

Associative and Propositional Processes in Evaluation: An Integrative Review of Implicit and Explicit Attitude Change

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A central theme in recent research on attitudes is the distinction between deliberate, “explicit” attitudes and automatic, “implicit” attitudes. The present article provides an integrative review of the available evidence on implicit and explicit attitude change that is guided by a distinction between associative and propositional processes. Whereas associative processes are characterized by mere activation independent of subjective truth or falsity, propositional reasoning is concerned with the validation of evaluations and beliefs. The proposed associative–propositional evaluation (APE) model makes specific assumptions about the mutual interplay of the 2 processes, implying several mechanisms that lead to symmetric or asymmetric changes in implicit and explicit attitudes. The model integrates a broad range of empirical evidence and implies several new predictions for implicit and explicit attitude change.

Keywords: attitude change, cognitive consistency, dual-process models, evaluative conditioning, implicit measures

If eras of psychological research can be characterized in terms of general ideas, a major theme of the current era is probably the notion of automaticity. Many aspects of human behavior that have previously been assumed to have their roots in higher order processes of deliberate reasoning are now viewed as resulting from automatic processes that may occur spontaneously and outside of people’s awareness or control (Bargh, 1997; Moors & De Houwer, 2006). This perspective is also dominant in contemporary research on attitudes, in which deliberate, “explicit” attitudes are often contrasted with automatic, “implicit” attitudes (Greenwald & Banaji, 1995; Petty, Fazio, & Briñol, in press; Wilson, Lindsey, & Schooler, 2000; Wittenbrink & Schwarz, in press). Whereas the former are usually equated with deliberative, self-reported evaluations, the latter are typically inferred from people’s performance on response latency measures, such as the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) or sequential priming tasks (Fazio, Jackson, Dunton, & Williams, 1995; Wittenbrink, Judd, & Park, 1997).

Even though previous models effectively account for the differential impact of implicit and explicit attitudes on spontaneous and deliberate behavior (e.g., Fazio & Olson, 2003; Strack & Deutsch,

2004; Wilson et al., 2000), theories of attitude change still face a considerable asymmetry in integrating the available evidence. Contemporary models of persuasion have been very successful in explaining the influence of different kinds of message cues on self-reported explicit evaluations (Chen & Chaiken, 1999; Kruglanski & Thompson, 1999; Petty & Wegener, 1999; for a review, see Visser & Cooper, 2003). However, changes in implicit attitudes are still largely unexplained. This shortfall has its roots in at least two conceptual issues. First, several models of attitude change do not distinguish between implicit and explicit attitudes in the first place but treat attitudes as a unitary construct (e.g., Chaiken, Liberman, & Eagly, 1989; Kruglanski & Thompson, 1999; Petty & Cacioppo, 1986; Van Overwalle & Siebler, 2005). As such, these models leave an explanatory gap for any dissociation that may emerge between explicit and implicit attitudes. For instance, some studies have demonstrated changes in explicit but not implicit attitudes (e.g., Gawronski & Strack, 2004), whereas others found changes in implicit but not explicit attitudes (e.g., M. A. Olson & Fazio, 2006). If explicit and implicit attitudes indeed represent a unitary construct, changes in one kind of attitude should usually be associated with corresponding changes in the other kind of attitude. Second, most attitude change models that do distinguish between explicit and implicit attitudes consider implicit attitudes to be stable evaluative representations stemming from long-term socialization experiences. Explicit attitudes, in contrast, are conceived as more recently acquired attitudes that coexist with the old, presumptively stable, implicit attitude (e.g., Petty, Tormala, Briñol, & Jarvis, 2006; Wilson et al., 2000). These models can explain patterns that involve changes in explicit but not implicit attitudes (e.g., Gawronski & Strack, 2004). However, they leave an explanatory gap for the accumulating number of studies showing changes in implicit but not explicit attitudes (e.g., Dasgupta & Greenwald, 2001; Karpinski & Hilton, 2001; M. A. Olson & Fazio, 2006; for a review, see Blair, 2002). If implicit attitudes indeed reflect highly stable evaluative representations that have

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their roots in long-term socialization experiences (e.g., Dovidio, Kawakami, & Beach, 2001; Petty et al., 2006; Rudman, 2004; Wilson et al., 2000), implicit attitudes should generally be more robust than explicit attitudes.

The main goal of the present article is twofold. The first objective is to propose a new theoretical model for the study of explicit and implicit attitude change. The second objective is to provide an integrative, exhaustive review of the available evidence regarding implicit and explicit attitude change that is organized according to the implications of the proposed model (for a list of the reviewed studies, see the Appendix).¹ For this purpose, the first section of this article outlines our theoretical conceptualization of implicit and explicit attitudes. In particular, we argue that implicit and explicit attitudes should be understood in terms of their underlying mental processes, which are associative and propositional processes. The second section uses the proposed associative–propositional evaluation (APE) model as an organizing framework to review the available evidence on explicit and implicit attitude change. This section specifies causes of implicit and explicit attitude change and how changes in one kind of evaluation may or may not be associated with changes in the other. Finally, the last section discusses the relation of our model to other theories of attitude change, the relative stability of attitude changes, limits of a single-process approach, directions for future research, and some methodological issues related to the application of the proposed model.

Associative and Propositional Processes in Evaluation

The systematic investigation of implicit and explicit attitudes began with the development of measures that were particularly designed to assess individual differences in automatic evaluations (Greenwald & Banaji, 1995). Research on implicit attitudes relies on a large variety of measures, such as the Implicit Association Test (Greenwald et al., 1998), affective priming (Fazio et al., 1995), semantic priming (Wittenbrink et al., 1997), the go/no-go association task (Nosek & Banaji, 2001), the extrinsic affective Simon task (De Houwer, 2003a), and the affect misattribution paradigm (Payne, Cheng, Govorun, & Stewart, 2005). These measures have been reviewed extensively elsewhere (De Houwer, 2003b; Fazio & Olson, 2003; Wittenbrink & Schwarz, in press), and thus we refrain from an elaborate discussion of them. Instead, we focus on a more detailed discussion of the proposed model that is used as the organizing framework of this review. The APE model builds on earlier dual-process theories of cognitive functioning that distinguish between two qualitatively different kinds of mental processes (e.g., Bazerman, Tenbrunsel, & Wade-Benzoni, 1998; Kahneman, 2003; Lieberman, Gaunt, Gilbert, & Trope, 2002; Sloman, 1996; Smith & DeCoster, 2000; Strack & Deutsch, 2004). In particular, we argue that implicit and explicit attitudes should be understood in terms of their underlying processes, which can be described as associative processes for implicit attitudes and propositional processes for explicit attitudes. This conceptualization adopts the widespread definition of *attitude* as a psychological tendency to evaluate a given entity with some degree of favor or disfavor (see Eagly & Chaiken, 1993; Zanna & Rempel, 1988). However, the APE model goes beyond this definition by arguing that such evaluative tendencies can be rooted in two kinds of mental processes.

Associative Processes

The first source of evaluative tendencies resides in associative processes, which build the basis for what many researchers call *implicit attitudes*. Associative evaluations are best characterized as automatic affective reactions resulting from the particular associations that are activated automatically when one encounters a relevant stimulus. Such activation processes do not require much cognitive capacity or an intention to evaluate an object (Cunningham, Raye, & Johnson, 2004). The most important feature, however, is that associative evaluations are independent of the assignment of truth values. That is, associative evaluations can be activated irrespective of whether a person considers these evaluations as accurate or inaccurate. For example, the activation level of negative associations regarding African Americans may be high even though an individual may regard these associations as inadequate or false (Devine, 1989). Thus, associative evaluations are not personal in the sense that they are not necessarily personally endorsed (cf. Arkes & Tetlock, 2004). Instead, the primary determinants of association activation are feature similarity and spatio-temporal contiguity (Bassili & Brown, 2005; Smith & DeCoster, 2000).

Another important aspect of associative processes is the notion of pattern activation (see Smith, 1996). *Pattern activation* refers to the idea that the activation of particular associations in memory is determined by the relative fit between (a) the preexisting structure of associations in memory and (b) the particular set of external input stimuli. For example, the associative pattern activated by the stimuli *basketball* and *gym* may include concepts such as “bouncing” but not concepts such as “floating.” However, the associative pattern activated by the stimuli *basketball* and *water* may include concepts such as “floating” but not “bouncing.” In other words, even though the concept “basketball” is associated with both “bouncing” and “floating” in memory, which of the two becomes activated depends on the particular context in which the stimulus *basketball* is encountered (see Barsalou, 1982). Thus, applied to attitudes, the same object may activate different associative patterns and thus different automatic affective reactions depending on the particular context in which the object is encountered. Still, automatic affective reactions are not purely context driven, as pattern activation generally depends on both (a) the preexisting structure of associations in memory and (b) the particular set of external input stimuli.

Propositional Processes

The second source of evaluative tendencies comes from propositional processes, which build the basis for what many research-

¹ For the review part of this article, we used three general inclusion criteria: (a) A study must include at least one implicit attitude measure, (b) the implicit measure must tap a general evaluation rather than a semantic association, and (c) the study must include at least one experimental manipulation. Thus, the present review covers not only evidence on attitude change but also studies on attitude formation. In addition, the present review includes findings that may be considered as attitude shifts rather than attitude change. For the sake of simplicity, however, we generally use the term *attitude change* to refer to attitude formation, attitude change, and attitude shifts.

ers call explicit attitudes. Evaluations resulting from propositional processes can be characterized as evaluative judgments that are based on syllogistic inferences derived from any kind of propositional information that is considered relevant for a given judgment. Drawing on Strack and Deutsch (2004), such inferences are assumed to occur in a reflective system that is superordinate to an associative store. That is, the reflective system is assumed to transform inputs from the associative store into propositional format (e.g., a negative affective reaction is transformed into the proposition "I dislike X"). The resulting propositions are then subject to syllogistic inferences that assess their validity. Thus, the most important feature that distinguishes propositional from associative processes is their dependency on truth values. Whereas the activation of associations can occur regardless of whether a person considers the associations to be true or false, processes of propositional reasoning are generally concerned with the validation of evaluations and beliefs. Moreover, whether a given proposition is explicitly endorsed depends on its subjective validity, as determined by processes of propositional reasoning.

Applying this reasoning to attitudes, we argue that people usually use their automatic affective reactions toward an object as a basis for evaluative judgments about this object. In other words, the default mode of propositional reasoning is affirmation of validity (Gilbert, 1991; see also Albarracín & Wyer, 2001), in this case the validity of the propositional implication of an automatic affective reaction (e.g., the proposition "I dislike X" implied by a negative affective reaction toward X). However, evaluative judgments can also be independent of automatic affective reactions, when the propositional implications of these reactions are rejected as a valid basis for an evaluative judgment (see Strack, 1992).² Perceived validity of a proposition—and thus of the propositional implication of an automatic affective reaction—depends on the consistency of this proposition with other propositions that are momentarily considered to be relevant for the respective judgment. In the case of evaluative judgments, such propositions may include nonevaluative propositions referring to general beliefs about the world or propositional evaluations of other attitude objects (Bem, 1970; Jones & Gerard, 1967).³ If the propositional implication of an automatic affective reaction is consistent with other relevant propositions, it will most likely be considered as valid and thus serve as the basis for an evaluative judgment. If, however, the propositional implication of an automatic affective reaction is inconsistent with other relevant propositions, it may be considered invalid.⁴ For example, the propositional implication of a negative affective reaction to a minority member (e.g., "I don't like this African American person") may be inconsistent with the propositional evaluation of another attitude object (e.g., "It is bad to evaluate members of disadvantaged minority groups negatively") and nonevaluative propositions about the world (e.g., "African Americans are a disadvantaged minority group"). Hence, the resulting inconsistency among the three propositions may lead to a rejection of the negative affective reaction as a valid basis for an evaluative judgment. However, the negative affective reaction may still serve as basis for an evaluative judgment if either the nonevaluative proposition about the world is considered invalid (e.g., "African Americans are not a disadvantaged minority group") or the propositional evaluation of another relevant attitude object is rejected (e.g., "Negative evaluations of disadvantaged minority members are okay").⁵

Another important aspect of propositional reasoning concerns hypothetical propositions and mere knowledge of propositions. From the perspective of the APE model, hypothetical propositions can be described as propositions that are assigned truth values with a preliminary character. That is, a proposition becomes hypothetical because of the tentative character of its truth value rather than because of something special about its content. This view has important implications for how hypothetical propositions affect information processing. Consistent with previous research, we argue that merely entertaining a particular proposition increases the momentary activation level of corresponding associations in memory (e.g., Gregg, Seibt, & Banaji, 2006). Because the default mode of propositional thinking is an affirmation of momentarily activated associations (see Gilbert, 1991), mere supposition should, in turn, increase the perceived validity of this proposition (for a review, see Koehler, 1991). Similar considerations can be applied to mere knowledge of a proposition. From the perspective of the APE model, mere knowledge of a proposition reflects cases in which a person knows about a proposition endorsed by other people irrespective of whether this person considers this proposi-

² From the perspective of the tripartite model of attitudes (see Zanna & Rempel, 1988), one could argue that implicit attitudes (i.e., automatic affective reactions) represent the affective component attributed to attitudes, whereas explicit attitudes (i.e., evaluative judgments) are typically a joint product of both affective and cognitive components, with their relative influence depending on factors such as cognitive elaboration (e.g., Shiv & Nowlis, 2004) and propositional consistency (e.g., Judd & Lusk, 1984).

³ It is important to note that such other (evaluative or nonevaluative) propositions are also based on inputs from the associative store. The present model implies no independent storage of propositions in long-term memory (see also Deutsch & Strack, in press).

⁴ Wyer and Radvansky (1999) recently argued that people sometimes recognize the truth or falsity of a proposition spontaneously in the course of comprehending a proposition. In particular, these researchers argued that people spontaneously construct mental models of a proposition in the course of comprehending that proposition. If the constructed model is redundant with the content of a previously formed model, people spontaneously recognize the corresponding proposition as true. Moreover, if the constructed model does not match with a previously formed model, people assess the validity of the proposition by comparing the similarity of its mental model with previously formed models of the same predicate. Applied to the present question, it is important to note that Wyer and Radvansky postulated such spontaneous validation processes only for declarative propositions (e.g., events, episodes), not for evaluative propositions. Moreover, given that automatic affective reactions have their roots in spontaneously activated associations, these associations—by definition—represent a previously constructed model. As such, associative evaluations should spontaneously be considered as true, which is consistent with our assumption that people, by default, base their evaluative judgments on their automatic affective reactions, unless higher order processes of propositional reasoning lead to a rejection of the propositional implications of an associative evaluation (see also Deutsch, Gawronski, & Strack, in press; Gilbert, 1991).

⁵ These two cases are also reflected in contemporary theories of (explicit) prejudice, such that explicitly accepting the derogation of disadvantaged groups is considered a traditional form of prejudice, whereas denying discrimination is considered a modern form of prejudice (e.g., McConahay, 1986; Swim, Aikin, Hall, & Hunter, 1995; for a more detailed discussion, see Gawronski, Peters, & Brochu, 2005).

tion as true or false. We argue that mere knowledge of a proposition endorsed by other people can contribute to the activation of corresponding associations in memory even when a person does not believe in the validity of that proposition (Kawakami, Dovidio, & Dijksterhuis, 2003). For example, mere knowledge of a cultural stereotype may lead to automatic negative reactions toward the members of a disadvantaged minority group even when the stereotype is considered inaccurate (Devine, 1989). This assumption is supported by research showing that members of disadvantaged minority groups often exhibit automatic negative reactions toward their own in-group, particularly when they perceive the majority group to exhibit a high level of negativity against the minority group (e.g., Livingston, 2002). It is important to note that such automatic negativity against the in-group is often rejected on the propositional level, which leads to negative (rather than positive) correlations between personally endorsed evaluations and evaluations by others (cf. Heider, 1958). That is, higher levels of perceived negativity from out-groups lead to more negative evaluations of the in-group on the associative level but to more positive evaluations on the propositional level (Livingston, 2002).

Cognitive Consistency

According to the APE model, cognitive consistency is exclusively a concern of propositional reasoning (Gawronski, Strack, & Bodenhausen, in press). In particular, we argue that consistency results from a propositional process of consistency assessment that is based on the assignment of truth values and the application of syllogistic rules and logical principles.⁶ From a general perspective, two propositions are consistent with each other when both are regarded as true and one does not imply the opposite of the other. In contrast, two propositions are inconsistent when both are regarded as true and one follows from the opposite of the other (see Festinger, 1957). It is important to note that, because (in)consistency between two propositions cannot even be defined without an assignment of truth values, people have to resolve inconsistency by means of propositional reasoning—that is, either by changing the truth value of one proposition or by finding an additional proposition that resolves the inconsistency (Gawronski, Strack, & Bodenhausen, in press; Kruglanski, 1989). For example, if exposure to a minority member automatically activates negative associations, people either may reject the propositional implication of these associations because of its inconsistency with other accepted propositions (see above) or may find an additional proposition that resolves the inconsistency (e.g., “This African American person was unfriendly”). Whereas the former process refers to what has been described as negation (Gilbert, 1991), suppression (Wegner, 1994), and hierarchical inhibition (Bodenhausen & Macrae, 1998), the latter process may be described as rationalization (Festinger, 1957) or justification (Crandall & Eshleman, 2003; Dovidio & Gaertner, 2004). The important point is that whenever cognitive consistency issues arise, propositional reasoning is the mediating mechanism underlying the obtained evaluative outcomes.

Cognitive Elaboration

Cognitive elaboration, or the degree of active thought devoted to an attitude object, has long been assumed to be of paramount importance in attitude change (Greenwald, 1968; Petty, Ostrom, &

Brock, 1981). As with other models of implicit and explicit attitudes (e.g., Fazio & Olson, 2003; Wilson et al., 2000), the APE model also implies a crucial role of cognitive elaboration. Fazio and Olson (2003), for example, argued that cognitive elaboration is a crucial determinant of people’s success in suppressing the influence of automatic attitudes on evaluative judgments. In a similar vein, Wilson et al. (2000) argued that cognitive elaboration is a crucial determinant of people’s success in retrieving their explicit attitudes from memory. Thus, both models imply that the correlation between implicit and explicit evaluations should decrease as a function of increasing cognitive elaboration. Consistent with this assumption, Florack, Scarabis, and Bless (2001) showed that implicit racial prejudice as measured by the IAT was more strongly related to deliberative judgments about members of the relevant racial out-group to the extent that respondents were low in need for cognition (i.e., had a low dispositional tendency to engage in deliberative analyses; see Cacioppo, Petty, Feinstein, & Jarvis, 1996). In a similar vein, a recent meta-analysis by Hofmann, Gawronski, Gschwendner, Le, and Schmitt (2005) showed that correlations between the IAT and explicit measures significantly increased as a function of increasing spontaneity in the course of making a judgment.

The APE model similarly posits that increased elaboration often reduces the correlation between explicit and implicit attitudes. However, the APE model differs from previous accounts with regard to its assumptions about the underlying processes. As we have noted, these earlier accounts argued that cognitive elaboration influences success in suppressing automatic evaluations (Fazio & Olson, 2003) or in retrieving explicit attitudes from memory (Wilson et al., 2000). In contrast to these models, the APE model assumes that cognitive elaboration affects the complexity of propositional thinking by influencing how many judgment-relevant propositions one considers in addition to one’s automatic affective reaction (see Albarracín & Wyer, 2000; Kruglanski & Thompson, 1999). More extensive elaboration generally implies considering a greater number of propositions about the attitude object. To the extent that any of these additional propositions is inconsistent with the automatic evaluative response, the extra elaboration is likely to reduce the correlation between automatic affective reactions and evaluative judgments (e.g., Florack et al., 2001; Hofmann et al., 2005; see also Shiv & Nowlis, 2004).

It is important to note, however, that increased cognitive elaboration does not inevitably reduce the relation between explicit and implicit attitudes. According to the APE model, cognitive elaboration should reduce the relation between explicit and implicit attitudes only if additionally considered propositions question the validity of one’s automatic affective reaction as a basis for an evaluative judgment (see Judd & Lusk, 1984). However, if additionally considered propositions do not question the validity of one’s automatic affective reaction, the relation between explicit and implicit attitudes should be unaffected by cognitive elaboration. Moreover, if additionally considered propositions confirm the subjective validity of one’s automatic affective reaction, the rela-

⁶ The term *logical consistency* is intended to refer more broadly to subjective consistency resulting from any kind of inferential rule that is considered to be valid, rather than to strict logical consistency in terms of normative syllogistic rules.

tion between explicit and implicit attitudes should actually increase (rather than decrease) as a function of cognitive elaboration. For example, if increased cognitive elaboration identifies an additional proposition (e.g., “This African American person behaved in a hostile manner”) that resolves the inconsistency among a propositionally transformed affective reaction (e.g., “I don’t like this African American person”); other, nonevaluative propositions (e.g., “African Americans are a disadvantaged minority group”); and propositional evaluations of other attitude objects (e.g., “It is bad to evaluate members of disadvantaged minority groups negatively”), the relation between explicit and implicit attitudes should actually increase rather than decrease as a function of cognitive elaboration. In other words, whether the relation between explicit and implicit attitudes increases or decreases as a function of cognitive elaboration does not depend on the amount of cognitive elaboration per se; rather, it is a function of a consistency assessment regarding the momentarily considered set of propositions.

Attitudes as Online Constructions

Although attitudes have traditionally been regarded as stable evaluative representations of an attitude object residing in long-term memory, some researchers have argued that attitudes are not merely retrieved from memory but rather are constructed on the spot (e.g., Schwarz & Bohner, 2001; Tesser, 1978; Wilson & Hodges, 1992; see also Bassili & Brown, 2005). A similar assumption is also implied by the APE model. However, the notion of attitude construction has substantially different meanings for associative and propositional processes.

For propositional processes, attitudes can be considered to be constructed in that the propositional implication of one’s automatic affective reaction can be regarded as either true or false, depending on the other propositions that one simultaneously considers in forming an evaluative judgment. That is, changes in the set of momentarily considered propositions can influence whether the propositional implication of one’s automatic affective reaction is considered valid or invalid. As such, evaluative judgments resulting from propositional processes can be regarded as constructed because they are not determined a priori. Rather, the truth value of a given propositional evaluation depends on its consistency with the set of other propositions that are currently considered to be relevant, and this set may change as a function of various factors (e.g., cognitive elaboration). Notwithstanding these factors, however, there can nevertheless be a great deal of stability in evaluative judgments, to the extent that the set of relevant propositions that one considers in forming an evaluative judgment is consistent across contexts. Thus, even though evaluative judgments resulting from propositional processes can be regarded as constructed, the APE model does not preclude the possibility of attitudinal stability or rigidity on the propositional level.

For associative processes, attitudes might also be considered to be constructed. However, in contrast to the active notion implied for the construction of evaluative judgments, the construction process for associative evaluations is rather passive. As we have outlined, we argue that automatic affective reactions depend on processes of pattern activation in associative memory. Moreover, these processes of pattern activation depend on (a) external input stimuli and (b) the preexisting structure of associations in memory. As such, different sets of input stimuli may activate different

associative patterns for a given attitude object. Accordingly, the same attitude object may be evaluated differently as a function of the particular context in which it is encountered. This assumption is consistent with research showing that implicit attitudes are highly sensitive to the particular context in which an attitude object is encountered (e.g., Barden, Maddux, Petty, & Brewer, 2004; Schaller, Park, & Mueller, 2003; Wittenbrink, Judd, & Park, 2001). From this perspective, implicit attitudes, or associative evaluations, can be regarded as constructed on the spot because their activation depends not only on the preexisting structure of associations in memory but also on the particular set of input stimuli. As with evaluative judgments, however, associative evaluations can also be quite stable, such that they show a high level of temporal consistency if the activation patterns elicited when one encounters the attitude object are themselves robustly stable. A rotten egg will likely produce a negative affective reaction regardless of the particular context within which the offending egg is encountered. From a general perspective, temporal consistency of associative evaluations reflects the chronic or dispositional aspect that is often attributed to attitudes. We consider the issue of temporal stability of attitudes in more detail in the remainder of this article.

Unconscious Attitudes

A final foundational question concerns the potential unconsciousness of implicit attitudes. Some researchers have argued that implicit attitudes reflect unconscious evaluations of an attitude object, whereas explicit attitudes reflect their conscious counterparts (e.g., Banaji, Lemm, & Carpenter, 2001). This assumption has its roots in Greenwald and Banaji’s (1995) definition of implicit attitudes as “introspectively unidentified (or inaccurately identified) traces of past experience” (p. 5) that mediate overt responses. The APE model deviates from this contention. Although we do not rule out the possibility that certain affective reactions are below the threshold of experiential awareness (e.g., Winkielman, Berridge, & Wilbarger, 2005; see also Cleeremans & Jiménez, 2002), we assume that people generally do have some degree of conscious access to their automatic affective reactions and that they tend to rely on these affective reactions in making evaluative judgments (Gawronski, Hofmann, & Wilbur, in press; Schimmack & Crites, 2005). To be sure, they also sometimes reject these automatic evaluations as a valid basis for an evaluative judgment. As we have argued, whether people consider their automatic affective reaction to be a valid basis for an evaluative judgment depends on the consistency of this evaluation with other propositions that might be relevant for an evaluative judgment. These assumptions about the consciousness of implicit attitudes—or automatic affective reactions—are consistent with recent findings by LeBel and Gawronski (2006), who found that correlations between explicit and implicit attitudes significantly increased (from $r = .19$ to $r = .51$) when participants were asked to focus on their feelings toward the attitude object in the course of making an evaluative judgment (for similar findings, see Nier, 2005). If implicit attitudes are truly unconscious, such introspection instructions should leave correlations between explicit and implicit attitudes unaffected.

Summary

Figure 1 provides a schematic depiction of our assumptions regarding the interplay of association activation and propositional reasoning in evaluation. We argue that implicit attitudes reflect automatic affective reactions resulting from the particular associations that are activated automatically when a person encounters a relevant stimulus. Explicit attitudes, in contrast, should be conceived as evaluative judgments about an attitude object that have their roots in processes of propositional reasoning. The crucial difference between associative and propositional processes is their dependency on truth values. Whereas the activation of associations can occur regardless of whether a person considers these associations as true or false, processes of propositional reasoning are generally concerned with the validation of propositions. Thus, even though evaluative judgments are usually based on automatic affective reactions, they can also be independent of associative evaluations when the propositional implication of an automatic affective reaction is considered invalid. Such rejections may occur when the propositional evaluation implied by an automatic affective reaction is inconsistent with other propositions that are considered relevant for the evaluative judgment.

In the following sections, we discuss several factors that can influence association activation and propositional reasoning, thus leading to implicit or explicit attitude change. In this context, we also provide an integrative, exhaustive review of the available evidence on implicit and explicit attitude change, which is organized according to the various mechanisms implied by the APE model.

Implicit and Explicit Attitude Change

The conceptualization of implicit and explicit attitudes proposed by the APE model has a number of implications for attitude change. First, changes in each kind of evaluation can be due to

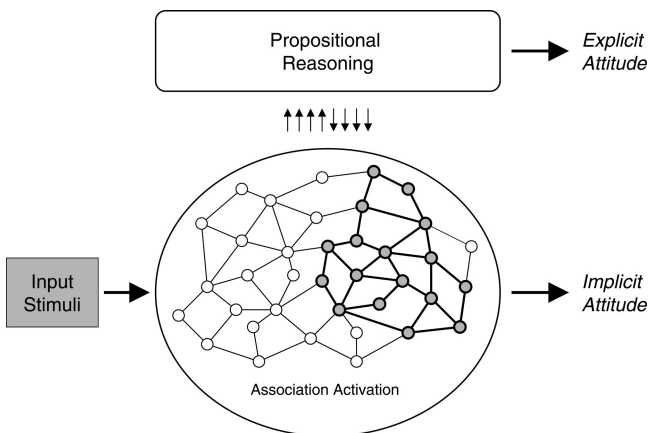


Figure 1. Schematic depiction of the interplay of association activation and propositional reasoning in explicit and implicit attitudes. Input stimuli are assumed to determine the pattern of associations that gets activated in memory (bold lines connecting dots), which in turn influences affective reactions reflected in implicit attitude measures. Processes of propositional reasoning are assumed to assess the validity of activated associations, which provides the basis for evaluative judgments reflected in explicit attitude measures.

several processes. Second, the particular interplay of associative and propositional processes may lead to various patterns of explicit and implicit attitude change. We start our review by discussing different causes of attitude change and then provide an overview of the potential interplay of implicit and explicit attitude changes.

Causes of Implicit Attitude Change

From the perspective of the APE model, changes in associative evaluations may reflect either (a) an incremental change in the associative structure or (b) a temporal change in the activation of preexisting patterns (Smith, 1996). Whereas the first case involves the learning of a new evaluation, the latter case reflects the differential activation of old evaluations that are already stored in associative memory.

Changes in associative structure. The prototypical case for implicit attitude changes resulting from changes in associative structure is evaluative conditioning (EC; for reviews, see De Houwer, Baeyens, & Field, 2005; De Houwer, Thomas, & Bayens, 2001; Walther, Nagengast, & Trasselli, 2005). Consistent with this notion, several studies demonstrated changes in implicit attitudes resulting from repeated pairings of an attitude object with positive or negative stimuli (e.g., Baccus, Baldwin, & Packer, 2004; Dijksterhuis, 2004; Hermans, Baeyens, Lamote, Spruyt, & Eelen, 2005; Hermans, Vansteenwegen, Crombez, Baeyens, & Eelen, 2002; Karpinski & Hilton, 2001; C. J. Mitchell, Anderson, & Lovibond, 2003; M. A. Olson & Fazio, 2001, 2002, 2006; Petty et al., 2006). M. A. Olson and Fazio (2001), for example, developed a conditioning paradigm in which several hundred randomly presented words and images were interspersed with critical pairings of positive or negative unconditioned stimuli (USs) with neutral conditioned stimuli (CSs). Results indicated that CSs paired with positive USs exhibited a more positive valence in an Implicit Association Test than CSs paired with negative USs. This finding was replicated in several follow-up studies that used a subliminal affective priming task as a dependent measure (M. A. Olson & Fazio, 2002) and pictures of Black and White individuals as CSs (M. A. Olson & Fazio, 2006).

Similar results were obtained by C. J. Mitchell et al. (2003), who found that the ostensible evaluative meaning randomly assigned to meaningless nonwords was subsequently reflected in implicit evaluations of these nonwords assessed with an Implicit Association Test. That is, nonwords that were randomly associated with a positive word showed a more positive implicit valence than nonwords that were randomly associated with a negative word.

With regard to social stimuli, Hermans et al. (2002) showed that formerly neutral faces (CS) that were associated with negative electrocutaneous stimulation (US) exhibited a more negative implicit valence in an affective priming task than when these faces were not associated with electrocutaneous stimulation. It is interesting to note that EC effects resulting from aversive stimulation did not differ from EC effects resulting from pairings with acoustically presented negative words. Hermans et al. (2005) obtained similar results using food stimuli as CSs and pleasant versus unpleasant odors as USs.

With regard to implicit self-evaluations, Dijksterhuis (2004) demonstrated that subliminal EC of self-related words can change implicit evaluations of the self. In particular, Dijksterhuis found that participants exhibited a higher level of implicit self-esteem

when self-related words (CS) were subliminally paired with positive adjectives (US) than when self-related words were subliminally paired with neutral words. These effects were consistent across different measures of implicit self-esteem (e.g., IAT, name letter effect). Baccus et al. (2004) obtained similar effects using a computer game that repeatedly paired self-relevant words (CS) with smiling, frowning, or neutral faces (US).

The notion of EC is also reflected in a study by Karpinski and Hilton (2001). These researchers found that implicit prejudice against older adults was influenced by repeated pairings of the words *youth* and *elderly* (CS) with positive and negative words (US). In particular, participants exhibited a lower level of implicit prejudice against older people in an Implicit Association Test when *youth* was repeatedly paired with negative words and *elderly* was repeatedly paired with positive words than when *youth* was repeatedly paired with positive words and *elderly* was repeatedly paired with negative words.

A special case of EC is represented by the creation of new associations between an attitude object and the self. Consistent with this notion, Walther et al. (2005) recently argued that the self can function as a US when it is "paired" with a neutral CS. Given that most people show positive evaluations of themselves (Bosson, Swann, & Pennebaker, 2000; Greenwald & Farnham, 2000; Koole, Dijksterhuis, & Van Knippenberg, 2001), the creation of a new association between an attitude object and the self should lead to more positive evaluations of the attitude object (e.g., Walther & Trasselli, 2003). It is important to note that, as the proposed conditioning process involves a mere associative transfer of self-evaluations to the attitude object, the resulting implicit attitude should depend on people's implicit self-evaluation such that implicit positivity toward the attitude object should increase as a function of implicit positivity toward the self.

Evidence for these assumptions can be found in a series of studies by Gawronski, Bodenhausen, and Becker (in press). Gawronski et al. found that choosing between two equally attractive pictures changed participants' implicit evaluations of these pictures, such that they evaluated chosen pictures more positively after than before the decision (see Brehm, 1956). Moreover, post-decisional associative evaluations were moderated by implicit self-evaluations, such that postdecisional positivity toward chosen pictures increased as function of participants' implicit positivity toward the self. It is important to note that this effect was independent of whether ownership resulted from participants' decision or from random assignment by the experimenter. In terms of the APE model, these results suggest that mere ownership can create an association between the owned object and the self, which then leads to an associative transfer of implicit self-evaluations to the object.

The notion of EC effects arising from new associations to the self is also consistent with research on implicit in-group favoritism. Using the minimal group paradigm (Tajfel, Billig, Bundy, & Flament, 1971), several researchers have found that minimal group settings are sufficient to induce an implicit preference for in-groups over out-groups (e.g., Ashburn-Nardo, Voils, & Monteith, 2001; Castelli, Zogmeister, Smith, & Arcuri, 2004; DeSteno, Dasgupta, Bartlett, & Caidric, 2004; Otten & Wentura, 1999; Pratto & Shih, 2000). Given that participants usually have little or no declarative knowledge regarding such minimal groups, this finding may appear somewhat surprising. From the perspective of EC,

however, one could argue that minimal group settings are sufficient to create an association between the new in-group and the self, which, in turn, should lead to an associative transfer of implicit self-evaluations to the new in-group (see also Cadinu & Rothbart, 1996; Gramzow & Gaertner, 2005; Greenwald & Banaji, 1995; Otten & Wentura, 2001; for a review, see Otten, 2003). Thus, given that most people's implicit self-evaluation is highly positive (Bosson et al., 2000; Greenwald & Farnham, 2000; Koole et al., 2001), the association between self and in-group may be sufficient to produce an implicit preference for in-groups over out-groups in minimal group settings.

Changes in pattern activation. A second cause for changes in associative evaluations is represented by changes in pattern activation. Such changes should occur when simple context cues are sufficient to influence which pattern of associations is activated for an already familiar attitude object. These cases differ from incremental changes in associative structure (e.g., by means of EC), such that no pairing with evaluative information is required to change implicit attitudes. Instead, changes in pattern activation presuppose (a) that the attitude object is already represented in a multifaceted manner and (b) that the presence of particular context cues activates different associative patterns reflecting different subsets of this representation.

A first set of studies that is consistent with the notion of differential pattern activation is concerned with the effects of momentarily accessible group members. Dasgupta and Greenwald (2001), for example, found that implicit prejudice against African Americans was lower when participants were presented with pictures of admired Blacks and disliked Whites before they completed an implicit prejudice task than when they were presented with pictures of disliked Blacks and admired Whites. Drawing on basic assumptions by the APE model, we argue that the presentation of familiar exemplars activates different patterns of the preexisting associative structure related to Black and White people, which, in turn, influences participants' associative evaluation of Black and White people in general. Because the pictures used in Dasgupta and Greenwald's studies generally depicted highly familiar individuals (e.g., Michael Jordan, Tom Cruise), it seems likely that these pictures led to changes in the activation of already existing patterns rather than to changes in the underlying associative structure. This interpretation can also be applied to findings by Rudman and Lee (2002), who found that exposure to violent rap music led White participants to show more negative associative evaluations of Black people. In terms of the APE model, exposure to violent rap music may activate a particular associative pattern of participants' representation of Black people. If this pattern involves a more negative evaluation of Black people, mere exposure to violent rap music may be sufficient to enhance implicit prejudice against African Americans.

Similar findings were obtained by J. P. Mitchell, Nosek, and Banaji (2003). These researchers found that associative evaluations elicited by well-known individuals depended on whether these individuals were categorized in terms of their race or other applicable categories (e.g., occupation). For example, Michael Jordan elicited a positive associative evaluation when he was categorized as an athlete but a negative associative evaluation when he was categorized as African American. These effects were obtained when categorization was manipulated by the category labels in an IAT (Greenwald et al., 1998) or by the salience of

categories in a go/no-go association task (Nosek & Banaji, 2001). It is important to note that the targets used by J. P. Mitchell et al. were all highly familiar individuals. In other words, participants already had a representation of these individuals in their associative memory, but the particular category applied to these individuals influenced which of the associative patterns got activated.

Particularly interesting with regard to the present question is research showing that simply increasing the salience of group categories can influence subsequent associative evaluations (e.g., Kühnen et al., 2001; Pratto & Shih, 2000; J. R. Steele & Ambady, 2006). In a study by Kühnen et al. (2001), for example, German participants were primed with the two subcategories *East German* and *West German* and then completed an IAT designed to assess implicit preference for West Germans over East Germans. Overall, the social stereotype of East Germans tends to be negative, whereas the social stereotype of West Germans tends to be positive. Results indicate that participants exhibited a stronger preference for West Germans over East Germans when they were primed with the two subcategories than when they were not primed with the two subcategories. It is interesting that this effect emerged for both East German and West German participants. Hence, activation of the in-group and out-group categories led to more or less favorable associative evaluations of the in-group, depending on the particular valence of in-group-related associations. Because Kühnen et al.'s priming procedure involved a neutral category prime rather than direct priming of positive or negative stereotypes, these results are consistent with the notion of differential pattern activation. If the two subcategories were not already associated with positive or negative stereotypes in associative memory, simple category priming should leave associative evaluations unaffected. This interpretation is also applicable to a finding by J. R. Steele and Ambady (2006), who found that women showed more gender-stereotypical implicit attitudes toward arts versus math (i.e., stronger preference for arts over math) when they were primed with gender categories than when they were primed with gender-neutral categories.

Additional evidence for changes in pattern activation comes from Wittenbrink et al. (2001), who found that automatic affective reactions elicited by African American individuals were less negative when the individuals were presented in a positive context (e.g., family barbeque) than when they were presented in a negative context (e.g., gang incident). These results indicate that the associative pattern that is activated by a given individual can differ as a function of the context in which this individual is encountered. In the present case, one could argue that the associative representation of African Americans is ambivalent, such that African Americans are associated with both positive and negative aspects. However, which of these aspects gets activated depends on the particular context in which an African American individual is encountered.

An interesting extension of Wittenbrink et al.'s (2001) research was recently presented by Barden et al. (2004; see also Maddux, Barden, Brewer, & Petty, 2005). These researchers showed that not the context per se but the social role within a particular context led to changes in automatic evaluations. In one study, for example, Barden et al. found that a Black person presented in a prison context elicited automatic negative reactions when this person was presented with dress suggesting the role of a prisoner. However, the same Black person elicited automatic positive reactions when

presented with dress suggesting the role of a lawyer. As with Wittenbrink et al.'s (2001) findings, these results indicate that different context cues influence which associative pattern will be activated for a particular attitude object and that such differences in pattern activation can lead to different associative evaluations of the same attitude object. Most important, such changes in pattern activation seem to be capable of reversing the automatic activation commonly attributed to implicit prejudice (see Devine, 1989; Fiske, 1998), such that the same Black person may activate either a negative or a positive associative evaluation depending on the social role in which this person is encountered.

Another study that can be interpreted in terms of differences in pattern activation was conducted by Lowery, Hardin, and Sinclair (2001). These researchers found that mere interaction with an African American experimenter was sufficient to reduce negative associative evaluations of African Americans. It is interesting to note that this effect emerged for European Americans but not for Asian Americans. Even though we cannot rule out the possibility that positive interactions with an African American experimenter may be sufficient to change participants' associative structure (e.g., by means of EC), it is quite difficult to explain why this effect should emerge only for European Americans, not for Asian Americans (given that the affective quality of the interaction was equal across the two groups of participants). An alternative explanation in terms of the present model is that European Americans and Asian Americans differ with regard to their preexisting associative representation regarding African Americans, such that European Americans' associative representation is more heterogeneous than Asian Americans' associative representation. Hence, interacting with an African American experimenter may activate an evaluatively different pattern of associations for European Americans, whereas the patterns activated in Asian Americans may be less affected by individual interactions.

Additional evidence for changes in pattern activation comes from research on social roles. Richeson and Ambady (2003) demonstrated that anticipated superior and subordinate roles in dyadic interactions with an African American individual influenced participants' associative evaluations of African Americans in general. In particular, White participants showed more negative associative evaluations of African Americans when they anticipated being in a superior role than when they anticipated a subordinate role (see also Richeson & Ambady, 2001). However, situational roles had no influence on associative evaluations of African Americans when participants expected to interact with a White person. From the perspective of the APE model, one could argue that anticipated social roles in interactions with African Americans increased the salience of particular aspects of participants' associative representation of African Americans. Because Richeson and Ambady's (2003) participants only anticipated, rather than actually engaged in, social interaction, it seems unlikely that participants formed completely new associative evaluations. Instead, anticipated roles might have activated those patterns of the preexisting associative representation that provided the best fit to the anticipated role.

Several studies have also shown that differences in the interpretation of abstract category labels can change affective responses on the IAT (e.g., Foroni & Mayr, 2005; Govan & Williams, 2004). Govan and Williams (2004), for example, found that the often demonstrated implicit preference for flowers over insects could be reversed when the stimuli in the IAT were unpleasant flowers (e.g.,

skunkweed) and pleasant insects (e.g., butterfly). According to Govan and Williams, the particular stimuli in the IAT determine how respondents interpret the respective categories, thus influencing their affective reactions to flowers and insects in general. This interpretation is also consistent with research by Feroni and Mayr (2005), who found that the preference for flowers over insects could be attenuated by a fictional scenario implying a reversal of the typical category evaluations. In their study, participants were asked to imagine a post-nuclear war scenario in which flowers were generally contaminated and insects were the only kind of harmless food available. From the perspective of the APE model, these results suggest that different exemplars (Govan & Williams, 2004) or fictional scenarios (Feroni & Mayr, 2005) may be sufficient to activate different associative patterns, thus leading to different associative evaluations of flowers and insects.

A particularly interesting case of changes in pattern activation comes from research on motivational states. Ferguson and Bargh (2004), for example, demonstrated that automatic associative evaluations of an attitude object differed as a function of the object's relevance for goal pursuit. Objects were evaluated more positively when they were relevant than when they were irrelevant for goal pursuit (see also Brendl, Markman, & Messner, 2003). Similar findings were reported by Sherman, Rose, Koch, Presson, and Chassin (2003), who showed that nicotine deprivation led to more positive associative evaluations of cigarettes in heavy smokers. However, light smokers showed more positive associative evaluations of cigarettes when they had just smoked a cigarette than when they were deprived. Taken together, these results indicate that associative evaluations depend not only on external input stimuli but also on internal motivational states. Moreover, given the transient nature of motivational states, these influences are likely to result from differences in pattern activation rather than from genuine differences in the underlying associative structure.

Another interesting line of research concerns the effect of emotional states on automatic associative evaluations. In a study by DeSteno et al. (2004), for example, anger but not sadness enhanced automatic negative evaluations of out-groups. According to DeSteno et al., these differences were due to the functional relevance of anger, in contrast to sadness, to intergroup conflict. This interpretation is also consistent with findings by Schaller et al. (2003), who showed that ambient darkness enhanced automatic negative evaluations of African Americans for participants with chronic beliefs in a dangerous world but not for participants who did not believe in a dangerous world. Similar differences were reported by Gemar, Segal, Sagrati, and Kennedy (2001), who found that recently recovered depressed patients showed more negative associative self-evaluations under sad mood as compared with control conditions. For never-depressed control participants, in contrast, mood had no effect on associative self-evaluations. Taken together, these results suggest that associative evaluations depend on emotional as well as motivational states. Moreover, as with transient motivational states, these influences are likely to result from differences in pattern activation rather than from genuine differences in the underlying associative structure.

Directly related to the notion of emotional states is a finding by Frantz, Cuddy, Burnett, Ray, and Hart (2004). These researchers found that implicit prejudice scores on the IAT were generally higher when the task was introduced as a diagnostic instrument for the assessment of racism. This finding is consistent with the claim

that increased arousal enhances dominant responses (Hull, 1943; Zajonc, 1965). That is, one could argue that automatic associations reflect a particular kind of dominant response (e.g., Lambert et al., 2003). Moreover, the diagnosticity instructions used by Frantz et al. (2004) are quite likely to result in evaluation apprehension, which typically increases arousal. This arousal, in turn, may enhance dominant responses, in this case the activation level of automatic associations. If this interpretation is correct, any kind of evaluation apprehension or arousal should enhance IAT effects, and this increase should emerge irrespective of whether the task is designed to assess implicit prejudice or any other kind of dominant response (e.g., implicit preference for flowers over insects).

Causes of Explicit Attitude Change

As with changes in implicit attitudes, changes in explicit attitudes can be due to a number of processes. According to the APE model, changes in evaluative judgments can be due to (a) a change of the associative evaluation of the attitude object, (b) a change in the set of propositions that are considered to be relevant for an evaluative judgment, or (c) a change in the strategy used to achieve consistency within a given set of propositions.

Changes in associative evaluation. The first kind of explicit attitude change involves instances in which incremental changes in the associative structure or temporal changes in the activation of associative patterns lead to a change of the associative evaluation of the attitude object. Because people tend to base their evaluative judgments on their automatic affective reactions, such changes in associative evaluations may, in turn, lead to corresponding changes in evaluative judgments.

With regard to changes in associative structure, a number of studies on EC have demonstrated that repeated pairings of CSs and USs influence subsequent evaluative judgments of the CSs. This research has been reviewed extensively elsewhere (De Houwer et al., 2001, 2005; Walther et al., 2005), and thus we refrain from an elaborate discussion of the relevant evidence. From the perspective of the APE model, however, it is important to note that processes of EC should not directly influence evaluative judgments. Rather, the influence of EC on evaluative judgments should be mediated by associative evaluations, which, in turn, influence evaluative judgments (see also De Houwer et al., 2001, 2005). This assumption has a number of important implications, which we discuss in more detail in the context of the interplay between explicit and implicit attitude changes.

As with changes in associative structure, temporal changes in the activation of preexisting associative patterns can lead to corresponding changes in evaluative judgments. That is, one could argue that any context stimulus that leads to a change in pattern activation should influence the associative evaluation of an attitude object, which, in turn, may further influence corresponding evaluative judgments. As with the case of EC, however, it is important to note that such changes in evaluative judgments do not reflect a direct influence of context stimuli on evaluative judgments. Rather, such influences should also be mediated by associative evaluations.

Evidence for explicit attitude changes resulting from differences in pattern activation comes from studies showing that recently encountered members of a social group influence judgments about the group in general (e.g., Bless, Schwarz, Bodenhausen, & Thiel,

2001; Bodenhausen, Schwarz, Bless, & Wänke, 1995; Gawronski, Bodenhausen, & Banse, 2005; Henderson-King & Nisbett, 1996; Sia, Lord, Blessum, Thomas, & Lepper, 1999; Wilder, Simon, & Faith, 1996). From a general perspective, this research has demonstrated that participants evaluated a social group more negatively when they had recently encountered a negatively evaluated exemplar of the group. In contrast, participants evaluated the same group more positively when they had recently encountered a positively evaluated exemplar. Findings such as these are consistent with the assumption that recently encountered group members influence the associative pattern that gets activated for the group. Such changes in pattern activation should influence the associative evaluation of the group (e.g., Dasgupta & Greenwald, 2001), which, in turn, may serve as a basis for evaluation judgments about the group.

Changes in the set of considered propositions. The second kind of influence on evaluative judgments involves changes in the set of propositions that are considered to be relevant for an evaluative judgment. According to the APE model, this may be the case when either (a) the acquisition of new propositional beliefs about the world or (b) the additional consideration of already familiar propositions implies a change in the evaluation of an attitude object.

The first case is probably best reflected in research on persuasion (for reviews, see Chen & Chaiken, 1999; Petty & Wegener, 1999). In studies of persuasion, participants are usually exposed to a persuasive message containing either strong or weak arguments about an attitude object and different kinds of peripheral or heuristic cues, such as the expertise of the source, the likability of the source, or consensus information. A well-replicated finding is that under conditions of low cognitive elaboration, attitudes are more likely to be influenced by peripheral or heuristic cues rather than by the quality of the arguments (but see Kruglanski & Thompson, 1999). Under conditions of high elaboration, in contrast, attitudes are more likely to be influenced by the quality of arguments, whereas the influence of peripheral or heuristic cues is often (but not always) attenuated. From the perspective of the APE model, persuasive arguments are—by definition—propositional statements and thus should influence attitudes primarily by processes of propositional reasoning. In other words, exposing participants to persuasive arguments may add new propositions to the set of propositions that are considered to be relevant for an evaluative judgment. If such changes in the set of considered propositions imply a different evaluation of a given attitude object, exposure to persuasive arguments is quite likely to lead to explicit attitude change. However, if the changes in the set of considered propositions do not imply a different evaluation, exposure to persuasive arguments should not lead to explicit attitude change. We come back to this question in more detail when we compare the APE model with persuasion models of attitude change.

The second case is represented by instances in which the additional consideration of already familiar propositions implies a change in evaluative judgments about an attitude object (see Judd & Lusk, 1984). Evidence for this kind of influence comes from research on mere thought (Tesser, 1978) or introspection (Wilson, Dunn, Kraft, & Lisle, 1989). Studies in these areas have demonstrated that merely thinking about an attitude object or introspecting about the reasons for an evaluation can change evaluative judgments about the object. From the perspective of the APE

model, mere thought or introspection about reasons is likely to add new propositions to the set of propositions that are considered to be relevant for an evaluative judgment. If such additionally considered propositions imply a different evaluation, mere thought and introspection should change evaluative judgments about the attitude object. If, however, additionally considered propositions confirm the original evaluation, enhanced thinking about an attitude object should leave evaluative judgments unaffected (or lead to attitude polarization; see Tesser, 1978). These assumptions are consistent with research showing that introspection about the reasons, but not introspection on feelings, leads to changes in evaluative judgments about an attitude object (e.g., Millar & Tesser, 1986; Wilson & Dunn, 1986).

Changes in the strategy to achieve consistency. The third kind of change in evaluative judgments involves changes in the strategy to achieve consistency. This kind of influence is prototypically reflected in research on cognitive dissonance. According to Festinger (1957), two cognitions are dissonant when, considered by themselves, one of them follows from the opposite of the other. Conversely, two cognitions are consonant when one of them does not follow from the opposite of the other. Because the notion of logical implication presupposed in this definition requires an assignment of truth values, cognitive dissonance can be regarded as an inherently propositional phenomenon. Consistent with this claim, Gawronski and Strack (2004) recently argued that both the causes of cognitive dissonance and the process of dissonance reduction are inherently propositional. With regard to the causes of cognitive dissonance, Gawronski and Strack argued that cognitive inconsistency—and thus cognitive dissonance—arises when two propositions are regarded as true and one follows from the opposite of the other. With regard to the process of dissonance reduction, Gawronski and Strack argued that people resolve cognitive inconsistency—and thus cognitive dissonance—either by explicitly rejecting one of the inconsistent propositions as false or by finding an additional proposition that resolves the inconsistency (see also Gawronski, Strack, & Bodenhausen, in press; Kruglanski, 1989).

The latter process of resolving the inconsistency between propositions is particularly relevant for the present question of explicit attitude change. Changes in evaluative judgments may occur when people resolve the inconsistency within a set of relevant propositions by rejecting the propositional implications of an associative evaluation. However, people may not change their evaluative judgments about an attitude object when they find an additional proposition that resolves the inconsistency. These cases are well reflected in Festinger and Carlsmith's (1959) induced compliance paradigm, in which counterattitudinal behavior leads to explicit attitude change only when participants do not have a situational explanation for their counterattitudinal behavior (i.e., when they reject the propositional implications of their associative evaluations), not when they can justify their counterattitudinal behavior with situational factors (i.e., when they find an additional proposition that resolves the inconsistency between their counterattitudinal behavior and the propositional implication of their associative evaluations). Moreover, these processes of achieving consistency may be affected by various moderators (e.g., Harmon-Jones, Brehm, Greenberg, Simon, & Nelson, 1996; Stalder & Baron, 1997; C. M. Steele & Lui, 1983; Stone & Cooper, 2003; for a review, see J. M. Olson & Stone, 2005), such that these moder-

ators may influence (a) which propositions within a given set of relevant propositions are considered as valid or (b) which other propositions may be considered relevant in addition to the central propositions we have discussed.

Interplay of Explicit and Implicit Attitude Change

It is important to note that the different kinds of influences on associative and propositional processes do not occur in isolation. Rather, changes in associative and propositional processes may or may not affect each other, thus leading to different patterns of explicit and implicit attitude change. Figure 2 depicts the general model that is used as a framework for discussing different patterns of explicit and implicit attitude change. According to the APE model, a given factor may influence the activation of associations in memory or processes of propositional reasoning (or both). Moreover, propositional reasoning may or may not lead to a rejection of the propositional implication of an associative evaluation, determining whether evaluative judgments will be influenced by automatic affective reactions. Finally, processes of propositional reasoning may or may not influence the activation of associations in memory, thus determining the associative evaluation of an attitude object. In other words, a given factor may influence explicit attitudes either directly or indirectly via changes in implicit attitudes. Conversely, a given factor may influence implicit attitudes either directly or indirectly via changes in explicit attitudes. As such, the APE model implies several patterns of how changes in one kind of evaluation may or may not be mediated by changes in the other kind of evaluation (i.e., no mediation, partial mediation, full mediation; see Baron & Kenny, 1986).

In the following sections, we discuss the various patterns of explicit and implicit attitude change implied by the APE model and how these cases are reflected in previous research on explicit and implicit attitude change (see Table 1). In this context, we also outline some new predictions that have not yet been subjected to empirical tests and thus may stimulate further research under the framework of the APE model. For each of the theoretical cases, we present a diagram to convey the key aspects of the case. In these diagrams, the relation between associative and propositional processes is conveyed by arrows; solid arrows reflect a causal influence, whereas open arrows reflect a lack of influence.

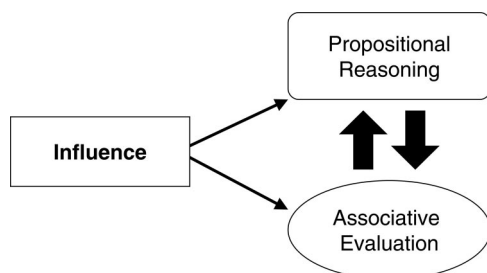


Figure 2. Processes underlying explicit and implicit attitude change, depicting potential direct and indirect influences on associative evaluations as determinants of implicit attitudes and propositional reasoning as determinants of explicit attitudes. Thin arrows depict direct effects on associative evaluations and propositional reasoning, whereas fat arrows depict indirect effects.

Case 1. The intuitively simplest case involves a direct influence on associative evaluations, which, in turn, provide the basis for evaluative judgments (see Figure 3). This pattern implies corresponding changes in implicit and explicit attitudes, with changes in explicit attitudes being fully mediated by changes in implicit attitudes. According to the APE model, such patterns should emerge when (a) a given factor leads to a change in pattern activation or associative structure and, additionally, (b) associative evaluations are consistent with the momentarily considered set of subjectively valid propositions.

An example fitting this pattern can be found in research on EC. Studies in this area have consistently shown that repeated CS-US pairings influence subsequent CS evaluations (for reviews, see De Houwer et al., 2001, 2005; Walther et al., 2005). Whereas previous studies have shown EC effects primarily for evaluative judgments, recent research using both explicit and implicit measures has demonstrated parallel effects for associative evaluations and evaluative judgments (e.g., Hermans et al., 2002; M. A. Olson & Fazio, 2001). M. A. Olson and Fazio (2001), for example, found corresponding influences of EC on both explicit and implicit attitudes, with the two being highly correlated. Most important, a reanalysis of M. A. Olson and Fazio's (2001) data revealed that changes in explicit attitudes were fully mediated by corresponding changes in implicit attitudes. That is, EC effects on explicit attitudes decreased to nonsignificance after the researchers controlled for implicit attitudes (M. A. Olson, personal communication, April 5, 2004). Moreover, changes in implicit attitudes were not mediated by explicit attitudes, as suggested by a significant effect of EC on implicit attitudes after the researchers controlled for explicit attitudes (M. A. Olson, personal communication, January 4, 2006). In other words, EC changed the associative representation of the attitude object, which then led to corresponding changes in evaluative judgments.

A similar pattern can be assumed for in-group favoritism in minimal group settings (Tajfel et al., 1971). As we have already outlined, previous research has consistently shown that minimal group settings are sufficient to induce a preference for in-groups over out-groups (for a review, see Hewstone, Rubin, & Willis, 2002). As with research on EC, such effects were originally demonstrated for explicit attitudes. Recent research found similar effects for implicit attitudes (e.g., Ashburn-Nardo et al., 2001; Castelli et al., 2004; DeSteno et al., 2004; Otten & Wentura, 1999; Pratto & Shih, 2000). Even though there is no evidence for a particular pattern of mediation available yet, the APE model implies that minimal group situations may change associative evaluations of the in-group, which then provide a basis for evaluative judgments about the in-group. That is, minimal group settings may create an association between the new in-group and the self. The associative evaluation of the self may then transfer to the new in-group (see also Cadinu & Rothbart, 1996; Gramzow & Gaertner, 2005; Greenwald & Banaji, 1995; Otten & Wentura, 2001). Given that most people have positive associative evaluations of the self (Bosson et al., 2000; Greenwald & Farnham, 2000; Koole et al., 2001), this evaluative transfer should lead to more positive associative evaluations of the in-group as compared with the out-group. Moreover, because evaluative judgments are usually based on the propositional implications of associative evaluations, this associative transfer of evaluations should lead to in-group favoritism not only for associative evaluations but also for evaluative judgments.

Table 1
Patterns of Implicit and Explicit Attitude Change and Their Conditions

Case	Theoretical description	Implicit attitude change	Explicit attitude change	Mediation pattern	Conditions of applicability	Example
1	Indirect influence on propositional reasoning mediated by direct influence on associative evaluation	Yes	Yes	Explicit attitude change fully mediated by implicit attitude change	Factor leads to change in pattern activation or associative structure; associative evaluations are consistent with momentarily considered set of subjectively valid propositions	Evaluative conditioning without contingency awareness
2	Direct influence on associative evaluation with neither direct nor indirect influence on propositional reasoning	Yes	No	No mediation; no relation between explicit and implicit attitudes	Factor leads to change in pattern activation or associative structure; associative evaluations are inconsistent with momentarily considered set of subjectively valid propositions	Evaluative conditioning with contingency awareness
3	Direct influence on propositional reasoning with neither direct nor indirect influence on associative evaluation	No	Yes	No mediation; no relation between explicit and implicit attitudes	Factor provides a basis for new propositions for propositional reasoning; propositional reasoning leads to retroactive negation of (old) associative evaluation	Cognitive dissonance resulting from counterattitudinal behavior
4	Indirect influence on associative evaluation mediated by direct influence on propositional reasoning	Yes	Yes	Implicit attitude change fully mediated by explicit attitude change	Factor provides a basis for new propositions for propositional reasoning; propositional reasoning leads to proactive construction of (new) associative evaluation	Recategorization or reappraisal of attitude object
5	Direct influence on associative evaluation and direct antagonistic influence on propositional reasoning	Yes	Yes	No mediation; no (or negative) relation between explicit and implicit attitudes	Factor leads to change in pattern activation or associative structure; associative evaluations are inconsistent with momentarily considered set of subjectively valid propositions; same external factor provides a basis for new propositions that imply an evaluation of the opposite valence	Evaluative conditioning with antagonistic, immediate short-term and delayed long-term consequences
6	Direct influence on propositional reasoning with additional indirect influence on propositional reasoning mediated by direct influence on associative evaluation	Yes	Yes	Explicit attitude change partially mediated by implicit attitude change	Factor leads to change in pattern activation or associative structure; associative evaluations are consistent with momentarily considered set of subjectively valid propositions; external factor provides a basis for new propositions that indirectly imply an evaluation of the same valence	Postdecisional dissonance with simultaneous evaluative conditioning effect with self as unconditioned stimulus
7	Direct influence on associative evaluation with additional indirect influence on associative evaluation mediated by direct influence on propositional reasoning	Yes	Yes	Implicit attitude change partially mediated by explicit attitude change	Factor leads to change in pattern activation or associative structure; associative evaluations are inconsistent with momentarily considered set of subjectively valid propositions; external factor provides a basis for new propositions that directly imply an evaluation of the same valence	(None; case highly unlikely according to APE model)
8	Direct influence on associative evaluation and propositional reasoning with mutual indirect influences	Yes	Yes	Explicit attitude change partially mediated by implicit attitude change; implicit attitude change partially mediated by explicit attitude change	Factor leads to change in pattern activation or associative structure; associative evaluations are consistent with momentarily considered set of subjectively valid propositions; external factor provides a basis for new propositions for propositional reasoning that directly imply evaluation of same valence	Persuasive message leading to evaluative conditioning effects and corresponding influence on propositional reasoning

Note. APE = associative-propositional evaluation.

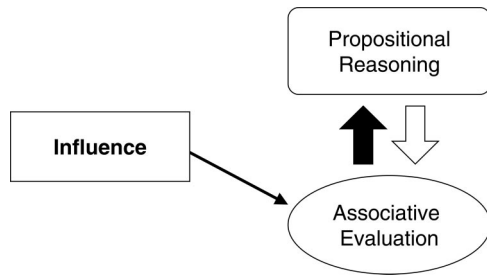


Figure 3. Case 1: Indirect influence on propositional reasoning mediated by a direct influence on associative evaluations, leading to corresponding changes in explicit and implicit attitudes. Solid arrows reflect a causal influence, whereas open arrows reflect a lack of influence.

ative judgments. This interpretation implies that (a) explicit in-group favoritism in minimal group settings should be mediated by implicit in-group favoritism and (b) in-group favoritism should be stronger for participants with high rather than low implicit self-esteem (cf. Rubin & Hewstone, 1998). Even though this interpretation of in-group favoritism is obviously post hoc, future research may provide empirical support for this assumption.⁷

Another instance of indirect influences on explicit attitudes arises when changes in pattern activation lead to corresponding changes in evaluative judgments. An illustrative example for this case is a study by Richeson and Nussbaum (2004). In their study, participants were presented with messages advocating either a color-blind or a multicultural approach to reducing interethnic tension. Participants evaluated African Americans less negatively after reading a multicultural proposal than after reading a color-blind proposal. This effect emerged for both explicit and implicit attitudes, with changes in explicit attitudes being fully mediated by changes in implicit attitudes (J. A. Richeson, personal communication, April 5, 2004). In contrast, changes in implicit attitudes were not mediated by explicit attitudes, as suggested by a significant effect on implicit attitudes after the researchers controlled for explicit attitudes (J. A. Richeson, personal communication, April 5, 2004). Drawing on the APE model, one could argue that the two ideological perspectives activated different patterns of the preexisting associative representation of African Americans. These resulting associative evaluations, in turn, served as a basis for participants' evaluative judgments about African Americans. Most important, the two messages did not imply different evaluations of African Americans, which could have led to a direct influence on evaluative judgments. In contrast, it seems that the two ideological approaches were associated with different construals of African Americans on the associative level, which, in turn, affected participants' evaluative judgments.

Case 2. The second case involves a direct influence on associative evaluations, with neither a direct nor an indirect influence on evaluative judgments (see Figure 4). This case implies a change in implicit but not explicit attitudes, with the two being generally uncorrelated. According to the APE model, such patterns should emerge when (a) a given factor leads to a change in pattern activation or associative structure and, additionally, (b) other relevant propositions lead to a rejection of associative evaluations as a valid basis for an evaluative judgment.

An illustrative example for this pattern is again found in research on EC, which has shown that conditioning effects on

evaluative judgments are often reduced when participants become aware of the contingency between CS and US (De Houwer et al., 2001; Fulcher & Hammerl, 2001; Walther, 2002). From the perspective of the APE model, one could argue that contingency awareness reduces participants' trust in the validity of their associative evaluations, such that actual changes in associative structure are not reflected in evaluative judgments. However, associative evaluations may still be influenced by EC manipulations, even when contingency awareness undermines corresponding effects for evaluative judgments. In other words, even when contingency awareness attenuates the indirect effect of EC on explicit attitudes, implicit attitudes may nevertheless show a direct influence of EC manipulations.

Preliminary evidence for this assumption comes from Karpinski and Hilton (2001). In their study, participants were presented with pairings of the words *youth* and *elderly* (CS) with positive and negative words (US). Participants' task was to memorize the specific word pairings and the frequency of their occurrence. Results showed that participants exhibited a lower level of implicit prejudice against older adults when *youth* was repeatedly paired with negative words and *elderly* was repeatedly paired with positive words. However, participants exhibited a higher level of implicit prejudice against older people when *youth* was repeatedly paired with positive words and *elderly* was repeatedly paired with negative words. It is interesting to note that explicit attitudes were neither affected by conditioning manipulations nor significantly related to implicit attitudes. Drawing on the considerations outlined above, it seems that memorization instructions made participants highly aware of the particular contingencies implied by the word pairings, which, in turn, reduced participants' trust in the validity of their associative evaluations. However, because contingency awareness may only undermine the influence of associative evaluations on propositional evaluations, the direct influence of EC on associative evaluations may still be unaffected. In other words, EC with contingency awareness may still change implicit attitudes even when explicit attitudes are unaffected.

Asymmetrical influences of this sort would, of course, also be expected when external stimuli lead to changes in pattern activation and perceivers reject their associative evaluations as a valid basis for an evaluative judgment. Examples of such effects are implied by research on exemplar accessibility. As previously noted, Dasgupta and Greenwald (2001) have shown that implicit prejudice against African Americans decreased when participants previously had been presented with pictures of admired Black and disliked White individuals. Similarly, Lowery et al. (2001) found that the mere presence of an African American experimenter reduced White participants' implicit prejudice against African Americans. In both studies, explicit evaluations of African Americans were unaffected by accessible exemplars. Drawing on the APE model, one could argue that the previously encountered exemplars led to a change in pattern activation. However, participants might have rejected their associative evaluations of African Americans as a valid basis for an evaluative judgment. Such

⁷ Note that this interpretation explains in-group favoritism but not out-group derogation (Brewer, 1999; Hewstone et al., 2002). In particular, the proposed transfer of associative self-evaluations to the in-group should influence associative evaluations of the in-group but not the out-group.

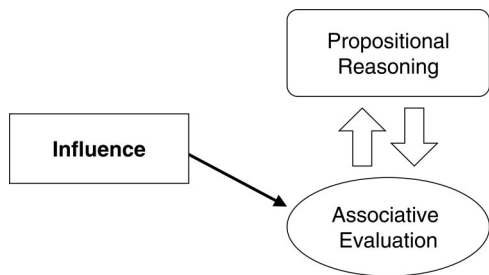


Figure 4. Case 2: Direct influence on associative evaluations with neither direct nor indirect influence on propositional reasoning, leading to implicit but not explicit attitude change. Open arrows reflect a lack of influence.

rejections seem particularly likely in the domain of prejudice and stereotyping, in which people may commonly consider other propositions to be more relevant for an evaluative judgment than the propositional implications of their associative evaluations. We come back to this issue in the context of theories of persuasion when we discuss motivational influences on evaluative judgments.

The abovementioned interpretation is also applicable to recent findings by M. A. Olson and Fazio (2006). These researchers found that EC influenced only implicit but not explicit prejudice against African Americans, with explicit and implicit prejudice being generally uncorrelated. In terms of the considerations we have outlined, one could argue that for prejudice-related judgments people commonly consider other propositions to be more relevant than the propositional implications of their associative evaluations. Thus, even though Olson and Fazio’s participants were generally unaware of the CS–US pairings of their conditioning manipulation, they might have generally tended to reject their associative evaluations as a basis for evaluative judgments about African Americans. As such, EC should influence only implicit but not explicit prejudice.

Case 3. The third case involves a direct influence on propositional reasoning, with neither a direct nor an indirect influence on associative evaluations (see Figure 5). This case implies a change of explicit but not implicit attitudes, with the two being generally uncorrelated. According to the APE model, such a pattern should emerge when (a) a given factor provides a basis for new propositions for propositional reasoning and (b) these propositions lead to a retroactive rejection of already activated associative evaluations.

An illustrative example for this case is provided by Gregg et al. (2006). In their research, participants received positive or negative information about two hypothetical groups called “Niffite” and “Luupite.” Information was presented on a computer screen, with one of the two groups being consistently described as negative and the other being consistently described as positive. Afterward, participants completed measures of explicit and implicit attitudes toward the two groups. When participants had completed these measures, the experimenter explained that the particular pairing of positive and negative statements about the two groups was intended to be counterbalanced across participants and that the participant unfortunately had been run in the wrong condition. The experimenter then asked the participant to imagine a reversal of the positive and negative statements about the two groups and to complete the two attitude measures again. Results indicate that reversal instructions clearly affected participants’ evaluative judg-

ments about the two groups. Associative evaluations, however, were generally unaffected, such that groups previously presented with positive statements were evaluated positively and groups previously presented with negative statements were evaluated negatively. In other words, participants changed their evaluative judgments about the two groups after considering the additional proposition that their associative evaluations were not valid. However, this additional proposition simply led to a rejection of the propositional implications of associative evaluations, not to a change of the underlying associative evaluations per se. This interpretation is also applicable to studies showing that instructions to fake a particular attitude influenced only explicit but not implicit attitudes (e.g., Banse, Seise, & Zerbes, 2001; Kim, 2003).

Another example of explicit attitude change without corresponding changes in implicit attitudes is implied by research on cognitive dissonance (Festinger, 1957). As previously mentioned, cognitive inconsistency—and thus cognitive dissonance—arises when two propositions are regarded as true and one follows from the opposite of the other (Festinger, 1957). People can resolve this inconsistency either by rejecting one of the inconsistent propositions as false or by adding an additional proposition that resolves the inconsistency. Drawing on these considerations, Gawronski and Strack (2004) predicted that cognitive dissonance arising from counterattitudinal behavior (Festinger & Carlsmith, 1959) should affect only explicit attitudes, not implicit attitudes. Moreover, explicit attitudes should be related to implicit attitudes when cognitive dissonance is reduced by an additional proposition that resolves the inconsistency. However, explicit and implicit attitudes should be uncorrelated when cognitive dissonance is resolved by a rejection of associative evaluations as a valid basis for an evaluative judgment. These predictions were confirmed in two studies in which participants were asked to write an essay in favor of a counterattitudinal position (Gawronski & Strack, 2004).

A similar pattern was recently presented by Nier (2005). In this study, explicit and implicit prejudices against African Americans were highly correlated when the implicit measure was introduced as a particular kind of “lie detector” (accuracy condition) but not when the task was described as a poor measure of people’s attitudes (inaccuracy condition). Moreover, explicit prejudice was significantly higher under accuracy than under inaccuracy conditions. Implicit attitudes, in contrast, were generally unaffected by task instructions. In terms of the APE model, these results suggest that participants based their evaluative judgments on their auto-

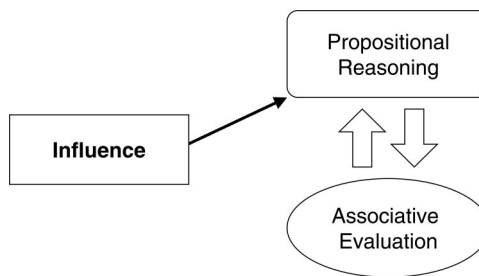


Figure 5. Case 3: Direct influence on propositional reasoning with neither direct nor indirect influence on associative evaluations, leading to explicit but not implicit attitude change. Open arrows reflect a lack of influence.

matic affective reactions toward African Americans when they expected the implicit measure to reveal their true feelings. However, participants seem to have rejected their automatic affective reactions as a basis for an evaluative judgment when they expected the implicit measure to be a poor measure of attitudes. In other words, Nier's (2005) manipulations influenced explicit attitudes, such that these manipulations determined whether participants used their automatic affective reactions as a basis for an evaluative judgment.

Case 4. The fourth case involves a direct influence on propositional reasoning, which, in turn, influences associative evaluations (see Figure 6). This pattern implies corresponding changes in implicit and explicit attitudes, with changes in implicit attitudes being fully mediated by changes in explicit attitudes. According to the APE model, such patterns should emerge when (a) a given factor provides a basis for new propositions for propositional reasoning (as, e.g., when persuasive arguments are encountered) and (b) these propositions lead to a proactive construction of new associative evaluations. Thus, the crucial difference determining whether propositional processes lead to changes in associative evaluations is whether propositional reasoning leads to a mere negation of evaluative associations that are already activated or to an affirmation of evaluative associations that were not activated before (see also Wegner, 1994).

An illustrative example for the differential role of affirmation and negation is Kawakami, Dovidio, Moll, Hermsen, and Russin's (2000) research on the negation of social stereotypes (see also Kawakami, Dovidio, & van Kamp, 2005). These researchers found that long-term training in the negation of social stereotypes resulted in lower levels in the automatic stereotype activation. This finding might seem problematic for the current conceptualization, in which negation is conceived as a propositional reasoning operation (because it involves the assignment of truth values to propositional claims). From this standpoint, one would expect negation training to operate primarily by promoting rejection of the propositional implications of an association (Deutsch et al., in press). It is important to note, however, that Kawakami et al.'s (2000) negation training confounded the negation of stereotypes with the affirmation of counterstereotypes. In one study, for example, participants were presented with pictures of Black and White people and traits that were related either to the stereotype of Blacks or to the stereotype of Whites. Participants' task was to respond with a *NO* key each time they saw a stereotype-congruent person-trait

combination (e.g., a Black face with a stereotypically Black trait word) and to respond with a *YES* key each time they saw a stereotype-incongruent person-trait combination (e.g., a Black face with a stereotypically White trait word). Hence, it is not clear whether the resulting reduction in automatic prejudice against Black people was due to the negation of the stereotype or to the affirmation of counterstereotype. Drawing on the considerations we have outlined, we argue that Kawakami et al.'s findings were exclusively driven by the affirmation of the counterstereotype rather than by the negation of the stereotype. This claim was recently confirmed in a study by Gawronski, Deutsch, and Mbirkou (2006), who found that only training in the affirmation of counterstereotypical information, not training in the negation of stereotypical information, led to a reduction in automatic stereotype activation. Moreover, the proposed difference between affirmation and negation focus is also consistent with research in other areas showing that deliberate attempts to suppress affective reactions (negation) usually leave these reactions unaffected, whereas attempts to attribute a different meaning to the response-eliciting stimulus (affirmation) is indeed capable of changing affective reactions (e.g., Butler et al., 2003; Gross, 1998).

Another example of the present case is research on cognitive balance (Heider, 1958). In a study by Gawronski, Walther, and Blank (2005), for example, participants first formed either positive or negative attitudes toward several "source" individuals (source valence) and then learned that these source individuals either liked or disliked another set of neutral "target" individuals (observed sentiment). Consistent with balance theory, participants showed more positive attitudes toward targets who were liked than toward those who were disliked by positive source individuals. In contrast, participants showed more negative attitudes toward targets who were liked than toward those who were disliked by negative source individuals. It is interesting to note that this effect emerged not only for explicit but also for implicit attitudes. From the perspective of the present framework, one could argue that a priori attitudes toward a given source individual influenced the interpretation of this individual's relation to another target individual. That is, participants might have interpreted a positive (negative) sentiment exhibited by a positively evaluated source individual as positive (negative) information about the target, whereas they might have interpreted a positive (negative) sentiment exhibited by a negatively evaluated source individual as negative (positive) information about the target. In other words, a priori attitudes toward the source individual proactively influenced participants' inferences about the evaluative meaning of the observed sentiment, which, in turn, affected not only evaluative judgments but also associative evaluations. This interpretation implies that the obtained effect of cognitive balance on associative evaluations should be mediated by processes of propositional reasoning. Moreover, balance-related inferences should leave associative evaluations unaffected if the temporal order of information acquisition would require a retroactive qualification of previously observed sentiment relations (e.g., when participants first learn about the attitude of a neutral source individual toward a neutral target individual and then receive evaluative information about the source). This assumption was confirmed by Gawronski, Walther, and Blank (2005) in a series of three experiments.

Another example for the present case is a recent study by Petty et al. (2006). These researchers first induced a positive or negative

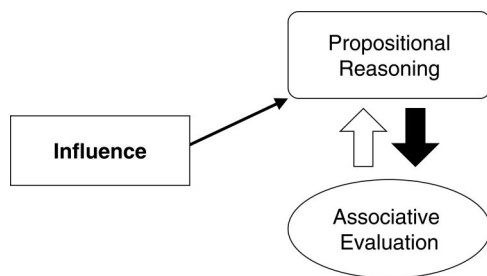


Figure 6. Case 4: Indirect influence on associative evaluations mediated by a direct influence on propositional reasoning, leading to corresponding changes in explicit and implicit attitudes. Solid arrows reflect a causal influence, whereas open arrows reflect a lack of influence.

attitude toward an unknown target by repeatedly pairing this target with either positive or negative images. Shortly afterward, participants received positive or negative verbal information about the target that either confirmed or disconfirmed the initially conditioned attitude. Petty et al. found that disconfirming information about the target influenced both explicit and implicit attitudes. However, whereas explicit attitudes were completely reversed by the counterattitudinal information, implicit attitudes showed somewhat weaker effects, such that implicit attitudes were only neutralized rather than reversed. When the subsequently presented information confirmed the initially conditioned attitude, both explicit and implicit attitudes remained stable. From the perspective of the APE model, the prior induction of explicit and implicit attitudes by means of EC represents an example of Case 1. More important, however, the subsequently induced change in attitudes can be interpreted as an example of Case 4, involving a direct effect on propositional reasoning with an additional indirect effect on associative evaluations mediated by propositional reasoning. For this interpretation, it is important to note that the new information presented after the EC manipulation represented propositional statements about the target. Moreover, the particular valence of this information was not directly implied in the statements. Instead, the valence was implied only indirectly, such that it had to be inferred. Hence, extracting the valence of this information required processes of propositional reasoning, which suggests an indirect influence on associative evaluations that was mediated by propositional reasoning. Even though this interpretation is obviously post hoc, it is consistent with the somewhat weaker effects on implicit attitudes, such that implicit attitudes were only neutralized, whereas explicit attitudes were completely reversed.

Case 5. The fifth case involves a direct influence on associative evaluations and a direct influence on propositional reasoning, with the two influences having distinct effects, such that evaluative judgments are not based on the propositional implications of associative evaluations and propositional processes leave associative evaluations unaffected (see Figure 7). This case implies different patterns of change for explicit and implicit attitudes, with the two being generally uncorrelated (or negatively correlated). According to the APE model, such patterns should emerge when (a) a given factor leads to changes in pattern activation or associative structure and (b) the same factor provides a basis for new propositions that imply an evaluation that is directly opposite to the one implied by associative evaluations.

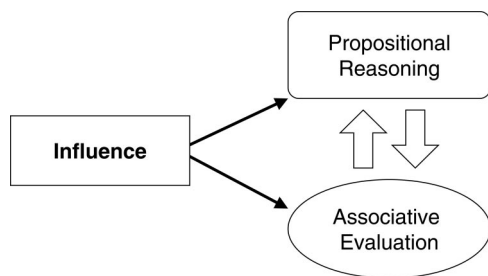


Figure 7. Case 5: Direct influence on propositional reasoning and direct (antagonistic) influence on associative evaluations, leading to noncorresponding changes in explicit and implicit attitudes. Open arrows reflect a lack of influence.

An interesting example for such a pattern can be found in a study by Deutsch and Strack (2002; reported in Strack & Deutsch, 2004). Participants were asked to open virtual doors to a photo gallery on a computer screen. Depending on the particular color of the door (i.e., blue vs. red), opening the door resulted in either (a) an immediate, brief presentation of a negative picture, which was followed by a delayed, long presentation of a positive picture, or (b) an immediate, brief presentation of a positive picture, which was followed by a delayed, long presentation of a negative picture. Results indicate that subsequent associative evaluations of the two types of doors were uniquely influenced by the immediate, short-term consequences associated with a particular kind of door. That is, associative evaluations of a particular type of door were more positive when opening these doors resulted in an immediate, brief presentation of a positive picture than when it resulted in an immediate, brief presentation of a negative picture. In contrast, evaluative judgments of the two types of doors were more positive when opening these doors resulted in a delayed, long presentation of a positive picture than when it resulted in a delayed, long presentation of a negative picture. From the perspective of the APE model, these results suggest that participants' associative evaluations depended on processes of EC and thus on the immediate, short-term consequences of their actions. Evaluative judgments, in contrast, were influenced by participants' propositional beliefs about the long-term consequences of their actions, thus leading to antagonistic effects for associative evaluations and evaluative judgments.

Case 6. The sixth case involves a direct influence on propositional reasoning and an additional indirect influence mediated by associative evaluations (see Figure 8). This pattern implies corresponding changes in explicit and implicit attitudes, with changes in explicit attitudes being partially mediated by changes in implicit attitudes. According to the APE model, such patterns should emerge when (a) a given factor leads to changes in pattern activation or associative structure, (b) associative evaluations are consistent with the momentarily considered set of subjectively valid propositions, and (c) the same factor provides a basis for new propositions that indirectly imply an evaluation of the same valence.

An illustrative example for such a pattern comes from research on postdecisional attitude change. Research in the cognitive dissonance tradition has consistently shown that decisions between two equally attractive alternatives lead to more favorable evaluations of chosen as compared with rejected alternatives (Brehm, 1956). A common explanation for this *spreading of alternatives* effect is that people experience an uncomfortable feeling of postdecisional dissonance when they recognize either (a) that the rejected alternative has positive features that the chosen alternative does not have or (b) that the chosen alternative has negative features that are not present in the rejected alternative (J. M. Olson & Stone, 2005). Hence, to reduce this uncomfortable feeling, people often emphasize (Brehm, 1956) or deliberately search for (Frey, 1986) positive characteristics of the chosen alternative and negative characteristics of the rejected alternative. This kind of selective information search, in turn, leads to more favorable evaluations of the chosen alternative but to less favorable evaluations of the rejected alternative.

Drawing on Gawronski and Strack's (2004) research on the propositional nature of cognitive dissonance, one could argue that

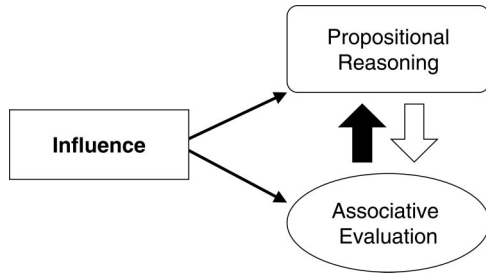


Figure 8. Case 6: Direct influence on propositional reasoning, with additional indirect influence mediated by associative evaluations, leading to corresponding changes in explicit and implicit attitudes. Solid arrows reflect a causal influence, whereas open arrows reflect a lack of influence.

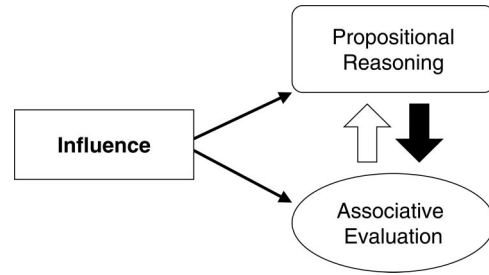


Figure 9. Case 7: Direct influence on associative evaluations, with additional indirect influence mediated by propositional reasoning, leading to corresponding changes in explicit and implicit attitudes. Solid arrows reflect a causal influence, whereas open arrows reflect a lack of influence.

postdecisional dissonance should affect only explicit but not implicit attitudes (see Case 3). In addition to cognitive dissonance, however, we previously noted that postdecisional attitude changes can also be due to an associative transfer of self-evaluations to objects that are associated with the self. This particular variant of EC may directly influence implicit attitudes without requiring processes of propositional reasoning (see also Greenwald & Banaji, 1995). Consistent with this assumption, Gawronski, Bodenhausen, and Becker (in press) demonstrated that simply choosing an object was sufficient to create an association between the object and the self, thus leading to an associative transfer of implicit self-evaluations to the chosen object. Given that most people's implicit self-evaluation is highly positive (Bosson et al., 2000; Greenwald & Farnham, 2000; Koole et al., 2001), this process of associative self-anchoring can lead to postdecisional changes of implicit attitudes without requiring higher order propositional processes (see also Lieberman, Ochsner, Gilbert, & Schacter, 2001). It is important to note that, because dissonance reduction and EC represent two independent mechanisms of attitude change, postdecisional attitude changes may be due to a direct influence on evaluative judgments (cognitive dissonance) and an indirect influence on evaluative judgments that is mediated by associative evaluations (EC). According to the APE model, such patterns should emerge as long as there is no reason to discount the propositional implications of these associative evaluations. However, given that the EC mechanism produces an outcome that is fully consonant with the propositional dissonance reduction mechanism, there is very little reason why people would not rely on their automatic affective reactions as well as their propositional conclusions.

Case 7. The seventh potential case involves a direct influence on associative evaluations and an additional indirect influence on associative evaluations mediated by processes of propositional reasoning (see Figure 9). This pattern implies corresponding changes in implicit and explicit attitudes, with changes in implicit attitudes being partially mediated by changes in explicit attitudes. Even though this case seems possible from a mere combinatorial perspective, it is highly unlikely from the perspective of the APE model. The particular mediation pattern implied in this case would involve a rejection of associative evaluations as a valid basis for evaluative judgments even though processes of propositional reasoning influence associative evaluations in the same direction. However, a rejection of associative evaluations seems quite para-

doxical when processes of propositional reasoning lead to exactly the same evaluation. As such, this case can be regarded as highly unlikely from the perspective of the APE model.

Case 8. The eighth and final case under consideration involves a complex pattern of direct and indirect effects on both associative and propositional processes (see Figure 10). That is, a given factor may directly affect associative evaluations, which, in turn, may indirectly affect evaluative judgments. Moreover, the same factor may directly affect processes of propositional reasoning, which, in turn, may indirectly affect associative evaluations. According to the APE model, such complex patterns should emerge when (a) a given factor leads to changes in pattern activation or associative structure, (b) associative evaluations are consistent with the momentarily considered set of subjectively valid propositions, and (c) the same factor provides a basis for new propositions that directly imply an evaluation of the same valence.

This case can be illustrated with a recent study by Castelli et al. (2004). Participants were first presented with pictures of men who were described either as child molesters or as child counselors and then completed a measure of associative evaluations for these individuals. Results indicated more negative associative evaluations for men who had been described as child molesters as compared with men who had been described as child counselors. Even though Castelli et al.'s (2004) studies did not include a measure of explicit attitudes, it seems quite likely that the child molester description had two independent but synergetic effects on participants' attitudes. First, because the category *child molester* can be assumed to have a clear negative associative valence,

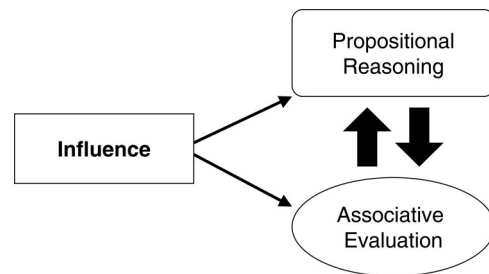


Figure 10. Case 8: Direct influence on associative evaluations and propositional reasoning with mutual indirect influences, leading to corresponding changes in explicit and implicit attitudes. Solid arrows reflect a causal influence.

repeatedly presenting a person (CS) with the label child molester (US) should result in a negative associative evaluation of this person via processes of EC. If people rely on their associative evaluations when making an evaluative judgment, this direct influence on associative evaluations should indirectly influence evaluative judgments of the target. Second, participants may use the provided negative information about the target to infer a negative evaluation of the target via processes of propositional reasoning. The deliberate retrieval of relevant category information in the course of propositional reasoning, in turn, may influence the particular pattern of associations that is activated (J. P. Mitchell et al., 2003), thus leading to an indirect effect on associative evaluations. This dual pathway implies that evaluative judgments may be indirectly affected via associative evaluations even when participants have no explicit memory for the category information (see Case 1; e.g., Castelli et al., 2004, Experiments 4 and 5). Moreover, associative evaluations may be indirectly affected via processes of propositional reasoning even when the provided information is insufficient to result in a direct EC effect (see Case 4).

Mixed influences and null effects. Even though all but one of the cases discussed so far have their empirical counterparts in the literature, it is reasonable to assume that many real-life situations involve multiple, mixed influences. Teachman and Woody (2003), for example, demonstrated treatment-related reductions in both implicit and explicit negativity toward spiders in people with spider phobia. This treatment involved a cognitive-behavioral therapy with several components, such as gradually increasing exposure (e.g., pictures, videos, real spiders) and education about the harmlessness of spiders (e.g., analysis of evidence for spider attacks). In a similar vein, Rudman, Ashmore, and Gary (2001) found a reduction of both implicit and explicit prejudice against African Americans in White students after a 14-week seminar on prejudice and conflict. As with Teachman and Woody's (2003) cognitive-behavioral therapy, this seminar included multiple components (e.g., education about socially determined inequalities, contact with an African American professor) that might have contributed to the final outcome. The crucial difference between these field studies and the laboratory studies we have discussed is that field studies often involve many kinds of simultaneous or sequential influences that are quite difficult to disentangle. Nevertheless, the APE model may provide a useful framework for investigating the contribution of particular processes, which may then be tested outside of the laboratory for their real-life implications.

A final issue concerns null effects of experimental manipulations on explicit and implicit attitudes. In the preceding sections, we discussed several cases in which a given factor should influence explicit but not implicit attitudes or implicit but not explicit attitudes. Even though the interpretation of null effects poses several problems (e.g., lack of statistical power, beta error), the APE model circumvents this problem by predicting specific patterns of correlations. For instance, with regard to Gawronski and Strack's (2004) finding that cognitive dissonance changed only explicit but not implicit attitudes, one could object that the reliability of the implicit measure might have been low, thus undermining significant effects on this measure. However, this interpretation can be ruled out on the basis of the predicted correlational patterns, such that explicit and implicit attitudes were highly correlated when participants had a situational explanation for their

counterattitudinal behavior as well as under control conditions but not when participants did not have a situational explanation for their counterattitudinal behavior (and thus changed their explicit attitudes). Notwithstanding these findings, there are a few studies in the literature that obtained null effects without providing independent evidence for the validity of the measure used, thus implying all problems typically associated with the interpretation of null effects. For instance, Glen and Banse (2004) found that interviews focusing on personal strengths versus personal deficits did not lead to the predicted changes in self-evaluations, such that self-evaluations would be more negative after participants focused on personal weaknesses than on personal strengths. This null effect held for both explicit and implicit self-evaluations. In a similar vein, Huijding, de Jong, Wiers, and Verkoijen (2005) found that smoking versus nonsmoking settings did not influence smokers' attitudes toward smoking. Again, this null effect was obtained for both explicit and implicit attitudes. Thus, even though the APE model predicts null effects on either explicit or implicit attitudes under certain conditions, it seems important to independently establish the validity of the respective measures, such as by means of predicted correlational patterns (e.g., Gawronski & Strack, 2004).

Discussion

The main goals of the present article are (a) to propose a new theoretical model for the study of explicit and implicit attitude change, the APE model, and (b) to provide an integrative, exhaustive review of the available evidence regarding implicit and explicit attitude change that is guided by the theoretical assumptions of the APE model. In particular, we argue that implicit and explicit attitudes should be understood in terms of their underlying mental processes, which are associative and propositional processes. Thus, whether a given factor leads to changes in implicit or explicit attitudes should depend on (a) which of the two processes is influenced in the first place and (b) whether a change in one kind of process mediates changes in the other. This conceptualization provides an integration of a broad range of seemingly inconsistent patterns of attitude change, such as changes in explicit but not implicit attitudes (e.g., Gawronski & Strack, 2004), changes in implicit but not explicit attitudes (e.g., Karpinski & Hilton, 2001), and changes in both explicit and implicit attitudes (e.g., M. A. Olson & Fazio, 2001). As such, the APE model goes beyond previous models that either imply only a single attitude construct (e.g., Chaiken et al., 1989; Kruglanski & Thompson, 1999; Petty & Cacioppo, 1986; Van Overwalle & Siebler, 2005) or claim that implicit attitudes reflect highly robust attitudes that have their origin in long-term socialization experiences (e.g., Dovidio et al., 2001; Petty et al., 2006; Rudman, 2004; Wilson et al., 2000). Whereas the former class of models is limited in its explanatory power by its inability to explain any kind of dissociation between explicit and implicit attitude change, the latter class of models is limited by its inability to explain changes in implicit but not explicit attitudes. In the remainder of this article, we provide a final discussion of (a) the relation of the APE model to persuasion theories of attitude change, (b) the relative stability of attitude changes, (c) limits of a single-process approach as compared with the proposed dual-process account, (d) directions for future re-

search, and (e) some methodological issues related to the application of the APE model.

Relations to Theories of Persuasion

Over the last decades, social psychological research on attitude change has been guided largely by theories of persuasion (for reviews, see Crano & Prislin, 2006; B. T. Johnson, Maio, & Smith-McLallen, 2005). Hence, to provide a genuine integration of research on attitude change, it seems necessary to discuss both the commonalities and the differences between the APE model and persuasion models. For this purpose, we discuss the relation of the APE model to the elaboration likelihood model (ELM; Petty & Cacioppo, 1986), the heuristic systematic model (HSM; Chaiken et al., 1989; Todorov, Chaiken, & Henderson, 2002), the unimodel (Kruglanski & Thompson, 1999), probabilistic models of attitude change (McGuire, 1981; Wyer & Goldberg, 1970), and the cognition in persuasion model (CPM; Albarracín, 2002).

ELM. The core assumption of Petty and Cacioppo's (1986) ELM is that attitudes can be influenced either by central or by peripheral cues present in a persuasive message (for a review, see Petty, Cacioppo, Strathman, & Priester, 2005). Whereas central cues refer to the quality of the arguments presented in a persuasive message, peripheral cues refer to other characteristics of the message, such as the expertise of the source, the likability of the source, or consensus information. A well-replicated finding in research on persuasion is that under conditions of low cognitive elaboration, attitudes are more likely to be influenced by peripheral cues rather than by the quality of the arguments (cf. Kruglanski & Thompson, 1999). Under conditions of high elaboration, in contrast, attitudes are more likely to be influenced by the quality of the arguments, whereas the influence of peripheral cues is often (but not always) attenuated.

As we have already alluded to in the context of the causes of attitude change, persuasive arguments (or central cues) are—by definition—propositional statements and thus should influence attitudes primarily by processes of propositional reasoning. According to the APE model, persuasive arguments contribute new propositions to the set of propositions that are considered to be relevant for an evaluative judgment, which may then influence evaluative judgments about an attitude object. Whether these processes will, in turn, affect associative evaluations depends on the particular nature of the new propositions. If the persuasive arguments lead to a retroactive rejection of an already activated associative evaluation, these arguments should leave associative evaluations unaffected (Case 3; see Figure 5). If, however, persuasive arguments lead to a proactive construction of a new associative evaluation, these arguments may indirectly influence associative evaluations mediated by processes of propositional reasoning (Case 4; see Figure 6). According to the APE model, the crucial difference between these two cases is whether the persuasive argument implies an affirmation of a new evaluation or a negation of an old evaluation (Deutsch et al., in press; Gilbert, 1991). That is, if a persuasive argument contains an affirmation of a new evaluation (e.g., "Diet soft drinks promote convulsions"), propositional processing of the argument leads to corresponding changes in the activated pattern of associations, thus resulting in an indirect effect on associative evaluations mediated by propositional reasoning. If, however, a persuasive argument contains a negation of

an old evaluation (e.g., "Diet soft drinks are not healthier than standard soft drinks"), propositional processing increases the activation level of the original (nonnegated) evaluation (see Kaup & Zwaan, 2003). Moreover, because negating a given proposition requires a reversal of its truth value, negations usually reverse only propositional judgments but not the activation of associations in memory (Deutsch et al., in press).⁸ As a result, persuasive arguments implying negations (i.e., a retroactive rejection of an already activated associative evaluation) should influence only evaluative judgments but not associative evaluations. In fact, associative evaluations may even show ironic effects, such that arguments implying a negated positive evaluation lead to more favorable implicit attitudes and arguments implying a negated negative evaluation lead to more negative implicit attitudes (see Grant, Malaviya, & Sternthal, 2004).

Beyond indirect effects on associative evaluations, it is important to note that persuasive arguments implying an affirmation of new evaluative information can have an additional direct effect on associative evaluations. That is, arguments of this kind may create an associative link between the attitude object and the new evaluation via processes of EC. Because evaluative judgments of an attitude object are usually based on the propositional implications of associative evaluations, such changes in associative structure may additionally lead to an indirect effect on evaluative judgments (Case 1; see Figure 3). Thus, persuasive arguments implying an affirmation of a new evaluation are likely to result in a complex pattern of direct and indirect effects on both implicit and explicit attitudes (Case 8; see Figure 10). Thus, arguments of this kind should generally be more effective than arguments implying a negation of an old evaluation, such that the same argument may still influence attitudes even if one of the multiple ways is undermined (e.g., persistent effects of EC resulting from the message "Diet soft drinks promote convulsions" even when recipients consciously reject the proposition that diet soft drinks promote convulsions).

Considering the influence of peripheral cues, one could be tempted to equate central influences with changes in evaluative judgments and peripheral influences with changes in associative evaluations (e.g., Smith & DeCoster, 2000). In contrast to this assumption, however, we have already proposed that central-route influences may or may not influence associative evaluations. In a similar vein, peripheral cues are sometimes processed in a propositional manner (Kruglanski & Thompson, 1999). For example, people may consider the expertise of a computer engineer recommending a particular computer as an additional argument in the set of relevant propositions. Recipients may assume that the computer must be good if it is recommended by an expert. This effect, however, may be different when the computer is advertised with a highly attractive supermodel. In this case, people will probably not consider the attractiveness of the source as a valid argument in the

⁸ An exception to this case is when the semantic content of the negated proposition is already stored independently in associative memory. This may be the case when the negated proposition has a specific referent (e.g., "no war" automatically activates "peace"; see Mayo, Schul, & Burnstein, 2004) or the negated proposition is used frequently in language (e.g., frequent use of "no problem" automatically activates positivity rather than negativity; see Deutsch et al., in press).

set of propositions. Rather, the attractiveness of the source is more likely to result in an EC effect, such that the positive valence of the source (US) becomes associated with the object (CS). In other words, whereas the first case (expertise) should lead to a direct influence on propositional evaluations, the second case (attractiveness) should lead to a direct influence on associative evaluations (see also Petty & Wegener, 1999). Hence, even though peripheral cues often differ from central cues with regard to their complexity and thus with regard to the amount of cognitive elaboration required for their processing, the distinction between central and peripheral influences is orthogonal to the distinction between associative and propositional evaluations, such that both central and peripheral cues may influence attitudes associatively or propositionally. It is important to note that what type of influence central or peripheral cues have on explicit or implicit attitudes depends on (a) whether a given cue, be it central or peripheral, is used as a propositional argument and (b) whether the same cue implies direct evaluative information that could function as a US. Whereas the first case should lead to a direct effect on explicit attitudes, the second case should lead to a direct effect on implicit attitudes. Moreover, a direct effect on explicit attitudes may additionally lead to an indirect effect on implicit attitudes, given that the persuasive message implies an affirmation (rather than a negation) of evaluative information; a direct effect on implicit attitudes, in turn, may additionally lead to an indirect effect on explicit attitudes, given that recipients base their evaluative judgments on the propositional implications of their automatic affective reactions.

Another important question in the context of the ELM is why argument strength usually influences explicit attitudes only under conditions of high elaboration but not low elaboration and why the impact of peripheral cues is often (but not always) attenuated under conditions of high elaboration. According to the APE model, cognitive elaboration primarily influences the number of propositions that are considered for an evaluative judgment. This assumption resembles the notion of cognitive response (Greenwald, 1968; Petty et al., 1981), stating that the impact of a persuasive message depends on the cognitive responses the message elicits in the recipient. In particular, we argue that for weak arguments, a higher number of additional propositions typically leads to a rejection of the persuasive argument. For strong arguments, in contrast, a higher number of additional propositions often implies a validation of the argument, thus increasing the recipient's confidence in the validity of the argument (Petty, Briñol, & Tormala, 2002). As such, the impact of strong arguments on explicit attitudes often increases as a function of cognitive elaboration, whereas the impact of weak arguments typically decreases. Similar considerations can be applied to peripheral cues, such that additionally considered propositions may challenge either the perceived validity of a propositionally processed cue (e.g., source expertise as an argument in propositional reasoning) or the perceived validity of an associative evaluation resulting from processes of EC (e.g., source attractiveness as a US).

It is somewhat surprising that there is almost no research on the effects of persuasive messages on implicit attitudes. In fact, we are aware of only two studies that have used implicit attitude measures in a typical persuasion design. Briñol, Horcajo, Becerra, Falces, and Sierra (2002) found that only implicit, not explicit, attitudes varied as a function of argument quality. In this study, implicit attitudes toward vegetables were more positive after exposure to a

persuasive message when that message contained strong rather than weak arguments for the consumption of vegetables. Using a similar manipulation, Tormala, Briñol, and Petty (2004) found that (under conditions of high elaboration) strong arguments led to more positive implicit attitudes than did weak arguments. Again, this effect emerged only for implicit but not explicit attitudes.⁹ Taken together, these results are consistent with our assumption that central and peripheral processing cannot be equated with influences on explicit versus implicit attitudes. Instead, central and peripheral cues may show very different patterns, such that they may influence (a) implicit but not explicit attitudes, (b) explicit but not implicit attitudes, or (c) both explicit and implicit attitudes. Moreover, which of the three potential outcomes will occur should depend on whether these cues are directed at associative or propositional processes and whether their direct influence on one kind of evaluation involves a mediating effect on the other kind of evaluation. Future research with the type of manipulations typically used in persuasion research may provide deeper insights into how exactly central and peripheral cues influence explicit and implicit attitudes.

HSM. Chaiken et al.'s (1989) HSM largely corresponds to the ELM with regard to its assumptions about the influence of heuristic (or peripheral) cues and systematic (or central) features under conditions of high and low cognitive elaboration (for a comparison of the two models, see Eagly & Chaiken, 1993). Thus, we refrain from restating these assumptions for the HSM. However, the HSM differs from the ELM by additionally positing several assumptions about motivational influences in persuasion that are not explicitly addressed in the ELM. That is, it is assumed that recipients may have a motivation to form accurate attitudes (accuracy motivation), a motivation to form socially desirable attitudes (impression motivation), or a motivation to form personally desired attitudes (defense motivation). These motivations are assumed to influence the content of persuasion processes, such that people focus on particular kinds of heuristic cues or systematic features for an attitudinal judgment. In addition, motivation is assumed to determine individual thresholds of desired judgmental confidence, which, in turn, influence the relative degree of cognitive elaboration.

With regard to three types of motivation proposed in the HSM, we argue that these motivations primarily influence processes of propositional reasoning, such that they determine (a) whether people base their evaluative judgments on the propositional implications of their automatic affective reactions and (b) the set of propositions that is considered to be relevant for an evaluative judgment. Increased accuracy motivation, for instance, may increase the number and the complexity of propositions considered for an evaluative judgment. Depending on whether these changes in the set of considered propositions confirm or disconfirm the validity of associative evaluations, increased accuracy motivation can either increase or decrease the relation between associative evaluations and evaluative judgments.

In a similar vein, enhanced impression motivation should increase the likelihood that a socially desired proposition is set as a preferred outcome for an evaluative judgment. If the automatic

⁹ Neither Briñol et al. (2002) nor Tormala et al. (2004) included a manipulation of peripheral cues.

affective response to the attitude object aligns with this preferred outcome, the search for additional relevant propositions may be truncated (Baumeister & Newman, 1994; Ditto & Lopez, 1992), and evaluative judgments may be based largely on affirmation of the automatic affect. If the automatic affective response does not align with the preferred outcome, people may either change the strategy to achieve consistency within a given set of propositions or actively search for additional propositions that make the set of considered propositions consistent with the socially desired outcome. Depending on whether these strategies confirm or disconfirm the validity of associative evaluations, increased impression motivation may either increase or decrease the relation between automatic affective reactions and evaluative judgments.

The process underlying defense motivation theoretically corresponds to impression motivation, except that whereas impression motivation results in the search for socially desirable evaluative outcomes, defense motivation increases the likelihood that a personally desired proposition is set as a preferred outcome for propositional reasoning. As with impression motivation, this can lead either to a change in the strategy to achieve consistency within a given set of propositions or to a deliberate search for additional propositions that make the set of considered propositions consistent with the desired outcome. Accordingly, increased defense motivation may either increase or decrease the relation between automatic affective reactions and evaluative judgments, depending on whether these strategies confirm or disconfirm the validity of associative evaluations. Despite the functional similarities between impression and defense motivation, the distinction between the two is still important given that they may differ with regard to their particular outcomes, because what is socially desirable is not always what is personally desirable. An illustrative example for this is research on prejudice and stereotyping, which has shown that (a) both internal (personal) and external (social) motivation to respond without prejudice contribute to the overt expression of prejudiced beliefs and (b) the two kinds of motivation can contribute independently to the rejection of associative evaluations as a valid basis for propositional evaluations (Plant & Devine, 1998).

With regard to motivational influences on cognitive elaboration, the HSM states that the relative degree of cognitive elaboration depends on the momentary difference between a person's current level of confidence and his or her desired level of confidence. In addition, the model states (a) that people will spend only as much cognitive effort as is required to satisfy their goal-related needs, as defined by the three types of motivation we have discussed (least effort principle), and (b) that people will spend whatever cognitive effort is required to attain a sufficient level of confidence to accomplish their goals (sufficiency principle). Thus, any motivational influence on cognitive elaboration should be mediated by people's sufficiency thresholds, such that any motivationally relevant factor (e.g., personal relevance, task importance, need for cognition) should affect the desired level of judgmental confidence. These aspects of the HSM can be easily applied to the notion of propositional processing embodied in the APE model. As we have noted, cognitive elaboration should primarily influence the number and complexity of propositions that are considered for an evaluative judgment. Thus, the number of momentarily considered propositions should increase as a function of the discrepancy between a person's actual and desired levels of judgmental confidence. Again, these processes should primarily influence processes

of propositional reasoning. Moreover, enhanced elaboration resulting from larger discrepancies may either increase or decrease the relation between automatic affective reactions and evaluative judgments, depending on whether enhanced elaboration leads to a confirmation or disconfirmation of the validity of associative evaluations.

Unimodel. A central assumption in both the ELM (Petty & Cacioppo, 1986) and the HSM (Chaiken et al., 1989) is that under conditions of low cognitive elaboration, attitudes are more likely to be influenced by peripheral–heuristic cues rather than by central–systematic features of a persuasive message. Under conditions of high elaboration, in contrast, attitudes are more likely to be influenced by central–systematic features, whereas the influence of peripheral–heuristic cues is often (but not always) attenuated. These assumptions were recently challenged by Kruglanski and Thompson (1999), who argued that both peripheral–heuristic cues and central–systematic features are processed propositionally. Moreover, they argued that cognitive elaboration influences attitude changes via the complexity of propositional reasoning processes, such that highly complex cues or arguments influence attitudes only under conditions of high cognitive elaboration, not under low cognitive elaboration. Less complex cues or arguments, in contrast, should influence attitudes under conditions of both high and low elaboration, unless their subjective relevance is overridden under conditions of high elaboration (e.g., Pierro, Mannetti, Kruglanski, & Sleeth-Keppler, 2004).

The APE model agrees with Kruglanski and Thompson's (1999) unimodel in stating that cognitive elaboration is primarily a determinant of propositional reasoning. That is, it is assumed that increased cognitive elaboration is likely to increase the number and complexity of propositions considered for an evaluative judgment. The APE model also agrees with the unimodel in assuming that many peripheral–heuristic cues may be processed propositionally (see discussion of the ELM). However, the APE model goes beyond the unimodel by arguing that both peripheral–heuristic cues and central–systematic features may change propositional evaluations in two qualitatively different ways—that is, either directly by influencing the set of considered propositions or indirectly by influencing associative evaluations. Moreover, when people reject their associative evaluations as a valid basis for an explicit evaluative judgment, indirect influences of peripheral–heuristic cues or central–systematic features may still affect associative evaluations, even when this change is not reflected in propositional evaluations of an attitude object (e.g., Dasgupta & Greenwald, 2001; Karpinski & Hilton, 2001; M. A. Olson & Fazio, 2006). As outlined in the context of the ELM, such dissociations should be particularly likely when processes of propositional reasoning lead to a deliberate rejection of the evaluation implied in the persuasive message but this evaluation nevertheless influences associative evaluations via processes of EC. Moreover, dissociations between associative evaluations and evaluative judgments are likely to occur when the persuasive argument implies a negation of an already activated evaluation rather than an affirmation of a new evaluation.

Probabilistic models. Another highly relevant class of persuasion models is the probabilistic models of belief organization and change (e.g., McGuire, 1981; Wyer & Goldberg, 1970; for reviews, see Wyer, 2004; Wyer & Albarracín, 2005). These models are concerned with the degree to which logical principles can

successfully predict a person's endorsement of target propositions, given his or her level of endorsement of related propositions. Thus, changes in the perceived likelihood of one proposition can influence the perceived validity of all other propositions that are logically connected to that proposition. The most important contribution of probabilistic models, however, is that they provide a set of mathematical equations that define probabilistic relations between logically related propositions and their subjective likelihoods of truth. These equations not only predict a person's endorsement of a particular proposition on the basis of his or her beliefs regarding the subjective likelihoods of logically related propositions; they can also be used to predict changes in the endorsement of a given proposition resulting from changes in the perceived likelihood of logically related propositions.

From the perspective of the APE model, probabilistic models primarily address processes of propositional reasoning. In particular, these models are concerned with the process of achieving and maintaining logical consistency within a given set of propositions (and also with the attainment of *hedonic consistency*, or compatibility between beliefs and desires). More important, probabilistic models can provide a useful extension to the APE model by including a probabilistic (rather than binary) interpretation of subjective truth. Such a probabilistic interpretation may provide a higher level of accuracy in the prediction of changes in evaluative judgments resulting from processes of propositional reasoning. Still, the APE model goes beyond the notion of propositional reasoning addressed by probabilistic models, such that it includes associative evaluations as an independent form of evaluation. In addition, the APE model specifies conditions under which a given factor may or may not influence associative evaluations and how such changes in associative evaluations may or may not lead to corresponding changes in evaluative judgments.

CPM. A relatively recent model of persuasion is Albarracín's (2002) CPM. Many of the predictions implied by the CPM correspond to the predictions by the ELM (Petty & Cacioppo, 1986) and the HSM (Chaiken et al., 1989). Thus, we refrain from restating these predictions for the CPM. However, the CPM goes beyond these two models by including several assumptions regarding the reception of a persuasive message, the retrieval of information from memory, and the role of affective states in persuasion. From the perspective of the APE model, the most important extension offered by the CPM is represented by its assumptions regarding reception processes. That is, the CPM proposes several sequential stages in the processing of a persuasive message, which are as follows: (a) interpretation of information, (b) identification of information, (c) selection of information, (d) validation of information, and (e) use of information in judgment.

From the perspective of the APE model, these processes are primarily related to direct influences of a persuasive message on propositional reasoning. Thus, the assumptions of the CPM regarding intervening variables at these stages provide a useful extension to the APE model when it comes to understanding how processes of propositional reasoning are influenced by persuasive messages. However, the APE model goes beyond the CPM (a) by additionally including associative processes as an independent form of evaluation and (b) by including an indirect method of explicit attitude change via changes in associative evaluations (e.g., EC). As outlined in the context of the ELM (Petty & Cacioppo, 1986), we argue that both central and peripheral cues can influence

evaluative judgments not only directly via processes of propositional reasoning but also indirectly via changes in associative evaluations. Most important, as direct effects on associative evaluations can occur even under suboptimal reception conditions (e.g., Dijksterhuis, 2004; M. A. Olson & Fazio, 2001, 2002, 2006; see also Baeyens, Eelen, & Van den Bergh, 1990; Krosnick, Betz, Jussim, & Lynn, 1992), reception processes may be more important for attitude changes resulting from a direct influence on propositional reasoning but less important for attitude changes resulting from a direct influence on associative evaluations.

Stability of Attitude Changes

An important question in the context of explicit and implicit attitude change concerns the relative stability of attitude changes. From a general perspective, one could argue that attitude changes should be more stable when they imply a change of the associative structure rather than a change in pattern activation. Even though we generally agree with this assumption, we argue that the stability of attitude changes is empirically defined only as the temporal consistency of associative evaluations or evaluative judgments (Lord & Lepper, 1999; Schwarz & Bohner, 2001; Wilson & Hodges, 1992). Temporal consistency, however, substantially depends on both associative structure and contextual factors (see Smith, 1996). For example, changes in associative structure should result in a high level of temporal consistency only if future events consistently activate the same associative pattern. However, if future events are unlikely to activate the same associative pattern, changes in associative structure could also result in a low level of temporal consistency. In a similar vein, changes in pattern activation may show a relatively high level of temporal consistency when future events consistently activate the same pattern of associations in memory. However, changes in pattern activation may show a low level of temporal consistency when future events activate different patterns of associations. In other words, changes in associative evaluations may exhibit either a high or a low level of temporal consistency regardless of whether these changes are due to differences in pattern activation or to changes in associative structure. Moreover, whether changes in associative evaluations show a high or a low level of temporal consistency is not only a matter of associative structure but also a matter of contextual factors that influence which associative pattern is activated.

Similar considerations apply to evaluative judgments (for a more detailed analysis, see Albarracín, Wallace, & Glasman, 2004). For instance, if people consistently base their evaluative judgments on associative evaluations, propositional evaluations may exhibit either a high or a low level of temporal consistency, depending on the temporal consistency of associative evaluations. However, even if associative evaluations show a low level of temporal consistency, propositional evaluations could still exhibit a high level of temporal consistency if people generally reject their associative evaluations as a valid basis for an evaluative judgment, consistently consider the same set of propositions, and use the same strategy to achieve consistency. Such imperviousness to influence can be regarded as the hallmark of attitude strength. People who are strongly committed to their evaluative judgments are unlikely to expose themselves to counterattitudinal information and are likely to vigorously counterargue it if they encounter it (e.g., Wyer & Frey, 1983). Thus, even if the automatic evaluative

associations of such persons could be successfully influenced, they would be expected to reject such associations as a valid basis for an evaluative judgment and to search for additional propositions to maintain their committed views. Because strong attitudes are often accompanied by extensive supporting knowledge (e.g., Abelson, 1988), it likely would not be hard to retrieve relevant propositions. In contrast to the case for strong attitudes, ambivalent attitudes are likely to produce much more pliable and unstable evaluative judgments (e.g., Armitage & Conner, 2000), in part because they may elicit greater cognitive elaboration (Hänze, 2001). Without any particular bias to constrain the direction of elaboration, ambivalent evaluative judgments not only may be more unstable but may also be less consistently correlated with automatic evaluative reactions (e.g., Nosek, 2005; see also Hofmann, Gschwendner, Nosek, & Schmitt, 2005).

The most general claim of the APE model is that the temporal consistency of evaluative judgments should vary as a function of the temporal consistency of associative evaluations when associative evaluations are considered as a valid basis for evaluative judgments. However, the temporal consistency of evaluative judgments can also be independent of the temporal consistency of associative evaluations when associative evaluations are rejected as a valid basis for evaluative judgments.

One or Two Processes?

Even though the distinction between associative and propositional processes is shared by several models of mental processing (e.g., Bazerman et al., 1998; Kahneman, 2003; Lieberman et al., 2002; Sloman, 1996; Smith & DeCoster, 2000; Strack & Deutsch, 2004), it also has been subject to criticism. With regard to the APE model, the three most critical arguments in this debate are as follows: (a) Effects of classical conditioning depend on higher order propositional rather than lower level associative processes (e.g., Holyoak, Koh, & Nisbett, 1989; Lovibond, 2003; Williams, 1995), (b) reasoning processes that have been described as associative are actually propositional (e.g., Erb et al., 2003; Osman, 2004), and (c) even associative processes follow rules, thus undermining the theoretical basis for a distinction between associative and rule-based processes (e.g., Gigerenzer & Regier, 1996; Kruglanski, Erb, Pierro, Mannetti, & Chun, in press). All of these arguments challenge the basic distinction between associative and propositional process, suggesting that a single process may be sufficient to account for the phenomena in question.

In our view, the APE model is not vulnerable to any of these arguments. With regard to the role of propositional processes in classical conditioning (e.g., Holyoak et al., 1989; Lovibond, 2003; Williams, 1995), it is important to note that the APE model is primarily concerned with effects of EC rather than with signal learning effects resulting from Pavlovian conditioning (PC). Whereas the CS in a PC paradigm typically acquires a *predictive value* for the US, the CS in an EC paradigm merely attains the *affective quality* of the US. This distinction is crucial, as the acquisition of affective quality differs from the acquisition of predictive value in several important aspects (for a review, see De Houwer et al., 2001). First, in contrast to PC effects, EC effects do not depend on people's awareness of the contingency between CS and US. Whereas PC effects require that people are consciously aware of the contingency between CS and US, EC effects can also

be observed (and sometimes even become stronger) when people are unaware of the contingency between CS and US (e.g., Baeyens et al., 1990). Second, in contrast to PC effects, EC effects do not depend on statistical CS-US contingencies. Instead, EC effects seem to be primarily driven by spatiotemporal contiguity between the two kinds of stimuli independent of statistical ratios (e.g., Baeyens, Hermans, & Eelen, 1993). Third, in contrast to PC effects, EC effects are resistant to extinction. Whereas single presentations of the CS typically reduce conditioning effects in PC, such single presentations leave EC effects unaffected (e.g., Baeyens, Crombez, Van den Bergh, & Eelen, 1988). Taken together, these results suggest that, even though PC effects may be driven by higher order propositional processes (e.g., Holyoak et al., 1989; Lovibond, 2003; Williams, 1995), EC effects are better explained by a qualitatively different, associative mechanism (De Houwer et al., 2001).

With regard to the role of propositional processes in human reasoning, we generally agree with the argument that many processes that have been described as associative may actually be propositional (e.g., Erb et al., 2003; Osman, 2004). In fact, we claim that any kind of reasoning process is inherently propositional, given that reasoning is concerned with validation and the assessment of truth values (Deutsch & Strack, in press). To be sure, automatic affective reactions resulting from associative processes are usually transformed into propositional format, thus representing a particular kind of information in propositional reasoning. However, this transformation does not imply that the associative process that gives rise to automatic affective reactions itself is propositional. It is important to note that even when an automatic affective reaction is rejected in the course of propositional reasoning, the automatic affective reaction may still be unaffected, thus leading to a dissociation between evaluative judgments and automatic affective reactions (e.g., Gawronski & Strack, 2004; see also Butler et al., 2003; Gross, 1998).

With regard to the rule-based character of associative processes (e.g., Gigerenzer & Regier, 1996; Kruglanski et al., in press), it is important to note that the primary criterion for distinguishing between associative and propositional processes in the APE model is the notion of truth values rather than "if . . . then" rules. In fact, we generally agree that associative processes follow a lawful manner, namely pattern activation in an associative network. However, associative processes differ from propositional processes, such that the activation of associations occurs independently of whether a person considers these associations to be accurate. Such validation requires propositional processes, which assess the truth or falsity of a given proposition by reference to their consistency with other relevant propositions (Kruglanski, 1989). Given that consistency assessment—and thus validation—is not possible without logical rules that define the relation between propositions, an important feature of propositional reasoning is the notion of syllogistic reasoning. However, this feature is an implication of our definition in terms of truth values rather than the defining feature per se. Thus, even though the "rule-based" character of associative processes (e.g., Gigerenzer & Regier, 1996; Kruglanski et al., in press) may pose a problem to models that define associative and propositional processes in terms of similarity-based processing versus application of syllogistic rules (e.g., Smith & DeCoster, 2000), it does not affect the proposed definition in terms of activation versus validation implied by the APE model.

Finally, we argue that any single-process model faces problems in explaining the multitude of patterns obtained in research on implicit and explicit attitude change. This limitation is most evident when it comes to explaining dissociations in attitude change, such as changes in explicit but not implicit attitudes (e.g., Gawronski & Strack, 2004), changes in implicit but not explicit attitudes (e.g., Karpinski & Hilton, 2001), or antagonistic changes in implicit and explicit attitudes (e.g., Strack & Deutsch, 2004). As we have illustrated, such dissociations are well explained by the APE model. However, it is less clear how a single-process model would account for such dissociations in attitude change. Moreover, the APE model implies specific predictions about (a) the conditions that should lead to changes in explicit attitudes, implicit attitudes, or both explicit and implicit attitudes and, given that corresponding changes in explicit and implicit attitudes are predicted, (b) the particular pattern of how changes in one kind of attitude should be mediated by changes in the other.

Implications and Future Directions

In addition to providing an integrative framework of the available evidence on explicit and implicit attitude change, the APE model also has several implications for future research. First, the APE model highlights the importance of focusing on the particular psychological processes that underlie implicit and explicit attitudes. Rather than using properties to describe implicit and explicit attitudes (e.g., automatic vs. controlled, conscious vs. unconscious, old vs. new), the APE model stresses the distinct psychological nature of two qualitatively different processes: associative and propositional processes. Fundamental to the APE model is the assumption that the two kinds of processes are influenced in very different ways. Thus, future research on attitude change may benefit from a priori considerations regarding which of the two processes are influenced by a particular variable under investigation, thus allowing for specific predictions regarding whether a given variable should influence only explicit attitudes, only implicit attitudes, or both explicit and implicit attitudes.

Second, the APE model highlights the importance of considering different processes that may be responsible for changes in explicit and implicit attitudes. With regard to changes in implicit attitudes, for example, it seems important to consider whether a particular variable leads to changes in the preexisting structure of associations or to changes in the associative pattern that is activated by a given stimulus. In a similar vein, changes in explicit attitudes may be due to changes in associative evaluations, changes in the set of propositions that are considered for an evaluative judgment, or changes in the strategy to achieve propositional consistency. Because these processes can be associated with different patterns of implicit and explicit attitude change, it seems important to consider not only which of the two processes is affected in the first place but also how the respective process is influenced by a particular variable.

Third, the APE model highlights the importance of focusing on mediating mechanisms as well as the particular interplay of associative and propositional processes. Rather than just testing whether a particular variable influences only explicit attitudes, only implicit attitudes, or both explicit and implicit attitudes, future research should address the mutual relation between explicit and implicit attitude change. Such investigations seem particularly

relevant in the case of corresponding attitude changes, which may reflect either (a) an indirect influence on explicit attitudes that is mediated by implicit attitudes or (b) an indirect influence on implicit attitudes that is mediated by explicit attitudes. Because the particular interplay between associative and propositional processes seems crucial for a sufficient understanding of explicit and implicit attitude change, mediation and correlational analyses provide an important supplement to standard analyses in terms of general effects on mean values.

Finally, the APE model implies several assumptions about the particular interplay of associative and propositional processes that have empirical implications for explicit and implicit attitude change. Some of these predictions have already been confirmed in previous research, whereas other predictions still remain to be tested. Most of these predictions refer to mediating mechanisms, such as the mediating role of associative evaluations in minimal group settings, the role of contingency awareness for EC effects on explicit and implicit attitudes, the joint influence of cognitive dissonance and associative self-anchoring on postdecisional attitude change, or the impact of proactive construction versus retroactive rejection of evaluations in persuasion. Thus, the APE model may stimulate future research designed to test these predictions.

Methodological Issues

Throughout this review, we have largely equated evaluative judgments resulting from propositional processes with self-reported evaluations and equated automatic affective reactions resulting from associative processes with performance on indirect measures, such as the Implicit Association Test (Greenwald et al., 1998) or affective priming (Fazio et al., 1995). However, the latter equation implies a number of methodological issues that one needs to consider when applying the APE model.

First, measures of implicit attitudes have shown large variation with regard to their internal consistency. Whereas many studies using the Implicit Association Test (Greenwald et al., 1998) showed quite satisfying reliability scores between .70 and .90 (e.g., Asendorpf, Banse, & Mücke, 2002; Egloff & Schmukle, 2002; Gawronski, Ehrenberg, Banse, Zukova, & Klauer, 2003; Gawronski, Geschke, & Banse, 2003), several other studies exhibited only moderate (e.g., Banse, 1999; Kawakami & Dovidio, 2001) or relatively unsatisfying scores (e.g., Banse, 2001; M. A. Olson & Fazio, 2003). Because many of our hypotheses about mediation processes depend on correlations between associative evaluations and evaluative judgments, low reliability of implicit attitude measures poses a serious problem (see also Cunningham, Preacher, & Banaji, 2001; Hofmann Gawronski, et al., 2005). Hence, when testing predictions derived from the present framework, it is important to consider the internal consistency of the implicit measures before interpreting the results of correlation or mediation analyses.

Second, different kinds of implicit attitude measures may tap different kinds of evaluative associations. For instance, whereas affective priming tasks seem to be primarily influenced by automatic evaluations of the particular exemplars used as prime stimuli (e.g., Livingston & Brewer, 2002; M. A. Olson & Fazio, 2003), the Implicit Association Test seems to be influenced by the valence of both the individual exemplars (e.g., Blüzmke & Frieze, 2006; Govan & Williams, 2004; J. P. Mitchell et al., 2003) and the

particular categories that are applied to these exemplars within the task (e.g., De Houwer, 2001; J. P. Mitchell et al., 2003; M. A. Olson & Fazio, 2003). Thus, when testing hypotheses derived from the APE model, it is important to consider whether the attitude object in question is represented on the exemplar level or on the level of general categories and whether the evaluation level in the implicit measure corresponds to the one implied in the explicit measure.

Third, many measures of implicit attitudes involve a notion of response compatibility (De Houwer, 2003b; see also Kornblum, Hasbroucq, & Osman, 1990). Automatic evaluations in these measures are assessed by means of the (in)compatibility of the response tendency elicited by an automatic affective reaction with the accurate response required by the task. However, such response compatibility mechanisms tap mental associations only indirectly rather than directly (i.e., by means of response activation). Thus, factors that directly affect the mediating variable (e.g., response activation) can sometimes lead to misleading results that do not reflect a genuine change in association activation. For instance, Gawronski and Bodenhausen (2005) and Gawronski, Deutsch, and Seidel (2005) recently demonstrated that increasing stimulation of associations in memory can lead to contrast effects (rather than additive effects) on implicit measures that involve a notion of response compatibility (Gawronski & Bodenhausen, 2005; Gawronski, Deutsch, & Seidel, 2005), whereas increasing stimulation leads to the expected additive effects on measures that do not involve a notion of response compatibility (Balota & Paul, 1996; Gawronski & Bodenhausen, 2005). Thus, when testing the impact of external factors on implicit attitude measures, it is generally important to consider the mechanisms underlying these measures to avoid misinterpretations of the obtained results.

Fourth, it is important to acknowledge that implicit attitude measures are not process pure. With regard to the Implicit Association Test (Greenwald et al., 1998), for example, several studies indicated that various nonassociative processes may contribute to systematic variance in IAT scores (Brendl, Markman, & Messner, 2001; McFarland & Crouch, 2002; Mierke & Klauer, 2003; Rothermund & Wentura, 2004). Consistent with this claim, Conrey, Sherman, Gawronski, Hugenberg, and Groom (2005) recently presented a multinomial model (see Batchelder & Riefer, 1999; Klauer & Wegener, 1998) that is able to disentangle the contribution of four qualitatively different processes on implicit task performance: (a) automatic activation of associations, (b) discriminability of the stimulus, (c) success at overcoming automatic associations, and (d) general guessing biases. Applied to the present question, such models are a desirable way to disentangle the genuine contribution of associative evaluations from other nonassociative processes when investigating the mutual interplay between associative evaluations and evaluative judgments.

Finally, some researchers have argued that implicit measures differ as to whether they tap cultural or personal associations. M. A. Olson and Fazio (2004), for example, argued that the standard variant of the Implicit Association Test is contaminated by cultural associations (i.e., associations endorsed by other people), which thus undermines its usefulness as a measure of personal associations (i.e., personally endorsed associations). To solve this problem, M. A. Olson and Fazio (2004) proposed a personalized variant of the IAT that was designed to reduce the impact of cultural associations. We consider this distinction be-

tween cultural and personal associations as problematic. From a representational perspective (Smith, 1998), the proposed distinction implies that the representation of associations in memory can differ as a function of their source. That is, the source of an association (i.e., personal vs. cultural) must be an essential part of the representation of an association. This assumption, however, seems implausible from the perspective of research on source memory that suggests an independent representation of source information in memory (for a review, see M. K. Johnson, Hashtroudi, & Lindsay, 1993). A similar conclusion can be drawn from research on the sleeper effect, which also suggests that source and content information are stored independently in memory (for a meta-analysis, see Kumkale & Albarracín, 2004). On the basis of these considerations, we argue that the personal character of associations is determined by their endorsement on a propositional level. That is, the representation of associations in memory does not differ as a function of whether they are personal or cultural. Rather, some of these associations may be more likely to be endorsed, whereas others may be rejected as a basis for evaluative judgments. Moreover, procedural differences among tasks may make some tasks more likely to reveal evaluations that are personally endorsed on a propositional level—for example, by means of a stronger impact of deliberate control on task performance (see Conrey et al., 2005). However, this personal character is determined by propositional processes rather than by the representation of evaluations in associative memory.

Conclusion

The main goals of the present article are (a) to propose a new theoretical model for the study of explicit and implicit attitude change, the APE model, and (b) to provide an integrative, exhaustive review of the available evidence regarding implicit and explicit attitude change that is guided by the assumptions of the APE model. Drawing on the general notion of associative and propositional processes implied by several dual-systems models of the mind (e.g., Kahneman, 2003; Lieberman et al., 2002; Sloman, 1996; Smith & DeCoster, 2000; Strack & Deutsch, 2004), we argue that explicit and implicit attitudes should be understood in terms of their underlying mental processes. Hence, different kinds of attitude changes may be better understood by the particular way these processes are affected by external influences. For associative evaluations, these processes include changes in associative structure and changes in pattern activation. For evaluative judgments, the relevant processes include changes in associative evaluations, changes in the considered set of propositions, and changes in the strategy to achieve propositional consistency. These processes may occur in various patterns that can imply corresponding or noncorresponding changes in implicit and explicit attitudes. Thus, the APE model provides a theoretical integration of the available evidence on explicit and implicit attitude change for a large variety of areas (e.g., cognitive dissonance, EC, priming, persuasion). It also implies a number of new predictions that may stimulate future research and thus may offer a better understanding of the underlying dynamics of associative and propositional processes in evaluation.

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Appendix

Exhaustive List of Reviewed Studies That Investigated the Impact of External Influences on Implicit Attitudes

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Ashburn-Nardo et al. (2001, Exp. 3)	Minimal in-group vs. out-group	Minimal group setting	Implicit Association Test		Minimal group setting induced implicit preference for in-group over out-group
Baccus et al. (2004)	Self	Evaluative conditioning	Combined score of Implicit Association Test and Name Letter Effect		Repeated pairings of self-relevant information with smiling faces increased implicit self-esteem
Banse et al. (2001, Exp. 2)	Homosexuality	Persuasive message, experimenter demand, faking instructions, control condition	Implicit Association Test	Affective and Cognitive Attitudes Toward Homosexuality Scales	Instructions to fake attitudes reduced heterosexual men's explicit negativity toward homosexuality but not their implicit negativity
Barden et al. (2004, Exp. 1)	Asians, Blacks, and Whites	Background picture in implicit measure: technical classroom vs. basketball court	Affective priming task	Semantic differential	White participants' explicit and implicit evaluations of Asians were more positive for classroom context than for basketball context; explicit and implicit evaluations of Blacks were more positive for basketball context than for classroom context; explicit and implicit evaluations of Whites were independent of context
Barden et al. (2004, Exp. 2)	Blacks vs. Whites	Background picture in implicit measure: factory vs. church vs. prison	Affective priming task	Semantic differential	White participants' explicit and implicit preference for Whites over Blacks was strongest when target was presented in prison context, moderate when target was presented in factory context, and weakest when target was presented in church context
Barden et al. (2004, Exp. 3)	Blacks vs. Whites	Background picture in implicit measure: prison; social role suggested by clothing: prisoner vs. lawyer	Affective priming task	Semantic differential	White participants' explicit and implicit preference for Whites over Blacks was stronger when target was presented in prisoner role than when target was presented in lawyer role
Briñol et al. (2002)	Vegetables	Persuasive message including strong vs. weak arguments	Implicit Association Test	Multiple-item rating scale	Argument strength affected only implicit but not explicit attitudes; effect of argument quality was particularly pronounced for participants high in need for cognition
Castelli et al. (2004, Exp. 1)	Unfamiliar individuals	Individuals labeled as child molester vs. child counselor	Affective priming task		Implicit evaluations were more negative for individuals labeled child molester than for individuals labeled child counselor
Castelli et al. (2004, Exp. 2)	Unfamiliar individuals	Individuals labeled as child molester vs. child counselor	Implicit Association Test		Implicit evaluations were more negative for individuals labeled child molester than for individuals labeled child counselor
Castelli et al. (2004, Exp. 3)	Unfamiliar individuals	Minimal group setting	Affective priming task		Implicit evaluations of individuals were more positive when they belonged to in-group than when they belonged to out-group
Castelli et al. (2004, Exp. 6)	Unfamiliar individuals	Individuals labeled as child molester vs. child counselor	Approach/avoidance task		Implicit evaluations were more negative for individuals labeled child molester than for individuals labeled child counselor

(Appendix continues)

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Dasgupta & Greenwald (2001, Exp. 1)	Blacks vs. Whites	Exposure to liked vs. disliked Black vs. White individuals	Implicit Association Test	Feeling Thermometer, semantic differential	Exposure to liked Blacks and disliked Whites reduced White participants' implicit but not explicit preference for Whites over Blacks
Dasgupta & Greenwald (2001, Exp. 2)	Young vs. older people	Exposure to liked vs. disliked older vs. young individuals	Implicit Association Test	Feeling Thermometer, semantic differential	Exposure to liked older and disliked young people reduced implicit but not explicit preference for young over older people
DeSteno et al. (2004, Exp. 1)	Minimal in-group vs. out-group	Emotion: anger, sadness, neutral	Affective priming task		Anger led to higher levels of implicit prejudice against out-group than sadness or neutral emotional state
DeSteno et al. (2004, Exp. 2)	Minimal in-group vs. out-group	Emotion: anger, sadness, neutral	Implicit Association Test		Anger led to higher levels of implicit prejudice against out-group than sadness or neutral emotional state
Dijksterhuis (2004, Exp. 1)	Self	Evaluative conditioning	Name Letter Effect		Repeated pairings of self-related words with positive trait words increased implicit self-esteem
Dijksterhuis (2004, Exp. 2)	Self	Evaluative conditioning	Name Letter Effect		Repeated pairings of self-related words with positive trait words increased implicit self-esteem
Dijksterhuis (2004, Exp. 3)	Self	Evaluative conditioning	Implicit Association Test		Repeated pairings of self-related words with positive trait words increased implicit self-esteem
Dijksterhuis (2004, Exp. 4)	Self	Evaluative conditioning after positive vs. negative feedback	Name Letter Effect		Implicit self-esteem was higher after positive as compared with negative feedback; repeated pairing of self-related words with positive trait words increased implicit self-esteem irrespective of feedback condition
Ferguson & Bargh (2004, Exp. 1)	Goal-relevant stimuli	State of goal pursuit: finished vs. unfinished	Affective priming task		Goal-relevant stimuli showed more positive implicit valence when goal was unfinished than when goal was finished, but only when achievement goal was strong
Ferguson & Bargh (2004, Exp. 2)	Thirst-relevant stimuli	Deprivation: thirsty vs. nonthirsty	Affective priming task		Thirst-relevant stimuli showed more positive implicit valence for thirsty but not for nonthirsty participants
Ferguson & Bargh (2004, Exp. 3)	Athletic-irrelevant vs. athletic-relevant stimuli	Recall of athletic performance: failure vs. success vs. neutral	Affective priming task		Under failure conditions, athletic-relevant objects showed more positive implicit valence for varsity athletes but not for intramural athletes
Froni & Mayr (2005, Exp. 1)	Flowers vs. insects	Fictional scenario that implied reversal of valence vs. instruction to reverse valence	Implicit Association Test		Fictional scenario but not instruction to reverse valence reduced implicit preference for flowers over insects
Froni & Mayr (2005, Exp. 2)	Flowers vs. insects	Fictional scenario that implied reversal of valence vs. instruction to reverse valence	Go/No-Go Association Task		Fictional scenario but not instruction to reverse valence reduced implicit preference for flowers over insects
Frantz et al. (2004, Exp. 1)	Blacks vs. Whites	Task introduced as measure of racial prejudice vs. cultural stereotypes vs. control conditions	Implicit Association Test		White participants' implicit preference for Whites over Blacks was stronger when task was introduced as a measure of racial prejudice and weaker when it was introduced as measure of cultural stereotypes

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Frantz et al. (2004, Exp. 2)	Blacks vs. Whites	Task introduced as measure of racial prejudice vs. brain lateralization during categorization of Blacks and Whites	Implicit Association Test		White participants' implicit preference for Whites over Blacks was stronger when task was introduced as measure of racial prejudice, but only for participants high in motivation to control prejudiced reactions
Frantz et al. (2004, Exp. 3)	Blacks vs. Whites	Task introduced as revealing racial prejudice for majority vs. minority of participants; self-affirmation vs. no self-affirmation	Implicit Association Test		White participants' implicit preference for Whites over Blacks was stronger when task was introduced as revealing racial prejudice for majority, but only for participants who did not have an opportunity for self-affirmation
Gawronski & Bodenhausen (2005, Exp. 1)	Blacks vs. Whites	Recollection of high vs. low number of liked vs. disliked Black individuals	Implicit Association Test		White participants' implicit preference for Whites over Blacks was weaker after retrieval of high number of disliked Black people and low number of liked Black people as compared with retrieval of low number of disliked Black people and high number of liked Black people
Gawronski & Bodenhausen (in press, Exp. 2)	Blacks vs. Whites	Recollection of high vs. low number of disliked Black individuals	Sequential priming with evaluative decision task vs. lexical decision task		White participants' implicit preference for Whites over Blacks was weaker after retrieval of high (vs. low) number of disliked Black people in priming with evaluative decision task; implicit preference for Whites over Blacks was higher after retrieval of high (vs. low) number of disliked Black people in priming with lexical decision task
Gawronski, Bodenhausen, & Becker (in press, Exp. 1)	Postcards	Ownership resulting from choice	Affective priming task		Chosen postcards showed more positive implicit valence than rejected postcards after decision but not before decision
Gawronski, Bodenhausen, & Becker (in press, Exp. 3)	Postcards	Ownership resulting from choice	Affective priming task		Chosen postcards showed more positive implicit valence than rejected postcards after decision; implicit evaluation of chosen postcard significantly correlated with implicit self-evaluations assessed with Name Letter Effect
Gawronski, Bodenhausen, & Becker (in press, Exp. 4)	Postcards	Ownership resulting from random assignment	Affective priming task		Owned postcards showed more positive implicit valence than nonowned postcards; implicit evaluation of owned postcard was significantly correlated with implicit self-evaluations assessed with Name Letter Effect
Gawronski, Deutsch, & Mbirkou (2006, Exp. 2)	Blacks vs. Whites	Training in negation of stereotypes vs. affirmation of counterstereotypes	Affective priming task		Training in affirmation of counterstereotypes reduced implicit preference for Whites over Blacks, whereas training in negation of stereotypes enhanced implicit preference for Whites over Blacks

(Appendix continues)

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Gawronski & Strack (2004, Exp. 1)	Alcoholic beverages	Counterattitudinal behavior under low choice vs. high choice conditions	Implicit Association Test	Two-item scale	Counterattitudinal behavior led to change in explicit but not implicit evaluations under high choice conditions; implicit and explicit evaluations were positively correlated under low choice conditions but not under high choice conditions
Gawronski & Strack (2004, Exp. 2)	Blacks vs. Whites	Counterattitudinal behavior under low choice vs. high choice conditions	Implicit Association Test	Feeling Thermometer	Counterattitudinal behavior led to change in White participants' explicit but not implicit evaluations under high choice conditions; implicit and explicit evaluations were positively correlated under low choice and control conditions but not under high choice conditions
Gawronski, Walther, & Blank (2005, Exp. 1)	Unfamiliar individuals	Unfamiliar individuals either liked or disliked by other individuals who were previously learned to be likable or dislikable	Affective priming task	Likability rating	For both explicit and implicit attitudes, more positive attitudes toward unfamiliar individuals who were liked by positive or disliked by negative individuals and more negative attitudes toward unfamiliar individuals who were disliked by positive or liked by negative familiar individuals
Gawronski, Walther, & Blank (2005, Exp. 2)	Unfamiliar individuals	Unfamiliar individuals either liked or disliked by other individuals who were subsequently learned to be likable or dislikable	Affective priming task	Likability rating	For both explicit and implicit attitudes, more positive attitudes toward unfamiliar individuals who were liked rather than disliked; for implicit but not explicit attitudes, more positive attitudes toward individuals who were paired with other individuals who were later learned to be likable than toward individuals who were paired with other individuals who were later learned to be dislikable
Gawronski, Walther, & Blank (2005, Exp. 3)	Unfamiliar individuals	Manipulations identical to Experiments 1 and 2 by Gawronski, Walther, & Blank (2005); order of likability manipulations varied between subjects	Affective priming task	Likability rating	Replication of the respective patterns obtained in Experiments 1 and 2 by Gawronski, Walther, & Blank (2005)
Gemar et al. (2001)	Self	Negative mood	Implicit Association Test	Dysfunctional Attitudes Scale	Formerly depressed (but not never-depressed) participants showed more negative evaluations of self after negative mood induction on both explicit and implicit measure
Glen & Banse (2004)	Self	Interview focusing on personal strengths vs. personal weaknesses	Implicit Association Test	Rosenberg Self-Esteem Scale; Self-Liking and Self-Competence Scale	No effects on implicit and explicit self-esteem; explicit self-liking increased in both interview conditions

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Govan & Williams (2004, Exp. 1)	Flowers vs. insects	Valence of stimulus items that represent category in implicit measure	Implicit Association Test		Implicit preference for flowers over insects depended on valence of exemplars that represented category in implicit measure
Govan & Williams (2004, Exp. 1)	Blacks vs. Whites	Valence of stimulus items that represent category in implicit measure	Implicit Association Test		White participants' implicit preference for Whites over Blacks depended on valence of exemplars that represented category in implicit measure
Govan & Williams (2004, Exp. 2)	Animals vs. plants	Valence of stimulus items that represent category in implicit measure	Implicit Association Test		Implicit evaluations of animals vs. plants depended on valence of exemplars that represented category in implicit measure
Gregg et al. (2006, Exp. 1)	Hypothetical social groups	Mere supposition vs. rehearsal of positive vs. negative information about groups	Implicit Association Test	Semantic differential	Both explicit and implicit attitudes were influenced by valence of information under supposition, exposure, and rehearsal conditions
Gregg et al. (2006, Exp. 2)	Hypothetical social groups	Mere supposition vs. learning of positive vs. negative information about groups	Implicit Association Test	Semantic differential	Both explicit and implicit attitudes were influenced by valence of information under supposition and learning conditions
Gregg et al. (2006, Exp. 3)	Hypothetical social groups	Exposure to positive vs. negative information about groups; subsequent instruction that valence of information about groups should be reversed	Implicit Association Test	Semantic differential	Exposure to valence information influenced both explicit and implicit attitudes; subsequent reversal instructions influenced only explicit but not implicit attitudes
Gregg et al. (2006, Exp. 4)	Hypothetical social groups	Exposure to positive vs. negative information about groups; subsequent instruction that valence of information about groups should be reversed vs. exposure to evaluatively incongruent information	Implicit Association Test	Semantic differential	Exposure to valence information influenced both explicit and implicit attitudes; reversal instructions and subsequently presented incongruent information showed stronger effect on explicit as compared with implicit attitudes
Hermans et al. (2005)	Food Stimuli	Evaluative conditioning	Affective priming task	Evaluative rating scale	Repeated pairings of food stimuli with positive vs. negative odor influenced explicit and implicit attitudes toward food stimuli
Hermans et al. (2002)	Unfamiliar individuals	Evaluative conditioning	Affective priming task	Evaluative rating scale	Repeated pairings of unfamiliar faces with either negative electrocutaneous stimuli or negative adjectives led to more negative implicit and explicit attitudes
Huijding et al. (2005, Exp. 2)	Smoking	Smoking vs. Nonsmoking setting	Implicit Association Test, Affective Simon Task	Semantic differential	Smokers' explicit and implicit attitudes were unaffected by smoking vs. nonsmoking setting
Karpinski & Hilton (2001, Exp. 3)	Young vs. older people	Evaluative conditioning	Implicit Association Test	Feeling Thermometer, Semantic differential, Attitudes Toward Old People Scale	Repeated pairings of the words <i>elderly</i> and <i>youth</i> with positive vs. negative adjectives influenced implicit but not explicit attitudes

(Appendix continues)

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Kim (2003, Exp. 1)	Flowers vs. insects	Instruction to fake attitude	Implicit Association Test		Faking instructions had no effect on implicit attitudes
Kim (2003, Exp. 1)	Musical instruments vs. weapons	Instruction to fake attitude	Implicit Association Test		Faking instructions had no effect on implicit attitudes
Kim (2003, Exp. 2)	Blacks vs. Whites	Instruction to fake attitude with and without information on how to fake	Implicit Association Test		Faking instructions had no effect on White participants' implicit attitudes unless specific instructions were given on how to modify responses in the task
Kühnen et al. (2001, Exp. 1)	East Germans vs. West Germans	Priming of group categories East German and West German by means of survey	Implicit Association Test		Group membership priming increased implicit in-group preference for West German participants but decreased implicit in-group preference for East German participants
Kühnen et al. (2001, Exp. 2)	East Germans vs. West Germans	Priming of group categories East German and West German by means of survey	Implicit Association Test		Group membership priming increased implicit in-group preference for West German participants but decreased implicit in-group preference for East German participants
Lowery et al. (2001, Exp. 1)	Blacks vs. Whites	Black vs. White experimenter	Implicit Association Test		White participants showed lower levels of implicit preference for Whites over Blacks when experimenter was Black than when experimenter was White
Lowery et al. (2001, Exp. 2)	Blacks vs. Whites	Black vs. White experimenter	Implicit Association Test		White but not Asian participants showed lower levels of implicit preference for Whites over Blacks when experimenter was Black than when experimenter was White
Lowery et al. (2001, Exp. 3)	Blacks vs. Whites	Black Experimenter; with vs. without instruction to be nonprejudiced	Implicit Association Test		White and Asian participants showed lower levels of implicit preference for Whites over Blacks when they were instructed to be nonprejudiced
Lowery et al. (2001, Exp. 4)	Blacks vs. Whites	Black vs. White experimenter	Affective priming task		White but not Asian participants showed lower levels of implicit preference for Whites over Blacks when experimenter was Black than when experimenter was White
Maddux et al. (2005, Exp. 1)	Blacks vs. Whites	Background picture in implicit measure: church vs. prison	Affective priming task		Prison context reduced White participants' implicit preference for Whites over Blacks, but only for participants high in motivation to control prejudice
Maddux et al. (2005, Exp. 2)	Blacks vs. Whites	Background picture in implicit measure: garden vs. foggy street	Affective priming task		Foggy street context reduced White participants' implicit preference for Whites over Blacks, but only for participants high in motivation to control prejudice
C. J. Mitchell et al. (2003, Exp. 1)	Meaningless nonwords	Evaluative conditioning	Implicit Association Test		Repeated pairings of nonwords with positive or negative words influenced implicit valence of nonwords
C. J. Mitchell et al. (2003, Exp. 2)	Meaningless nonwords	Evaluative conditioning	Implicit Association Test		Repeated pairings of nonwords with positive or negative words influenced implicit valence of nonwords

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
J. P. Mitchell et al. (2003, Exp. 1)	Black athletes and White politicians	Categorization in terms of race vs. occupation	Implicit Association Test		White participants showed implicit preference for White politicians over Black athletes when they were categorized in terms of race but implicit preference for Black athletes over White politicians when they were categorized in terms of occupation
J. P. Mitchell et al. (2003, Exp. 2)	Blacks vs. Whites	Valence of exemplars that represent category in implicit measure	Implicit Association Test		White participants showed implicit preference for Whites over Blacks depending on valence of exemplars that represented category in implicit measure
J. P. Mitchell et al. (2003, Exp. 3)	Black athletes and White politicians	Categorization in terms of race vs. occupation	Implicit Association Test		White participants showed implicit preference for White politicians over Black athletes when they were categorized in terms of race but implicit preference for Black athletes over White politicians when they were categorized in terms of occupation
J. P. Mitchell et al. (2003, Exp. 4)	Black women and White men	Salience of social categories in implicit measure	Go/No-Go Association Task		White participants showed implicit preference for White men over Black women when race category was salient but implicit preference for Black women over White men when gender category was salient
J. P. Mitchell et al. (2003, Exp. 5)	Black women and White men	Salience of social categories in implicit measure	Go/No-Go Association Task		White participants showed implicit preference for White men over Black women when race category was salient but implicit preference for Black women over White men when gender category was salient
Nier (2005)	Black vs. Whites	Bogus pipeline vs. neutral condition	Implicit Association Test	Modern Racism Scale	White participants' explicit but not implicit preference for Whites over Blacks increased under bogus pipeline conditions; correlations between explicit and implicit attitudes increased under bogus pipeline conditions
M. A. Olson & Fazio (2001, Exp. 2)	Pokemons	Evaluative conditioning	Implicit Association Test	Evaluative rating scale	Repeated pairings of Pokemon pictures with positive or negative stimuli influenced both explicit and implicit attitudes
M. A. Olson & Fazio (2002)	Pokemons	Evaluative conditioning	Affective priming task		Repeated pairings of Pokemon pictures with positive or negative stimuli influenced both explicit and implicit attitudes
M. A. Olson & Fazio (2006, Exp. 2)	Blacks vs. Whites	Evaluative conditioning	Affective priming task	Modern Racism Scale, Feeling Thermometer	Repeated pairings of Black and White faces with positive vs. negative stimuli influenced White participants' implicit but not explicit attitudes
M. A. Olson & Fazio (2006, Exp. 3)	Blacks vs. Whites	Evaluative conditioning	Affective priming task	Modern Racism Scale, Feeling Thermometer	Repeated pairings of Black and White faces with positive vs. negative stimuli influenced White participants' implicit but not explicit attitudes
Otten & Wentura (1999, Exp. 1)	Minimal in-group vs. out-group	Minimal group setting	Affective priming task		Minimal group setting induced implicit preference for in-group over out-group

(Appendix continues)

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
Otten & Wentura (1999, Exp. 2)	Minimal in-group vs. out-group	Minimal group setting	Affective priming task with response window	Five-item rating scale	Minimal group setting induced implicit and explicit preference for in-group over out-group
Petty et al. (2006, Exp. 1)	Unknown individuals	Evaluative conditioning and subsequent confirmation vs. disconfirmation by verbal information	Affective priming task	Likability rating	Repeated pairings of pictures of unknown individuals with positive and negative pictures influenced both explicit and implicit attitudes; verbal invalidation reversed explicit attitudes and neutralized implicit attitudes
Pratto & Shih (2000, Exp. 2)	In-group vs. out-group	Priming of intergroup context by means of essay	Affective priming task		Priming intergroup context enhanced implicit preference for in-group over out-group, but only for participants high in social dominance orientations
Richeson & Ambady (2001)	Men vs. women	Anticipated social role in cross-gender interaction: superior vs. subordinate vs. equal status	Implicit Association Test		Male (but not female) participants showed implicit preference for men over women when they anticipated a superior role but not when they anticipated equal status or a subordinate role
Richeson & Ambady (2003)	Blacks vs. Whites	Anticipated social role in mixed race vs. same race interaction: superior vs. subordinate	Implicit Association Test		White participants' implicit preference for Whites over Blacks was stronger when White participants anticipated a superior role in interaction with a Black person than when they anticipated a subordinate role
Richeson & Nussbaum (2004)	Blacks vs. Whites	Exposure to message advocating multicultural vs. color-blind perspective on racial relations	Implicit Association Test	Feeling Thermometer	White participants' implicit and explicit preference for Whites over Blacks were stronger for color-blind perspective than for multicultural perspective
Rudman et al. (2001, Exp. 1)	Blacks vs. Whites	Participation in diversity seminar	Implicit Association Test	Modern Racism Scale, trait ratings	White participants' explicit and implicit preference for Whites over Blacks was reduced after participation in diversity seminar
Rudman et al. (2001, Exp. 2)	Blacks vs. Whites	Participation in diversity seminar	Implicit Association Test	Modern Racism Scale, trait ratings	White participants' explicit and implicit preference for Whites over Blacks was reduced after participation in diversity seminar
Rudman, & Lee (2002, Exp. 1)	Blacks vs. Whites	Exposure to violent rap music vs. nonviolent popular music	Implicit Association Test	Trait endorsement measure	Exposure to violent rap music increased White participants' implicit and explicit preference for Whites over Blacks
Schaller et al. (2003, Exp. 2)	Blacks vs. Whites	Well-lit vs. dark laboratory room	Implicit Association Test		White participants' implicit preference for Whites over Blacks was stronger when lab room was dark than when it was well lit, but only for participants with chronic beliefs in a dangerous world
Sherman et al. (2003, Exp. 2)	Smoking	Deprivation: requested not to smoke for at least 4 hr before study vs. last cigarette shortly before study	Affective priming task, Implicit Association Test	Semantic differential	On the affective priming task, light smokers showed more positive attitudes toward smoking when they were not deprived than when they were deprived; heavy smokers showed more positive attitudes toward smoking when they were deprived than when they were not deprived; no effects on the Implicit Association Test or the explicit measure

Appendix (continued)

Study	Attitude object	Manipulation	Implicit measure	Explicit measure	Results
J. R. Steele & Ambady (2006, Exp. 2)	Math vs. arts	Priming of gender categories with survey that highlighted either gender or neutral identity	Implicit Association Test		Female participants showed more gender-stereotypical implicit attitudes (i.e., stronger preference for arts over math) after priming of gender category as compared with neutral priming
Strack & Deutsch (2004)	Virtual doors of red vs. blue colors	Valence of immediate, short-lasting vs. delayed, long-lasting consequences of opening virtual doors	Stop paradigm	Forced choice preference task	Implicit attitudes were influenced by immediate, short-lasting consequences; explicit attitudes were influenced by delayed, long-lasting consequences
Teachman & Woody (2003)	Spiders vs. snakes	Cognitive-behavioral therapy against spider phobia	Implicit Association Test	Fear of Spiders Questionnaire; Spider Phobia Questionnaire	Treatment reduced both explicit and implicit negativity toward spiders in people with spider phobia
Tormala et al. (2004, Exp. 1)	Vegetables	Persuasive message including strong vs. weak arguments	Implicit Association Test	Multiple-item rating scale	Argument strength affected only implicit but not explicit attitudes
Wittenbrink et al. (2001, Exp. 1)	Blacks vs. Whites	Movie clips depicting Blacks in barbeque context vs. gang-related incident	Implicit Association Test	Feeling Thermometer, Modern Racism Scale, Pro-Black and Anti-Black Scales, Diversity and Discrimination Scales	Barbeque context (but not gang-related context) reduced White participants' implicit preference for Whites over Blacks; explicit-implicit correlations were reduced after positive clip (exception: Feeling Thermometer)
Wittenbrink et al. (2001, Exp. 2)	Blacks vs. Whites	Valence of background context in implicit measure: church vs. graffiti wall	Affective priming task	Feeling Thermometer, Modern Racism Scale, Pro-Black and Anti-Black Scales, Diversity and Discrimination Scales	Church context (but not graffiti context) reduced White participants' implicit preference for Whites over Blacks; explicit-implicit correlations were reduced for positive context (exception: Feeling Thermometer)

Note. The list includes any study that meets each of the following three criteria: (a) the study must include at least one implicit attitude measure, (b) the implicit measure must tap a general evaluation rather than a semantic association, and (c) the study must include at least one experimental manipulation. Articles were retrieved from PsycINFO via the keywords *implicit attitudes*, *implicit evaluation*, *automatic attitudes*, and *automatic evaluation* as well as keywords related to widely used implicit attitude measures (i.e., Implicit Association Test, affective priming, evaluative priming, Affective Simon, Bona Fide Pipeline, Go/No-Go Association Task, Name Letter Effect, Implicit Egotism, Approach-Avoidance); articles that were in press were gathered by means of requests submitted to the mailing lists of professional psychological organizations (September 1, 2005). In addition, we included studies from our own lab that were particularly designed to test the assumptions of the associative-propositional evaluation model.

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