5

Goals, Motivated Social Cognition, and Behavior

Henk Aarts

Human behavior is sensitive to learning, is influenced by past experiences, and tends to be organized and structured in the service of future action. Research in the tradition of behaviorism has shown that behavior follows from rigid responses to stimuli that are reinforced by rewards. According to this work, the environment organizes and determines human behavior. However, acting on fixed stimulus–response rules, such as saying "yeah" when someone is knocking on the door, is not the whole story. Our behavior is more flexible to deal with the varying circumstances we encounter in daily social life. Such flexibility relies on our capacity to mentally represent what we want and do, and to control behavior in line with the representations. Accordingly, a substantial component of human behavior is directed at goals that motivate and control the behavioral system in a dynamic environment.

This chapter provides an analysis of the role of goals in social behavior. Fortunately, there are a few recent excellent volumes on goals (Aarts & Elliot, 2012; Moskowitz & Grant, 2009; Shah & Gardner, 2008), so there is no need to review the literature on this topic in all its details here again. Instead, this chapter aims to offer an examination of the general principles that govern goal pursuit. Goal-directed behavior has been mainly conceptualized and studied as the product of our conscious mind. That is, goal setting and control is believed to rely on consciousness, because people are often consciously aware of the goals they pursue. However, the discovery that decisions start in the unconscious (Libet et al., 1983; Soon et al., 2008), and the importance of unconscious processes in social cognition and behavior (Bargh, 2007) has questioned the causal status of consciousness in goal-directed behavior. Here we examine the origin and control of conscious goal-directed behavior and the possibility that goals operate outside awareness. However, we first briefly discuss a few research programs suggesting that the role of goals in social cognition is not taken for granted, and that we should be careful in considering the goal concept as an explanatory tool for social behavior.

THE DEBATE OF GOALS IN SOCIAL COGNITION

The idea that our behavior is goal-directed appears to be well-accepted by most contemporary researchers, but this was (and, in some instances, still is) not always the case in the study of social cognition. This dispute about the role of goals is rooted primarily in the cognitive revolution, in which there was no room for motivation, and cognition was seen as the more parsimonious account for behavior.

In the study on reasoning, the notion that goals affect attitudes (Festinger, 1957), attributions (Heider, 1958), and beliefs (Kruglanski, 1996) has been put forth by some psychologists and challenged by others. For instance, goals have been posited to lead people to make self-serving attributions for success and failure, even though such attributions do not reflect the actual cause

of behavior. However, this motivational view of self-serving attributions has been challenged, as effects of goals on attributional reasoning could be interpreted in entirely cognitive, non-motivational terms as the result of prior beliefs and expectancies that people have about success and failure (Miller & Ross, 1975). This dispute between motivation-driven versus cognition-driven accounts for self-serving attributions is still alive, but recently attempts to reconcile have been made by suggesting that cognitive and motivational processes often work in tandem (Shepperd, Malone, & Sweeny, 2008).

In the study on stereotyping and prejudice, it has been argued that stereotypes are automatically activated and applied upon encountering members of stereotyped groups. Thus, exposure to a bagpipe blower automatically leads to the activation and application of stereotypical traits, such as brave and dry sense of humor. This activation of stereotypical traits, however, is facilitated by context and specific processing goals (Kunda & Spencer, 2003). Furthermore, once stereotypes are activated, goals, such as the desire to avoid being prejudiced or to be egalitarian (Devine, 1989; Moskowitz, Gollwitzer, Wasel, & Schaal, 1999), can control the application of stereotypes. Thus, goals guide the activation as well as the control of different aspects of social stereotyping, and seem to impinge on social behavior in the early stage of attention and social information processing.

In a third area of research examining the boundaries of automatic processes in social cognition, psychologists became interested in the question whether stereotypes and other socially meaningful information can unconsciously prime overt behavior. Indeed, stereotypes (e.g., of professors) automatically trigger actions (e.g., being smart in a quiz) consistent with the content of stereotypes (e.g., Dijksterhuis & Bargh, 2001). These effects were initially conceptualized as resulting from a common coding between perception and action (Prinz, 1997; cf. the ideomotor principle, James, 1890). Thus, priming stereotype knowledge directly leads to action. Despite the parsimoniousness of this cognitive account, it should be noted that some direction and control is required to engage in most of the studied behaviors, suggesting that behavioral priming result from goals and are motivational in nature (Custers & Aarts, 2010).

A great deal of past empirical work on the role of goals in social cognition has been open to a cognitive account because it has often neglected to precisely specify what goals are, and how they emerge and execute control over behavior. Fortunately, this has changed over the past two decades. Given this state of affairs about the concept of goals in social cognition research, it therefore seems opportune to devote a chapter to the process by which the mind creates goals and controls social behavior. In doing this, we address three basic questions that organize current research on goal-directed behavior: How do people represent goals? Where do goals come from? And what do goals do in the process of regulation? In examining these questions, we first focus on research suggesting that goals and their pursuit rely on consciousness. Next, we look into research revealing the possibility that the pursuit of goals occurs outside of conscious awareness. Finally, we briefly address a few challenging issues in the study of conscious and unconscious processes in goal pursuit.

HOW DO PEOPLE REPRESENT GOALS?

When asking people to indicate the goal that drives their behavior at a certain point in time, most of them can provide an answer within a few seconds – no matter whether these answers reflect the true goal of their behavior. Some goals may appear trivial, such as scratching one's nose, turning on the light to find the house keys, making coffee, or writing an email, while other goals seem more important, such as going out with friends, earning a lot of money, being a good parent, or treating people equal. Although goals can differ between people and may vary in meaning, there is common agreement that the goals we explicitly articulate refer to some kind of outcome that we desire to attain. Thus, researchers define goals as desired outcomes (Carver & Scheier, 1998; Cooper & Shallice, 2006; Gollwitzer & Moskowitz, 1996).

Defining goals as desired outcomes may be tricky, because this definition can be applied to any entity or system that is capable of action in response to specific conditions in the world, such as the meat-eating plant's goal of opening the flower to invite insects for dinner, or the heating system's goal of keeping the temperature in the house at a constant level. The operation of these biological and mechanical systems corresponds with a cybernetic approach to human behavior in which the actual state of the world is controlled by a reference value or standard (Wiener, 1948). However, most social psychologists treat the concept of goals in a different way by assigning a dedicated role to the mind in controlling behavior. Accordingly, to study the role of goals in human behavior empirically it is important to be a bit more precise.

Although it seems reasonable to assume that the mind plays a vital role in goal-directed

behavior, psychology as a science started out quite differently. In the behaviorists' highly influential approach to human behavior (e.g., Skinner, 1953), the term *goal* was used to refer to a particular object or event in the world (water, food, mating partner) that is chosen by the investigator to study a subject's response to the selected object. For example, if water is studied as a goal to a thirsty person, then the goal does simply refer to the notion that water pulls the person to the object. In other words, whether an object is treated as a goal relies on the investigator's mind, and not on the subject's mind. On this view, human behavior is controlled by goals only at the moment the person is exposed to the goal object. It is in this sense that behaviorists consider human behavior to follow from automatic stimulus–response (S–R) associations without the need to propose a mind that controls behavior.

A large part of our behavior relies on the S–R association principle, and this principle does well when behavior occurs under similar circumstances. However, human behavior is suggested to benefit from being more adaptive and flexible in the dynamic world we live in. Such flexibility is thought to originate from the human (or the brain's) capacity to predict and represent the outcomes of actions and the rewards they produce, and to control behavior such that rewarding outcomes are attained (Frith, Blakemore, & Wolpert, 2000; Gilbert & Wilson, 2007; Powers, 1973; Suddendorf & Corballis, 2007; Tolman, 1939). This temporal view on human behavior implies a few key features that are inherent to goals. First, goals are mentally represented in terms of outcomes of actions. Second, goals become active before perceiving the goal object and controlling behavior (e.g., we can think about eating an apple before we actually eat it). Third, the rewarding property of goals motivates the person, such that effort is invested and resources are recruited to attain goals. Thus, while the behaviorists' approach delegates the control of human behavior completely to the environment on the basis of well-learned responses to desired goal objects, the cognitive approach opens the possibility that these goal objects are mentally represented as desired outcomes that motivate and flexibly control behavior before the actual outcome is observed and attained.

One way to understand how such internal representations of goals are acquired and capable of guiding action is to consider human behavior from an instrumental action perspective (Dickinson & Balleine, 1995; Thorndike, 1911), and to propose a bi-directional link between actions and effects that is stored in memory when effects are perceived to result from action performance (Hommel, Muesseler, Aschersleben, & Prinz, 2001). Therefore, thinking about the effect prepares and directs the associated action leading to the effect. In a study testing this idea (Elsner & Hommel, 2001), participants first learned to randomly alternate two actions which were consistently followed by specific outcomes (e.g., pressing a left key produced a low tone and pressing a right key produced a high tone). After practice, participants were exposed to the tones just before a response was required. It turned out that random responding became more difficult, as was revealed by a response bias towards the tones. These results suggest that representations of outcomes (low tone) that previously served as actual effects of actions (pressing a left key) can operate as a goal for people's actions.

From this perspective, human goal-directed behavior can be understood to evolve from simple movement goals to more complex social goals (Maturana & Varela, 1987). We first learn to orchestrate our limbs and motor movements before we pick up a phone and make a date to go out, so to speak. In this way, certain patterns of motor movements become associated with their observable outcomes in terms of sensory/perceptual and semantic/cognitive codes (Aarts & Veling, 2009). Indeed, studies have demonstrated that the acquisition of sensory–motor goal representations involved in goal-directed behavior generalizes to more abstract features of outcomes, such that goal representations become more socially meaningful (e.g., Beckers, De Houwer, & Eelen, 2002; Hommel, Alonso, & Fuentes, 2003; Kray et al., 2006). Furthermore, as suggested by contemporary research on incentive learning (Berridge, 2001), such goals acquire motivational significance when effects of actions are accompanied by rewarding properties (e.g., when meeting friends in a bar evokes pleasure). Whereas people (including researchers) may express this motivation in different ways (e.g., importance, value, utility, commitment, aspiration, wanting, striving), on an operational level goals act as desired action–outcomes that stir up behavior when the actual state of the world is discrepant with the desired outcome.

It is important to note that considering goals as mental representations of desired outcomes indicates that goals are subjective and rely on specific psychological processes in order to become active and manifest. This raises the question where goals as a psychological internal state start.

WHERE DO GOALS COME FROM?

In understanding the nature of goal-directed behavior, most research in experimental psychology

(including social cognition) has treated goals as an independent variable: goals are manipulated by explicitly asking subjects to execute one goal versus another (much like behaviorists select the goal object for subjects), such that one can examine the processes and consequences of pursuing a goal. Surely, this is a viable way in which goals are arrived at in a given moment. Yet focusing on instances when goals are provided to people from external sources, usually in the form of task instructions, circumvents an important question. It ignores how people set their own goals, and removes the issue to the external goal setter: i.e. How do external agents set the goal of setting other people's goal?

Accordingly, to understand where goals come from we have to consider the psychological processes that occur before a goal is set and materializes. The common perspective on this matter is to conceptualize goal setting as a conscious and intentional process. Theories differ in the specifics of the information involved in this process, but they all share the basic idea that goals emerge from expected values (see e.g., Bandura, 1997; Fishbein & Ajzen, 1975; Gollwitzer, 1990; Locke & Latham, 2002; Vroom, 1964). Specifically, the person is treated as a decision maker bringing a potential goal or outcome to mind available in her repertoire in response to a challenge or opportunity in the environment, and computing an expected value of the outcome to determine whether the outcome should be set as a goal one wants to attain. In essence, the expected value principle holds that the motivation to produce an outcome is the product of its rewarding value and the expectancy of being able to realize it. In other words, whether a particular outcome is set as a goal one is motivated to attain depends on its perceived desirability and feasibility.

Because the expected value of an outcome is conceived of as an important determinant of the goals that people set, several research programs have examined how expected values can be changed. One major approach concerns the role of persuasion in altering the perceived desirability of outcomes. For instance, much research on dual-process models of attitude formation and change has illustrated that the perceived desirability of an outcome is changed by superficial or elaborate information processing, depending on the person's motivation and ability to process the relevant information (Chaiken, 1987; Petty & Cacioppo, 1986; for a recent review, see Albarracin & Vargas, 2010). Also, research has examined how fluctuations in basic needs (e.g., food, water, social contact) contribute to perceived desirability of outcomes, and how needs interact with other sources of desirability in goal setting (Veltkamp, Aarts, & Custers, 2009). For instance, people who perceive a soft drink as desirable to quench their thirst are more likely to set the goal to consume a soft drink when thirsty, and this need effect can be simulated by increasing the desirability by means of evaluative conditioning (Veltkamp, Custers, & Aarts, 2011). Thus, both internal needs and externally shaped desirability cause people to set goals for action.

Other research has targeted the perceived feasibility of outcomes. In this approach, people are subjected to a treatment in the hope to augment their belief in being able to perform an action that produces the outcome (Bandura, 1997; Strecher et al., 1986). In other words, people are taught to perceive and experience themselves as strong agents that are capable of controlling their own behavior. Thus, the perceived feasibility (or self-efficacy) increases when people undergo a skill training required to reach the outcome. Perceived feasibility can also be augmented by observing role models executing actions that lead to the outcome (also known as vicarious learning) or exposure to a pep talk. By and large, this research suggests that the perceived feasibility of attaining an outcome relies on actual skills and the subjective confidence of carrying them out.

Changing the perceived desirability and feasibility of outcomes is one major strategy to demonstrate that people compute expected values to set favorable goals. Another, more recent approach is to examine contextual conditions that cause people to consider pre-existing perceptions of desirability or feasibility of given outcomes in setting them as goals. For instance, in testing their temporal construal theory, Liberman and Trope (1998) showed that when people consider an outcome (e.g., eating healthy food) to be attained in the far future, they focus more on outcome desirability. However, when the outcome is seen as something that one aims to attain in the near future, people focus more on feasibility. Thus, the desirability and feasibility of outcomes receive different weights in the process of goal setting, depending on the temporal construal of the outcome that a person has in mind to deal with a challenge or opportunity. Similar modulation effects on the contribution of desirability and feasibility have been suggested for other contextual factors, such as counterfactual thinking (Epstude & Roese, 2008), the anticipation of self-control problems (Mischel, Shoda, & Rodriguez, 1989), the introduction of discrepancies (Moskowitz et al., 1999), attributions of feedback on behavior (Fishbach, Eyal, & Finkelstein, 2010), and probing one's current mood states (Clore et al., 2001).

Expected values of outcomes play a central role in the specific goals that people set and the extent to which they are motivated to attain them. However, people's goals do not only depend on

expected values. Goals are also structured by the (learned) context in which people bring potential goals and outcomes to mind. Such context frames the reference value or standard in guiding cognition and behavior of a goal, thus offering an explanation for why two persons with the same goal respond differently. For instance, goals that people set might be framed in terms of approach or avoidance (Elliot, 2008), or gains or losses (Higgins, 1997). For example, a person who is challenged by his teacher to be a good student may set the goal of pleasing his teacher as either approaching good manners or avoiding bad manners. Thus, the reference value of the same goal is toward positive versus negative actions, respectively. The idea that context structures the way people label the goals they set has been explored in other research programs, including the study on action identification in terms of means/ends (Vallacher & Wegner, 1987), and achievement motivation as a function of internal/external (social) standards (Dweck, 1999).

Importantly, once an outcome is set as a goal, the person can act on it. This transition from deliberation to actual goal pursuit is considered to require an act of conscious will that creates an intention to pursue the goal (Bandura, 1997; Fishbein & Ajzen, 1975; Gollwitzer, 1990; Locke & Latham, 2002). These intentions are proposed to form the input for initiating and regulating behavior.

WHAT DO GOALS DO IN THE PROCESS OF REGULATION?

To understand how goals regulate behavior we need to take into consideration that goals often are part of knowledge structures including the context, the goal itself, and actions as well as objects that may aid goal pursuit, that are shaped by direct experience and other types of learning (Aarts & Dijksterhuis, 2003; Bargh & Ferguson, 2000; Kruglanski et al., 2002). For example, the goal of consuming fruit may be related to eating a banana while having lunch in the university cafeteria. Or, a visit to a bar may be connected to interacting with friends and the desire to socialize. Thus, when intending to pursue goals (e.g., eating fruit, socializing), we do not access a single concept, but rather a rich structure containing, among others, cognitive, affective, and behavioral information (Bargh, 2006).

Accordingly, the goals that people set have distinctive effects on information processing in the service of goal achievement. These effects can be classified in two categories: (1) effects that pertain to the processing of relevant information in order to enhance the probability to act on the goal and (2) effects that deal with the control of goal-directed behavior once goal pursuit is launched. The first category of effects has been mainly studied in the context of biases in perception and evaluation of goal-relevant attributes, and such biases direct behavior by causing stimuli in the environment related to goals to pop out relative to other stimuli (Bruner, 1957; Lewin, 1935). The second category of effects has been examined in the context of top-down attention and cognitive operations that are assumed to facilitate effective goal attainment. These operations are also known under the umbrella of working memory or executive control (Baddeley & Hitch, 1974; Miyake & Shah, 1999), and involve processes that render goal-directed behavior stable and adaptive. Below we will first examine the effects of goals on biases in information processing. Next, we examine goal effects on executive control processes.

Goals and biases in information processing

Goals and biases in visual perception

Research on vision has shown that perceived object size depends on factors like retinal image size, angle, and contextual cues (Rookes & Willson, 2000). Thus, objects that are bigger pop out in the environment and appear to be closer in space. However, apart from such objective factors, size perception is also influenced by subjective factors. Based on this notion, Bruner and Goodman (1947) argued that objects related to goals are perceived as bigger, such that they are more easily identified. The empirical support provided by Bruner and Goodman for this idea was heavily criticized (see e.g., Tajfel, 1957), but research on perceptual biases as a function of goals has recently re-entered the field using novel ways of experimentation.

In a recent study, for example, a group of thirsty and non-thirsty students estimated the size of different objects as they appear on a computer screen (Veltkamp, Aarts, & Custers, 2008b). One of the objects was a glass of water. However, just before they saw the glass, some participants were reminded of the potential goal of drinking, and others were not. Results showed that, compared to non-thirsty participants, thirsty participants perceived the glass of water as bigger, but only when the goal to drink was brought to mind. The fact that non-thirsty participants' size perception was unaffected by the reminder of drinking indicates that the effects were not merely cognitive, based on the mental accessibility of drinking. What was

needed for size perception to be accentuated was the motivation to drink. Perceiving goal objects to be bigger when motivated may not be the only way in which goals facilitate their attainment. Objects that are perceptually accentuated also appear to be closer as size is an important cue to distance. In line with this notion, studies have demonstrated that the perceived distance to goal objects is biased as a function of consciously held goals (Balcetis & Dunning, 2010; Witt, Proffitt, & Epstein, 2004).

It is not entirely clear yet how goals biases basic perception of size, but neuro-scientific models on vision suggest that objects or tools that are functional for current behavior are allocated more processing resources (i.e., brain cells) and therefore occupy a larger area of the visual cortex (e.g., Serences & Yantis, 2006). These objects may be perceived as being bigger in relation to other stimuli in the visual field. Perhaps more disturbing, one may wonder whether perceiving objects to be bigger makes it more difficult to actually grasp the objects. Studies on vision and action suggest that it does not. The visual system can be separated in two largely independent operating streams, one dealing with object identification (ventral), the other with the action execution on the objects (dorsal; Goodale & Milner, 1992). As a result, increased size perception facilitates detection of the object, but this perceptual accentuation does not impinge on the information that is used by the system that deals with object prehension and utilization. In short, goals render goal-relevant objects to be perceived as bigger, thus promoting an easier mode of detecting them.

Goals and biases in evaluations

Goals do not only bias perceptual processing of goal-relevant objects to enhance the probability to act on the goal. Goals also bias the evaluation of objects (see also Chapter 9). Such biasing follows from the idea that goals represent desired outcomes that people want to attain, and hence people like objects that promote goal achievement and dislike objects that hamper the goal. Goal instrumental objects thus become more appealing than goal non-instrumental objects.

Ferguson and Bargh (2004; see also, Seibt, Häfner, & Deutsch, 2007), for example, asked participants to refrain from drinking for 3 hours before the experiment. One (non-thirsty) group quenched their thirst, and another (thirsty) group were made even more aware of their goal to drink by asking them to consume salty food. Next, participants took part in an affective priming task (Fazio et al., 1986), assessing their implicit evaluations of goal-related objects. It was found that goal-relevant objects (e.g., water) evoked more positivity in thirsty than in non-thirsty participants. These biases in evaluative processing did not show up for goal-unrelated objects (e.g., shoe). Other studies have shown that consciously held goals can have corollaries for the evaluation of objects that hamper the goal (e.g., Ferguson, 2007; Markman & Brendl, 2000). It is not (yet) clear how these biases in evaluation occur. They may result from a conscious rule-based process (e.g., "If I want to drink, then I like a glass of water") or an implicit associative process (e.g., affective priming in a knowledge network). However, these studies at least show that people feel good or bad towards objects that support or hinder goal pursuit, respectively.

It is interesting to note that goals not only play a role in biased valence processing of goal objects but also in responses to the affect-laden object itself. For instance, Chen and Bargh (1999) have shown that participants are faster to pull a lever toward the body (an approach reaction) after perception of positive stimuli, and to push a lever away from the body (an avoidance reaction) after perception of negative stimuli, than vice versa. These results are often conceptualized in terms of automatic responses, in that positive objects unintentionally evoke an approach and negative objects an avoidance response. However, recent research suggests that these approach and avoidance responses are not fully automatic, but are contingent on the compatibility between valence of response and valence of stimuli (Eder & Rothermund, 2008; Lavender & Hommel, 2007). Specifically, responses are facilitated when valence of response codes (e.g., away = negative and toward = positive) and valence of stimuli codes match independent of specific muscle movements. Whereas this work does not rule out that affect-laden objects can unintentionally prepare approach/avoidance movements (Krieglmeyer, Deutsch, De Houwer, & De Raedt, 2010), it suggests that such movements are responsive to how they are represented in terms of their effect, hence rendering them goal-dependent.

Goals and biases in decision making

The detection of goal-relevant information is an important step in the process of goal pursuit. In this step, internal representations of goals and associated knowledge interact with environmental features, such that top-down and bottom-up processes work together in initiating goal-directed behavior. If a suitable goal response is available in one's repertoire, action is launched and the goal can be attained. For instance, if a person wants to call a friend, action can be directly implemented upon seeing the cell phone on the table. Indeed, research on skills and habits indicates that setting

a goal can directly lead to the execution of habitual actions leading to the goal (Aarts & Dijksterhuis, 2000; Sheeran et al., 2005; Wood & Neal, 2007).

However, it is important to stress that direct effects of goals (via perception and evaluation) on behavior do not always occur. People may have different options at their disposal, and be motivated to carefully select one (e.g., induced by the goal to be accurate or to justify one's choices; Neuberg & Fiske, 1987; Tetlock, 1985). In that case, they may compute expected values of each means, and select the one with the highest value. The literature on decision making offers several rational choice models that describe the weighing and decision rules that people should apply to select the best option, as well as models that take into account the bounded rationality of decision makers (Payne, Bettman, & Johnson, 1993; see also Chapter 13).

Interestingly, the notion that goals are mentally represented in knowledge structures implies that the activation of goals leads to enhanced accessibility of goal-related information in memory that guides attention, similar to other social constructs such as stereotypes and scripts (Bargh, 1997). For example, a person who associates the goal to meet friends with going to an Irish pub is likely to bring that pub and related attributes to mind (e.g., Irish music, playing darts, pint, and no foam). This enhanced accessibility of goal-related information can bias the decision-making process, such as the search of information and the weights people place on options and attributes of options (Aarts, Verplanken, & Van Knippenberg, 1998; Beach & Mitchell, 1987; Verplanken & Holland, 2002). In a demonstration of this idea, Verplanken and Holland (2002) asked participants to select a TV out of 20 options that were described on different attributes (e.g., screen quality, environmental friendliness). They showed that the environmental friendliness dimension was given more weight in the decision process, but only for participants who had the goal to protect the environment. These findings indicate that goals motivate biases in decision making, resembling effects of directional goals on confirmation biases (Kunda, 1990).

Goals and executive control of behavior

The biases in processing of goal-relevant information and the selection of means form a vital part of goal pursuit, but a real challenge starts when people have to control their mind and action to attain the goal. Such challenges occur when the situation does not allow for direct execution of means or skills, or contains distractions and temptations that push the current goal out of attention. In that case, we may need to postpone our goals, shield them from interfering (unwanted) responses, check the current status of our goals, and act on feedback and opportunities to attain them. People may experience these challenges as demanding and effortful (Kahneman, 1973), as they involve a set of executive control functions to aid effective goal pursuit. Research on executive control processes has flourished in the last decade. This research has been especially fruitful in understanding how people control attention and action in accord with goals, and in providing a neurocognitive account for how this ability is biologically implemented (Funahashi, 2001; Miller & Cohen, 2001; Miyake & Shah, 1999). A common framework proposed in this research is that the prefrontal cortex (PFC), anterior cingulate cortex (ACC), and posterior parietal cortex (PPC) are the main areas taking care of attentional and control processes.

According to research on executive control, stable and adaptive cognition and behavior depend on: (1) active maintenance of ordered information; (2) attention to task-relevant information and inhibition of task-irrelevant information; and (3) monitoring and feedback processing. These characteristics concur with the following functions underlying goal-directed thought and action: (1) holding goal-relevant information active in mind for a critical period of time; (2) keeping focused and shielding goals from interfering information; and (3) checking up the current state of goal pursuit, and supporting progress of goal attainment by taking advantage of opportunities and adapting to the situation at hand. In studying the regulatory nature of social behavior, research in social cognition employs tasks that rely on these control functions, such as tasks that ask subjects to resist temptations, impulses, and automatic tendencies, and tasks that put them under cognitive load in a dual-task context. Because these functions often operate jointly in the process of executive control, it is difficult to demonstrate their unique contribution to goal pursuit. However, there are a few lines of research that have tried to isolate the operation of these functions to offer clues about the workings of the goal-directed mind.

Active maintenance of goal-relevant information

Effective goal pursuit requires a mechanism that keeps the representation of goals and related information alive for a critical period of time, especially when this information is no longer externally present. Consistent with this idea,

research shows that goal representations maintain active in memory – in comparison to semantic knowledge, which shows a rapid decay of activation in memory over short periods of time, usually within a few seconds (Baddeley & Logie, 1999; Joordens & Becker, 1997; McKone, 1995).

One research area in which this process has been tested is that of prospective memory. Goschke and Kuhl (1993) asked participants to study a series of actions (e.g., making coffee) and informed them that they had to perform some of these actions later on (goal condition) or to merely study or observe another person performing them (no-goal condition). Using a recognition paradigm, they established that actions were recognized faster when participants had the goal to execute them in comparison to the no-goal condition, indicating sustained accessibility of the goal in memory (see also, Marsh, Hicks, & Bink, 1998). Other research shows that this active maintenance process of consciously set goals is dependent on the expected value or motivational strength of the goal (Förster, Liberman, & Higgins, 2005).

Another area in which active maintenance processes of goal pursuit are studied concerns the effects of rewards, i.e., the perceived value part of goals. Because working memory has limited capacity, and thus not all information in the environment can be attended to and maintained at the same time, this research suggests that a reward-driven modulation of working memory is highly adaptive (Miller & Cohen, 2001; Pessoa, 2009; Veling & Aarts, 2010). For instance, Heitz, Schrock, Payne, and Engle (2008) tested the effects of monetary rewards on performance on a reading span task and found that participants performed significantly better when they could earn money. Gilbert and Fiez (2004) used functional magnetic resonance imaging (fMRI) to study the effect of money on active maintenance performance, and also found that participants performed better when performance was rewarded. Informatively, during the delay period of rewarded (compared to not rewarded) trials, greater activation was found in the dorsolateral prefrontal cortex (DLPFC), an area that is typically recruited during the active maintenance of information after it is no longer externally present.

Keeping focused and shielding goals from interfering information

Another challenge that people encounter when pursuing goals is distractions. For instance, a person going to the kitchen to do the dishes may suddenly find himself doing something else, such as taking a sausage from the refrigerator. Similarly, a student having the goal to work on a paper may start typing an email and forgets all about the initial goal. More generally, other meaningful or personally relevant information may interfere with keeping focused on the goal. Such information may be triggered by environmental cues associated with habits (e.g., when passing the fridge in the kitchen) and from internally represented information that is accessible but not relevant for the goal at hand (e.g., remembering an unfinished email conversation). In both cases, people are distracted from pursuing the original goal. Accordingly, effective goal pursuit requires a cognitive control mechanism that enhances focus and stability of the goal and shields the goal from interference of competing information by inhibiting it.

The potentials of an inhibition system in promoting effective goal pursuit have been studied in several research programs. In the realm of stereotyping, Moskowitz and colleagues (1999; Moskowitz, 2010) propose that people who have egalitarian goals are motivated to inhibit stereotypical traits upon exposure to stereotyped groups. In a series of studies, they have demonstrated this mechanism in several ways, using goal induction methods such as introducing goal discrepancies, and testing goal effects on reaction time tasks assessing the activation of stereotypes. It is important to note that studies on egalitarian goals and stereotype inhibition use individual differences in motivation, such that goal effects on inhibition are correlational. Although suggestive, these studies are not conclusive, as they may illustrate differences in goal activation, pre-existing knowledge structures, or both.

In a recent study, Danner and colleagues (Danner, Aarts, Papies, & De Vries, 2011) tested effects of goal activation on the inhibition of habitual tendencies while keeping pre-existing knowledge constant. In line with goal system theory (Kruglanski et al., 2002), they proposed that goals are associated with multiple means that enjoy inhibitory links in the service of goal pursuit. Hence, when people have the goal to perform new goal-directed behaviors (e.g., taking the bus to go to work), habitual means (e.g., the car) should be inhibited to protect the goal from habit intrusion. In their study, participants first studied habitual and new behaviors for various goals. Next, following the procedure of Goschke and Kuhl (1993), participants set the goal to perform some of the new behaviors later on (goal condition), while other new goal-directed behaviors only had to be studied (no-goal condition). Employing a recognition task, results showed that the new behaviors were recognized faster when participants had the goal to perform them compared to the no-goal condition, indicating that the new goal-directed behaviors maintained active in memory. Importantly, in the goal condition,

habitual behaviors were less accessible than in the no-goal condition, showing that habitual behaviors were inhibited. Thus, participants kept focus on their active new goals by shielding attention from habit intrusion.

Whereas inhibition of interfering information plays a role in staying tuned to current goals, other studies have provided insight in inhibition processes during task switching or when goals are no longer valid. For instance, Mayr (2002) conducted research on the inhibition of action rules in a task-switch paradigm as a function of accessibility (i.e., recent vs non-recent use of action rules), and showed that action rules that are recently used but not relevant are inhibited, while action rules engaged in less recently are not inhibited. Thus, the rationale here is that a previously used task rule as part of a sequential action is inhibited if it causes interference (i.e., is accessible) when switching to another task rule. If the previous task rule does not interfere (i.e., is not accessible), there is no need to inhibit it. In a similar vein, research on prospective memory suggests that goals that are completed or canceled are inhibited, which is assumed to be functional in switching and attending to new goals (Marsh, Hicks, & Bink, 1998; Marsh, Hicks, & Bryan, 1999).

Goals and monitoring and feedback processing

Human goal pursuit often starts with the detection of a discrepancy between the desired outcome or goal and the actual state of the world. That is to say, the person wants something she does not have, or she encounters a situation she does not want to be in. Moreover, once the process of goal pursuit is launched, people have to check up the current state of goal pursuit and to keep an eye out to identify ways to reduce the discrepancies. In other words, they engage in monitoring and feedback processing.

Over the last 20 years, several studies have explored the neural correlates of this internal performance monitoring system. Measuring event-related potentials (ERPs), Gehring and colleagues (1990) discovered a neural response to errors that is now called the error-related negativity (ERN). The ERN consists of a large negative shift in the response-locked ERP occurring within 100 ms after subjects have made an erroneous response. Typically observed at fronto-central recording sites, the ERN has its source in the anterior cingulate cortex (Dehaene et al., 1994). Indeed, the ACC is involved in the processing of outcomes that deviate from conscious task-performance goals (reward prediction-errors; Matsumoto, Matsumoto, Abe, & Tanaka, 2007), and responds with increased activation when subjects commit errors (Ullsperger, Nittono, & Von Cramon, 2007), when feedback indicates that outcomes are below expectations (Nieuwenhuis, Schweizer, Mars, Botvinick, & Hajcak, 2007), or when performance is socially disapproved (Boksem, Ruys, & Aarts, 2011).

Most social psychological models on goal pursuit recognize that discrepancy detection and reduction plays an essential role in attaining and maintaining desired goals (Carver & Scheier, 1998; Hyland, 1988; Lewin, 1935). In research, these discrepancies are at times introduced by external agents (such as negative feedback from a significant other) and are at times introduced by the individual's own monitoring processes. A wide range of studies, relying on a variety of goals (from reducing one's prejudice, to affirming one's worth as a smart person), have illustrated effects on people's tendency to pursue a goal when confronted with such explicit discrepancies (e.g., Elliot & Dweck, 1988; Monteith, 1993; Steele, Spencer, & Lynch, 1993; Wicklund & Gollwitzer, 1982). Other research in the context of failure feedback suggests that discrepancies detection effects on motivation are moderated by reasoning processes, such as attributions (Fishbach et al., 2010; Weiner, 1986).

It is important to note that most studies on goals and discrepancies alluded to above assessed effects on measures indexing people's motivation to pursue or adhere to goals. These motivational responses to discrepancies offer clues that people engage in goal-directed monitoring and feedback processing, but do not directly speak to the operation of an executive control process that induces behavioral adaptation to the situation at hand. As far as behavioral effects have been studied, they mainly concern the goal-setting effect itself. That is, most studies on goal setting can be seen as relying on discrepancy detection, as goal setting usually occurs in a context in which goal discrepancy is inherent because the goal has yet to be achieved (Custers & Aarts, 2005a). However, this confound makes it difficult to determine whether the behavior resulted from "simple" goal setting, or whether it involves a reaction to a detected discrepancy as a function of monitoring. In a recent attempt to solve this issue, Custers and Aarts (2007a) manipulated discrepancies of a goal which typically needs to be maintained over time (the goal of looking well-groomed). They showed that these discrepancies (e.g., the shoes are dirty) trigger actions (e.g., polishing) to restore the discrepancy. However, this effect only occurred in people who are chronic well-groomers (as a result of pursuing the goal frequently), suggesting that adaptive behavior is supported by goal-directed monitoring and feedback processing.

Who sets and controls the goals that we pursue?

We observed that humans bring outcomes to mind in a current situation. Outcomes are set as goals when they are rewarding and attainable on the basis of an expected value analysis. These goals render behavior persistent, effortful, and flexible, directed at attaining desired outcomes. Thus, goals motivate people to process information in the environment and to employ a set of executive functions that promote effective goal pursuit.

As mentioned earlier, research on goal pursuit commonly assumes that goal setting and execution rely on conscious processes. This assumption is central to research on volitional behavior (Haggard, 2008), and the role of the self in controlling behavior (e.g., Baumeister, Schmeichel, & Vohs, 2007). The idea that behavior is controlled by the self is intuitively appealing. After all, the actions we conduct and the outcomes they produce are often accompanied by feelings of self-causation and belonging to oneself. However, there has been some debate about the uniqueness of the self in processing goal-relevant information (Greenwald & Banaji, 1989) and the brain areas involved in such processes (Legrand & Ruby, 2009). Furthermore, research suggests that our sense of self as an agent is likely to result from inferences that we draw from controlling behavior, whether we are the actual cause or not (Aarts, Custers, & Marien, 2009; Ruys & Aarts, in press; Wegner, 2002).

Accordingly, the human pursuit of goals may not (always) result from an agent that consciously sets and controls goals. Perhaps, then, the origin and control of our goal pursuit happens somewhere else. Recent theorizing about human motivation and goal-directed behavior takes an evolutionary perspective on this matter. Specifically, modern goal pursuit is suggested to be primarily based on old brain systems that take care of goal pursuit in an unconscious fashion. The more recent brain systems involved in higher cognitive processes (including consciousness) build on these old systems (Bargh & Morsella, 2008). Thus it is likely that goal-directed processes rely on existing unconscious structures to control behavior in dynamic environments. Others even suggest that consciousness (as we know it) is a relatively young capacity in terms of human evolution, and therefore we should be cautious in assigning a specific function to it (Dennett, 1991; Jaynes, 1976; Pinker, 1997).

These convergent views on the (modest) role of consciousness in behavior underscore the idea that our behavior starts in the unconscious, and is often directed and motivated by goals outside of conscious awareness, even though we share the belief and experience that we consciously set and pursue goals. We now turn to the empirical research that has tested this possibility. We first focus on research that explored whether goals and the subsequent motivation and regulation of behavior can be triggered outside of conscious awareness. We then briefly survey the potential mechanism that enables people to pursue and attain goals unconsciously.

UNCONSCIOUS PROCESSES IN GOAL PURSUIT

In a remarkable experiment conducted about three decades ago (Libet, Gleason, Wright, & Pearl, 1983), participants were instructed to freely choose when to move their index finger while the timing of the action itself, of its preparation in the brain, and of when the subject became aware of the decision to act were measured. Although the decision did indeed precede the action, the preparation of the finger movement in the brain was well on its way by the time people consciously decided to act. Apparently, when people consciously set the goal to engage in behavior, their conscious will to act starts out unconsciously.

The finding that the pursuit of the goals that we consciously set and adopt is prepared unconsciously, at least in the earliest moments before we act on them, is intriguing. Research in social cognition, however, goes even one step further. This research suggests that goals themselves can arise and operate unconsciously. Social situations and stimuli in the surroundings activate goals in people's minds outside of their awareness, thereby motivating and guiding behavior.

Goal priming and unconscious effects on motivated behavior

One of the first empirical demonstrations of this notion comes from Bargh et al.'s (2001) research program on goal priming effects on achievement. In one of their studies, they unobtrusively exposed students to words such as "strive" and "succeed" to prime the goal of achievement in a first task, and then gave them the opportunity to perform well in a second task (solving anagrams). Results indicated that students primed with the achievement goal outperformed those who were not primed with the goal. Further experimentation established that such goal priming effects have motivational qualities, such as persistence in solving puzzles. Extensive debriefing revealed that the

students did not experience an influence of the first task on their responses to the second. These findings indicate that the mere activation of a goal representation suffices to motivate and direct goal pursuit without conscious thought and intent (for more evidence of achievement priming effects, see Bongers, Dijksterhuis, & Spears, 2010; Custers, Aarts, Oikawa, & Elliot, 2009; Eitam, Hassin, & Schul, 2008; Engeser, Wendland, & Rheinberg, 2006; Hart & Albarracin, 2009; Hassin, 2008; Oikawa, 2004; Shantz & Latham, 2009).

Recently, researchers have started to identify the specific aspects in the social environment that may cause people to automatically set and pursue goals. Through their associations with particular goals, these aspects *indirectly* prime goal representations. For instances, goal pursuit is automatically triggered when goals are inferred from the behavior of others, an effect dubbed goal contagion (Aarts, Gollwitzer, Hassin, 2004; Dik & Aarts, 2007; Friedman, Deci, Elliot, Moller, & Aarts, 2010; Loersch, Aarts, Payne, Jefferis, 2008). In addition, goals and their pursuit materialize after exposure to important others (Fitzimons & Bargh, 2003; Kraus & Chen, 2009; Shah, 2003), and members of social groups that contain the representation of a goal that is believed to be held by that group (Aarts et al., 2005; Custers, Maas, Wildenbeest, & Aarts, 2008).

It is important to stress that most studies on social triggers of unconscious goal pursuit alluded to above employ a so-called unrelated studies set-up: participants are exposed to consciously visible goal primes in a first task and effects on behavior are tested on a second unrelated task. However, these studies have been criticized for allowing participants to be aware of the primes (Custers & Aarts, 2010). Even though participants report being unaware of the influence of the goal priming on their behavior, they could still have formed conscious intentions at the moment they consciously perceived the goal information. Hence, their goal pursuit may still be caused by an act of conscious will.

To offer even more compelling evidence for unconscious goal pursuit, researchers have recently resorted to more stringent methods such as subliminal stimulation, which prevents conscious perception of the primes. Typically, people cannot consciously detect these stimuli, but they are nevertheless influenced by them. Whether subliminal stimulation can convey meaningful information has been debated for quite some time, especially in light of the question of whether the unconscious is dumb (rigid responses) or smart (flexible cognitive processes) when people are exposed to stimuli with an intensity that is too low to reach the threshold of conscious awareness (Loftus & Klinger, 1992). Nevertheless, recent findings provide strong evidence that subliminal primes affect people's responses (Schlaghecken & Eimer, 2004), activate semantically related knowledge (Naccache & Dehaene, 2001), and even influence cognitive control (Lau & Passingham, 2007).

Research also has demonstrated effects of subliminal stimulation on goal pursuit. Priming of achievement-related words increases task performance (Gendolla & Silvestrini, 2010; Hart & Albarracín, 2009); priming drinking-related words enhances fluid consumption in a taste task (Strahan, Spencer, & Zanna, 2002; Veltkamp, Aarts, & Custers, 2008b), and priming of monetary rewards increases the recruitment of effort on physical and cognitive tasks (Bijleveld, Custers, & Aarts, 2009; Pessiglione et al., 2007). Furthermore, studies have shown an increase in motivated social behaviors (e.g., helping another person) after priming names of significant others (e.g., a good friend) or occupations (e.g., nurse) associated with these goals (Aarts et al., 2005; Fitzsimons & Bargh, 2003). Importantly, in most of these subliminal goal priming studies, subjects are asked in retrospect to report whether they were motivated to pursue the primed goal. The general finding is that, although reported motivation sometimes correlates with behavior (e.g., people who worked harder report to be more motivated), these reports are not influenced by the primes. This suggests that subliminal priming of goals does not affect goal pursuit because people become conscious of their motivation to pursue the goal after it is primed.

Goal priming and unconscious effects on the regulation of behavior

The studies discussed above indicate that goal priming leads to motivated behavior. However, apart from effects on motivated behavior, studies have shown that goal priming also biases information processing. For instance, in a study on drinking behavior (Veltkamp et al., 2008a) participants' level of fluid deprivation was measured in an unobtrusive way, such that they were unaware of being thirsty at the time of testing. Some participants were subliminally exposed to drinking-related words in a stimulus detection task, others were not. It was found that subliminal exposure to drinking words caused thirsty participants to perceive a glass of water as bigger compared to non-thirsty participants and to thirsty participants who were not primed. Thus, only in participants for which drinking was a desired goal, priming caused perceptual accentuation of goal-instrumental objects. In the context of biases in evaluation,

Ferguson (2008) showed that priming goals outside of awareness leads to stronger positive affective responses toward goal-instrument objects.

Furthermore, goal priming shapes executive control processes supporting goal pursuit. For instance, research has demonstrated that goals that are activated unconsciously maintain active over time (Aarts, Custers, & Holland, 2007; Aarts, Custers, & Veltkamp, 2008; Aarts et al., 2009). For instance, Aarts et al. (2007) examined how the mental accessibility of a goal after a short interval changes as a function of subliminally priming the goal. In one of their studies, participants were primed or not with the goal to socialize, and 2.5 minutes later tested for accessibility of the goal in a lexical decision task. Results showed that the representation of the goal remained accessible when participants were primed to attain the goal. Similar persistent activation effects – even after 5 minutes of goal priming – have been obtained for behavioral measures (e.g., Aarts et al., 2004; Bargh et al., 2001), suggesting that some kind of active maintenance process keeps goal-relevant information alive non-consciously.

The role of unconscious goals in active maintenance processes has also been studied in the context of reward priming. For instance, in one study (Zedelius, Veling, & Aarts, 2011) participants could earn money (1 cent or 50 cents) by accurately reporting a set of studied words after a delay. The rewards were presented as coins just before a trial, and the coins were either consciously visible or subliminal. Thus, effects of conscious and unconscious reward cues could be compared within one experiment. Results showed that performance on the maintenance task was higher for 50 cents trials than for 1 cent trials, regardless of whether the coins were presented consciously or unconsciously. Another study showed that both conscious and unconscious presentation of high (vs low) monetary rewards increase the dilation of the pupil during the maintenance task, indicating that participants invested more mental effort (Bijleveld et al., 2009). Interestingly, these effects only showed up when the reward required considerable mental effort to obtain (i.e., when 5 rather than 3 words had to be retained), suggesting that people unconsciously react to reward information by recruiting resources to support the active maintenance process.

Other work has started to explore whether humans can keep their eyes on their ongoing goal pursuit in a non-conscious manner when competing information conflicts with their pursuit (Aarts et al., 2007; Papies, Stroebe, & Aarts, 2008; Shah, Friedman, & Kruglanski, 2002). For instance, Shah and colleagues (2002) demonstrated that non-consciously instigating participants to pursue a given goal (by subliminally exposing them to words representing the goal, e.g., of studying) caused them to inhibit competing accessible goals (e.g., going out); moreover, this inhibition facilitated the achievement of the non-consciously activated goal. These findings provide support for the existence of a non-conscious attention/inhibition mechanism that shields goals from distracting thoughts. Shah et al. speculated that these goal-shielding effects require extensive and effortless practice, thus arguing for a well-learned automated mechanism. Recent studies, however, indicate that the inhibitory effects in goal-directed behavior may kick in rather rapidly – i.e., after a few practice trials (Danner, Aarts, & De Vries, 2007; McCulloch et al., 2008; Veling & Aarts, 2009).

Finally, there are a few studies that show that people engage in unconscious monitoring and feedback processing and that situations that are discrepant with non-consciously activated goals encourage people to adapt their behavior (Custers & Aarts, 2005a, 2007a; Fourneret & Jeannerod, 1998: Slachevsky et al., 2001). For instance, Custers and Aarts (2007a) non-consciously activated the goal of looking well-groomed or not in a parafoveal priming task, just before participants were confronted with a situation that was discrepant with the goal. Their findings showed that the non-consciously activated goal facilitated the identification of actions reducing the discrepancy. However, these goal priming effects did not emerge when the situation was not discrepant with the primed goal (Custers & Aarts, 2005a).

In sum, several lines of research suggest that goals that we pursue are often triggered by the social environment. Apparently, people do not (always) consciously bring potential goals or outcomes to mind and assess the desirability and feasibility of the outcomes in order to consciously set and regulate goals. People are motivated to initiate and control behaviors when goals are primed, even though they are not aware of the primed goal or its effect on their motivation and behavior. In other words, the pursuit of goals seems to be set and flexibly regulated in the unconscious. This unconscious flexibility fits well with research showing that human functioning (information encoding, memory use, evaluation, inferences, social perception, and judgment) is largely rooted in cognitive processes that do not require conscious control (Bargh, 2007).

How does the unconscious pursue goals?

Although the unconscious goal pursuit effects reported in the literature are intriguing and

impressive, they may leave (some) readers with the pressing question how this all works: How do people resolve whether to pursue a given goal and to invest effort or recruit resources to attain it without involvement of conscious will?

In an attempt to examine the potential mechanism of unconscious goal pursuit, Custers and Aarts (2005b, 2010) propose that unconscious goal pursuit is likely to occur when the activation of a goal representation available in a person's repertoire is immediately followed by the activation of a positive affective tag. Specifically, goals are suggested to consist of two distinctive features that allow people to pursue goals without conscious intervention: a representation of an outcome and a reward signal attached to the outcome. An outcome is likely to operate as a potential goal when one has learned to represent the outcome in terms of effects resulting from actions. For instance, a person may represent the event of "calling a friend" or "earning money" as outcomes of one's own actions, but not events such as "flying to the moon" or "being Clint Eastwood" (though the last events could be fantasies). The outcome representation thus provides a reference point in directing perception and action: i.e., actions can be initiated by processing information about outcomes, because actions and outcomes are associated on a perceptual, sensory, and motor level. Therefore, bringing to mind the outcome representation prepares and directs perception and action to produce the outcome without much thought. Many of the unconscious behavioral priming studies reported in the literature qualify as such a priming effect (Dijksterhuis, Chartrand, & Aarts, 2007), indicating that outcome representations can be processed and acted upon unconsciously.

However, although priming an outcome representation prepares and directs action, it does not necessarily motivate and control action (Aarts, Custers, & Marien, 2008). For motivation and control to occur a second feature is required: namely, the outcome should be attached to a positive affect or a reward signal that motivates goal-directed behavior. Neuroimaging research has revealed that reward cues are processed by limbic structures such as the nucleus accumbens and the ventral striatum. These subcortical areas play a central role in determining the rewarding value of outcomes and are connected to frontal areas in the cortex that modulate executive control in goal pursuit (e.g., Aston-Jones, & Cohen, 2005). These reward centers in the brain respond to evolutionarily relevant rewards such as food and sexual stimuli, but also to learned rewards (e.g., money, status), or words (e.g., good, nice) that are associated with praise or rewards (Schultz, 2006). Thus, regardless of their shape or form, positive stimuli can induce a reward signal that is readily picked up by the brain.

The analysis discussed above suggests that the representation of an outcome and an accompanying reward signal provide the building blocks for unconscious goal pursuit. Specifically, when a desired outcome or goal is primed, activation of the mental representation of this outcome is immediately followed by the activation of an associated positive tag, which acts as a reward signal for pursuing the primed goal. The positive reward signal attached to a goal thus unconsciously facilitates the actual selection of the goal and the subsequent mobilization of effort and resources to control goal-directed behavior, unless other (e.g., more strongly activated or rewarding) goals gain priority. This affective-motivational process relies on associations between the representations of outcomes and positive reward signals that are shaped by one's history (e.g., when a person was happy when making money or performing well). In this case, the goal is said to pre-exist as a desired state in mind, and priming the representation of the goal motivates people to pursue the goal because of its association with positive affect (Custers & Aarts, 2007a; Ferguson, 2007).

Unconscious goal pursuit can also be simulated by externally triggering the affective signal just after activation of a potential goal or outcome representation. This ability to respond to the mere co-activation of goal representations and positive affective cues is thought to play a fundamental role in social learning (Miller & Dollard, 1941) and considered as basic in motivational analyses of human behavior (Shizgal, 1997). Thus, when a child observes her mother's smile upon munching homemade cookies, or a student witnesses a hilarious joke upon entering the classroom, this can cause the goal representations that are primed by those situations (eating candy, achieving at school) to acquire an intrinsic reward value, which motivates and regulates goal-directed behavior.

A decent number of studies, testing simple action goals as well as more abstract social goals, have shown that the co-activation of a goal representation and positive affect produces unconscious goal pursuit (Aarts et al., 2008a, 2008b; Capa et al., 2011; Custers & Aarts, 2005b; Holland et al., 2009; Van den Bos & Stapel, 2009; Veltkamp et al., 2008a, 2011). In addition, priming a goal representation in temporal proximity to the activation of positive affect has been demonstrated to bias information processing of goal objects, such as size perception (Aarts et al., 2008b; Veltkamp et al., 2008) and to evoke executive control processes supporting the goal, such as active maintenance (Aarts et al., 2008b, 2009) and overcoming well-learned responses to swiftly switch

to alternative courses of action (Marien, Aarts, & Custers, in press).

ISSUES IN THE STUDY OF CONSCIOUS AND UNCONSCIOUS GOAL PURSUIT

So far, the examination of the general principles that govern goal pursuit indicates that people engage in flexible and effortful regulation of goal pursuit. Such regulation results from conscious as well as unconscious processes. The new insight that both conscious and unconscious processes contribute to the pursuit of goals, and its consequence for our understanding of how goals control behavior, lead to a number of interesting issues that require further scrutiny.

First of all, although research suggests that unconscious goal pursuit involves adaptive and flexible processes, understanding exactly how unconscious goals flexibly control behavior remains a challenge. One way to approach this issue is by proposing that goals direct attention and behavior, even without awareness of the goal (Bargh & Ferguson, 2000; Dijksterhuis & Aarts, 2010). In other words, we need attention to flexibly pursue goals, but not necessarily consciousness. Attention is a functional process that selects and biases the flow of incoming information and internal representations in the service of goal attainment. Thus, the content of attention represents the goals that are active at a specific moment in time. Consciousness in the context of goal pursuit usually refers to mental processes that are accompanied by (reported) awareness of certain aspects of the process and/or awareness of relevant contents or perceptual products (Blackmore, 2003; Gray, 2004).

In everyday life, attention and consciousness are correlated, basically because a stimulus that one pays more attention to is more likely to enter conscious awareness. However, this does not mean that attention and consciousness are the same. In fact, recent conceptualizations treat attention and consciousness as orthogonal (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006; Koch & Tsuchiya, 2006; Lamme, 2003). From this perspective, it would be interesting to offer stricter tests of the possible mediating role of attention in the relation between goals and behavior (independent of consciousness). Such an enterprise may call for new methods and operationalizations that allow us to distinguish attention from consciousness as to the content and workings of the goal-directed mind (Lau, 2009; Seth et al., 2008), and to establish their unique contribution in unconsciously triggered goal pursuit.

Second, we still know surprisingly little about how consciously and unconsciously activated goals differ in their control of behavior. There is quite some research showing that consciously set goals (vs no goal at all) facilitate human functioning in several ways (e.g., Alonso, Fuentes, & Hommel, 2006; Baddeley, 1993; Locke & Latham, 2002), and these data portray the general picture that consciousness plays a causal status in goal-directed behavior. Although tempting, this conclusion may be wrong or at least premature, as most studies lack the proper controls to exclude the possibility that attention actually does the work (Custers & Aarts, 2011; Lau, 2009). The research discussed here indicates that conscious goals (often induced by explicit task instructions) and unconscious goals (induced by priming) have similar effects on tasks that rely on executive control. This suggests that conscious and unconscious goals (partly) rely on the same functional architecture of attention and information processing in which the same cognitive functions or hardware are recruited and shared to pursue goals (Aarts, 2007; Badgaiyan, 2000). How, then, may consciously and unconsciously activated goals differ in directing behavior?

Recent research has started to explore this question. This research looks for instances in which conscious goals would produce different effects on behavior than unconscious goals. In a study on effects of the goal to earn money on performance (Bijleveld, Custers, & Aarts, 2010), participants had to solve an arithmetic problem in a speed–accuracy paradigm to attain a consciously or unconsciously presented high- or low-value coin. Unconscious high (vs low) rewards made participants more eager (i.e., faster, but equally accurate). In contrast, conscious high (vs low) rewards caused participants to become more cautious (i.e., slower, but more accurate). However, the effects of conscious rewards mimicked those of unconscious rewards when the tendency to make speed–accuracy tradeoffs was reduced. These findings suggest that pursuing monetary rewards initially facilitate effort to work on a task regardless of whether or not people are aware of them, but affect speed–accuracy tradeoffs only when the reward information gains access to consciousness.

Another recent study demonstrates that conscious, but not unconscious, pursuit of monetary rewards can deteriorate instead of improve performance (Zedelius et al., 2011). In this study, participants had to retain words in memory. When rewards were presented before participants saw the words, both conscious and unconscious high rewards improved performance. However, when rewards were presented just after the presentation of the words (during the active maintenance process), only unconscious high rewards improved

performance, whereas conscious high rewards impaired performance. This pattern is consistent with the idea that unconscious rewards boost task effort, causing people to do well. When rewards are consciously processed, conscious concerns (e.g., "Will I do well?") may interfere with the task, causing people to perform worse. This latter effect concurs with studies on choking under pressure, showing that conscious reflection on behavior or rewards taxes the limited capacity of conscious processes and distracts attention away from the task (Beilock, 2007; Mobbs et al., 2009).

The research alluded to above suggests that consciousness interferes with goal-directed attentional processes that we usually engage in skillfully. However, we should not conclude from this that consciousness is always defective in the pursuit of goals, as we do not yet know whether there are special cases in which consciousness (apart from attention) facilitates goal-directed performance. One such case pertains to situations in which no information or action is available in one's repertoire to deal with challenges or opportunities posed. Often, this implies the preparation of a course of action that is totally new or has never been executed before in the situation at hand. According to Global Workspace Theory (e.g., Baars, 1997), consciousness then helps to mobilize and integrate brain functions and representations/processes that otherwise operate independently in the course of building up a new action. It offers a "facility for accessing, disseminating, and exchanging information, and for exercising global coordination and control" (Baars, 1997, p. 7).

Consistent with this idea, research has shown that conscious planning leads to more successful goal achievement, as such plans integrate and establish links between representations of relevant actions and cues (Gollwitzer & Sheeran, 2006). Moreover, recent research suggests that conscious planning has more stable and reliable effects on goal attainment than merely attending to information of the plan (Papies, Aarts, & de Vries, 2009). Whether these beneficial effects of planning rely on consciousness itself is not clear yet, as there may be other factors that contribute to stronger effects of planning on behavior (e.g., motivation, enhanced attentional processing). However, a large sample of studies in various fields suggest that it may be wise to consciously plan behavior ahead in time when facing new goals and actions.

CONCLUSION

The present chapter indicates that the concept of goals is an important construct in understanding and studying the potential causes, processes, and consequences of people's behavior in their social surroundings. Research on the role of goals in motivated social cognition and behavior thus demonstrates how social and contextual settings cause people to set goals they are motivated to attain, and how such goals shape subsequent information processing and executive control that promote the actual attainment of goals. In so doing, goals play a vital role in rendering human behavior flexible and effortful, suited to meet the dynamics of the environment. This flexible and effortful regulation of goal pursuit can be largely engaged in without conscious intervention. Accordingly, whereas the causal status of consciousness in human behavior is often taken for granted, people seem to navigate their goal-directed behavior quite adequately without a need to postulate an inner agent that sets and controls goal pursuit by an act of conscious will. In the search for the mental faculties that make human behavior goal-directed, then, it is important to further our understanding of how people pursue goals unconsciously, and how conscious processes evolve from, and build on, unconscious processes in promoting effective goal pursuit.

ACKNOWLEDGMENT

The preparation of this chapter was supported by VICI grant 453-06-002 from the Netherlands Organization for Scientific Research.

REFERENCES

Aarts, H. (2007). Health behavior and the implicit motivation and regulation of goals. *Health Psychology Review, 1*, 53–82.

Aarts, H., Chartrand, T. L., Custers, R., Danner, U., Dik, G., Jefferis, V., et al. (2005). Social stereotypes and automatic goal pursuit. *Social Cognition, 23*, 464–489.

Aarts, H., Custers, R., & Holland, R. W. (2007). The nonconscious cessation of goal pursuit: When goals and negative affect are coactivated. *Journal of Personality and Social Psychology, 92*, 165–178.

Aarts, H., Custers, R., & Marien, H. (2008). Preparing and motivating behavior outside of awareness. *Science, 319*, 1639.

Aarts, H., Custers, R., & Marien, H. (2009). Priming and authorship ascription: When nonconscious goals turn into conscious experiences of self-agency. *Journal of Personality and Social Psychology, 96*, 967–979.

Aarts, H., Custers, R., & Veltkamp, M. (2008a). Goal priming and the affective-motivational route to nonconscious goal pursuit. *Social Cognition, 26*, 555–577.

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*, 53–63.

Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: Environment, situational norm and social behavior. *Journal of Personality and Social Psychology, 84*, 18–28.

Aarts, H., & Elliot, A. (2012). *Goal-directed behavior.* New York: Psychology Press.

Aarts, H., Gollwitzer, P. M., & Hassin, R. R. (2004). Goal contagion: Perceiving is for pursuing. *Journal of Personality and Social Psychology, 87*, 23–37.

Aarts, H., & Veling, H. (2009). Do resonance mechanisms in language and action depend on intentional processes? *European Journal of Social Psychology, 39,* 1188–1190.

Aarts, H., Verplanken, B., & Van Knippenberg, A. (1998). Predicting behavior from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology, 28*, 1356–1375.

Albarracín, D., & Vargas, P. (2010). Attitudes and persuasion. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 394–427). New York: Wiley.

Alonso, D., Fuentes, L. J., & Hommel, B. (2006). Unconscious symmetrical inferences: A role of consciousness in event integration. *Consciousness and Cognition, 15*(2), 386–396.

Aston-Jones, G., & Cohen, J. D. (2005). An integrative theory of locus coeruleus-norepinephrine function: Adaptive gain and optimal performance. *Annual Review of Neuroscience, 28*, 403–450.

Baars, B. J. (1997). *In the theatre of consciousness: The workspace of the mind.* New York: Oxford University Press.

Baddeley, A. D. (1993). Working memory and conscious awareness. In A. Collins & S. Gathercole (Eds.), *Theories of memory* (pp. 11–28). Hillsdale, NJ: Lawrence Erlbaum Associates.

Baddeley, A. D., & Hitch, G. (1974). Working memory. In G. Bower (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 8, pp. 47–89). New York: Academic Press.

Baddeley, A. D., & Logie, R. H. (1999). Working memory: The multiple-component model. In A. Miyake & P. Shah (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control* (pp. 28–61). New York: Cambridge University Press.

Badgaiyan, R. D. (2000). Executive control, willed actions, and nonconscious processing. *Human Brain Mapping, 9*, 38–41.

Balcetis, E., & Dunning, D. (2010). Wishful seeing: More desired objects are seen as closer. *Psychological Science, 21*, 147–152.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman.

Bargh, J. A. (1997). The automaticity of everyday life. In R. S. Wyer (Ed.), *The automaticity of everyday life: Advances in social cognition* (Vol. 10, pp. 1–61). Mahwah, NJ: Erlbaum.

Bargh, J. A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behavior. *European Journal of Social Psychology, 36*, 147–168.

Bargh, J. A. (2007). *Social psychology and the unconscious: The automaticity of higher mental processes.* New York: Psychology Press.

Bargh, J. A., & Ferguson, M. J. (2000). Beyond behaviorism: On the automaticity of higher mental processes. *Psychological Bulletin, 126*, 925–945.

Bargh, J. A., Gollwitzer, P. M., Lee Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology, 81*, 1014–1027.

Bargh, J. A., & Morsella, E. (2008). The unconscious mind. *Perspectives on Psychological Science, 3,* 73–79.

Baumeister, R. F., Schmeichel, B. J., & Vohs, K. D. (2007). Self-regulation and the executive function: The self as controlling agent. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2nd ed., pp. 516–539). New York: Guilford Press.

Beach, L. R., & Mitchell, T. R. (1987). Image theory: Principles, goals, and plans in decision making. *Acta Psychologica, 66*, 201–220.

Beckers, T., De Houwer, J., & Eelen, P. (2002). Automatic integration of non-perceptual action effect features: The case of the associative affective Simon effect. *Psychological Research, 66,* 166–173.

Beilock, S. L. (2007). Choking under pressure. In R. F. Baumeister & K. D. Vohs (Eds.), *Encyclopedia of social psychology* (pp. 140–141). Thousand Oaks, CA: SAGE.

Berridge, K. C. (2001). Reward learning: Reinforcement, incentives, and expectations. In D. L. Medin (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 40, pp. 223–278). San Diego, CA: Academic Press.

Bijleveld, E., Custers, R., & Aarts, H. (2009). The unconscious eye opener: Pupil dilation reveals strategic recruitment of mental resources upon subliminal reward cues. *Psychological Science, 20*, 1313–1315.

Bijleveld, E., Custers, R., & Aarts, H. (2010). Unconscious reward cues increase invested effort, but do not change speed–accuracy tradeoffs, *Cognition*, *115*, 330–335.

Blackmore, S. (2003). *Consciousness.* New York: Oxford University Press.

Boksem, M. A. S., Ruys, K. I., & Aarts, H. (2011). Facing disapproval: Performance monitoring in a social context. *Social Neuroscience, 6*, 360–368.

Bongers, K. C. A., Dijksterhuis, A., & Spears, R. (2010). On the role of consciousness in goal pursuit. *Social Cognition, 28*, 262–272.

Bruner, J. S. (1957). On perceptual readiness. *Psychological Review, 64*, 123–152.

Bruner, J. S., & Goodman, C. C. (1947). Value and need as organizing factors in perception. *Journal of Abnormal and Social Psychology, 42,* 33–44.

Capa, R. L., Cleeremans, A., Bustin, G. M., Bouquet, C. A., Hansenne, M. (2011). Effects of subliminal priming on nonconscious goal pursuit and effort-related cardiovascular response. *Social Cognition, 29*, 430–444.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* New York: Cambridge University Press.

Chaiken, S. (1987). The heuristic model of persuasion. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social influence: The Ontario Symposium* (Vol. 5, pp. 3–39), Hillsdale, NJ: Erlbaum.

Chen, M., & Bargh, J. A. (1999). Consequences of automatic evaluation: Immediate behavioral predispositions to approach or avoid the stimulus. *Personality and Social Psychology Bulletin, 25*, 215–224.

Clore, G. L., Wyer, B., Dienes, K., Gasper, C., Gohm, W., & Isbell, L. (2001). Affective feelings as feedback: Some cognitive consequences. In L. L. Martin & G. L. Clore, (Eds.), *Theories of mood and cognition. A user's handbook (*pp. 27–62). Mahwah, NJ: Erlbaum.

Cooper, R. P., & Shallice, T. (2006). Hierarchical schemas and goals in the control of sequential behavior. *Psychological Review, 113*, 887–916.

Custers, R., & Aarts, H. (2005a). Beyond accessibility: The role of affect and goal-discrepancies in implicit processes of motivation and goal-pursuit. *European Review of Social Psychology, 16,* 257–300.

Custers, R., & Aarts, H. (2005b). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology, 89*, 129–142.

Custers, R., & Aarts, H. (2007a). Goal-discrepant situations prime goal-directed actions if goals are temporarily or chronically accessible. *Personality and Social Psychology Bulletin, 33*, 623–633.

Custers, R., & Aarts, H. (2007b). In search of the nonconscious sources of goal pursuit: Accessibility and positive affective valence of the goal state. *Journal of Experimental Social Psychology, 43*, 312–318.

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science*, *329*, 47–50.

Custers, R., & Aarts, H. (2011). Learning of predictive relations between events depends on attention, not on awareness. *Consciousness and Cognition*, *20*, 368–378.

Custers, R., Aarts, H., Oikawa, M., & Elliot, A. (2009). The nonconscious road to perceptions of performance: Achievement priming, success expectations and self-agency. *Journal of Experimental Social Psychology, 45,* 1200–1208.

Custers, R., Maas, M., Wildenbeest, M., & Aarts, H. (2008). Nonconscious goal pursuit and the surmounting of physical and social obstacles. *European Journal of Social Psychology, 38,* 1013–1022.

Danner, U. N., Aarts, H., & De Vries, N. K. (2007). Habit formation and multiple options to goal attainment: Repeated selection of targets means causes inhibited access to alternatives. *Personality and Social Psychology Bulletin, 33,* 1367–1379.

Danner, U. N., Aarts, H., Papies, E. K., & De Vries, N. K. (2011). Paving the path for habit change: Cognitive shielding of intentions against habit intrusion. *British Journal of Health Psychology*, *16*, 189-200.

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

Dehaene, S., Posner, M. I., & Tucker, D. M. (1994). Localization of a neural system for error-detection and compensation. *Psychological Science, 5*(5), 303–305.

Dennett, D. C. (1991). *Consciousness explained*. Boston, MA: Little, Brown.

Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 5–18.

Dickinson, A., & Balleine, B. W. (1995). Motivational control of instrumental action. *Current Directions in Psychological Science*, *4*, 162–167.

Dik, G., & Aarts, H. (2007). Behavioral cues to others' motivation and goal-pursuits: The perception of effort facilitates goal inference and contagion. *Journal of Experimental Social Psychology, 43,* 727–737.

Dijksterhuis, A., & Aarts, H. (2010). Goals, attention, and (un)consciousness. *Annual Review of Psychology*, *61*, 467–490.

Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 33, pp. 1–40). San Diego, CA: Academic Press.

Dijksterhuis, A., Chartrand, T., & Aarts, H. (2007). Effects of priming and perception on social behavior and goal pursuit. In J.A. Bargh (Ed.), *Social psychology and the unconscious: The automaticity of higher mental processes* (pp. 51–131). New York: Psychology Press.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality and development*. Philadelphia, PA: Psychology Press.

Eder, A., & Rothermund, K. (2008). When do motor behaviors (mis)match affective stimuli? An evaluative coding view of approach and avoidance reactions. *Journal of Experimental Psychology: General, 137,* 262–281.

Eitam, B., Hassin, R. R., & Schul, Y. (2008). Nonconscious goal pursuit in novel environments: The case of implicit learning. *Psychological Science, 19*, 261–267.

Elliot, A. J. (2008). *Handbook of approach and avoidance motivation*. Mahwah, NJ: Lawrence Erlbaum Associates.

Elliott, E. S., & Dweck, C .S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54,* 5–12.

Elsner, B., & Hommel, B. (2001). Effect anticipation and action control. *Journal of Experimental Psychology: Human Perception and Performance*, *27*, 229–240.

Engeser, S., Wendland, M., & Rheinberg, F. (2006). Nonconscious activation of behavioral goals, a methodologically refined replication. *Psychological Reports, 99*, 963.

Epstude, K., & Roese, N. J. (2008). The functional theory of counterfactual thinking. *Personality and Social Psychology Review*, 12, 168–192.

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology, 50*, 229–238.

Ferguson, M. J. (2007). On the automatic evaluation of end-states. *Journal of Personality and Social Psychology*, *92*, 596–611.

Ferguson, M. J. (2008). On becoming ready to pursue a goal you don't know you have: Effects of nonconscious goals on evaluative readiness. *Journal of Personality and Social Psychology*, *95*, 1268.

Ferguson, M. J., & Bargh, J. A. (2004). Liking is for doing: The effects of goal pursuit on automatic evaluation. *Journal of Personality and Social Psychology*, *87*, 557–572.

Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.

Fishbach, A., Eyal, T., & Finkelstein, S. R. (2010). How positive and negative feedback motivate goal pursuit. *Social and Personality Psychology Compass, 4,* 517–530.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fitzsimons, G. M., & Bargh, J. A. (2003). Thinking of you: Nonconscious pursuit of interpersonal goals associated with relationship partners. *Journal of Personality and Social Psychology, 84*, 148–163.

Förster, J., Liberman, N., & Higgins, E. T. (2005). Accessibility from active and fulfilled goals. *Journal of Experimental Social Psychology, 41,* 220–239.

Fourneret, P., & Jeannerod, M. (1998). Limited conscious monitoring of motor performance in normal subjects. *Neuropsychologia, 36*, 1133–1140.

Friedman, R., Deci, E. L., Elliot, A., Moller, A., & Aarts, H. (2010). Motivation synchronicity: Priming motivational orientations with observations of others' behavior. *Motivation and Emotion*, 34, 34–38.

Frith, C. D., Blakemore, S. J., & Wolpert, D. M. (2000). Abnormalities in the awareness and control of action. *Philosophical Transactions of the Royal Society of London, 355*, 1771–1788.

Funahashi, S. (2001). Neuronal mechanisms of executive control by the prefrontal cortex. *Neuroscience Research, 39*, 147–165.

Gehring, W. J., Coles, M. G. H., Meyer, D. E., & Donchin, E. (1990). The error-related negativity: an event-related brain potential accompanying errors. *Psychophysiology, 27*, s34.

Gendolla, G. H. E., & Silvestrini, N. (2010). The implicit "Go": Masked action cues directly mobilize mental effort. *Psychological Science, 21*, 1389–1393.

Gilbert, A. M., & Fiez, J. A. (2004). Integrating rewards and cognition in the frontal cortex. *Cognitive, Affective & Behavioral Neuroscience, 4,* 540–552.

Gilbert, D. T., & Wilson, T. D. (2007). Prospection: Experiencing the future. *Science*, *317*, 1351–1354.

Gollwitzer, P. M. (1990). Action phases and mindsets. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition*. New York: Guilford Press.

Gollwitzer, P. M., & Moskowitz, G. B. (1996). Goal effects on action and cognition. In E. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 361–399). New York: Guilford Press.

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 38, pp. 69–119). San Diego, CA: Elsevier Academic Press.

Goodale, M. A., & Milner, D. A. (1992). Separate visual pathways for perception and action. *Trends in Neurosciences, 15*, 20–25.

Goschke, T., & Kuhl, J. (1993). Representation of intentions: Persisting activation in memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*, 1211–1226.

Gray, J. A. (2004). *Consciousness: Creeping up on the hard problem.* New York: Oxford University Press.

Greenwald, A. G., & Banaji, M. R. (1989). The self as a memory system: Powerful, but ordinary. *Journal of Personality and Social Psychology*, 57, 41–54.

Haggard, P. (2008). Human volition: Towards a neuroscience of will. *Nature Reviews: Neuroscience*, *9*, 934–946.

Hart, W., & Albarracín, D. (2009). The effects of chronic achievement motivation and achievement primes on the activation of achievement and fun goals. *Journal of Personality and Social Psychology, 97*, 1129–1141.

Hassin, R. R. (2008). Being open minded without knowing why: Evidence from nonconscious goal pursuit. *Social Cognition, 26*, 578–592.

Heider, F. (1958). *The psychology of interpersonal relations.* New York: Wiley.

Heitz, R. P., Schrock, J. C., Payne, T. W., & Engle, R. W. (2008). Effects of incentive on working memory capacity: Behavioral and pupillometric data. *Psychophysiology, 45,* 119–129.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52*, 1280–1300.

Holland, R. W., Wennekers, A. M., Bijlstra, G., Jongenelen, M. M., & Van Knippenberg, A. (2009). Self-symbols as implicit motivators. *Social Cognition, 27*, 579–600.

Hommel, B., Alonso, D., & Fuentes, L. J. (2003). Acquisition and generalization of action effects. *Visual Cognition, 10*, 965–986.

Hommel, B., Muesseler, J., Aschersleben, G., & Prinz, W. (2001). The theory of event coding (tec): A framework for perception and action planning. *Behavioral and Brain Sciences, 24*, 849–937.

Hyland, M. E. (1988). Motivational control theory: An integrative framework. *Journal of Personality and Social Psychology, 55*, 642–651.

James, W. (1890). *The principles of psychology.* London: Macmillan.

Jaynes, J. (1976). *The origin of consciousness in the breakdown of the bicameral mind.* Boston, MA: Houghton Mifflin.

Joordens, S., & Becker, S. (1997). The long and short of semantic priming effects in lexical decision. *Journal of Experimental Psychology: Learning, memory and cognition*, *23*, 1083–1105

Kahneman, D. (1973). *Attention and effort.* Englewoods Cliffs, NJ: Prentice Hall.

Koch, C., & Tsuchiya, N. (2006). Attention and consciousness: Two distinct brain processes. *Trends in Cognitive Sciences, 11*, 16–22.

Kraus, M. W., & Chen, S. (2009). Striving to be known by significant others: Automatic activation of self-verification goals in relationship contexts. *Journal of Personality and Social Psychology, 97*, 58.

Kray, J., Eenshuistra, R., Kerstner, H., Weidema, M., & Hommel, B. (2006). Language and action control: The acquisition of action goals in early childhood. *Psychological Science, 17*, 737–741.

Krieglmeyer, R., Deutsch, R., De Houwer, J., & De Raedt, R. (2010). Being moved: Valence activates approach–avoidance behavior independent of evaluation and approach–avoidance intentions. *Psychological Science, 21*, 607–614.

Kruglanski, A. W. (1996). Motivated social cognition: Principles of the interface. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: A handbook of basic principles* (pp. 493–522). New York: Guilford Press.

Kruglanski, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A theory of goal-systems. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 34). New York: Academic Press.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480–498.

Kunda, Z., & Spencer, S. J. (2003). When do stereotypes come to mind and when do they color judgment? A goal-based theory of stereotype activation and application. *Psychological Bulletin*, *129*, 522–544.

Lamme, V. A. F. (2003). Why visual attention and awareness are different. *Trends in Cognitive Sciences, 7*, 12–18.

Lau, H. (2009). Volition and the function of consciousness. In E. M. Gazzaniga (Ed.), *Cognitive neurosciences IV* (pp. 1191–1200). Cambridge, MA: MIT Press.

Lau, H. C., & Passingham, R. E. (2007). Unconscious activation of the cognitive control system in the human prefrontal cortex. *Journal of Neuroscience, 27*, 5805.

Lavender, T., & Hommel, B. (2007). Affect and action: Towards an event-coding account. *Cognition and Emotion, 21*, 1270–1296.

Legrand, D., & Ruby, P. (2009). What is self-specific? Theoretical investigation and critical review of neuroimaging results. *Psychological Review, 116*, 252–282.

Lewin, K. (1935). *A dynamic theory of personality: Selected papers.* New York: McGraw-Hill.

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology, 75*, 5–18.

Libet, B., Gleason, C. A., Wright, E. W., & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential): The unconscious initiation of a freely voluntary act. *Brain*, *106*, 623–642.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, *57*, 705–717.

Loersch, C., Aarts, H., Payne, B. K. & Jefferis, V.E. (2008). The influence of social groups on goal contagion. *Journal of Experimental Social Psychology*, *44*, 1555–1558.

Loftus E. F., & Klinger M. R. (1992). Is the unconscious smart or dumb? *American Psychologist, 47,* 761–765.

Marien, H., Aarts, H., & Custers, R. (in press). Being flexible or rigid in goal-directed behavior: When positive affect implicitly motivates the pursuit of goals or means. *Journal of Experimental Social Psychology.*

Markman, A. B., & Brendl, C. M. (2000). The influence of goals on value and choice. In D. L. Medin (Ed.), *The psychology of learning and motivation* (Vol. 39, pp. 97–129). San Diego, CA: Academic Press.

Marsh, R. L., Hicks, J. L., & Bink, M. L. (1998). Activation of completed, uncompleted and partially completed intentions. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *24*, 350–361.

Marsh, R. L., Hicks, J. L., & Bryan, E. S. (1999). The activation of unrelated and canceled intentions. *Memory and Cognition*, *27*, 320–327.

Matsumoto, M., Matsumoto, K., Abe, H., & Tanaka, K. (2007). Medial prefrontal cell activity signaling prediction errors of action values. *Nature Neuroscience, 10*(5), 647–656.

Maturana, H. R., & Varela, F. G. (1987). *The tree of knowledge: The biological roots of human understanding.* Boston, MA: Shambhala.

Mayr, U. (2002). Inhibition in action rules. *Psychonomic Bulletin and Review, 9*, 93–99.

McCulloch, K. C., Aarts, H., Fujita, J., & Bargh, J. A. (2008). Inhibition in goal systems: A retrieval-induced forgetting account. *Journal of Experimental Social Psychology*, *44*, 857–865.

McKone, E. (1995). Short-term implicit memory for words and nonwords. *Journal of Experimental Psychology: Learning, Memory and Cognition, 21*, 1108–1126.

Miller, D. T., & Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin*, *82*, 213–225.

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience, 24*, 167–202.

Miller, N. E., & Dollard, J. (1941). *Social learning and imitation.* New Haven, CT: Yale University Press.

Mischel, W., Shoda,Y., & Rodriguez, M.I. (1989). Delay of gratification in children. *Science*, *244*, 933–938.

Miyake, A., & Shah, P. (1999). *Models of working memory: Mechanisms of active maintenance and executive control.* New York: Cambridge University Press.

Mobbs, D., Hassabis, D., Seymore, B., Marchant, J. L., Weiskopf, N. Dolan, R. J., et al. (2009). Choking on the money. Reward-based performance decrements are associated with midbrain activity. *Psychological Science, 20,* 955–962.

Monteith, M.J. (1993). Self-regulation of prejudiced responses: Implications for progress in prejudice reduction efforts. *Journal of Personality and Social Psychology, 65*, 469–485.

Moskowitz, G. B. (2010). On the control over stereotype activation and stereotype inhibition. *Social and Personality Psychology Compass*, *4*, 140–158.

Moskowitz, G. B., Gollwitzer, P. M., Wasel, W., & Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology, 77*, 167–184.

Moskowitz, G. B., & Grant, H. (2009). *The psychology of goals.* New York: Guilford Press.

Naccache, L., & Dehaene, S. (2001). Unconscious semantic priming extends to novel unseen stimuli. *Cognition*, *80*, 215–229.

Neuberg, S. L., & Fiske, S. T. (1987). Motivational influences on impression formation: Outcome dependency, accuracy-driven attention, and individuating processes. *Journal of Personality and Social Psychology, 53*, 431–444.

Nieuwenhuis, S., Schweizer, T. S., Mars, R. B., Botvinick, M. M., & Hajcak, G. (2007). Error-likelihood prediction in the medial frontal cortex: A critical evaluation. *Cerebral Cortex, 17*(7), 1570–1581.

Oikawa, M. (2004). Moderation of automatic achievement goals by conscious monitoring. *Psychological Reports, 95*, 975–980.

Papies, E. K., Aarts, H., & de Vries, N. K. (2009). Planning is for doing: Implementation intentions go beyond the mere creation of goal-directed associations. *Journal of Experimental Social Psychology, 45*, 1148–1151.

Papies, E. K., Stroebe, W., & Aarts, H. (2008). Healthy cognition: Processes of self-regulatory success in restrained eating. *Personality and Social Psychology Bulletin, 34*, 1290–1300.

Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. New York: Cambridge University Press.

Pessiglione, M., Schmidt, L., Draganski, B., Kalisch, R., Lau, H., Dolan, R. J., et al. (2007). How the brain translates money into force: A neuroimaging study of subliminal motivation. *Science, 316*, 904–906.

Pessoa, L. (2009). How do emotion and motivation direct executive control? *Trends in Cognitive Sciences, 13,* 160–166.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer-Verlag.

Pinker, S. (1997). *How the mind works.* New York: Norton & Company.

Powers, W. T. (1973). *Behavior: The control of perception*. Chicago, IL: Aldine.

Prinz, W. (1997). Perception and action planning. *European Journal of Cognitive Psychology, 9*, 129–154.

Rookes, P., & Willson, J. (2000). *Perception: Theory, development and organization.* London: Routledge.

Ruys, K. I., & Aarts, H. (in press). I didn't mean to hurt you! Unconscious origins of experienced self-agency over other's emotions. *Emotion*.

Schlaghecken, F., & Eimer, M. (2004). Masked prime stimuli can bias "free" choices between response alternatives. *Psychonomic Bulletin and Review, 11*, 463–468.

Schultz, W. (2006). Behavioral theories and the neurophysiology of reward. *Annual Review of Psychology, 57*, 87.

Seibt, B., Häfner, M., & Deutsch, R. (2007). Prepared to eat: How immediate affective and motivational responses to food cues are influenced by food deprivation. *European Journal of Social Psychology, 37*, 359–379.

Serences, J. T., & Yantis, S. (2006). Selective visual attention and perceptual coherence. *Trends in Cognitive Sciences, 10*, 38–45.

Seth, A. K., Dienes, Z., Cleeremans, A., Overgaard, M., & Pessoa, L. (2008). Measuring consciousness: Relating behavioral and neurophysiological approaches. *Trends in Cognitive Sciences, 12*, 314–321.

Shah, J. Y. (2003). Automatic for the people: How representations of significant others implicitly affect goal pursuit. *Journal of Personality and Social Psychology, 84*, 661–681.

Shah, J. Y., Friedman, R., & Kruglanski, A. W. (2002). Forgetting all else: On the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology, 83*, 1261–1280.

Shah, J. Y., & Gardner, W. (2008), *Handbook of motivation science*. New York: Guilford Press.

Shantz, A., & Latham, G. P. (2009). An exploratory field experiment of the effect of subconscious and conscious goals on employee performance. *Organizational Behavior and Human Decision Processes, 109*, 9–17.

Sheeran, P., Aarts, H., Custers, R., Rivis, A., Webb, T. L., & Cooke, R. (2005). The goal-dependent automaticity of drinking habits. *British Journal of Social Psychology, 44*, 47–63.

Shepperd, J. A., Malone, W., & Sweeny, K. (2008). Exploring causes of the self-serving bias. *Social and Personality Psychology Compass, 2*, 895–908.

Shizgal, P. (1997). Neural basis of utility estimation. *Current Opinion in Neurobiology, 7,* 198–208.

Skinner, B. F. (1953). *Science and human behavior*. Oxford, England: Macmillan.

Slachevsky A., Pillon B., Fourneret P., Pradat-Diehl P., Jeannerod M., & Dubois B. (2001). Preserved adjustment but impaired awareness in a sensory–motor conflict following prefrontal lesions. *Journal of Cognitive Neuroscience, 13*, 332–340.

Soon, C. S., Brass, M., Heinze, H. J., & Haynes, J. D. (2008). Unconscious determinants of free decisions in the human brain. *Nature Neuroscience, 11*, 543–545.

Steele, C. M., Spencer, S. J., & Lynch, M. (1993). Self-image resilience and dissonance: The role of affirmational resource. *Journal of Personality and Social Psychology, 64,* 885–896.

Strahan, E. J., Spencer, S. J., & Zanna, M. P. (2002). Subliminal priming and persuasion: Striking while the iron is hot. *Journal of Experimental Social Psychology, 38*, 556–568.

Strecher V., DeVellis B., Becker M., & Rosenstock I. (1986). The role of self-efficacy in achieving health behavior change. *Health Education Quarterly, 13*, 73–91.

Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel and is it unique to humans? *Behavioral and Brain Sciences, 30*, 299–313.

Tajfel, H. (1957). Value and the perceptual judgment of magnitude. *Psychological Review, 64,* 192–204.

Tetlock, P. E. (1985). Accountability: The neglected social context of judgment and choice. In B. Staw & L. Cummings (Eds.), *Research in organizational behavior* (Vol. 7, pp. 297–332). Greenwich, CT: JAI Press.

Thorndike, E. L. (1911). *Animal intelligence*. New York: Macmillan.

Tolman, E. C. (1939). Prediction of vicarious trial and error by means of the schematic sow bug. *Psychological Review, 46*, 318–336.

Ullsperger, M., Nittono, H., & von Cramon, D. Y. (2007). When goals are missed: Dealing with self-generated and

externally induced failure. *Neuroimage, 35*(3), 1356–1364.

Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review, 94*, 3–15.

Van Den Bos, A., & Stapel, D. A. (2009). Why people stereotype affects how they stereotype: The differential influence of comprehension goals and self-enhancement goals on stereotyping. *Personality and Social Psychology Bulletin, 35*, 101–113.

Veling, H., & Aarts, H. (2009). Putting behavior on hold decreases reward value of need-instrumental objects outside of awareness. *Journal of Experimental Social Psychology, 45,* 1020–1023.

Veling, H., & Aarts, H. (2010). Cueing task goals and earning money: Relatively high monetary rewards reduce failures to act on goals in a Stroop task. *Motivation and Emotion, 34,* 184–190.

Veltkamp, M., Aarts, H., & Custers, R. (2008a). On the emergence of deprivation-reducing behaviors: Subliminal priming of behavior representations turns deprivation into motivation. *Journal of Experimental Social Psychology, 44,* 866–873.

Veltkamp, M., Aarts, H., & Custers, R. (2008b). Perception in the service of goal pursuit: Motivation to attain goals enhances the perceived size of goal-instrumental object. *Social Cognition, 26,* 720–736.

Veltkamp, M., Aarts, H., & Custers, R. (2009). Unravelling the motivational yarn: A framework for understanding the instigation of implicitly motivated behaviour resulting from deprivation and positive affect. *European Review of Social Psychology, 20*, 345–381.

Veltkamp, M., Custers, R., & Aarts, H. (2011). Subliminal conditioning in the absence of basic needs: Striking even when the iron is cold. *Journal of Consumer Psychology,* 21, 49–56.

Verplanken, B., & Holland, R. (2002). Motivated decision-making: Effects of activation and self-centrality of values on choices and behavior. *Journal of Personality and Social Psychology, 82*, 434–447.

Vroom, V. H. (1964). *Work and motivation*. New York: Wiley.

Wegner, D. M. (2002). *The illusion of conscious will*. Cambridge, MA: MIT Press.

Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer-Verlag.

Wicklund, R. A., & Gollwitzer, P. M. (1982). *Symbolic self-completion*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Wiener, N. (1948). *Cybernetics: Or control and communication in the animal and the machine*. Cambridge, MA: MIT Press.

Witt, J. K., Proffitt, D. R., & Epstein, W. (2004). Perceiving distance: A role of effort and intent. *Perception, 33*, 570–590.

Wood, W., & Neal, D. T. (2007). A new look at habits and the interface between habits and goals. *Psychological Review, 114,* 843–863.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35*, 151–175.

Zedelius, C. M., Veling, H., & Aarts, H. (2011). Boosting or choking – How conscious and unconscious reward processing modulate the active maintenance of goal-relevant information. *Consciousness and Cognition, 20*, 355–362.