To enable this model to go beyond explaining the generation of social judgments, we attempt to integrate elements from other research programs that provide links to social behavior. Specifically, the work by Norman and Shallice (1986), Cacioppo, Priester, and Berntson, (1993), as well as Gollwitzer (1999) provided important conceptual elements that added a motivational dimension to the model. In particular, we suggest that behavior is a function of schemata that are jointly controlled by environmental input and superordinate attention (Norman & Shallice, 1986), and we propose the existence of a motivational orientation that acts as a behavioral catalyst and relates valence to approach and avoidance (Cacioppo et al., 1993). To bridge temporal gaps between a decision and its behavioral implementation, we integrated a mechanism of intending (Gollwitzer, 1999). In addition, we propose that the deprivation of basic needs influences spontaneous evaluation and preactivates behavioral schemata relevant for the satisfaction of the deprived needs.

Taken together, the value of this model is not that it is new in each of its components. Rather, we see its merits in its attempts to integrate elements from existing theories and to describe how they interact at different stages of processing. Most important, we try to tie mental processes to social behavior in a nontrivial way; that is, we do not assume that behavior follows inevitably from a decision and therefore does not deserve attention beyond its cognitive precursors. Instead, we construe social behavior as the result of several determinants that may operate in accord or conflict with each other.

Basic Properties and Functions

For reasons of clarity, the proposed model is described in 10 theses (see Figure 1 for an overview). As mentioned before, several components are shared by existing dual-process models. The descriptions of those components are somewhat briefer than of those we believe to be unique to this model.

> Thesis 1: Basic assumption. Social behavior is the effect of the operation of two distinct systems of information processing: a reflective system and an impulsive system. The systems can be specified by different principles of representation and information processing.

In the reflective system, behavior is elicited as a consequence of a decision process. Specifically, knowledge about the value and the probability of potential consequences is weighed and integrated to reach a preference for one behavioral option. If a decision is made, the reflective system activates appropriate behavioral schemata through a self-terminating mechanism of *intending*. In contrast, the impulsive system activates behavioral schemata through spreading activation, which may originate from perceptual input or from reflective processes. As described in James' (1890) ideo-motor principle (see also Lotze, 1852), a behavior may be elicited without the person's intention or goal. In addition, the activation of behavioral schemata may be moderated by motivational orientations or deprivation.

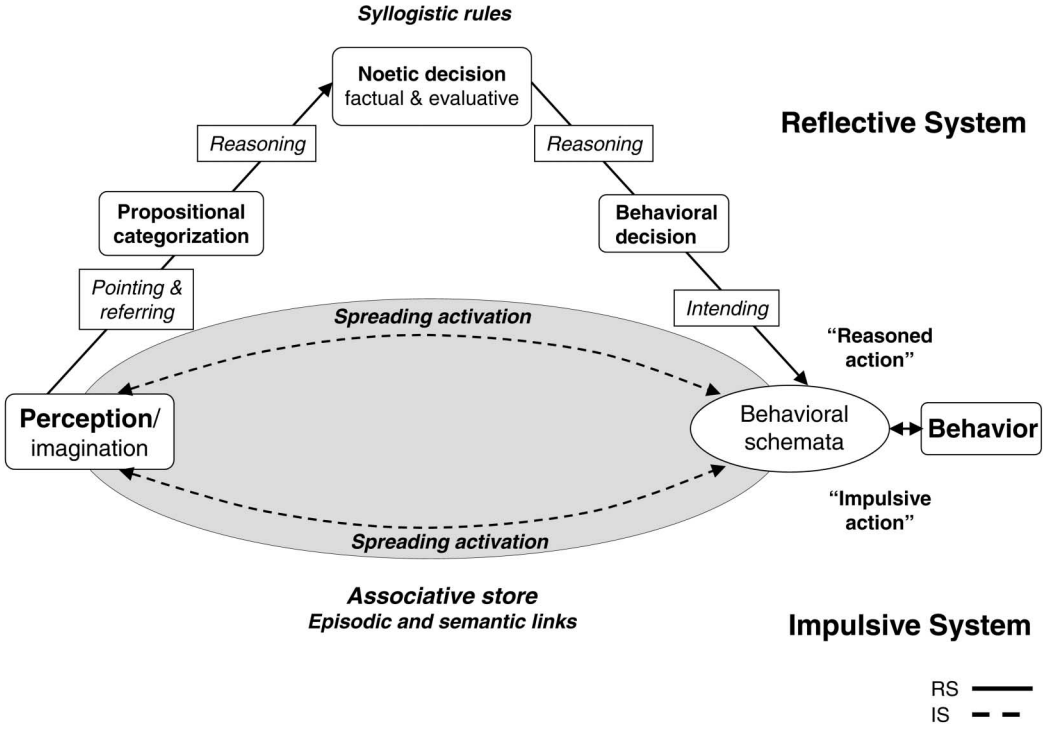

Figure 1. Overview of the reflective–impulsive model. Note that reflective and impulsive processes are represented by solid or broken lines, respectively.

sentations of the typical properties of the environment over many learning trials (see J. L. McClelland et al., 1995; Smith & DeCoster, 2000). The impulsive system has low flexibility but is fast and needs no attentional resources.

In addition, associative links can be formed through reflective operations. This is possible because every propositional representation in the reflective system activates corresponding contents in the impulsive system. As a result, elements that do not co-occur in reality but are often related to each other in the reflective system will also become associatively linked in the impulsive system (cf. Smith & DeCoster, 2000). Thus, semantic concepts will emerge in the impulsive system through frequent propositional categorizations. It is important to note that the links in the impulsive system, different from some other network models (e.g., Collins & Quillian, 1969), are not assumed to have any semantic meaning by themselves. Therefore, the only relation between two or more elements is that of a mutual activation.

For example, if we see an elderly person, perceptual features such as hair color or body posture may activate specific elements in the impulsive system (see Figure 2). Because such elements have previously been paired with other features that are correlated with advanced age, a whole cluster of elderly features will be activated. As a consequence, contents of the elderly stereotype will be more readily accessible and may guide subsequent processing. For example, the concept of slowness may become activated in the impulsive system and reflect our direct or indirect experiences with elderly people.

Although the connections between elements in the impulsive system do not carry a truth value and do not reflect declarative knowledge about elderly people being slow, the associative link between *elderly* and *slow* may bias perception and influence behavior if it is activated. Moreover, it is possible that motor programs that have been executed frequently in connection with elderly people in the past may again be activated. Research on the connection between perception and behavior bolsters the idea that semantic concepts can be directly connected to motor programs (e.g., Bargh, Chen, & Burrows, 1996; Dijksterhuis & Bargh, 2001). Recent findings on the interplay of gestures and lexical access indicates that this connection is bidirectional (e.g., Krauss, Chen, & Gottesman, 2000). Associative clusters in the impulsive system can be hierarchically structured and can therefore differ in abstractness. As a consequence, clusters may resemble either concrete perceptual concepts or abstract semantic concepts or schemata.

Processes in the impulsive system may be accompanied by an experiential state of awareness; that is, without necessarily knowing its origin, people may experience a feeling with its distinct phenomenal quality. For example, a person may have a visual perception of lightness or darkness, a pleasant or unpleasant feeling, or the experience of pain or familiarity without knowing the concepts or categories of light, pleasantness, pain, or familiarity. Thus, the impulsive system can be understood as a system of experiential primacy, in which affective and nonaffective feelings are generated quickly and without syllogistic processes of inference (see also Zajonc, 1980).

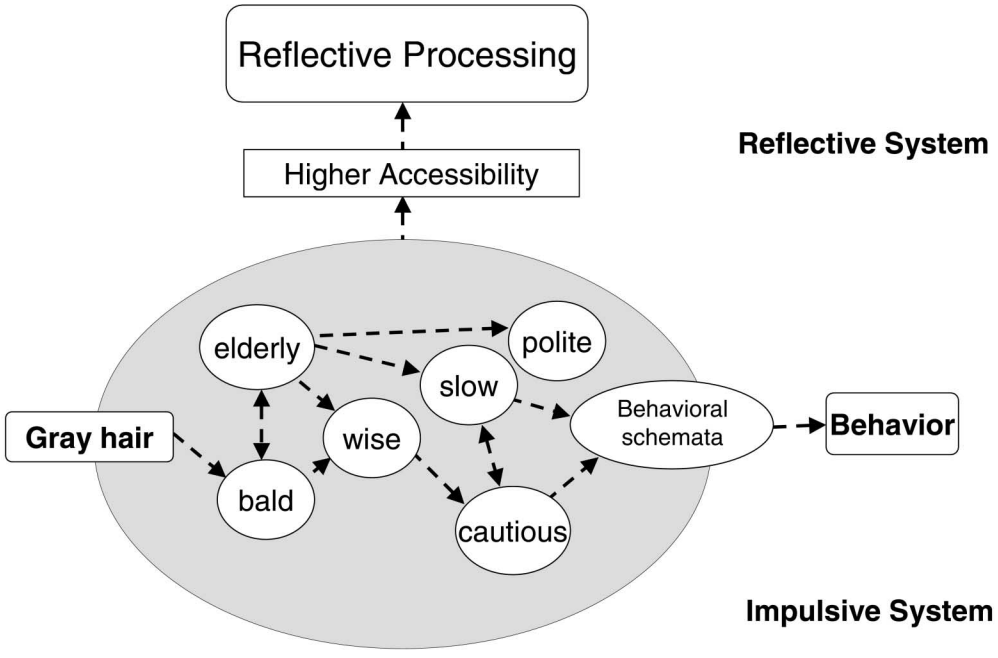

Figure 2. Activation of a hypothetical elderly cluster in the impulsive system. The perception of gray hair leads to a higher accessibility of associated contents and may facilitate associated behavior.

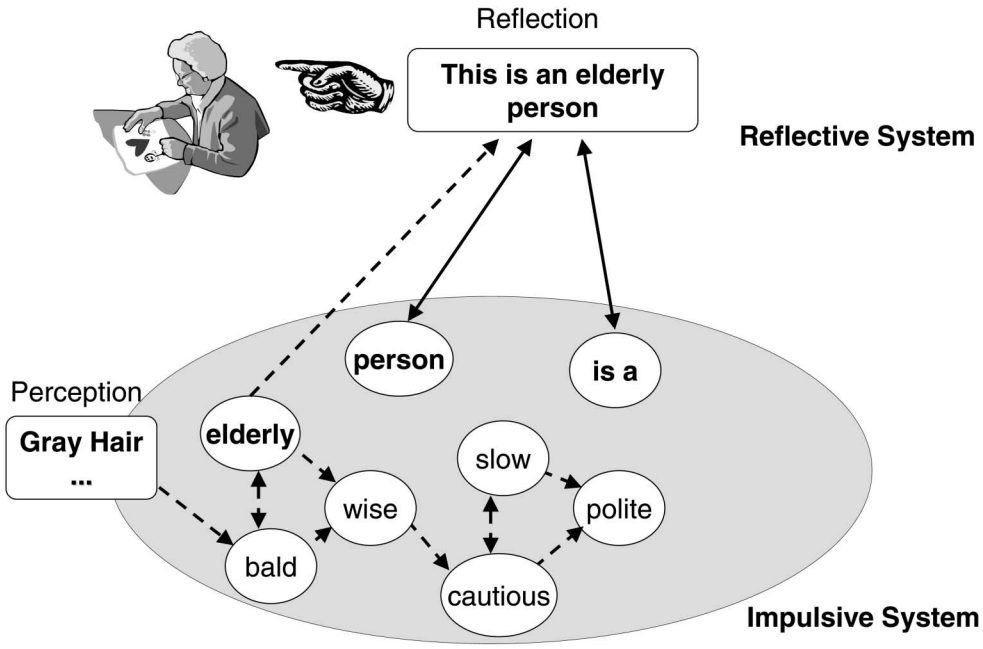

Figure 3. Schematic representation of a propositional categorization. The concepts *elderly* and *person,* as well as the relation *is a,* are retrieved from the impulsive system and transformed into a proposition.

The Generation of Knowledge Through Propositional Categorizations and Syllogistic Inferences in the Reflective System

The impulsive system can be thought of as long-term memory, whereas the reflective system has the properties of a temporary storage in that the amount of information that can be represented at any given time is limited, and the representation will fade if it is not rehearsed (Baddeley, 1986). The reflective system generates declarative knowledge by assigning perceptual input to a semantic category. Unlike simple associative links and structures, knowledge in the reflective system consists of one or more elements to which a relational schema is applied. Most important, a truth value is assigned to that relation. As a consequence, this system represents states of the world or the organism in a propositional format. In this endeavor, the reflective system is driven by the principle of consistency as it strives to avoid or remedy inconsistencies between its elements (Gawronski & Strack, in press). An important feature of representations in the reflective system is that they can be flexibly generated and changed. Thus, the reflective system can solve a multitude of tasks, such as reasoning, planning, or mental simulation. However, it is slower than the impulsive system and requires attentional resources.

How are such representations generated? We assume that the elements of the proposition—that is, one or more concepts and the relation that is applied to them—are retrieved from the impulsive system. The reflective system generates semantic or episodic knowledge by assigning a truth value to the concept and the relation. Take again the perception of an elderly person. The perceivable features have spread activation to the elderly concept in the impulsive system. To generate a propositional categorization, the relational schema of category membership *(is a)* will be retrieved from the impulsive system and combined with the label *elderly* and the representation of the perceptual input, in this case the visual representation of the person. Thus, the propositional representation *this is an elderly person* is generated (for a detailed computational account on how relations and their arguments are bound together to compose propositions, see Hummel & Holyoak, 2003; see Figure 3).

The number of relations that can be applied to these contents is nearly infinite. Beside simple logical relations, such as *is a*, *is not*, or *implies*, there are also more complex and abstract relations, such as causality. In addition, there are many social relations such as friend, enemy, spouse, or partner. Of course, new relations can develop as a person's knowledge expands.

Once knowledge has been generated, syllogistic[2] rules are applied to draw inferences that go beyond the information given (Bruner, 1973). For example, a person may wonder how wise an elderly person is. Categorical knowledge about the elderly may be derived from the categorization of a given person as elderly. The quality *wise* may then be inferred based on this categorization. Note again the fundamental difference to the mere activation of the concept, which facilitates the inference but does not generate knowledge about

[2]The term *syllogistic* is meant to refer to all types of rules that are used for the transfer of truth from the premises to the conclusion. There are no implications about the validity of such syllogistic inferences.

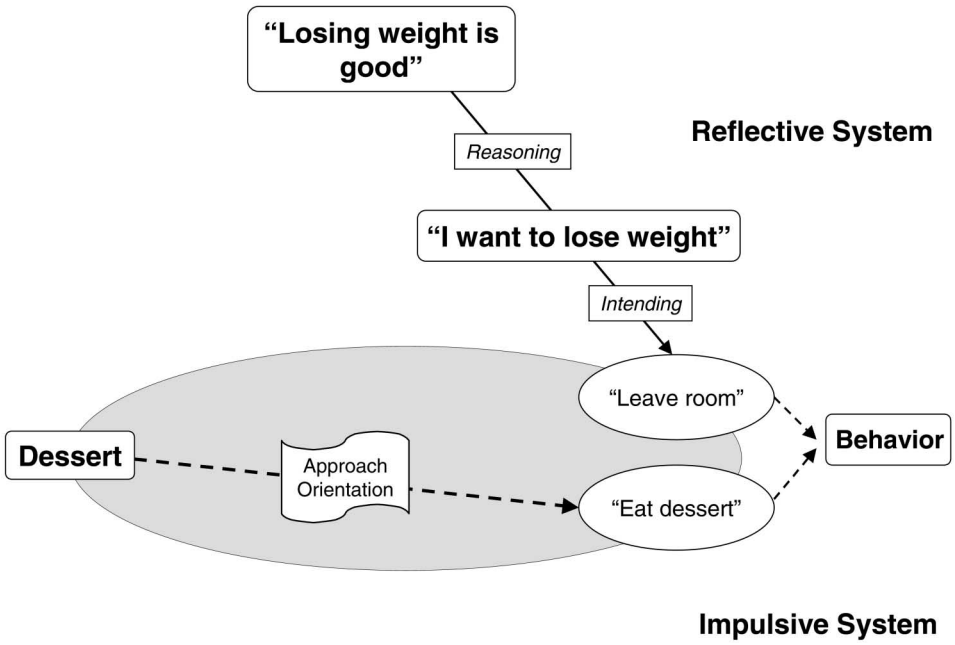

Figure 4. Impulsive and reflective activation of competing behavioral schemata. While the perception of a dessert directly activates an approach tendency, the noetic decision to lose weight leads to the behavioral decision to go for a walk instead of eating the dessert.

obstacles requires the reflective system to establish alternative means–ends relationships and initiate a new operation of intending.

Motivation

So far, we have described the reflective system as a highly flexible system when it comes to action, whereas the impulsive system appears to be relatively rigid. Specifically, changing evaluations in the reflective system may result in new decisions and their concomitant behavioral consequences. In contrast, the impulsive system seems to be driven by the perceptual input as it is connected to behavioral schemata. Changes of these links are assumed to develop slowly following the law of effect, the law of readiness, and the law of practice (Thorndike, 1911).

However, there are some ways in which the impulsive system can also react more flexibly, taking external and internal conditions into account. For external conditions, we propose that the impulsive system can alternate between two distinct motivational orientations that guide the processing of information and the activation of behavior. For internal conditions, we propose a specific way by which homoeostatic dysregulations may influence impulsive processing. Both motivational aspects are outlined in more detail in the following sections.

Motivational Orientation

Thesis 8: Motivational orientation: The impulsive system can be oriented toward approach and avoidance. This motivational orientation may be elicited by

- the processing of positive or negative information,
- the perception of approach or avoidance,
- the experience of positive or negative affect,
- the execution of approach or avoidance behaviors.

In the impulsive system, processing of information and the execution of behavior are mediated by two motivational orientations (Cacioppo et al., 1993). In accordance with other theorists (e.g., Gray, 1982; Lang, 1995; Sutton & Davidson, 1997), we assume that these functional orientations serve to prepare the organism for two fundamental types of reactions toward the environment: approach and avoidance. Approach orientation is a preparedness to decrease the distance between the person and an aspect of the environment. This includes physical locomotion, instrumental action, consumption, or the imagination thereof. Avoidance orientation can be conceptualized as a preparedness to increase the distance between the person and the environment. This can be achieved by either moving away from a target (flight) or by causing the target to be removed (fight). The specific type of response within both motivational orientations is determined by other influences.

Because evidence for the existence of approach and avoidance systems is extensively reviewed elsewhere (Gray, 1982; Lang, 1995), we focus here on the relationship between affect, behavior, and information processing within the two motivational orientations. The following thesis is grounded in the idea that processing of positive information and the experience of positive af-

fect are most important for the regulation of approach behavior, whereas the processing of negative information and the experience of negative effect are most important for the regulation of avoidance behavior.

> Thesis 9: Compatibility. The processing of information, the experience of affect, and the execution of behavior are facilitated if they are compatible with the prevailing motivational orientation.

The following propositions can be derived directly from Thesis 9: If the impulsive system is oriented toward approach, it facilitates the processing of positive information, the experience of positive affect, and the execution of approach behavior. In an avoidance mode, it facilitates the processing of negative information, the experience of negative affect, and the execution of avoidance behavior. Moreover, Thesis 9 implies the principle of bidirectionality, that is, a reverse causal influence (cf. Neumann, Förster, & Strack, 2003). Specifically, a motivational orientation may be elicited by the valence of the processed information, the valence of affect, or the orientation of a behavior (approach vs. avoidance).

In the reflective system, a behavior may become the basis for inferences about its underlying attitude (Bem, 1967). This, however, requires that the behavior is propositionally categorized. That is to say, only if the behavior is related to a category (e.g., forgetful) can it enter into syllogistic inferences. In contrast, processing in the impulsive system and the principle of bidirectionality allow a behavior to influence processing without being propositionally categorized; that is, people are influenced by what they are doing even if the meaning of an action is not recognized.

In the following discussion, we first review evidence backing the idea that behavior may have a direct effect on the processing of information that occurs in the impulsive system and is therefore not mediated by syllogistic inferences. At the same time, this evidence serves as support for Thesis 9, which refers to compatibility as a basic principle of the impulsive system. Then we focus on the reversed direction of influence and review studies that illustrate the impact of evaluative information on behavior. The principles of motivational orientation are represented in Figure 5.

The Compatibility Principle I: The Direct Impact of Behavior on Mental Processes

Facial feedback. Self-perception theory (Bem, 1967) is among several applications that have been harnessed to explain a phenomenon in the domain of emotional expression. Specifically, it has long been argued (e.g., Darwin, 1872/1965) that facial (and other bodily) expressions serve to not only communicate feelings to others and thereby regulate social exchanges but also to increase or diminish the intensity of an affective experience. Applied to the face, Darwin's facial-feedback hypothesis has been studied from a self-perception perspective. Most prominently, Laird (e.g., 1974) found that experimental participants who had been asked to adopt a smiling expression gave a more positive judgment about themselves (e.g., their own well-being) and about affective stimuli (e.g., cartoons) that had been presented to them. According to self-perception theory, participants inferred their affective state from their facial expression. Such an inference, however, requires that the behavior be interpreted as the expression of a particular affective state; that is, a person can only infer that she must be happy (or amused) if she knows that she is smiling.

From the perspective of the reflective–impulsive model, this is not the only way in which an overt behavior may influence mental processes. The inferences described by self-perception theory operate according to the principles of the reflective system; the impulsive system, in contrast, allows for different mechanisms. Specifically, it follows from Thesis 9 (compatibility) that behavior may directly influence information pro-

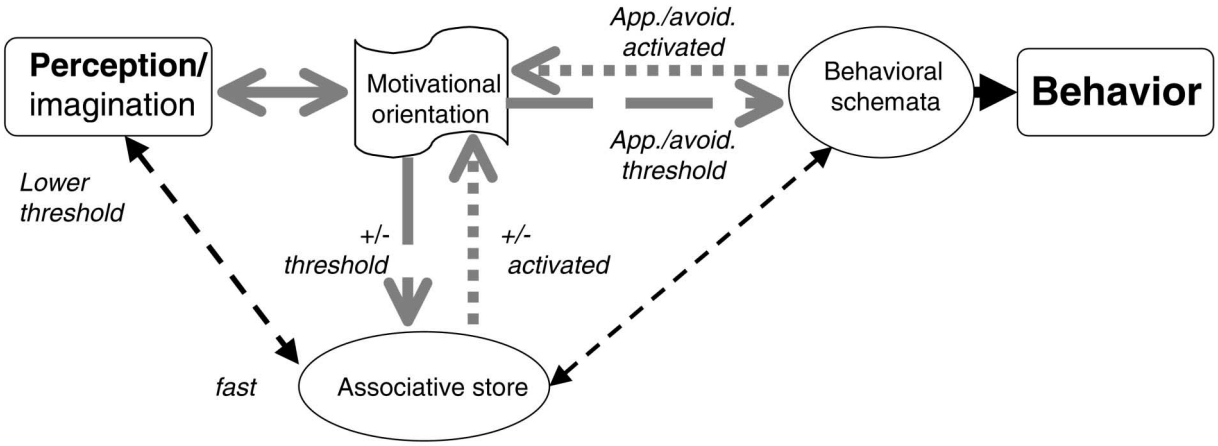

Figure 5. Principles of motivational orientation.

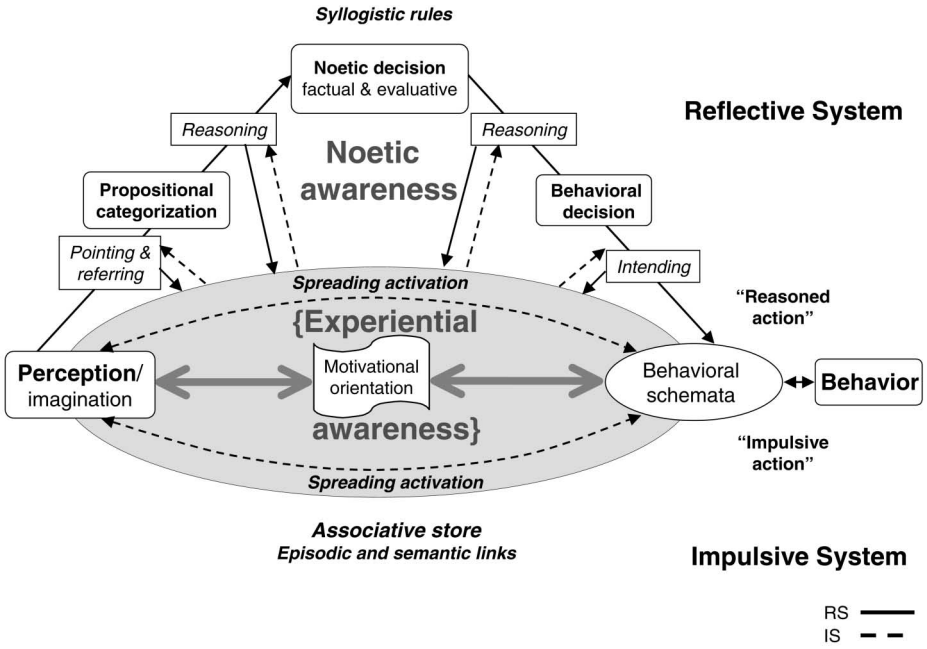

Figure 6. Overview of the complete reflective–impulsive model.

istence of implicit attitudes, implicit stereotypes, implicit goals, or implicit self-esteem.

Some theorists in the field of implicit social cognition have begun to elaborate on more unique features of implicit phenomena. For instance, Wilson et al. (2000) advanced the thesis that implicit attitudes may change more slowly than explicit ones and tend to influence expressive and automatic behaviors. Greenwald et al. (2002) specified implicit associative mechanisms that incorporate principles of cognitive balance. We would like to go one step further and propose to ground the implicit–explicit distinction primarily on operational characteristics. In line with other dual-process models (e.g., Smith & DeCoster, 2000), we locate implicit processes in the impulsive system, whereas explicit processes are thought to take place in the reflective system. Specifically, we prefer to use the terms *explicit* versus *implicit* for psychological processes but not for mental contents. As a consequence, an attitude is defined as a belief following from an evaluative decision that follows from reflection about what is good or bad. At the same time, we talk about evaluative associations to describe links between concepts and evaluative responses in the impulsive system. In a similar vein, stereotypic associations are distinguished from stereotypic beliefs (Devine, 1989).

This conceptualization affects the interpretation of implicit measures. Despite their popularity, the psychological status of what they assess is still unclear (for a review, see Fazio & Olson, 2003). Some theorists argue that implicit measures identify implicit attitudes or implicit stereotypes (e.g., Wilson et al., 2000); others prefer to view the measure itself as implicit, but not the attitude (or whatever other concept; Fazio & Olson, 2003). From the perspective of the reflective–impulsive model, explicit and implicit measures are defined by the cognitive operations that they capture. In this sense, explicit measures tap into people's knowledge or beliefs, implicit measures tap into their associative structures.

Beyond redefining the implicit versus explicit dichotomy, the reflective–impulsive model may help to understand how behaviors may be influenced by explicit and implicit mechanisms. Although it has been proposed that the implicit and explicit phenomena may take different routes to behavior (e.g., Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Wilson et al., 2000), most models are relatively mute on the cognitive or motivational structures underlying such influences. The reflective–impulsive model can account for such influences through its inherent interconnections between conceptual and behavioral representations as well as through its motivational orientations.

Automatic Attitude Activation

Many studies (see Fazio, 2001) have demonstrated that attitudes may be activated very quickly, efficiently, unintentionally, or even unconsciously on the perception of the attitude object. In his influential motivation and opportunity as determinants model (MODE model), Fazio (1990) specified the circumstances under which attitudes may automatically influence behavior. In particular, Fazio assumed that only strongly associated attitudes will exert automatic influences. The main process through which attitudes may influ-