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The Situated Inference Model: An Integrative Account of the Effects of Primes on Perception, Behavior, and Motivation

Chris Loersch[1] and B. Keith Payne[2]
[1]Department of Psychology, University of Missouri, Columbia, and [2]Department of Psychology, University of North Carolina at Chapel Hill

Abstract
The downstream consequences of a priming induction range from changes in the perception of objects in the environment to the initiation of prime-related behavior and goal striving. Although each of these outcomes has been accounted for by separate mechanisms, we argue that a single process could produce all three priming effects. In this article, we introduce the situated inference model of priming, discuss its potential to account for these divergent outcomes with one mechanism, and demonstrate its ability to organize the priming literatures surrounding these effects. According to the model, primes often do not cause direct effects, instead altering only the accessibility of prime-related mental content. This information produces downstream effects on judgment, behavior, or motivation when it is mistakenly viewed as originating from one's own internal thought processes. When this misattribution occurs, the prime-related mental content becomes a possible source of information for solving whatever problems are afforded by the current situation. Because different situations afford very different questions and concerns, the inferred meaning of this prime-related content can vary greatly. The use of this information to answer qualitatively different questions can lead a single prime to produce varied effects on judgment, behavior, and motivation.

Keywords
priming, automatic, unconscious, cognition

People ordinarily feel that their judgments, behaviors, and motives are freely chosen, reflecting personal concerns and preferences. This intuitive perspective has been echoed by various rationalist models of human behavior, such as those long popular in economics (Friedman & Savage, 1948; Keeney & Raiffa, 1976, von Neumann & Morgenstern, 1944). Compelling research from the past few decades, however, has shown that this belief is often mistaken (Nisbett & Wilson, 1977). In many instances, our judgments, feelings, and behaviors are not driven by active thinking and reasoning but are instead set in motion by seemingly inconsequential and logically irrelevant cues, or primes. Such effects include many well-known findings across areas of psychology, such as the power of ''mere exposure'' to influence preferences (Zajonc, 1968), the ability of irrelevant ''anchor'' values to shape numerical judgments (Tversky & Kahneman, 1974), and the ability of experiences of prime-induced processing fluency to create memory illusions (Jacoby & Kelley, 1987). Beyond these effects on basic affective and cognitive processes, primes also appear to shape higher-level processes, including the impressions people form of other individuals and social situations, and complex social behavior. Even the goals people pursue, typically considered to operate though deliberative choice and conscious control, can be instigated by passive exposure to a prime. And strikingly, across all of these findings, people seem to be unaware that they were influenced by a prime (Bargh & Chartrand, 2000; Bargh & Pietromonaco, 1982).

The implications of this work for theories of human consciousness, judgment, and behavior have excited considerable interest in both public (Gladwell, 2005) and scientific (Hassin, Uleman, & Bargh, 2005) communities. Although this wide

Corresponding Author:
Chris Loersch, Department of Psychology, University of Missouri, 210 McAlester Hall, Columbia, MO 65211, or B. Keith Payne, Department of Psychology, University of North Carolina at Chapel Hill, Campus Box 3270, Chapel Hill, NC 27599
E-mail: loerschC@missouri.edu or payne@unc.edu

interest has produced a well-established literature providing detailed mechanisms for each priming effect listed above, theoretical mysteries remain. One of the most critical is the question of how to predict what type of effect will emerge from any single priming event. If, for example, people were exposed to words related to the concept of hostility (e.g., "hit," "punch," "aggress"), it could reasonably be predicted that they would subsequently (a) be faster to identify a gun (semantic priming; Meyer & Schvaneveldt, 1971), (b) perceive another individual as more hostile (construal priming; Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1979), behave in a more hostile manner themselves (behavior priming; Carver, Ganellen, Froming, & Chambers, 1983), and (d) become motivated to actively seek out an opportunity to aggress against some other person or object (goal priming; Todorov & Bargh, 2002). Exactly under what conditions one of these effects will emerge as opposed to another remains unknown, and multiple effects have been observed as the result of a single priming induction (e.g., construal and goal priming; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001, Study 3). Known as the "many effects of one prime problem," this theoretical mystery is one of the major issues confronting scientists in this research domain (Bargh, 2006).

In this article, we examine the literature related to effects of primes on higher order thought and behavior, and use the commonalities we observe to derive a new model of how priming effects occur. Based on a number of well-established principles from within these literatures, we use this model to consolidate many priming effects and provide one possible answer for the many effects of one prime problem. In the sections that follow, we first outline this model and illustrate how it can provide a unifying framework for understanding multiple forms of priming. We then utilize the model to organize a literature review, highlighting the framework's ability to account for the wide variety of moderators that exist across the priming literature. Finally, we discuss the novel predictions generated by the model and compare it to other theoretical accounts.

The Situated Inference Model

Although primes have been shown to affect a diverse set of outcomes including social perception/construal, judgments, behaviors, and motivation, most of these effects have been demonstrated using virtually identical methodologies. The general procedure involves first making a specific concept accessible (i.e., ready to use in further information processing) by presenting words, texts, or images related to the concept. Priming manipulations take a number of forms. In some cases, the prime information is consciously processed (i.e., supraliminally presented), such as a set of scrambled sentences that the participant unscrambles, or lexical decision tasks in which a series of letter strings is presented, and participants decide whether each string is a word; or simply a paragraph of prose that participants read. In other cases, words are presented on a computer monitor very briefly and masked for a subliminal presentation (see Table 2 for an overview of the priming tasks used in the reviewed studies and examples of stimuli). The influence of this accessible concept on social perception, behavior, or motivation is then measured on a second task that is presented as completely unrelated to the original priming induction. The situated inference model argues that many of the different influences produced through such a procedure might actually be created by a single process. We call this framework the *situated inference model* of priming to emphasize that the way individuals make sense of primed information depends on their immediate situation. Generally, the model is based on a three-step process: (a) a priming stimulus makes related information highly accessible; (b) this information becomes misattributed to one's natural response toward some object in the situation, and (c) the misattributed content is used to answer the most salient question afforded by the environment. These steps are explained in more detail in the next sections (see Fig. 1 for a schematic depiction of the model and Table 1 for key citations relating to each model step).

Step 1: Prime exposure

We propose, as do most other models, that the influence of primes on judgment, behavior, and motivation begins with the simple accessibility created by associative priming (McNamara, 2005). Consistent with much research in social and cognitive psychology, we define accessibility as readiness to use a construct in information processing (Higgins, 1996; Tulving & Pearlstone, 1966). Through this process, a prime can potentially increase the accessibility of any mental content that is experientially (Bearce & Rovee-Collier, 2006; Conway, 1990), semantically (Neely, 1977), and evaluatively related (Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Spruyt, Hermans, De Houwer, Vandromme, & Eelen, 2007). We differ from a number of past theories, however, by proposing that this change in base construct accessibility rarely has a direct effect on judgment or behavior and instead represents only an increased readiness to utilize the accessible information in subsequent processing.

Step 2: Misattribution

Instead of directly affecting judgment, behavior, or motivation, we propose that the general accessibility resulting from prime exposure is most likely to have an effect when one misattributes it to his or her natural response toward some aspect of the situation. When mistaking the information made accessible by the prime as due to one's own internal thought process, this mental content naturally becomes a source of bias in people's routine decision-making processes and is especially likely to be used to inform subsequent judgment, behavior, or motivation. It is important to note that because accessible information tends to be interpreted as being about whatever object is focal in attention (see the *aboutness* and *immediacy* principles; Higgins, 1998, and Clore & Gasper, 2000, respectively), individuals are likely to mistake the source of the information made accessible by many environmental stimuli. As long as the prime is not particularly blatant or salient, the true source of the

Table 1. Key Evidence and Example Studies for Each Step of the Situated Inference Model

Model step & principle	Study finding	Citation	Priming effect
Step 1: Prime exposure	*A single priming induction can produce multiple outcomes*:		
Primes produce general construct accessibility that is used flexibly	Participants' attitudes toward a primed category determine prime's effect.	Cesario, Plaks, & Higgins (2006)	Goal
	Different objects of focus cause a prime to produce either contrastive or assimilative effects.	Kay, Wheeler, & Smeesters (2008)	Behavior
	Mindset inductions alter how participants use primes.	Stapel & Koomen (2001)	Construal
Step 2: Misattribution	*Factors affecting a prime's confusability with one's own thoughts moderate priming effects*:		
Accessible content is misattributed to one's own response	Social category primes produce assimilation; exemplar primes produce contrast.	Dijksterhuis et al. (1998)	Behavior
	Moderate power primes produce assimilation; extreme primes produce contrast.	Herr, Sherman, & Fazio (1983)	Construal
	Judgments of participants consciously aware of the primes show contrast, and those of unaware participants show assimilation.	Lombardi, Higgins, & Bargh (1987)	Construal
	Participants with a high need for cognition show contrast after blatant primes, but they show assimilation after subtle primes.	Petty et al. (2008)	Behavior/construal
Step 3: Afforded questions	*Different focal targets afford unique questions and lead to different priming outcomes*:		
Misattributed content is used to answer the question afforded by the focal target	Primes differentially produce goal or construal priming depending on focal task.	Bargh et al. (2001)	Construal/goal
	Primes only influence judgments of the target on which participants focus after priming.	DeMarree & Loersch (2009)	Construal
	Primes have opposite effects depending on the stop-rule on which participants focus.	Jefferis & Fazio (2008)	Behavior
	Behavioral effects of primes are mediated through changes in judgments of the focal target.	Smeesters, Wheeler, & Kay (2009)	Behavior

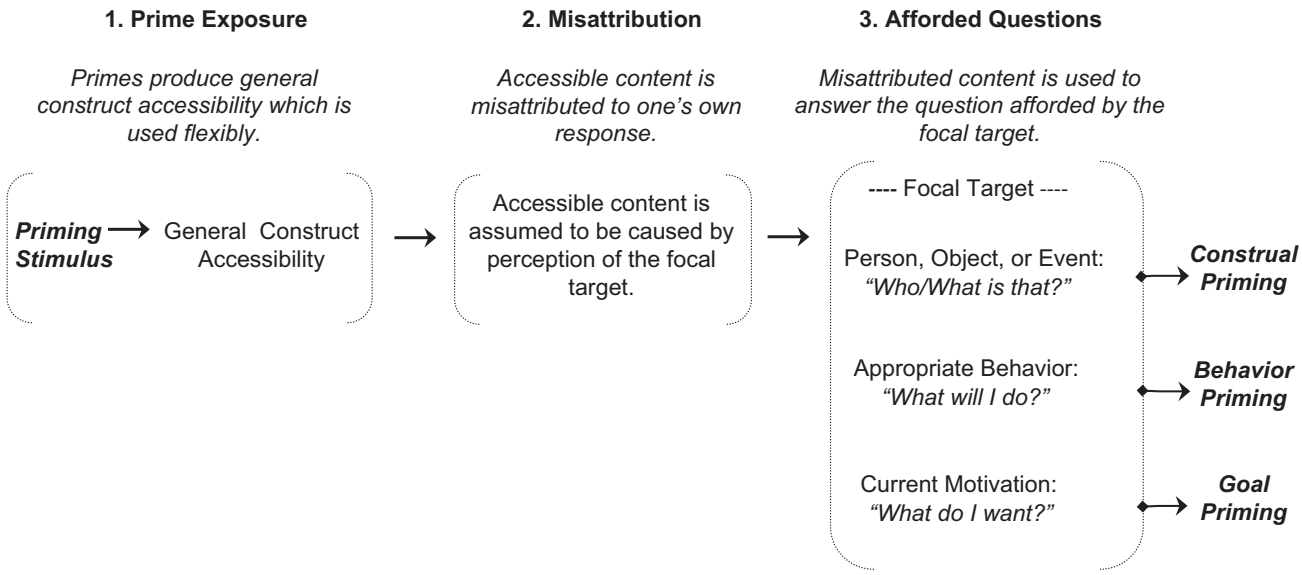

Fig. 1. A schematic representation of the situated inference model.

mental content it makes accessible is not likely to be apparent, and this information will thus be susceptible to the misattribution process (Lombardi, Higgins, & Bargh, 1987; Schwarz & Clore, 1983). In this way, we propose that the basic attributional principles controlling the influence of affect and arousal on judgment (Cantor, Zillmann, & Bryant, 1975; Dutton & Aron, 1974; Schachter & Singer, 1962; Schwarz & Clore, 1983; Zanna & Cooper, 1974) might also be critical for the production of high level priming effects.[1]

Step 3: Afforded questions

Because different situations afford very different options for judgment or behavior, the inferred meaning of any misattributed prime-related information can vary greatly. It is in this way that the general construct accessibility resulting from a single prime can differentially produce downstream changes in judgment, behavior, and motivation. In particular, we propose that the possible effects of any given prime are determined by the basic questions afforded by the current situation. We draw upon Gibson's (1977) notion of affordances as possibilities for action provided by the environment. But where Gibson focused on how physical action possibilities shape visual perception, our concern is somewhat broader. We propose that the affordances of physical and interpersonal environments that shape visual perception also influence social perception, actions, and motivations.

A person moving through the environment is repeatedly confronted with multiple options for interpretation, judgment, and behavior. From one moment to the next, attention is drawn to various objects in the environment, each of which affords a different question or concern: Is this object something I can sit on? How close to this person should I sit? Now that I'm at the bar, do I want a drink? Notice that these questions vary in their likelihood of conscious consideration. To answer all such questions (at both conscious and unconscious levels), people must use whatever mental content is currently accessible and relevant to the judgment at hand. We propose that primes bias the answers to these questions by altering the information considered as one completes this obligatory decision-making process.

As demonstrated by research examining the influence of mood on judgment (Martin, Abend, Sedikides, & Green, 1997; Martin, Ward, Achee, & Wyer, 1993; Schwarz & Clore, 2007), the use of accessible mental content to answer different questions can cause a priming induction to have very different downstream consequences. From our perspective, it is the affordance of qualitatively different questions that leads a single prime to differentially produce construal, behavior, and goal priming.

In particular, we propose that construal priming effects tend to result when the situation focuses one on judging another person or object in the environment. These situations afford basic questions, such as "Who is that?" or "What is that?" As long as prime-related mental content is misattributed to one's natural thoughts about this target of focus, the content will serve as a potential source of information for answering this question. To the extent that the accessible information is seen as relevant for inferring an answer, then judgments of the object will be affected and a construal priming effect will emerge. We further propose that behavior priming occurs through the same basic

Table 2. Priming Procedure Details From Research Cited in the Literature Review

Task	Prime type	Primed concept(s)	Example stimuli	Citation
			Construal priming studies	
Anagrams	Words	Likeability	10 trait-related anagrams: v-o-l-e (love)	Mussweiler & Neumann (2000), Study 2
Biased paragraph	Paragraph	Opportunity & threat	Description of a business opportunity or threat	Stapel & Koomen (2001), Study 1
Biased questions	Names	Hostility	Questions about individuals of varying hostility (Santa Claus, Daniel Boone, Bobby Knight, Dracula)	Herr (1986), Study 1
Biased questions	Sentences	Positive & negative traits	Descriptions of confident (positive) and conceited (negative) actions	Stapel & Koomen (1996), Study 1
Biased questions	Sentences	Positive & negative traits	"To what extent does the phrase exemplify trait *X*?" (boldness, self-assurance, foolhardiness, egotism)	Martin (1986), Study 1
Impression formation	Images[a]	Positivity & negativity	Positive (a puppy, the Olympic medal ceremony) and negative (a burned body, a disfigured child) images	Loersch et al. (in press)
Lexical decisions	Words[a]	Resistance & flexibility	rigid, resist; yield, flexible	Petty et al. (2008), Study 2
Lexical decisions	Words[a]	Hostility & peacefulness	Words consistent with African American stereotype (rap, religious, black), or inconsistent with it (peaceful, calm, quiet)	DeMarree et al. (2005)
Memory test	Words	Ferocity	Memory items with animals of varying ferocity (shark, wolf, fox, opossum, dove)	Herr et al. (1983), Study 1
Memory test	Words	Positive & negative traits	honest, persistent; stingy, conceited	Newman & Uleman (1990), Study 1
Memory test	Words	Adventurous & reckless	adventurous, persistent, self-confident; reckless, conceited, stubborn	Higgins et al. (1977)
Parafoveal priming	Words & names	Hostility	Hostile traits (perverse, warlike) & exemplars (Robin Hood, Mike Tyson)	Moskowitz & Skurnik (1999), Study 1
Recall	Own thought	Assertiveness	Recall of past occasions of assertive behavior	Schwarz et al. (1991), Study 1
Scrambled sentences	Sentences	Persistence & stubbornness	"you stubborn are here"; "diligent students workers are"	Lombardi et al. (1987), Study 1
Scrambled sentences	Sentences	Positive & negative traits	bold, brave, daring; careless, foolhardy, rash	Häfner & Stapel (2010), Study 1
Scrambled sentences	Sentences	Hostility	"leg break arm his"	Srull & Wyer (1979), Study 1
Scrambled sentences	Sentences	Positive & negative traits	Trait-implying sentences (persistent, confident; stubborn, conceited)	Moskowitz & Roman (1992), Study 1
Social empathy	Sentences	Positive & negative traits	"Write a sentence that captures the same feeling as this sentence"	Martin et al. (1990), Study 1
Tone judgment	Words	Helpful & dishonest	None provided	Strack et al. (1993)
Word completions	Words	Hostility	Skinhead stereotype traits (hostility, racist, radical)	Petty et al. (2008), Study 3
			Behavior priming studies	
Biased instructions	Paragraph	Win & lose	Instructions framed as winning or losing	Petty et al. (2008), Study 1
Biased paragraph	Paragraph	Fast & slow	Paragraph including references to fast (antelope, cheetah) or slow (snail, turtle) animals	Aarts & Dijksterhuis (2002), Study 2
Directed thought	Own thought	Intelligent & unintelligent	"List the typical behaviors of X" (a professor; Albert Einstein; a supermodel; Claudia Schiffer)	Dijksterhuis et al. (1998), Study 1
Directed thought	Own thought	Helpful	"List the typical behaviors associated with Superman"	Nelson & Norton (2005), Study 1
Directed thought	Own thought	Intelligence	"Describe the similarities (or differences) of these four supermodels"	Haddock et al. (2002), Study 2
Directed thought	Own thought	Intelligence	"Think about X . . . " (a professor; Albert Einstein)	LeBoeuf & Estes (2004), Study 1
Impression formation	Sentences	Fast & slow	Form an impression of young or old individuals	Dijksterhuis et al. (2001), Study 1
Lexical decisions	Words[a]	Cooperation & competition	fair, cooperate; win, compete	Kay et al. (2008), Study 3
Lexical decisions	Words[a]	Unkindness	disliked, surly, unpleasant	Smeesters et al. (2009), Study 1
Lexical decisions	Words[a]	Aggressiveness & caring	African American, Black; Buddhist Monk	DeMarree & Loersch (2009), Study 1
Parafoveal priming	Words[a]	Fast & slow	fast, quick; slow, crawl	Jefferis & Fazio (2008), Study 1
Parafoveal priming	Words[a]	Intelligence	Asian stereotype traits (wok, wonton, Asia)	Shih et al. (2002), Study 2
Puzzle	Words	Achievement	Achievement words embedded in a word search puzzle (achieve, compete, win)	Loersch & Payne (2011)

Table 2 (continued)

Task	Prime type	Primed concept(s)	Example stimuli	Citation
Scrambled sentence	Sentences	Slow	Sentences containing elderly stereotype traits (old, wrinkled, knits)	Bargh et al. (1996), Study 2
Scrambled sentence	Sentences	Hostility	"hits her he then"	Carver et al. (1983), Study 2
			Goal priming studies	
Biased questions	Biased questions	Achievement	Questions about mother's appearance, activities, etc.	Morrison et al. (2007), Study 3
Directed thought	Own thought	Helping	"Think of a friend or coworker"	Fitzsimons & Bargh (2003), Study 1
Dot identification	Words[a]	Puzzling	number, sequence, puzzle, logic, calculate	Custers & Aarts (2005), Study 3
Dot identification	Words[a]	Socializing	socializing, going out, partying, celebrate, dancing	Aarts et al. (2007), Study 3
Lexical decisions	Words[a]	Achievement	father, dad	Shah (2003), Study 2
Numerical estimates	Images[a]	Elderly & youth	Headshots of elderly men or teenage boys	Cesario et al. (2006), Study 2
Parafoveal priming	Names[a]	Have fun & work hard	Idiosyncratic names of individuals who want the participant to have fun or work hard	Chartrand et al. (2007), Study 1
Perceptual judgment	Images[a]	White & African American	Black and white faces	Cesario et al. (2010), Study 2
Puzzles	Words	Achievement	Achievement words embedded in a word search (achieve, compete, win)	Bargh et al. (2001), Study 1
Scrambled sentences	Sentences	Have fun & impress others	"That is true entertainment"; "He wore expensive attire"	Laran et al. (2008)

Note: Descriptions of tasks follow. Anagrams: Participants unscramble letter strings to make words; Biased Instructions: Instructions are worded so as to prime a particular concept; Biased Paragraph: Text includes reference to the primed concept; Biased Questions: Participants are asked questions about prime-related objects; Directed Thought: Participants are asked to think about a target and list its typical attributes; Dot Identification: Primes are covertly presented while participants identify the dot's position; Impression Formation: Participants are asked to form an impression of a target that acts in a prime-congruent fashion; Lexical Decisions: Primes are covertly presented while participants identify letter strings as words or nonwords; Memory Test: Primes are covertly included among other information to be memorized; Numerical Estimates: Primes are covertly presented while participants estimate the number of Xs on the screen; Parafoveal Priming: Primes are covertly presented while participants identify the location of stimuli on the screen; Perceptual Judgment: Primes are covertly presented while participants judge the number of circles on the screen as odd or even; Puzzle: Primes are embedded among other words in a crossword puzzle; Recall: Participants are asked to recall past instances of prime-congruent behavior; Scrambled Sentences: Primes are embedded among the other words in scrambled sentences—participants must discard one word and rearrange all other words into a grammatically correct sentence; Sentence Reading: Participants read sentences that imply prime-consistent behavior; Social Empathy: Participants are asked to write a sentence that has the same emotion as other prime-related text; Tone Judgment: Participants are covertly exposed to primes while identifying audio tones; Word Completions: Participants fill in the missing letters in word stems—prime-related words are embedded among filler items.

[a] Subliminal prime presentation.

process, but that unlike construal priming, it is caused when the situation draws one's attention to the various behavioral options afforded by the local environment. In this case, however, the basic type of question afforded by the situation is "What will I do?" Finally, goal priming effects are produced when one is led to consider his or her current desires, presenting a basic question or concern of the type "What do I want?" By being differentially used to answer these separate classes of afforded questions, a single prime can affect judgment, behavior, or motivation through the same simple mechanism. As long as the information made accessible by a prime is misattributed to one's natural response to the situation and is seen as a valid source of information for answering the basic question or concern afforded by the target of focus, a priming effect should emerge.

Imagine, for example, that a subject is primed to think about competitiveness, and then is asked to form an impression regarding another person. Learning about a new person naturally and automatically affords the question "What kind of person is this?" As the subject is faced with this basic concern, thoughts about competitiveness come to mind because of the earlier priming manipulation. If the subject interprets those thoughts as his or her own, then he or she is likely to perceive the new person as competitive. Now, imagine that the same subject is instead asked to play a game in which he or she has the choice to compete or cooperate. If thoughts about competitiveness come to mind as the behavioral options are considered, he or she is likely to answer the afforded question "What will I do?" with "compete." Finally, if the game is set up so that the subject can pursue competitive versus cooperative goals, the same process is likely to lead to pursuit of a competitive goal. In this way, the misattribution of primed concepts to one's own thoughts provides a mechanism for translating general accessibility into personal cognition, behaviors, and motivations. The basic questions afforded by the situation shape which kind of priming emerges, changing base construct accessibility into complex, higher-order thought and behavior.

Organization of the Literature Using the Situated Inference Model

In this section, we review effects of primes on social perception, behavior, and motivation using the situated inference model as an organizing framework (see Table 2 for a summary of the cited studies). The first area of focus, described in the next section, is research suggesting that primes can be flexibly used as sources of information. In contrast to models that posit a direct effect of priming (e.g., Bargh, 1990; Dijksterhuis & Bargh, 2001; Higgins, 1996), the situated inference model stresses that priming stimuli make related information accessible for many possible inferences. Because of this, the way in which a perceiver uses prime-related information should be able to drastically alter the prime's effect, causing a single prime to sometimes lead to assimilation, sometimes lead to contrast, and sometimes lead to no effect at all. We outline a number of variables that influence when primed information is used to produce one effect or the other.

The second way the effect of a prime can be determined is by the confusability of the primed information with one's own response to the target. The greater the likelihood that this information is misattributed to one's natural thoughts about the target, the greater the probability that judgments and behavior will assimilate to the prime. If the primed construct is especially distinctive (such as when primes are extreme or exemplars), this accessible information is likely to stand out in one's mind. Because of this, it is less likely to be confused with one's natural response and tends to produce an effect on judgment, behavior, or motivation either by serving as a comparison standard or by inducing effortful correction (Moskowitz & Skurnik, 1999).

Finally, even when primed information is easily confused with one's natural response to a situation, the exact influence of this information depends on metacognitive cues about the validity of the accessible information. Because misattributed information is being used to answer the basic questions afforded by the environment, only when this mental content is viewed as valid or diagnostic does it actually produce a priming effect. Thus, any variable signaling that one's thoughts are especially useful or trustworthy (such as feelings of ease, fluency, or confidence; Häfner & Stapel, 2010; Tormala, Petty, & Briñol, 2002) should increase the efficacy of priming. Variables that cause one to doubt one's thoughts, however, should eliminate any influence of the prime on judgments and behavior (Petty, Briñol, & Tormala, 2002).

1. Flexible use of accessible information

According to the situated inference model, information made accessible through priming does not always have an automatic or default effect. Instead of automatically producing changes in judgment, behavior, or motivation, this accessible mental content is often used as information for coming to an inference about how to judge another person or object, about how to behave, or about what one wants. Because of this, the general construct accessibility that results from priming can have very different effects depending upon a person's information processing style, the particular target or judgment, or the surrounding context. This basic hypothesis is supported by research across the construal, behavior, and goal priming literatures demonstrating that the accessibility resulting from priming often does not produce automatic, default effects. Instead, we suggest, prime-related information can be used flexibly depending on one's current situation.

Construal priming. A primary prediction of the situated inference model is that primes will often have differential effects depending upon the situation and the subject's focus of attention. A number of research findings are consistent with this hypothesis. In one exemplary study (Kay, Wheeler, & Smeesters, 2008), participants were first primed with either the construct of competition or the construct of cooperation. Following this priming induction, participants were led to focus

either on the general situation surrounding another's actions or directly on this person's behavior, and then were asked to judge that person's competitiveness in a prisoner's dilemma game (see Rapoport & Chammah, 1965). When focusing directly on the person after priming, participants displayed a classic priming effect: Those who had been exposed to competitive stimuli rated the actor as a more competitive person than did those who had been exposed to cooperative stimuli. Participants who focused on the situation, however, showed a contrast effect. Participants primed with competition viewed the actor as less competitive than participants primed with cooperation. Analysis of participants' perceptions of the situation surrounding the actor's behavior showed that this occurred because these individuals actually used the prime to inform judgments of the situation. Participants who focused on the situation after competition priming judged the situation to be relatively competitive; this change in situation construal led them to judge the actor's behavior as less competitive. The reverse occurred for those who had been primed with cooperation and were then led to focus on the situation surrounding the actor's behavior. All changes in participants' judgments of the actors in this situation-focused condition were statistically mediated through changes in their construal of the actor's situation. These findings provide support for our model by showing that the primes did not produce direct, automatic effects, but instead provided information that participants flexibly used to answer whatever basic question was afforded by the current target of focus (e.g., "What type of person is this?" vs. "What type of situation is this?"; see also DeMarree & Loersch, 2009).

In a similar vein, other research has shown that the effect also depends upon the cognitive set of the perceiver (Stapel & Koomen, 2001). In this study, participants first read a number of sentences describing various targets' behavior. They then either wrote down the personality trait implied by the behavior (to induce an interpretation mindset) or indicated the extent to which the target possessed the trait compared to another person or group (to induce a comparison mindset). Following this mindset induction, all participants were primed with the concept of either opportunity or threat, and then read a scenario describing a situation ambiguous on these dimensions. When operating with an interpretation mindset, the information made accessible by priming led participants to judge the target in an assimilative fashion. When operating with a comparison mindset, the exact same accessibility led participants to contrast their judgments against the prime. Thus, participants were able to flexibly use the information made accessible by priming, applying it to the current situation in whatever way seemed appropriate at the time of judgment.

Finally, research on individual differences has shown that personality traits can make people differentially susceptible to construal priming effects. Participants high in the *need for cognition* (i.e., a tendency to enjoy and engage in effortful cognitive activity; Cacioppo & Petty, 1982; Petty, Briñol, Loersch, & McCaslin, 2009) were especially likely to be affected by a subtle priming manipulation. Because those high in the need for cognition tend to naturally engage in greater amounts of thought, they should be especially likely to produce prime-related cognitions, thus encouraging the misattribution process proposed by our model (Petty, DeMarree, Briñol, Horcajo, & Strathman, 2008, Study 2). In contrast, those low in the need for cognition might not always engage in enough processing for the accessibility from priming to introduce such prime-related cognitions, and therefore do not have the biased cognitions needed to change their judgments of the target.

Behavior priming. The behavior priming literature has documented findings similar to those cited in the previous section. For example, manipulations affecting the target of attention focus after a priming induction can cause a single prime to produce very different effects (Smeesters, Wheeler, & Kay, 2009). In this work, participants were led to be either high or low in other-focus (i.e., focusing on others rather than oneself) prior to being primed with either "unkindness" or neutral words. After these inductions, participants were asked to play an Ultimatum game and rate the perceived kindness of their partner. In the Ultimatum game, the first player (the participant in this experiment) is given a sum of money and proposes how to divide it between the two players. The second player can either accept or reject this proposal. If the second player accepts, the money is split according to the proposal, but if the proposal is rejected, neither player receives anything (see Thaler, 1988). Although participants in all conditions gave the partner less money after being primed with unkindness, the reasons for this effect differed across conditions. For those in the other-focus condition, this effect was statistically mediated by changes in participants' construals of their interaction partner. As in the work on construal priming cited above, these participants seemed to use the prime to answer the questions afforded by their current target of focus (i.e., "What type of person is this?"). Thus, these other-focused individuals directed their attention to their interaction partner, concluded that this individual was relatively unkind, and then offered the person a significantly reduced amount of money. The behavior of participants in the control condition, on the other hand, was not mediated through this pathway. Instead, the prime had no effect on their perceptions of their partner and they appeared to use the information made accessible by the prime to directly inform their behavior.

In further support of the situated inference model, other work within the behavioral priming literature (Jefferis & Fazio, 2008) has demonstrated that accessible information can indeed be used to answer the particular questions afforded by the current task. Participants were subliminally primed with words related to either "fast" or "slow" and then completed a number of anagrams to measure the behavioral effects of priming. Critically, the anagram task was accompanied by one of two stop-rules (see Hirt, McDonald, Levine, Melton, & Martin, 1999). Participants were either told to stop solving anagrams when they were "tired of the anagram task" or when they had "mastered the anagram task." Primes had very different effects under these two conditions. For participants instructed to stop "when tired of the anagram task," those primed with words related to "fast" spent more time completing anagrams than

those primed with words related to "slow." In contrast, participants instructed to stop when they had "mastered the anagram task" spent more time completing anagrams when primed with slow than when primed with fast. Presumably, these differential effects occurred because participants were using the information made accessible by these primes (thoughts of speed or lethargy) as information for making the stop-rule decisions. For the tired stop rule, participants appeared to use information related to the concept of fast to infer that they were not yet tired, and persisted at the task. Under the master stop rule, the primes had a very different effect. Because people who have mastered a task should be faster at it, the fast prime instead led individuals to stop more quickly. This research provides a direct demonstration that behavioral priming effects can be mediated by the use of accessible information to answer the questions afforded by the current situation. Manipulating the question on which participants were focused altered the way they used accessible information, evidence supportive of the processes outlined in our model.

Finally, the previously cited research on the role of need for cognition in susceptibility to priming (Petty et al., 2008) also contained a study utilizing a behavioral measure. Participants were primed with either the construct of winning or losing and were then given an opportunity to gamble a portion of their payment for completing the study. As in the previously cited work, only those participants who were high in the need for cognition showed an effect of the prime, betting more when subtly exposed to winning-related stimuli. This provides evidence for our perspective, as high need for cognition individuals should be more likely to produce prime-related cognitions than their counterparts with low need for cognition. Thus, when the situation calls for participants to consult their mental contents and infer the proper course of action, these individuals should be more likely to have prime-related information in mind.

Goal priming. In the realm of goal priming, research on stereotype activation provides the most direct evidence that primed constructs can be flexibly used to infer one's subsequent motivation (Cesario, Plaks, & Higgins, 2006). In this research, participants primed with a social category activated a goal related to interacting with a member of the primed group. The precise type of interaction goal activated was moderated by participants' attitudes towards the primed category. For example, participants were primed with the concept of "youth" or "elderly" before being given a chance to walk down the hall (in order to measure walking speed, a behavior related to interacting with members of these two social groups). Participants who liked the elderly walked more slowly after being primed with this category, but those who disliked the elderly walked more quickly. According to the authors, this occurred because the primes caused participants to become motivated to interact with a member of this social group, and behavior was adjusted appropriately. That is, those who liked the elderly wanted to slow down in order to facilitate interaction whereas those who disliked the elderly wanted to speed up to avoid interaction. In a related line of work, the researchers demonstrated that the goal inferred by participants can also depend on the constraints of individuals' current environment (Cesario, Plaks, Hagiwara, Navarrete, & Higgins, 2010, Study 2). In this study, participants primed with a social stereotype typically associated with aggression responded with fight-like behavior when in a constrained location (an enclosed booth), but with flight-like behavior when in an open environment (an open field). As predicted by the situated inference model, the inferred goal depended on the subjective meaning of the information made accessible by the prime. Even though all participants had the same social stereotype accessible in all studies, its motivational implication depended greatly on the meaning of the accessible content within the current situation.

Laran, Janiszewski, and Cunha (2008) also demonstrated that the effects of a goal priming manipulation can depend on context. Participants were primed with either the goal to have fun or the goal to impress others. They were then asked to select a dining location from a list of establishments that had been pretested to be either fun and relaxed or upscale and nice. In addition, the decision context was manipulated so that participants were choosing for a dining event that was happening either "tonight" or "a month from now." When making the choice for tonight, participants' selections assimilated to the primed construct. Participants in the impress-others condition tended to select upscale restaurants and those in the have-fun condition selected more relaxed establishments. The effects of the primes were reversed, however, when individuals were making the choice for a month in the future. In this decision context, participants' choices instead contrasted against the primes. As in the behavioral priming work of Jefferis and Fazio (2008), simply altering the question confronting participants after the priming induction caused the primes to have drastically different downstream consequences. The information made accessible by these primes was flexibly used to inform participants' goals.

Similar flexibility has been observed in a number of studies on the motivational effects of priming significant others (Chartrand, Dalton, & Fitzsimons, 2007; Fitzsimons & Bargh, 2003; Shah, 2003). Although all of this research uses the same basic priming procedure, each separate package also demonstrates a unique effect of priming participants with a significant other. In particular, Fitzsimons and Bargh found that participants automatically adopted the goals they pursued when primed with a relationship partner (e.g., "I want to be nice because I want to please my mother"), Shah found that participants adopted goals that a relationship partner held for them (e.g., "I want to stop drinking because my mother wants me to be an upstanding citizen"), and Chartrand et al. demonstrated that reactant individuals actually became motivated to pursue a goal opposite to the wishes of the primed individual (e.g., "I want to get drunk because my mother wants me to stop drinking").

Although these divergent findings were not all obtained in the same study, other work has indeed documented two of these motivational effects from a single significant other prime. This research compared the effects of priming significant others in

individuals who were high or low in the *need to belong* (i.e., the desire to feel valued and accepted by peers and significant others; Morrison, Wheeler, & Smeesters, 2007). Participants high in the need to belong were especially likely to take on the goals another person held for them (as in Fitzsimons & Bargh, 2003). Presumably, these individuals were more likely to be concerned with the question, ''How do others want me to behave?'' and therefore tended to have the answer to this question biased by recently primed content. In contrast, participants with a low need to belong were less likely to consider this aspect and, when primed by a significant other, were more likely to take on goals they personally possessed (as in the work of Shah). Together, these findings provide evidence for the situated inference model by demonstrating that significant other primes seem not to have a single, default effect. Instead, the information made accessible by these primes can be used to make a number of very different motivational inferences.

2. Confusability of prime and target information

The second critical aspect of situated inference model is the prediction that the effects of primes depend on how easily the primed content is confused with one's own cognitive responses. When this information is easily misattributed to one's thoughts, it is effortlessly integrated into judgments and used to answer whatever question is afforded by the current situation. If, however, the prime-related information is highly distinctive, such as when one is primed with individual exemplars or very extreme categories, this misattribution process is less likely to occur.

Construal priming. Because they make unusual information accessible, extreme primes are especially likely to prevent the misattribution process proposed by the situated inference model. In work supportive of this proposal (Herr, Sherman, & Fazio, 1983), participants were primed with animals of varying ferocity, from extremely gentle to extremely ferocious. Moderate primes (e.g., ''kangaroo'' and ''opossum''; ''wolf'' and ''badger'') led to assimilative judgments of an ambiguous target, but extreme primes (e.g., ''dove'' and ''rabbit''; ''shark'' and ''tiger'') led to contrast. In fact, this effect was strong enough that participants primed with the extremely gentle animals actually judged the target to be more ferocious than those primed with the extremely ferocious animals. From our perspective, these effects arise because the information made accessible by extreme primes is not easily confused with a person's thoughts about the target, preventing judgmental assimilation. Instead of helping one decide what a target *is*, this very distinctive information stands out from one's thoughts and serves as a source of comparison for deciding what the target *is not*. In this way, the information is used as a comparison standard (Mussweiler, 2003; Schwarz & Bless, 1992; Stapel, 2007), a process that is likely to produce contrast when primes are extreme (Herr, 1986; Moskowitz & Skurnik, 1999).

Similar results are expected when the information made accessible by the prime is distinct for other reasons. Another way in which this can occur is if the prime is associated with a specific person instead of a general trait. Stapel and Koomen (1996) exposed participants to two trait-implying sentences before reading about an ambiguous target. Critically, these traits were descriptive of either a particular kind of behavior or a particular person. When the traits were descriptive of a general behavior, judgments assimilated to the trait primes. When the exact same traits were descriptive of a particular person, however, judgments contrasted against the primes. Presumably, this occurred because information associated with a specific person is more distinctive and less easily confused with one's response to the target. As with extreme primes, this distinctiveness is likely to cause the prime-related information to be used as a comparison standard, thus producing contrastive judgments.

Although the above research illustrates how various features of a prime can decrease its confusability with one's natural response toward a target, other research findings suggest that certain aspects of the target can lead to similar effects. For instance, because relatively unambiguous targets are more likely to elicit very specific and distinctive thoughts when considered for judgments, they are less susceptible to the misattribution process proposed by the situated inference model. Highly ambiguous targets, on the other hand, do not call for any specific type of thought. This allows a variety of prime-related mental content (even that only loosely related to the target) to serve as a potential source of information. It is interesting to note that although primes are less likely to provide relevant information for judgments of unambiguous targets, they can still provide a source of comparison. In this way, unambiguous targets should be especially likely to elicit contrast effects, especially when the information made accessible by the prime is also quite distinct. The research cited above on the effects of priming extreme animal exemplars (Herr et al., 1983) also provides support for his hypothesis. When the targets were highly ambiguous (e.g., imaginary animals such as ''jabos'' and ''lemphors''), moderately extreme primes affected judgments in an assimilative manner. If the animals were instead unambiguous (e.g., ''pigs'' and ''goats''), these same primes produced contrast. As outlined above, this presumably occurred because the accessible information from priming could not be confused with the targets (because they were concrete, real animals) and instead served as a comparison standard, providing information about what the target was not.

Yet another variable that decreases the probability of confusion between prime-related content and one's own thoughts is knowledge (or suspicion) that this information was made accessible by some external stimulus. When this is the case, people are unlikely to mistake any prime-related content with their natural response to a target and instead tag these thoughts as originating from the alternative source. When individuals are able to identify such an influence, primes are more likely to have an effect because of people's inaccurate efforts to correct for this potential source of bias (Martin, Seta, & Crelia, 1990; Schwarz & Clore, 1983; Wegener & Petty, 1995). In this situation, any effect of the prime results from people's inability

to correctly calibrate their attempts to separate the prime-related content from their own natural thoughts about the target (Wilson, Laser, & Stone, 1982).

The area of construal priming is replete with demonstrations of motivated correction (e.g., Martin et al., 1990; Schwarz & Bless, 1992; Wegener & Petty, 1995; Wilson & Brekke, 1994). In one representative study (Strack, Schwarz, Bless, Kübler, & Wänke, 1993), participants naturally assimilated judgments toward a prime, unless they were reminded of an earlier priming task. When they were reminded, they attempted to correct for the prime's influence and showed judgmental contrast. Similarly, in an examination of individual differences in memory for primes, Lombardi et al. (1987) found that participants who possessed explicit memories of the earlier primes contrasted their judgments against the stimuli's judgmental implications. Those participants with no explicit memories of these primes instead judged the same target in an assimilative fashion. Presumably, this occurred because participants with memories of the primes were aware of the potential influence and attempted to correct for this potential bias.

This hypothesis is also supported by a highly related line of work on blatant versus subtle priming manipulations (Martin, 1986; Martin et al., 1990; Newman & Uleman, 1990; Petty et al., 2008). In general, these studies showed assimilation to subtle primes (when participants are unlikely to suspect an influence and the misattribution process can unfold naturally) but contrast against blatant primes (when participants are likely to suspect an influence and misattribution is prevented). Some work has even shown both assimilation and contrast in the case of blatant priming (Mussweiler & Neumann, 2000). The degree to which participants expected the primes to bias their judgments was manipulated. When participants were unlikely to be aware of the primes' potential bias (because they had accidentally generated the primes themselves during a stem completion task), even a blatant priming procedure produced assimilation (for similar results, see Moskowitz & Roman, 1992).

Finally, awareness of a prime's potential influence need not always induce motivated correction. For instance, Loersch, McCaslin, and Petty (in press) showed that participants subliminally primed with positive or negative images readily used this information to form an impression of a judgmental target, despite being aware that the primes would bias their thoughts. Critically, before the priming induction, participants were informed that the priming stimuli were being presented to provide additional information about the target of judgment. Even though participants knew they were being influenced by an external agent, the bias was welcomed as a legitimate source of information, and led to assimilative effects on later judgments. Although the misattribution process was prevented, the accessible content was still seen as an applicable source of information for answering the basic question presented by the judgment task.

Behavior priming. In the area of behavior priming, evidence for the role of confusability comes from work in which participants were asked to think of either a general social category (e.g., supermodels or professors) or an actual exemplar (e.g., "Claudia Schiffer" or "Albert Einstein") belonging to that group (Dijksterhuis et al., 1998). Because the stereotypes of these categories (and the traits of individuals belonging to them) are applicable to the construct of intelligence, participants subsequently completed a general knowledge test to determine the behavioral ramifications of priming. Whereas activation of the vague social categories caused behavioral assimilation, priming a distinctive exemplar produced contrast (see also Nelson & Norton, 2005). It is interesting to note that it is not the case that priming with exemplars always makes very distinctive information accessible. In other research (Dijksterhuis, Spears, & Lépinasse, 2001), participants primed with a single exemplar showed behavioral contrast whereas participants exposed to a group of exemplars displayed assimilation. Presumably, this occurred because participants processing the group of exemplars formed a more diffuse, generalized impression of the group's common characteristics. Those considering only a single individual, however, only considered that person's distinctive traits. Because of this, the information made accessible by the group was less likely to be distinct and was more easily confused with participants' own thoughts about how to behave.

Knowledge that one has recently been exposed to a priming stimulus should also make individuals less likely to misattribute the information made accessible by the prime to their own thoughts about how to behave. Interestingly, because researchers have generally assumed that primes automatically elicit corresponding behavior (Dijksterhuis & Bargh, 2001), they have largely ignored the possibility of effortful correction in behavior priming. Although it might seem strange to consider correcting for the automatic tendency to move slowly (Bargh, Chen, & Burrows, 1996) or behave aggressively (Carver et al., 1983), this is quite likely to occur if behavior priming proceeds as outlined by the situated inference model. In fact, because many experimental procedures have participants effortfully think about a primed category (Aarts & Dijksterhuis, 2002), a specific exemplar (Dijksterhuis et al., 1998), or a group of exemplars (Haddock, Macrae, & Fleck, 2002), a subset of the contrast effects discovered in the behavior priming literature might be due to this correction process.

The behavior priming literature on applicability provides some support for this proposal. For example, although Shih, Ambady, Richeson, Fujita, and Gray (2002) found that subliminal primes more strongly affected participants who were members of a primed category, they also included a blatant priming condition in which participants saw the primes (e.g., "*TOKYO*," "*HONG KONG*," "*CHINATOWN*") for a full 1,000 ms. When this occurred, participants to whom the primes were applicable (Asian Americans) demonstrated behavioral contrast and performed worse on a math test than individuals exposed to neutral primes. Presumably, this occurred because these individuals knew the stereotype was applicable, suspected a potential influence of the blatant primes, and then (over)corrected, behaving less intelligently. The misattribution

process was prevented by correct labeling of the source of the prime-related information.

As already pointed out in the literature review, this is not an isolated finding. In fact, Aarts and Dijksterhuis (2002) directly manipulated applicability and found a similar pattern. In their research, thinking about distinct exemplars (such as very fast animals) produced contrast when the stimuli were perceived as similar to humans, presumably because participants were either correcting for the biasing influence of the primes or using the primes as a comparison standard. However, when the primed animals were instead described to participants as quite dissimilar from humans, behavioral assimilation was found. It appears that participants no longer felt that the primes were applicable and were no longer motivated to correct for the biasing information (i.e., thoughts of speed) introduced by perception of these stimuli. Conceptually identical results have been described in research using both trait (e.g., intelligence) and person-exemplar (e.g., "Einstein") primes (LeBoeuf & Estes, 2004).

Goal priming. We are unaware of any goal priming research that includes manipulations affecting how easily prime-related content is confused with one's own cognitive responses. Our model, however, suggests that the same basic factors discussed for construal and behavior priming should also moderate goal priming effects.

3. Effects of validity cues

According to the situated inference model, the information made accessible by a prime affects later judgments and behavior through its use in a subsequent decision-making process. Instead of having a direct effect, we propose that this prime-related mental content often serves as a source of information that people later use as evidence that they should judge an object a certain way, behave in some manner, or adopt a specific goal. Because of this, even accessible information that is both applicable to a judgmental target and easily confused with one's natural reaction toward this object only produces a priming effect when a person trusts this content and views it as a valid source of information. In contrast to models that assume that primes directly activate behaviors or goals, the situated inference model predicts that metacognitive judgments about the meaning and validity of thoughts are critical (see also Wheeler, DeMarree, & Petty, 2007). If one's thoughts are viewed as invalid, nondiagnostic, or otherwise inappropriate for use in the inference process, then priming will have no effect on subsequent judgment, behavior, or motivation.

Construal priming. Although not typically associated with the construal priming literature, other research on judgmental biases provides evidence that people use the *sense of ease* to determine whether accessible information should be used in making subsequent judgments. Schwarz et al. (1991) asked participants to recall either a large number (12) or a small number (6) of past instances in which they had behaved in an assertive manner. Although simple accessibility accounts would predict that having more examples of this behavior in mind should lead to greater judgments of assertiveness, this did not occur. Instead, participants who recalled few examples judged themselves to be more assertive than those who recalled many examples. It appears that participants used this accessible information as evidence for coming to a conclusion about their personalities. Because of this, the information only affected judgments when it was associated with feelings of ease and felt diagnostic and self-descriptive. Later work has indeed demonstrated that such effects are often due to increases in the perceived validity of the easily generated information (Tormala et al., 2002). Thus, people tend to have greater confidence in accessible content when it is easily generated, and this heightened sense of validity increases the impact of the information on subsequent judgments.

Other validity cues such as head movements can also alter the effects of accessible information on participants' judgments (Briñol & Petty, 2003). Participants were asked to either nod their head up and down (as if agreeing) or shake their head from side to side (as if disagreeing) while listening to a persuasive message. Although these manipulations did not influence the number or valence of thoughts generated in response to the message, they affected the confidence with which these thoughts were held. Nodding led participants to trust their thoughts but shaking led them to distrust them.

In support of the situated inference model, other work has demonstrated that these same processes can occur without conscious elaboration of the accessible content. In fact, attributional cues of validity can even affect information made accessible by subliminal primes. In research conducted by DeMarree, Briñol, and Petty (2005), participants were first subliminally primed with the trait of either hostility or peacefulness. They were then induced to either nod or shake their heads by following a vertically or horizontally moving ball on the computer screen during a three-minute task on "motor eye coordination." Participants then judged their feelings of hostility. Individuals who nodded their heads judged themselves to be more aggressive if they had been primed with hostile stimuli than with peaceful stimuli. Participants who shook their heads showed no effects of the primes. These effects presumably emerged because participants used their head movements as evidence regarding the veracity of the prime-related content. Research such as these head-nodding studies has been used in studies of "embodied cognition" to demonstrate that knowledge is not represented solely in abstract symbols.

Finally, research has recently demonstrated that the sense of validity induced by fluent processing can cause even objectively inapplicable primes to be used to inform judgments of a target individual (Häfner & Stapel, 2010). The researchers manipulated the processing fluency associated with a primed construct by embedding the primes within scrambled sentences that either rhymed or did not rhyme. Then, participants formed impressions of a target person whose behaviors could be interpreted in multiple ways. When the primes were processed fluently, their evaluative meaning was used to inform judgments of the target individual. When the primes were processed under more normal conditions (i.e., within sentences that did not

rhyme), the inapplicable primes had no effect on subsequent judgments.

Behavior priming. Recent work in our own lab provides some preliminary evidence that cues about the relevance of primed information can affect behavioral outcomes (Loersch & Payne, 2011b). We hypothesized that one possible outcome of a behavioral priming manipulation is an effect on the experience of recalling prime-related information. Because of the spreading of activation from semantic priming, participants should find it significantly easier to recall information related to the prime. This experience of ease, in turn, might serve as an attributional cue signaling that the recalled information is especially diagnostic for decisions about how to behave. To test these hypotheses, we first primed participants with words related to achievement and then had them spend five minutes recalling past occasions on which they had tried very hard to achieve. As expected, priming affected the rated ease of recall, such that achievement-primed participants found the task significantly easier than did participants primed with control words. In a subsequent study, we manipulated the experienced ease of the recall by having participants retrieve either four instances (easy recall condition) or 10 instances (difficult recall condition) of past achievement behavior. In line with our predictions, participants in the easy recall condition spent more time working on optional anagrams in an effort to get as high a score as possible. Thus, we showed that a traditional behavioral priming manipulation affects the subjective ease of recalling prime-relevant information, and that this validity cue (Tormala et al., 2002) is causally related to subsequent behavioral changes. As predicted by the situated inference model, only participants who associated the accessible information with the subjective sense of ease used it to inform their behavior.

In subsequent studies, we demonstrated that making thoughts appear more or less diagnostic had similar effects to those of subjective ease just outlined. For example, in one study, all participants recalled three occasions on which they had been highly motivated to clean some area or object. While they were recalling these instances, they also heard backward recorded speech and were told that the speech contained subliminal messages that would either make it especially easy or especially difficult for them to recall instances of motivated cleaning. We predicted that the recalled information in the easy condition would be nondiagnostic for later behavioral inferences because participants would feel that the speech had caused them to recall these instances. Telling participants that the speech would make it especially difficult to complete the recall task, however, should make these instances seem highly diagnostic for later decisions because they were recalled despite the speech's interference. After completing the recall task, participants' cleaning behavior was measured by giving them a color-by-numbers worksheet and measuring the percentage of crayons they used that were then picked up and placed back into the crayon box. As predicted, participants who felt that their thoughts were highly diagnostic (i.e., the difficult recall condition) displayed significantly more cleaning behavior than participants who viewed their thoughts as nondiagnostic (i.e., the easy recall condition).

Goal priming. If the situated inference model is correct, goal priming can occur through the same attributional inference process as occurs in construal and behavior priming, and should also be susceptible to manipulations such as those outlined in the previous sections. Although not from traditional priming procedures, recent work on the rebound of suppressed thoughts provides evidence for this proposal. If people try to avoid having a particular thought (e.g., "Don't think about a white bear"), the suppressed thought may come to mind more often than if it had not been suppressed at all (Wegner, Schneider, Carter, & White, 1987). According to Liberman and Förster (2000), this rebound occurs because participants "interpret the instructions to suppress, the difficulty experienced during suppression, and suppression failures as indicating a motivation to use the suppressed construct" (p. 199). That is, instructions to suppress thoughts lead to the inference, "If I'm finding it this difficult to suppress thoughts of a white bear, I must be motivated to think about them." Förster and Liberman (2001, Study 2) found that postsuppression rebound occurred only when participants felt that any thought intrusions they experienced were personally diagnostic. Participants listened to a tape recording of unintelligible speech while completing a thought suppression task (i.e., "Do not think of white bears"). Attributions for suppression failures were then manipulated, leading participants to believe that the speech would either encourage or prevent thought intrusions during the suppression task. For participants who felt that the intrusions might have been caused by an external source, these thoughts no longer led to an inference of a personal motivation to use the suppressed construct, so there was no postsuppression rebound. When participants instead thought that the external source was helping prevent thought intrusions, these thoughts became even more diagnostic for the motivational inference and the normal postsuppression rebound effect was magnified.

In addition to demonstrating that highly accessible information can be used as evidence for inferring personal motivation, this work also demonstrates that the process is affected by attributional cues of validity. For instance, in the experiment just cited (Förster & Liberman, 2001) all participants had the same information accessible (i.e., thoughts about a white bear), but only those who felt that the consequence of this accessibility (i.e., the suppression failure) was personally diagnostic used it to make a motivational inference. Such cues appear to affect more traditional forms of goal priming as well. Positive and negative affect, two variables shown in past work to influence thought validity (e.g., Briñol, Petty, & Barden, 2007; Schwarz & Clore, 1988, 2003), have received the most attention. For example, Custers and Aarts (2005) primed participants with a number of words related to completing number puzzles (e.g., "calculate," "logic," "number," "puzzle," "sequence") and then informed them that they would be able to work on a puzzle if enough time remained in the experiment. Because this opportunity would only be presented if participants worked quickly enough, the speed with which they moved through an earlier task was measured to determine their motivation to complete

the number puzzle. Critically, for half of the participants, these puzzle-related words were paired with positive stimuli during the priming induction. Although information related to completing the puzzle was accessible to all participants, only those for whom the primes were presented along with positive stimuli worked more quickly in an effort to get to the puzzle task. Thus, when participants were focused on how they wanted to behave (i.e., ''Do I want to hurry to get to the puzzle task?''), those who associated thoughts about the word search puzzle with a validity cue were more likely to use this information to inform their motivational state.

If such effects are due to the processes we propose, then not only should positive affect increase the perceived validity of accessible information, but negative affect should decrease participants' trust in this mental content (see Briñol et al., 2007). Other research supports this possibility, as pairing motivationally relevant primes with negative stimuli prevented participants from striving for previously desired goal states related to the primes (Aarts, Custers, & Holland, 2007). In this study, participants were primed with words related to socializing and were then given a chance to win a ticket to a ''student party'' if enough time remained at the end of the experiment. As in Custers and Aarts (2005), the socializing-related stimuli were paired with either negative or neutral stimuli during the priming task. As one might expect, those participants for whom negative stimuli and socializing-related words were coactivated took significantly more time to get to the student party ticket raffle task, providing evidence that they were less motivated to get a chance to socialize. Although all participants had information related to socializing accessible from priming, those who associated these primes with a cue of invalidity (i.e., negative affect) were less likely to use the information to inform their desires (see also Fishbach & Labroo, 2007).

Comparisons With Other Models

In general, our model shares a basic structure with other theories of misattribution effects. Although our review has focused on the influence of primes on construal, behavior, and motivation, the same analysis can apply to any question considered by a person. For instance, some situations might focus people on their internal states, affording the basic question, ''How do I feel?'' As outlined earlier, our perspective was most directly informed by prior work on the influence of mood on judgments. Research in this area has demonstrated both the operation of an affective misattribution mechanism (Schwarz & Clore, 1988, 2003) and the ability of individuals to use affective information to answer questions presented by the environment (Martin et al., 1997). Research on emotion has produced similar findings, demonstrating that a basic physiological state can serve as a source of information that is subsequently attributed to an emotional state (Barrett; 2006; Dutton & Aron, 1974). Mirroring our proposal that the meaning of conceptual information varies across situations, the research on emotion shows that the very same physiological state can produce unique emotions depending upon the affordances of the current environment (Schachter & Singer, 1962; Sinclair et al., 1994).

Similar attributional explanations have been put forward to account for the effects of processing fluency, which might serve as a general source of information that is easily misattributed to various targets. For example, mere exposure to a stimulus can lead individuals to infer that they like that stimulus (Bornstein & D'Agostino, 1994) or that previously experienced stimuli are aesthetically beautiful (Reber, Schwarz, & Winkielman, 2004). Similar manipulations of prior exposure can lead to both false memories and decreased recognition of previously seen information, depending upon the interpretation of a fluency experience (Whittlesea, 2002). A single manipulation of fluency might increase recognition judgments for a stimulus, increase its perceptual vividness, or decrease judgments of difficulty or background noise (Jacoby & Kelley, 1987). Thus, fluency experiences can be interpreted in many different ways, depending on the context, to produce a variety of downstream effects. Fluency experiences are thus affected by many of the same processes proposed by the situated inference model, with misattribution and the interpretive options afforded by the current situation playing critical roles.

Our perspective also shares some similarities with recent models in which primes affect behavior indirectly, through subjective construals. In particular, it has been proposed that, in some cases, primes shape perceptions of one's interaction partner (Herr, 1986; Smeesters et al., 2009), the nature of one's current situation (Kay & Ross, 2003; Kay et al., 2008), and self-perceptions (DeMarree, Wheeler, & Petty, 2005). These models share with ours the emphasis on subjective construal as a mediator of priming effects (see Smeesters, Wheeler, & Kay, 2010, for a review of indirect effects of primes on behavior). Our model differs from these, however, in our emphasis on attributional processes. Our model is also unique in its focus on the affordances of the situation as means by which a single prime may have multiple effects. Other models have posited that primes might have their effects via a number of indirect routes; the situated inference model attempts to identify principles for understanding when each route is likely to be relevant.

An alternative perspective

The most comprehensive account of the ''many effects of one prime'' problem to date is Bargh's (2006) review. Bargh's model proposes that priming a concept entails activating a complex array of ideas, scripts, motivations, action plans, and bodily responses, all of which are simultaneously and unconsciously activated in parallel. Which outcome is expressed in a study depends on which dependent variable the experimenter chooses to measure. In everyday life, these inputs are narrowed into a single serial set of outputs via selective attention, which is itself driven by the individual's goals.

Our model differs from Bargh's (2006) in at least two important ways. The first difference lies in the way a single prime can come to have many effects. In Bargh's model, the variety of effects can be traced to rich and complex

representations. In contrast, our model traces the variety of outcomes to the richness of the social environment. Whereas Bargh's model emphasizes internal complexity, ours emphasizes complexity in the world. Bargh's model is closely related to embodied cognition approaches, in which cognition is grounded in bodily states (e.g., action routines, sensory and motor processing; Barsalou, 2008; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). Our model is more closely related to situated cognition approaches, in which cognition is distributed not only across the brain and body, but also across the environment in which it unfolds (Clark, 1999).

A second difference between our model and Bargh's concerns when and how activated ideas are selected for the control of action. In the tradition of selective attention theories, Bargh's model is akin to "late selection" models (Deutsch & Deutsch, 1963). In late selection models, many streams of input are processed to a high level of semantic analysis in parallel, and attention serves a gating function that selects one among the many fully processed streams to gain access to consciousness or action. The situated inference model, in contrast, is akin to early selection models (Broadbent, 1958; Treisman, 1964). In early selection models, unattended information receives scant processing, and attentional selection is necessary for a stream of information to reach high-level analysis. In the situated inference model, affordances of the environment direct attention to some targets over others, and the focus of attention shapes the meaning of primed content early in processing.

It has been famously difficult to design a critical test to choose between early and late selection models of attention. Likewise, we do not expect a critical test to easily confirm one of these models of priming at the expense of the other. And, as in the case of attention models, it seems likely that both models may describe priming effects under certain boundary conditions (LaVie, 2008). In the interest of highlighting unique aspects of the situated inference model and generating new research, we next describe testable predictions that follow from our model that might not have been generated by these other perspectives.

Unique model predictions

One distinctive aspect of the situated inference model is our prediction that the attributions people make about the sources of primed cognitions should moderate effects of the primes. We recently documented that attributional processes can in fact modulate the influence of conceptual primes on behavior (Loersch & Payne, 2011a). In one study, we subliminally primed participants with the concept of either fast or slow while they completed a thought suppression task, and then measured reading speed. We also manipulated the likelihood of misattribution by telling participants that various aspects of the experimental procedure would make it especially easy or difficult to complete the suppression task. In the internal source/misattribution condition, participants were told that the flashing stimuli they saw during the task would interrupt any thoughts and make the suppression task especially easy. In this way, we encouraged any accessible content to be misattributed to participants' internal thoughts. In the external source condition, participants were instead told that the flashing stimuli would actively create thoughts and make the suppression task much more difficult. We thus encouraged any accessible content to be attributed to this external stimulus. Consistent with the predictions of the situated inference model, only those participants for whom internal misattributions were encouraged showed an effect of primes on reading speed. This held true even when comparing the behavior of these individuals with participants in a control condition who were subliminally primed with the same concepts during a surveillance task (scanning the flashing stimuli for the number 104). Thus, we found evidence that misattribution to an internal source was necessary to produce a behavioral priming effect.

The importance of attributions leads to a second prediction: The influence of accessible information should be limited by the specific target to which it is attributed. That is, by tagging the prime-related content as emerging from one particular source (e.g., "my own thoughts," "those flashing stimuli"), it should no longer be available for misattribution to another target. In this way our misattribution mechanism provides a natural means of "unpriming" a person (Sparrow & Wegner, 2006), eliminating future effects of the primed construct. Evidence for this prediction has recently been obtained (DeMarree & Loersch, 2009). In this research, we subliminally primed participants with a social stereotype (e.g., African Americans or Buddhist monks) and then had them spend two minutes thinking about either themselves (affording the basic question, "Who am I?") or their best friend (affording the question, "Who is he/she?"). Participants then rated their own hostility and that of their best friend. As we hypothesized above, the primes were selectively and uniquely misattributed to participants' thoughts about the individual on which they focused. For individuals who thought about themselves after priming, the primes were used to answer the question, "Who am I?" and influenced their self-perceptions, but not perceptions of the friend. In contrast, for those who focused on their best friend, the primes were used to answer the question "Who is he/she?" and influenced perceptions of the friend but not self-perceptions. Thus, although both individuals were applicable targets, the misattribution process prevented a general judgmental bias. Instead, participants misattributed the information made accessible by priming to their reaction toward the specific target of focus, and this stopped the prime from affecting judgments of the other applicable object.

These new studies provide evidence for two of our model's most unique principles. First, they suggest that attributions about the source of primed information are critical processes that moderate the effects of priming. Second, they provide evidence that even when the dependent variable is held constant across conditions, the focus of respondents' attention shapes how primed ideas are manifest.

Conclusions

As our review makes clear, a single priming event is capable of producing a variety of effects. When exactly will a prime cause one effect as opposed to another? The situated inference model suggests that a prime's separate effects on judgment (construal priming), action (behavior priming), and motivation (goal priming) can all be produced through the same basic process. In each case, the prime makes information accessible that is then used to answer some question or concern related to the current situation. If the situation calls for one to judge another object or individual, construal priming results. If the situation calls for a judgment about how to behave, behavior priming is observed, and if the situation calls for one to determine what they want or desire, goal priming takes place. Of course, if respondents are aware that the accessible information was activated by primes rather than their own response to the situation, they would not be inclined to use that information. Thus, priming effects are most likely to emerge under conditions that allow people to misattribute the primed information to their own thoughts, feelings, or impulses.

Using the framework provided by the situated inference model, we demonstrated in this review how it can make sense of a great deal of research, and how it potentially offers a unifying solution to the many effects of one prime problem. For these reasons, we believe that the situated inference model offers a generative perspective on priming and helps elucidate the basic cognitive processes that might contribute to the many effects of seemingly innocuous primes.

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The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Note

1. For other theories applying principles of misattribution to trait and behavior priming, see Clore (1992); Schwarz and Clore (1996); and Wheeler, DeMarree, and Petty (2007).

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