

Pay attention! Attention to the primes increases attitude assessment accuracy [☆]

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Abstract

We demonstrate that an oft-used indirect attitude assessment technique—the *attitude activation paradigm*—accurately assesses attitudes only when participants attend to the prime stimuli during the attitude activation task. Attitude activation attitudes toward obviously valenced words (e.g., *torture*, *liberty*) were more sensitive to attitude valence and extremity when participants were required to attend to the prime words than when they attended to a competing stimulus. As a result, we observed a significantly stronger correlation between attitude activation attitudes and a direct, self-report attitude measure when participants attended to the primes than when they ignored them. We conclude that failing to require participants to attend to the primes during the attitude activation task results in a flawed measurement, which could lead researchers to underestimate relations between the attitude activation measure and direct, self-report attitude measures.

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In recent years, attitude researchers have emphasized a distinction between direct and indirect methods of attitude assessment. Direct attitude assessment uses traditional self-report methodology, and is accomplished by simply asking people how much they like or dislike some object. In contrast, indirect attitude assessment does not require people to report their attitudes, but instead involves measuring their attitudes surreptitiously, and in a way that prevents people from controlling what their attitudes are revealed to be (Dovidio & Fazio, 1992; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, Jackson, Dunton, & Williams, 1995; Greenwald & Banaji, 1995).

Indirect methods of attitude assessment are potentially valuable for at least two reasons. First, because

indirect assessment techniques often prevent people from exerting control of their responses, indirect measures have the potential to more accurately measure participants' true attitudes than do direct measures, particularly when researchers are interested in assessing attitudes that people are unlikely to report truthfully (Fazio et al., 1995). Second, some researchers believe that indirect measurement techniques assess different kinds of attitudes (those that are unconsciously held) than do more direct measures (those that are consciously held; e.g., Banaji, 2001; Dovidio et al., 1997; Hetts, Sakuma, & Pelham, 1999; Wilson, Lindsey, & Schooler, 2000).

Whether the purpose of indirect assessment is to circumvent untruthful responding or to measure a different construct entirely, it is important for researchers to understand how indirect assessment techniques work. In this paper, we investigate the workings of an oft-used indirect measurement technique known as the *attitude*

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activation paradigm.¹ In so doing, we reveal the conditions under which this procedure accurately assesses people's attitudes and the conditions under which it does not.

The attitude activation paradigm

In the attitude activation paradigm, researchers use a sequential priming procedure to examine people's automatic evaluations of attitude objects. In this procedure, participants respond to a series of target stimuli, each of which is immediately preceded by a prime stimulus. On a given trial, the prime and the target are either of the same or opposite valence. *Automatic attitude activation*, reported first by Fazio, Sanbonmatsu, Powell, and Kardes (1986), is defined as more rapid responding to targets that are preceded by primes of the same valence than to targets that are preceded by primes of the opposite valence. Because this effect has been demonstrated to occur when the time between prime onset and target onset—the stimulus onset asynchrony (SOA)—is short (i.e., ≤ 300 ms), researchers agree that conscious processes cannot account for the effect. As a result, this priming effect is taken as evidence that people unconsciously and uncontrollably evaluate stimuli when they encounter them. Attitudes are often, if not always, automatically activated (e.g., Bargh, 1997; Duckworth, Bargh, Garcia, & Chaiken, 2002).

Once the reliability of the attitude activation effect was established, researchers adapted the attitude activation procedure to measure people's attitudes. If positive (negative) primes facilitate responding to positive (negative) targets, then the differential rate of responding to positive vs. negative targets following a particular prime can provide a measure of association between the prime concept and its valence. This differential facilitation can provide an indirect assessment of one's attitude toward the prime; faster responding to positive (negative) than negative (positive) targets following a particular prime indicates a positive (negative) attitude toward the prime concept (Fazio et al., 1995).

The use of the attitude activation paradigm (or some variant of it; e.g., Wittenbrink, Judd, & Park, 2001) to measure attitudes has become popular among researchers looking for new ways to assess attitudes and predict behavior. Researchers have used this procedure in attempts to more accurately assess attitudes toward socially sensitive attitude objects (e.g., Fazio et al., 1995), to more accurately predict intergroup behaviors (e.g., Wilson et al., 2000) and emotions (Fazio & Hilden, 2001), to assess implicit racial biases (e.g., Cunningham, Preacher, & Banaji, 2001; Payne, 2005) and gender biases (Brauer, Wasel, & Niedenthal, 2000), and to assess implicit self-esteem (Bosson, Swann, & Pennebaker, 2000; Hetts et al., 1999).

Attending vs. ignoring the primes

Although many procedural aspects of the attitude activation paradigm are consistently employed in attitude activation research, there are some procedural aspects of the paradigm that are inconsistently employed. Most relevant to our research, attitude activation studies are inconsistent regarding what participants are instructed to do with the prime stimuli. Some researchers require participants to study the primes for a later recognition test (Fazio et al., 1995); some require participants to attend to all of the prime stimuli by having them say the primes out loud after each trial (e.g., Bargh, Chaiken, Govender, & Pratto, 1992; Fazio et al., 1986); some merely instruct participants to attend to the primes (e.g., Duckworth et al., 2002; Klauer & Musch, 2001); some instruct participants to ignore the primes (e.g., Glaser & Banaji, 1999; Hermans, De Houwer, & Eelen, 1994, 2001); and others do not tell participants what to do with the primes (e.g., De Houwer, Hermans, & Spruyt, 2001). There is no consensus about how participants should process the prime stimuli during the attitude activation task, and it is unclear which instruction will yield the most accurate measurement. Should participants attend to the primes, should they ignore the primes, or does it not matter?

The use of the attitude activation procedure as a measurement tool depends on the assumption that the presentation of a prime *activates* the prime's evaluation, which in turn *facilitates* responding to targets that share that evaluation. Importantly, research in cognitive psychology suggests that this assumption may only hold when participants attend to the primes, because only then do primes activate concepts that are related. In contrast, when participants ignore the primes, primes do not always facilitate responding to related targets. In some cases, ignoring the primes significantly reduces priming effects (e.g., Musch & Klauer, 2001), and in others it causes people to respond more *slowly* to related than to unrelated targets (i.e., *negative priming*; e.g., Neill, 1977; Tipper, 1985). Thus, ignoring primes during the attitude activation task may decrease or possibly reverse the facilitatory effects of primes on targets, thereby decreasing the validity of the attitude activation procedure as a measurement instrument.

Consistent with this reasoning, researchers instructing participants to attend to the primes typically observe attitude activation (Bargh et al., 1992; Fazio et al., 1986). However, instructing participants to ignore the primes has produced less consistent results, with some studies finding attitude activation (e.g., Hermans et al., 1994, Hermans, De Houwer, & Eelen, 2001) and others finding null effects (Klauer & Musch, 2001) or even reversals (Glaser & Banaji, 1999). The inconsistent effects of ignore instructions may arise because active ignoring is difficult (Wegner, 1994). Participants may sometimes fail to follow this difficult instruction, so that they attend to the primes even when instructed to ignore them. In support of this claim, Simmons (2004) found that participants reported having more difficulty ignoring primes than attending to them, and that

¹ This procedure has also been referred to as the affective priming paradigm, the bona fide pipeline procedure, and the evaluative priming procedure.

this difficulty often muddled the relationship between prime instructions and the findings that emerged. Thus, simply comparing studies that differ in their instructions does not guarantee insight into the effects of attention to the primes.

In contrast, research *manipulating* attention to the primes suggests that attending to the primes is important for observing the traditional attitude activation effect (see Fazio, 2001). Musch and Klauer (2001) found that when primes and targets were simultaneously presented, the attitude activation effect emerged only when target words were presented in an unpredictable location. Presumably, primes were more successfully ignored when participants could focus their attention on the location of the target, suggesting that the attitude activation effect may depend on whether participants attend to the primes. Similarly, De Houwer and Randell (2002) found that instructing participants to attend to the primes increased the attitude activation effect in a naming task, so long as trials were included that helped participants realize the benefit of attending to the primes.

Our research extends previous work in a number of ways. First, unlike Musch and Klauer (2001), we investigate the effects of attention to the primes using a more traditional sequential priming paradigm rather than a simultaneous priming paradigm. Because the sequential priming paradigm is the one that researchers typically use to *assess* attitudes (e.g., Fazio et al., 1995; Hetts et al., 1999), it is important to demonstrate that the effects of attention obtain when the prime and target are presented sequentially rather than simultaneously. Second, unlike De Houwer and Randell (2002), we investigate these effects using an evaluation task—which researchers often use to assess attitudes (e.g., Fazio et al., 1995)—rather than the more unreliable naming task—which has never, to our knowledge, been used to assess attitudes. Third, by offering participants a reward for attending to the primes or to a competing stimulus, we use a stronger manipulation of attention to the primes than previous research has employed (see Simmons, 2004). Finally, our investigation focuses on the effects of attention to the primes on attitude assessment accuracy, rather than on how attention impacts the priming effect alone (De Houwer & Randell, 2002; Musch & Klauer, 2001). In so doing, we go beyond previous research by investigating whether attention to the primes increases the attitude activation procedure's sensitivity to both attitude valence and extremity.

Overview of the present research

An accurate attitude measure must accomplish at least three things. First, an accurate measure must be sensitive to attitude valence: it should indicate that people evaluate obviously positive words like *beauty* or *liberty* significantly more positively than obviously negative words like *torture* and *disease*. Second, an accurate attitude measure must discriminate among similarly valenced words that differ in attitude extremity: it should indicate that people evaluate

extremely positive words like *peace* more positively than moderately positive words like *aquarium*. Third, an accurate attitude measure must correlate highly with other accurate attitude measures.

Our research investigated whether attention to the primes increases the accuracy of attitudes assessed using the attitude activation procedure. Specifically, we investigated whether attention to the primes increases the attitude activation measure's (1) sensitivity to attitude valence, (2) sensitivity to attitude extremity, and (3) correspondence with a direct, self-report measure. This third criterion of accuracy may seem problematic to researchers familiar with the argument that direct attitude measures do not necessarily assess "true" attitudes, and do not therefore qualify as a proper standard of attitude accuracy (e.g., Fazio et al., 1995; Greenwald & Banaji, 1995). Instead, indirectly assessed attitudes may sometimes be the "true" standard, or direct measures may sometimes measure a different attitude than the indirect measure. Although we acknowledge and endorse these possibilities, these arguments apply only to attitudes that people are likely to report untruthfully, and attitudes that are theorized to differ in their conscious vs. unconscious forms. The *obviously valenced* attitude objects (e.g., abuse, friend) that we employ in this research are unlikely to provoke deceptive responding to attitude measures (e.g., people are unlikely to report dislike for the word *friend* when they in fact like it), and they are unlikely to differ in their conscious vs. unconscious forms (e.g., no theory predicts that people would consciously dislike the word *abuse* while unconsciously liking it). Because we used such obviously valenced attitude objects in this research, we believe that the direct attitude measure appropriately serves as a standard of attitude accuracy.

Methods

Participants

Forty-seven Princeton undergraduates (26 females) participated in exchange for \$8.00. Additionally, they were paid up to \$5.00 for following the task instructions. One participant was excluded because his error rate was more than seven standard deviations above the mean. All analyses are based on the remaining 46 participants.²

Stimuli

The stimulus words were selected to vary orthogonally on the dimensions of valence and extremity on the basis of pretesting in the participant population. In pretesting, 24 Princeton undergraduates evaluated 150 words on an 11-point scale ranging from *extremely negative* to *extremely positive*. The extremity of each word was computed as the absolute

² Participant sex did not qualify any of the results reported herein. Therefore, we collapsed across this factor in all analyses.

value of the difference between the word's average rating and the scale midpoint (six). There were a total of 300 rated objects and so each student evaluated half of the words. Thus, each object was evaluated by 12 of the 24 students.

From the set of 300 objects we selected 20 positive and 20 negative words with mean extremity scores in the bottom or top third of the distribution. Within each valence, half of the words were extreme ($M = 3.84$, $SD = .57$) and half were moderate ($M = 1.75$, $SD = .50$). Within each valence $\times$ extremity cell, we chose five words to always appear as primes, and five to always appear as targets. Thus, there were 20 prime words and 20 target words.

Procedure

Upon arrival, participants were seated in front of a computer, and the experimenter delivered the task instructions. Participants were told that on each trial of the task a word and a four-digit number would be simultaneously and briefly flashed before the appearance of a target word. Participants were informed that they had two tasks on each trial. One task was to evaluate the target word as quickly as possible, by pressing a key marked POS when the word was positive and a key marked NEG when the word was negative. The other task was to attend to either the four-digit number (Ignore condition) or the prime word (Attend condition). Ignore condition participants were further informed that at random points during the experiment, the computer would prompt them to write down the number that appeared on the previous trial, and that for every correct response they would earn 25 cents. Here the experimenter emphasized the value of attending to the number by alerting participants that they could earn an extra \$5.00 or so by simply paying attention to the number and reporting it correctly when asked.³ Participants in the Attend condition were similarly instructed, but they were told to pay attention to the prime word and to record it when prompted. Finally, participants were informed that the number and the prime word would always appear in the same screen locations on each trial. Half of the participants were informed that the prime would appear just above the center of the screen while the number would appear just below the center of the screen. For the other half of participants, the positions of the number and the prime word were reversed.⁴

During the evaluation task, participants were presented with 20 practice trials, followed by 320 critical trials. On each trial, a fixation cross appeared for 500ms and was immedi-

ately followed by a prime word that was presented for 200ms. Following the prime, the screen remained blank for 100ms before the target word appeared. Thus, the SOA was 300ms. The target word remained on the screen until the participant responded or until 1500ms had elapsed. Participants received feedback after each trial when they responded incorrectly or when they took longer than 1500ms to respond. The next trial began 500ms later. After 20 random trials, the computer asked participants to write down the number (Ignore condition) or prime word (Attend condition) that had appeared on the previous trial. When this occurred, participants were given as much time as they needed to write down the information. They re-started the task by pressing the space bar.

The 320 trials were presented in four blocks of 80 trials each. Within each block, each possible prime valence $\times$ prime extremity $\times$ target word combination was presented once in a random order. After each block participants rested for as long as they needed before re-starting the task. Three buffer trials were inserted at the beginning of each block to account for any variance associated with re-orienting to the task.

After the evaluation task participants completed a surprise recognition test. The recognition test consisted of 80 positive and negative words, including the 40 words that had served as primes and targets during the task. Participants were instructed to circle the 40 words that appeared at some point during the evaluation task. The instructions emphasized that participants should circle exactly 40 words, even if they could not remember all of the words. After completing the recognition task, participants were debriefed.

Results

Manipulation check

We excluded two participants from analyses of the recognition data because they failed to follow the recognition task instructions. Among the remaining participants, there was no difference between the conditions in their recognition of target words ($M = 98.57\%$, $SD = 3.22\%$ in the Ignore condition; $M = 97.39\%$, $SD = 4.23\%$ in the Attend condition), $t(42) = 1.03$, $p > .30$. Attend condition participants did correctly recognize more primes ($M = 96.09\%$, $SD = 6.56\%$) than Ignore condition participants ($M = 58.10\%$, $SD = 11.56\%$), $t(42) = 13.56$, $p < .001$, indicating that the attention manipulation was effective. However, participants in the Ignore condition did perform well above the chance expectation of 33% in their recognition of primes, indicating that they too were attending to the primes at least somewhat.⁵

Priming effects

Before conducting the analyses, we excluded data from trials on which participants responded incorrectly, too

³ Although each participant was asked to write down the prime word exactly 20 times during the experiment, the answer sheet on which participants recorded the words had 21 blank spaces, thus leading participants to believe that they could be asked to provide as many as 21 answers during the task. We incorporated this minor deception because we did not want participants to stop attending to the prime word after they recorded their 20th answer.

⁴ The relative positioning of the word and number did not qualify any of the results reported herein. Therefore, we collapsed across this factor in all analyses.

⁵ The chance expectation of 33% assumes that participants correctly recognize all of the target words, and that they randomly circle 20 of the remaining 60 words.

slowly (response times [RTs] greater than 1500 ms), and too quickly (RTs less than 300 ms). In total, we eliminated data from 6.34% of trials. We subjected the remaining RTs to a Condition $\times$ Prime Extremity $\times$ Prime Valence $\times$ Target Extremity $\times$ Target Valence mixed model ANOVA, with repeated measures on the last four factors.^{6,7}

The five-way ANOVA revealed significant main effects of prime valence, $F(1, 44) = 15.13, p < .001$, target extremity, $F(1, 44) = 121.30, p < .001$, and condition, $F(1, 44) = 7.96, p < .008$, indicating that overall participants evaluated targets more quickly when primes were positive, when targets were extreme, and when they attended to the primes. The ANOVA also revealed a Prime Valence $\times$ Target Valence interaction, $F(1, 44) = 38.58, p < .001$, indicating that participants evaluated targets more quickly when they were preceded by evaluatively congruent primes. This interaction represents the traditional attitude activation effect. The Prime Valence $\times$ Target Valence interaction was qualified by a significant Condition $\times$ Prime Valence $\times$ Target Valence interaction, $F(1, 44) = 12.36, p = .001$, and by a significant Prime Extremity $\times$ Prime Valence $\times$ Target Valence interaction, $F(1, 44) = 4.87, p < .04$. The first of these three-way interactions indicates that, as predicted, the attitude activation effect was more pronounced in the Attend condition than in the Ignore condition. The second interaction indicates that the attitude activation effect was more pronounced on trials when extremely valenced primes were presented, a result that was itself qualified by the predicted Condition $\times$ Prime Extremity $\times$ Prime Valence $\times$ Target Valence interaction, $F(1, 44) = 6.32, p < .02$.

To interpret this interaction, we conducted Prime Extremity $\times$ Prime Valence $\times$ Target Extremity $\times$ Target Valence repeated measures ANOVAs within each condition. Within the Attend condition, a significant Prime Valence $\times$ Target Valence interaction indicated that participants evaluated targets more quickly following evaluatively congruent primes, $F(1, 22) = 30.80, p < .001$, while a significant Prime Extremity $\times$ Prime Valence $\times$ Target Valence interaction indicated that this effect was more pronounced when primes were extremely valenced rather than moderately valenced, $F(1, 22) = 12.63, p < .003$. Within the Ignore condition, the Prime Valence $\times$ Target Valence interaction was significant, $F(1, 22) = 7.82, p < .02$, but the Prime Extremity $\times$ Prime Valence $\times$ Target Valence interaction was not, $F(1, 22) = 0.04, p > .83$. Participants in the Ignore condition evaluated targets more quickly following evaluatively congruent primes, but this effect was weaker than that observed in the Attend condition, and it did not vary as a function of prime extremity. Thus, priming effects in the Attend condition reflected sensitivity to valence and extremity, whereas priming effects in the Ignore condition

Table 1
Mean RTs to evaluate targets following evaluatively congruent vs. incongruent primes as a function of Condition and Prime Extremity

Condition	Extremity	Incongruent		Congruent		Difference	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Ignore	Extreme	661	120	652	119	+9*	20
	Moderate	657	119	648	119	+9**	15
Attend	Extreme	593	77	554	66	+39**	33
	Moderate	588	74	560	63	+28**	26

Note. The significance tests in the Difference column reflect the results of the Prime Valence $\times$ Target Valence interaction for each cell of the Condition $\times$ Prime Extremity design.

* $p < .05$.

** $p < .01$.

reflected sensitivity to valence only—and a reduced sensitivity at that. Table 1 displays the relevant means.

The relation between the attitude activation measure and the direct attitude measure

To investigate the effects of attention to the primes on the relationship between the attitude activation measure and the direct attitude measure, we computed across-object correlations between the two measures for each condition (for a similar approach, see Brendl, Markman, & Messner, 2005). To accomplish this, we averaged across participants within each condition, and computed each object's attitude

Table 2
Directly and indirectly assessed attitudes toward the 20 attitude objects

Attitude object	Direct measure	Attitude activation measure	
		Ignore condition	Attend condition
hell	1.42	−53.94	−28.60
abuse	1.75	−11.34	−71.87
corpse	1.92	−6.24	−59.02
torture	2.33	6.84	−58.52
crime	2.50	0.44	−67.78
headache	4.00	−24.36	−66.29
decrease	4.25	−21.80	0.18
trial	4.33	20.68	6.63
graffiti	4.58	−31.85	−24.79
vanity	4.75	−7.40	11.09
prairie	7.50	57.27	23.59
clothes	7.75	12.38	27.02
glacier	7.75	−21.05	−0.68
parade	7.83	−9.24	22.92
aquarium	8.08	−14.59	15.99
beauty	9.42	31.10	28.97
wedding	9.50	20.02	28.61
friend	9.67	13.39	1.50
kindness	10.17	−9.16	2.52
liberty	10.33	0.63	50.88

Note. The direct measure required participants to rate each of these objects on a scale ranging from 1 (*extremely negative*) to 11 (*extremely positive*). The attitude activation measure was computed by subtracting RTs (in milliseconds) to positive targets from RTs to negative targets following each object prime. For both measures, higher numbers indicate more positive attitudes.

⁶ We included the theoretically irrelevant Target Extremity factor in the analysis for the sake of completeness.

⁷ Because RT data are positively skewed, we conducted the same analyses on participants' log-transformed RTs. These analyses yielded nearly identical results.

activation measure by subtracting the sample's average RT on trials during which the object preceded a positive target from the average RT on trials during which it preceded a negative target. Higher scores indicated more positive attitudes toward the object.

Table 2 displays the pretest sample's directly assessed attitudes and this sample's attitude activation attitudes toward each object as a function of condition. As predicted, the relation between the two measures increased as attention to the primes increased. In the Ignore condition, the relation was only marginally significant, $r(18) = .42$, $p < .07$. However, in the Attend condition, the correlation between the two measures was very strong, $r(18) = .82$, $p < .001$, and significantly more positive, $z = 2.09$, $p < .02$.

Discussion

This research found that when participants attended to the primes during the attitude activation task, their attitude activation attitudes showed greater sensitivity to the valence and extremity of the stimuli. In addition, having participants attend to the primes increased the relation between attitudes assessed by the attitude activation paradigm and those assessed by the self-report measure. This supports the notion that the attitude activation measure assesses participants' true attitudes most accurately when participants fully attend to the primes. When participants do not fully attend to the primes, the correlation between the attitude activation measure and direct attitude measures will be reduced.

Although the attention manipulation exerted its hypothesized effects, there was nevertheless evidence from the recognition task that the Ignore condition participants attended to the primes at least to some extent. This is not surprising, as previous research has demonstrated that participants often have difficulty following ignore instructions (Simmons, 2004). Thus, it makes sense that the Ignore condition produced a significant attitude activation effect. Nevertheless, in the Ignore condition the attitude activation measure did not demonstrate significant sensitivity to attitude extremity, and was thus less effective as an attitude measure.

This research indicates that the attitude activation paradigm assesses attitudes most effectively when participants fully attend to the primes. Future research should apply this knowledge to investigate the relation between the attitude activation measure and direct measures of attitudes that are theorized to differ in their unconscious vs. conscious forms. Perhaps the zero-order correlations sometimes observed between these measures are attributable not to a conceptual distinction between indirectly and directly assessed attitudes, but to participants' failure to attend fully to the primes during the attitude activation task in previous studies. At the very least, it seems likely that requiring participants to attend to the primes will increase the relation between these measures, even if the magnitude of the relation serves to nevertheless preserve their conceptual distinc-

tion. Our point is that one cannot know the true nature of the relationship between the attitude activation measure and other measures without assessing attitude activation attitudes appropriately—by having participants fully attend to the primes.

Implications for attitude activation research

Although we have emphasized the implications of our findings for attitude measurement, our research has broader implications as well, as it may be able to shed light on some perplexing findings in the attitude activation literature.

The moderating role of attitude extremity

In the early stages of attitude activation research, Fazio et al. (1986) discovered that extremely valenced primes produced faster responding to evaluatively consistent targets than did moderately valenced primes. This effect was replicated by Bargh et al. (1992), but not by researchers who failed to require participants to attend to the primes (Bargh, Chaiken, Raymond, & Hymes, 1996; Chaiken & Bargh, 1993; Giner-Sorolla, Garcia, & Bargh, 1999, Experiment 2). This discrepancy prompted Giner-Sorolla et al.'s summary statement: "when the participant is not required to name the prime object before responding to the target, attitude strength does not moderate automatic evaluative priming" (pp. 91–92). Our research provided further support for this idea, as we observed moderation of the priming effect by prime extremity only when participants were required to attend to the primes.

Reverse priming

Researchers have discovered that a *reverse priming effect* sometimes emerges from the attitude activation paradigm. Glaser and Banaji (1999) found that participants were faster to pronounce target words following evaluatively *incongruent* primes when the primes were evaluatively extreme. Banse (2001) found evidence of reverse priming when primes were only partially visible compared to when they were fully visible. And, Giner-Sorolla and Zuffi (1995) and Hermans (1996, reported in Klauer and Musch, 2003) observed reverse priming in later blocks of trials during the attitude activation task.

If we make reasonable assumptions concerning the extent to which participants were attending vs. ignoring the primes in these studies, then these results might be explained by the notion that ignoring the primes may affect priming by, in some cases, inhibiting the primes' evaluations (Houghton & Tipper, 1994; Simmons, 2004). In this light, we might predict Glaser and Banaji's (1999) finding of reverse priming if we assume that participants in Glaser and Banaji's studies were ignoring the primes—as they were instructed to do. Banse's (2001) result is consistent with this analysis if one reasonably assumes that participants were ignoring primes that were difficult to see. And, the block effects observed by Giner-Sorolla and Zuffi (1995) and Hermans (1996) are consistent

with this if one assumes that, perhaps because of fatigue, participants in those studies ignored more primes in the later blocks of trials than they did in the earlier blocks of trials.

Of course, these arguments are speculative given that we found no evidence of reverse priming in our own Ignore condition. This fact may indicate either that our ignore instruction did not effectively cause participants to ignore most of the primes (Simmons, 2004) or that different processes are responsible for reverse priming and our own. Resolving this issue is a worthwhile goal of future research.

Attitude activation using subliminal primes

Attitude activation effects sometimes emerge even when primes are presented subliminally (Greenwald, Draine, & Abrams, 1996; Greenwald, Klinger, & Liu, 1989; Greenwald, Klinger, & Schuh, 1995; Wittenbrink et al., 2001). This finding seemingly represents a challenge to our contention that attention to the primes is necessary for obtaining the attitude activation effect. If attitude activation depends on attention to the primes, then why does attitude activation follow from priming stimuli that are presented too quickly to capture conscious attention?

Though we have no definitive answer to this question, we offer several observations. First, there is a difference between consciously attending to the primes and consciously attending to the priming *episode*. It is possible that consciously attending to the priming *episode* is critical and that subliminal priming “works” only when participants consciously attend to the flash of light that constitutes the subliminal prime. Second, although subliminal priming effects are achieved reliably with only very short SOAs (under 100 ms), our research used a longer SOA of 300 ms. It is possible that even ignored primes’ evaluations are activated initially, but that their activation dissipates very quickly or becomes inhibited (Eimer & Schlaghecken, 1998). Subliminal primes may produce attitude activation at low SOAs simply because all primes initially activate their associated evaluations, even when those primes are not consciously attended. However, at higher SOAs, the activation afforded to subliminal primes may dissipate or become inhibited by virtue of their being ignored. Finally, it is worth noting that although some researchers have found evidence for attitude activation using subliminal primes at short SOAs, recent research by Hermans, Spruyt, De Houwer, and Eelen (2003) failed to replicate this effect using extremely valenced pictorial stimuli, instead finding evidence of *reverse priming* during the second block of trials. Perhaps subtle differences in the procedures employed by Hermans et al. made it less likely that participants in these studies would attend to the priming episode. We encourage future research to examine this admittedly speculative possibility.

Conclusion

As researchers increasingly rely on priming paradigms to investigate psychological phenomena, it is important that

they understand how these techniques work. Failing to account for something as seemingly trivial as whether participants attend to the primes during a priming task could lead researchers to draw erroneous inferences about psychological phenomena. We hope that this research encourages researchers to instruct participants appropriately during the attitude activation task, in order to achieve a greater understanding of the phenomena investigated using this paradigm.

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