi:10.1016/j.concog.2012.12.005

Cunningham, S. J., Brebner, J. L., Quinn, F., & Turk, D. J. (2014). The self-reference effect on memory in early childhood. *Child Development*, *85*, 808-823. doi:10.1111/cdev.12144

Cunningham, S. J., Turk, D. J., MacDonald, L. M., & Macrae, C. N. (2008). Yours or mine? Ownership and memory. *Consciousness and Cognition*, *17*, 312-318. doi:10.1016/j.concog.2007.04.003

Dehaene, S., Changeux, J.-P., Naccache, L., Sackur, J., & Sergent, C. (2006). Conscious, preconscious, and subliminal processing: A testable taxonomy. *Trends in Cognitive Sciences*, *10*, 204-211. doi:10.1016/j.tics.2006.03.007

Dehaene, S., Naccache, L., Cohen, L., Le Bihan, D., Mangin, J.-F., Poline, J.-B., & Rivière, D. (2001). Cerebral mechanisms of word masking and unconscious repetition priming. *Nature Neuroscience*, *4*, 752-758. doi:10.1038/89551

Eckstein, D., & Perrig, W. J. (2007). The influence of intention on masked priming: A study with semantic classification of words. *Cognition*, *104*, 345-376. doi:10.1016/j.cognition.2006.07.005

Eichenbaum, H., Yonelinas, A. P., & Ranganath, C. (2007). The medial temporal lobe and recognition memory. *Annual Review of Neuroscience*, *30*, 123-152. doi:10.1146/annurev.neuro.30.051606.094328

Ferguson, T. J., Rule, B. G., & Carlson, D. (1983). Memory for personally relevant information.

Journal of Personality and Social Psychology, *44*, 251-261. doi:10.1037/0022-3514.44.2.251

Geng, H., Zhang, S., Li, Q., Tao, R., & Xu, S. (2012). Dissociations of subliminal and supraliminal self-face from other-face processing: Behavioral and ERP evidence. *Neuropsychologia*, *50*, 2933-2942. doi:10.1016/j.neuropsychologia.2012.07.040

Gray, H. M., Ambady, N., Lowenthal, W. T., & Deldin, P. (2004). P300 as an index of attention to self-relevant stimuli. *Journal of Experimental Social Psychology*, *40*, 216-224. doi:10.1016/S0022-1031(03)00092-1

Greenwald, A. G., Draine, S. C., & Abrams, R. L. (1996). Three cognitive markers of unconscious semantic activation. *Science*, *273*, 1699-1702. doi:10.1126/science.273.5282.1699

Gronau, N., Cohen, A., & Ben-Shakhar, G. (2003). Dissociations of personally significant and task-relevant distractors inside and outside the focus of attention: A combined behavioral and psychophysiological study. *Journal of Experimental Psychology: General*, *132*, 512-529. doi:10.1037/0096-3445.132.4.512

Hommel, B. (2000). The prepared reflex: Automaticity and control in stimulus-response translation. In S. Monsell & J. Driver (Eds.), *Control of cognitive processes: Attention and performance XVIII* (pp. 247-273). Cambridge, MA: MIT Press.

Jacoby, L. L. (1991). A process dissociation framework: Separating automatic from intentional uses of memory. *Journal of Memory & Language*, *30*, 513-541. doi:10.1016/0749-596X(91)90025-F

JASP Team (2018). JASP (Version 0.8.6). [Computer software] Available from https://jasp-stats.org

Jeffreys, J. (1961). *Theory of probability* (3rd ed.). Oxford, England: Oxford University Press.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, *114*, 3-28. doi:10.1037/0033-2909.114.1.3

Kang, T. S. (1972). Name and group identification. *Journal of Social Psychology*, *86*, 159-160. doi:10.1080/00224545.1972.9918610

Kass, R. E., & Raftery, A. E. (1995). Bayes Factors. *Journal of American Statistical Association*, *90*, 773-795. doi:10.1080/01621459.1995.10476572

Kawahara, J., & Yamada, Y. (2004). Does one's name attract visual attention? *Visual Cognition*, *11*, 997-1017. doi:10.1080/13506280444000049a

Keenan, J. M., & Baillet, S. D. (1980). Memory for personally and socially significant event. In R. S. Nickerson (Ed.), *Attention and performance* (Vol. 8, pp. 651-69). Hillsdale, NJ: Erlbaum.

Kim, K., Johnson, J. D., Rothschild, D. J., & Johnson, M. K. (2018). Merely presenting one's own name along with target items is insufficient to produce a memory advantage for the items: A critical role of relational processing. *Psychonomic Bulletin & Review*. Advanced online publication. doi:10.3758/s13423-018-1515-9

Klein, S. B., & Loftus, J. (1988). The nature of self-referent encoding: The contributions of elaborative and organizational processes. *Journal of Personality and Social Psychology*, *55*, 5-11. doi:10.1037/0022-3514.55.1.5

Koivisto, M. (1998). Categorical priming in the cerebral hemispheres: Automatic in the left hemisphere, postlexical in the right hemisphere? *Neuropsychologia*, *36*, 661-668. doi:10.1016/S0028-3932(97)00147-4

Kuiper, N. A., & Rogers, T. B. (1979). Encoding of personal information: Self-other differences. *Journal of Personality and Social Psychology*, *37*, 499-514. doi:10.1037/0022-3514.37.4.499

Lamme, V. A. F. (2006). Towards a true neural stance on consciousness. *Trends in Cognitive Sciences*, *10*, 494-501. doi:10.1016/j.tics.2006.09.001

Lamme, V. A. F., & Roelfsema, P. R. (2000). The distinct modes of vision offered by feedforward and recurrent processing. *Trends in Neurosciences*, *23*, 571-579. doi:10.1016/S0166-2236(00)01657-X

Levin, I., Both-De Vries, A., Aram, D., & Bus, A. (2005). Writing starts with own name writing: From scribbling to conventional spelling in Israeli and Dutch children. *Applied Psycholinguistics*, 26, 463-477. doi:10.1017/S0142716405050253

Logan, G. D. (1985). Skill and automaticity: Relations, implications, and future directions. *Canadian Journal of Psychology*, *39*, 367-386. doi:10.1037/h0080066

Macrae, C. N., Visokomogilski, A., Golubickis, M., Cunningham, W. A., & Sahraie, A. (2017). Self-relevance prioritizes access to visual awareness. *Journal of Experimental Psychology: Human Perception and Performance*, *43*, 438-443. doi:10.1037/xhp0000361

Mandel, D. R., Jusczyk, P. W., & Pisoni, D. B. (1995). Infants' recognition of the sound pattern of their own names. *Psychological Science*, *6*, 314-317. doi:10.1111/j.1467-9280.1995.tb00517.x

Maoz, K., Breska, A., & Ben-Shakhar, G. (2012). Orienting response elicitation by personally significant information under subliminal stimulus presentation: Demonstration using the Concealed Information Test. *Psychophysiology*, *49*, 1610-1617. doi:10.1111/j.1469-8986.2012.01470.x

Martens, U., Ansorge, U., & Kiefer, M. (2011). Controlling the unconscious: Attentional task sets modulate subliminal semantic and visuomotor processes differentially. *Psychological Science*, *22*, 282-291. doi:10.1177/0956797610397056

Mattler, U. (2005). Inhibition and decay of motor and nonmotor priming. *Perception & Psychophysics*, *67*, 285-300. doi:10.3758/BF03206492

Moors, A., & De Houwer, J. (2006). Automaticity: A theoretical and conceptual analysis. *Psychological Bulletin*, *132*, 297-326. doi:10.1037/0033-2909.132.2.297

Moray, N. (1959). Attention in dichotic listening: Affective cues and the influence of instructions. *Quarterly Journal of Experimental Psychology*, *11*, 55-60. doi:10.1080/17470215908416289

Nakamura, K., Dehaene, S., Jobert, A., Le Bihan, D., & Kouider, S. (2007). Task-specific change of unconscious neural priming in the cerebral language network. *Proceedings of* *the National Academy of Sciences*, *104*, 19643-19648. doi:10.1073/pnas.0704487104

Neisser, U. (1988). Five kinds of self-knowledge. *Philosophical Psychology*, *1*, 35-59. doi:10.1080/09515088808572924

Noel, J. -P., Blanke, O., Serino, A., & Salomon, R. (2017). Interplay between narrative and bodily self in access to consciousness: No difference between self- and non-self attributes. *Frontiers in Psychology*, *8,* 72. doi:10.3389/fpsyg.2017.00072

Öhman, A. (1979). The orienting response, attention and learning: An information processing perspective. In H. D. Kimmel, E. H. vanOlst, & J. F. Orlebeke (Eds.), *The orienting reflex in humans* (pp. 443-472). Hillsdale, NJ: Erlbaum.

Pannese, A., & Hirsch, J. (2010). Self-specific priming effect. *Consciousness and Cognition*, *19*, 962-968. doi:10.1016/j.concog.2010.06.010

Pannese, A., & Hirsch, J. (2011). Self-face enhances processing of immediately preceding invisible faces. *Neuropsychologia*, *49*, 564-573. doi:10.1016/j.neuropsychologia.2010.12.019

Parise, E., Friederici, A. D., Striano, T. (2010). "Did you call me?" 5-month-old infants own name guides their attention. *PLoS One*, *5*, e14208. doi:10.1371/journal.pone.0014208

Pfister, R., Pohl, C., Kiesel, A., & Kunde, W. (2012). Your unconscious knows your name. *PLoS One*, *7*, e32402. doi:10.1371/journal.pone.0032402

Rogers, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology*, *35*, 677-688. doi:10.1037/0022-3514.35.9.677

Rouder, J. N., Morey, R. D., Verhagen, J., Swagman, A. R., & Wagenmakers, E.-J. (2017). Bayesian analysis of factorial designs. *Psychological Methods*, *22*, 304-321. doi:10.1037/met0000057

Rouder, J. N., Speckman, P. L., Sun, D., Morey, R. D., & Iverson, G. (2009). Bayesian t tests for accepting and rejecting the null hypothesis. *Psychonomic Bulletin & Review*, *16*, 225-237. doi: 10.3758/PBR.16.2.225

Squire, L. R. (1992). Memory and the hippocampus: A synthesis from findings with rats, monkeys, and humans. *Psychological Review*, *99*, 195-231. doi:10.1037/0033-295X.99.2.195

Stein, T., Siebold, A., & van Zoest, W. (2016). Testing the idea of privileged awareness of self-relevant information. *Journal of Experimental Psychology: Human Perception and Performance*, *42*, 303-307. doi:10.1037/xhp0000197

Sui, J., & Humphreys, G. W. (2017). The self survives extinction: Self-association biases attention in patients with visual extinction. *Cortex*, *95*, 248-256. doi:10.1016/j.cortex.2017.08.006

Sweeny, T. D., Grabowecky, M., Suzuki, S., & Paller, K. A. (2009). Long-lasting effects of subliminal affective priming from facial expressions. *Consciousness and Cognition*, *18*, 929-938. doi:10.1016/j.concog.2009.07.011

Tacikowski, P., Berger, C. C., & Ehrsson, H. H. (2017). Dissociating the neural basis of conceptual self-awareness from perceptual awareness and unaware self-processing. *Cerebral Cortex*, *27*, 3768-3781. doi:10.1093/cercor/bhx004

Tacikowski, P., & Ehrsson, H. H. (2016). Preferential processing of self-relevant stimuli occurs mainly at the perceptual and conscious stages of information processing. *Consciousness and Cognition*, *41*, 139-149. doi:10.1016/j.concog.2016.02.013

Turk, D. J., Brady-Van den Bos, M., Collard, P., Gillespie-Smith, K., Conway, M. A., & Cunningham, S. (2013). Divided attention selectively impairs memory for self-relevant information, *Memory and Cognition*, *41*, 503-510. doi:10.3758/s13421-012-0279-0

Turk, D. J., Cunningham, S. J., & Macrae, C. N. (2008). Self-memory biases in explicit and incidental encoding of trait adjectives. *Consciousness and Cognition*, *17*, 1040-1045. doi:10.1016/j.concog.2008.02.004

Turk, D. J., van Bussel, K., Brebner, J. L., Toma, A. S., Krigolson, O., & Handy, T. C. (2011). When “it” becomes “mine”: Attentional biases triggered by object ownership. *Journal of Cognitive Neuroscience*, *23*, 3725-3733. doi:10.1162/jocn_a_00101

Van den Bos, M., Cunningham, S. J., Conway, M. A., & Turk, D., J. (2010). Mine to remember: The impact of ownership on recollective experience. *Quarterly Journal of Experimental Psychology*, *63*, 1065-1071. doi:10.1080/17470211003770938

Van Opstal, F., Reynvoet, B., & Verguts, T. (2005). Unconscious semantic categorization and mask interactions: An elaborate response. *Cognition*, *97*, 107-113. doi:10.1016/j.cognition.2005.04.005

Villaume, S. K., & Wilson, L. C. (1989). Preschool children’s explorations of letters in their own names. *Applied Psycholinguistics*, *10*, 283-300. doi:10.1017/S0142716400008638

Wagenmakers, E. -J., Love, J., Marsman, M., Jamil, T., Ly, A., Verhagen, J., … Morey, R. D. (2018). Bayesian inference for psychology Part II: Example applications with JASP. *Psychonomic Bulletin & Review*, *25*, 58-76. doi: 10.3758/s13423-017-1323-7

Watson, R. S. (1986). The named and the nameless: Gender and person in Chinese society. *American Ethnologist*, *13*, 619-631. doi:10.1525/ae.1986.13.4.02a00020

Wickens, T. D. (2002). *Elementary signal detection theory*. Oxford, England: Oxford University Press.