Goals, Attention, and (Un)Consciousness

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Abstract

In this article, literature from neuroscience, cognitive psychology, and social cognition is integrated to discuss the relation between goals, attention, and consciousness. Goals are the tools with which people engage in volitional behavior. Whereas goal pursuit was traditionally assumed to be strongly related to consciousness, recent research and theorizing suggest that goals guide behavior through attention, and this guidance can occur outside of a person's awareness. The crucial explanatory role of goals and attention in behavior, as well as the relative unimportance of consciousness, is examined in the context of social cognition research on goal priming. Furthermore, three research domains are discussed that are relevant for the understanding of the implementation of volitional behavior: implicit learning, evaluative conditioning, and unconscious thought. It is concluded that these processes are goal dependent and that they need attention, but that they can generally proceed without awareness. Finally, when people are consciously aware of their behavior or their goals, the effects can be beneficial as well as detrimental.

Contents

INTRODUCTION

> Don't know what I want but I know how to get it.
>
> *The Sex Pistols*

The ability to engage in volitional behavior is often considered to be a uniquely human trait. Human behavior is motivated by, and directed at, goals. When we set, strive for, and attain our goals, we have a sense of agency or willfulness in that we experience ourselves as the cause of our own behavior as a result of decisions and actions. Volition, then, is a fundamental feature of the way people see and define themselves.

People have long assumed that volition and consciousness are intimately linked. We know what we want, and when we act on what we want, we do so by making a conscious decision. Moreover, when we make a conscious decision to act—such as to buy a new pair of jeans, to call a friend, or to order a pepperoni pizza—it feels as if that conscious decision is the first and foremost cause of the act that follows. Whereas it is accepted that many mundane behaviors are automatized in that they bypass consciousness (Bargh & Chartrand 1999), the field of psychology has not yet fully come to grips with the role of consciousness in behavior that is (or at least feels as if it is) clearly volitional.

The idea that consciousness is necessary to evoke volitional behavior was severely shaken by a famous experiment by Libet and colleagues (1983). They asked participants to freely choose when to move their index fingers and measured the movement itself, to report their conscious decision to start the movement, and the onset of the brains' readiness potentials preparing the movement. As expected, the conscious decision preceded the act itself (roughly by a quarter of a second). However, readiness potentials could be identified up to a full second before the actual movement, clearly demonstrating that the brain started to prepare the movement long before consciousness became involved.

Libet's work was—and still is—controversial. Arguably, the most important problem in interpreting Libet's findings is that one can contend that the movement still starts with a conscious decision (van de Grind 2002). After all, the chain of events starts with an experimenter telling participants that they have to move their finger and, obviously, participants are consciously aware of this instruction. One could conclude that participants unconsciously decided *when* to make the actual movement, but not *whether* to make the movement in the first place.

Recently, Soon and colleagues (2008) extended the findings by Libet and colleagues. They changed the paradigm in such a way that participants not only chose when to engage in a specific act, but also which one of two possible acts to make. They replicated Libet's work and found readiness potentials (in the supplementary motor area, or SMA) some time before participants reported making a conscious decision as to which act to engage in. More importantly, they found activity predictive of the specific act in the frontal and parietal cortex up to 10 seconds before the actual act. In other words, we unconsciously choose which behavior to engage in long before we are consciously aware of it.

Goals: the mental representation of behaviors or behavioral outcomes that are associated with positive affect. They determine our actions

Volition: also often called the will. The process by which we "decide" to engage in a particular behavior

Consciousness: the ability to be aware of things. Contents of consciousness are assumed to be available for verbal report

The assumption that the role of consciousness in volitional behavior is much more modest than long assumed is also emphasized by recent research showing that goals and higher cognitive processes that rely on cortical brain areas can be modulated by unconscious stimuli. In a recent experiment, for instance, Lau & Passingham (2007) instructed participants to either prepare a phonological judgment or a semantic judgment on an upcoming word. In some trials, however, they were subliminally primed to do the opposite. On these trials, it was found that brain activity in areas relevant to the instructed task was reduced, whereas activity related to the primed task was enhanced. The cognitive control system, in other words, can be activated by subliminal stimuli. In addition, Pessiglione and colleagues (2007) showed that strength of motivation can be subliminally primed. Participants in their experiment did a task whereby they could win money on successive trials by squeezing a handgrip. The amount of money at stake (a pound versus a penny) was subliminally primed during each trial, and it indeed affected force of handgrip, along with skin conductance and activation in the ventral palladium, an area known to be devoted to emotional and motivational output of the limbic system. Pushing the bar even higher, Bijleveld et al. (2009) recently showed that people recruit more resources in response to high (as compared to low) subliminal reward cues, but only when the reward required considerable mental effort to obtain. This research demonstrates that people use reward information in a strategic manner to recruit resources, without this information ever reaching conscious awareness.

These findings concur with a growing body of literature from the social cognition domain showing that goals can affect higher cognitive processes and overt behavior without conscious awareness of the goal. For example, Bargh and colleagues (2001) unobtrusively exposed participants to words such as "strive" and "succeed" to prime an achievement goal and then gave them the opportunity to perform well by giving them a set of anagrams. Participants primed with an achievement goal outperformed those who were not primed with the goal. Bargh et al. (2001) also demonstrated that such goal priming leads to qualities associated with motivational states or "goal-directedness," such as persistence and increased effort (for other such demonstrations, see, e.g., Aarts et al. 2008, Fitzsimons & Bargh 2003, Lakin & Chartrand 2003, Shah et al. 2002).

In summary, people become consciously aware of an act only after they unconsciously decide to engage in it. In addition, at least some volitional behavior does not require any conscious awareness at all: Goals and motivation can be unconsciously primed.

In the present contribution, we aim to explore how goals, attention, and consciousness are related to gain a better understanding of how people can engage in goal-directed, volitional behavior in the absence of conscious awareness. The central message and organizing theme is the following: People have long assumed that consciousness plays a leading role in guiding volitional behavior, but we contend that the lead role is actually for goals and for attention. They are the stars of the play called volitional behavior. Goals guide attention and thereby often behavior, and both goals and attention are largely independent from consciousness. To bolster this claim, literature from social psychology, cognitive psychology, and neuroscience on the relation between goals, attention, and (un)consciousness, is reviewed in this article.

In the next section, the key concepts are defined, and more importantly, recent research on their relations is discussed in the context of social cognition research on goal priming. Because goals seem to originate in the unconscious (e.g., Libet et al. 1983, Soon et al. 2008), it is essential to understand how such unconsciously evoked goals may control volitional behavior. Furthermore, if goals are capable of directing attention and behavior outside of awareness, it is possible that goals modulate bottom-up information processes relevant for the creation and implementation of volitional behavior. Accordingly, we review recent developments in three lines of research against the background

Unconscious: all the psychological processes of which we are not aware at a given moment in time

Attention: the extent to which incoming information is processed

of the proposed relationship between goals, attention, and consciousness. Specifically, implicit learning, evaluative conditioning, and unconscious thought are elaborated upon as instances of bottom-up processes that may be moderated by goals and attention in the absence of awareness. Finally, the possible role of consciousness in volitional behavior is analyzed, whereby a framework is presented about when conscious awareness is beneficial and when it is (potentially) harmful for effective goal-directed behavior.

GOALS, ATTENTION, AND CONSCIOUSNESS

Goals are conceptualized as mental representations of behaviors or behavioral outcomes that are desirable or rewarding to engage in or to attain. Most goals are linked to lower-level acts and skills and thus provide a reference point for cognition and action (Aarts & Dijksterhuis 2000, Hommel 1996, Jeannerod 1997, Vallacher & Wegner 1987). Goals are the starting point and/or reference point of almost all behavior. Furthermore, the notion that goals are rewarding to attain suggests that goals control behavior through cognitive as well as motivational processes (Bargh et al. 2009, Custers & Aarts 2005). Accordingly, any behavior or outcome that is represented in terms of a result of more concrete action can potentially operate as a goal if one is motivated or encouraged by the external environment to attain it.

An abundance of recent evidence (reviewed more fully below) demonstrates that goals can be activated unconsciously by features of the environment (Aarts & Dijksterhuis 2000, Bargh & Gollwitzer 1994, Bargh et al. 2001, Kruglanski et al. 2002). Given that people unconsciously "decide" what goals to pursue merely as a consequence of priming by the environment, goals must be mentally represented (Bargh & Gollwitzer 1994). In a recent research program, Custers & Aarts (2005) unveiled the structure of such goal representations. They selected behaviors that were pretested as neutral (doing puzzles, studying, going for a walk) and conditioned these activities with positive, neutral, or negative words. This was done subliminally: The participants could consciously detect the valenced words but not the activities that were conditioned. The results showed that participants later wanted to engage in the positively conditioned activities but not in the other activities. In another experiment, participants were promised they could engage in the conditioned activity after doing a filler task. Participants who were promised they could do something that was positively conditioned and that they wanted to engage in completed the filler task faster than did other participants. In summary, when the representation of a behavior becomes unconsciously associated with positive affect, it becomes a goal that motivates people to maintain and achieve it.

Attention is commonly referred to as the selective processing of one aspect while ignoring other irrelevant aspects. About one million fibers leave each human eye, meaning that we have to deal with about one megabyte of raw data each second (Koch & Tsuchiya 2006). It is impossible to process all this information on higher levels. Because information-processing capacity involved in the control of higher-level cognition and behavior is limited, attention facilitates which stimuli and actions get access to these capacity-limited processes. Therefore, attention must be flexibly applied to different processes (Kahneman 1973, Moors & de Houwer 2006). As Moors & De Houwer (2006) pointed out, early stages of information processing (sensory analysis) generally require no attention, whereas later stages require an increasing amount. Given that attention is a limited resource, some of these later processing stages do indeed continue because enough attention is devoted to them, whereas other processes are "filtered out" by lack of attention.

Whether incoming information is attended to or not—that is, whether incoming information is processed on higher stages—is determined both by bottom-up and top-down processes (Corbetta & Shulman 2002, Dehaene et al. 2006, Koch & Tsuchiya 2006). Bottom-up (exogenous) attentive processes are involuntary

and elicited by stimulus saliency, such as brightness or speed of movement and stimuli that are of instinctive or learned biological importance (Koch & Ullman 1985). However, most attentive processes are driven by top-down (endogenous) concerns, and this is where goals come into play. Both the amount and duration of attention devoted to incoming information is determined by active goals: Incoming information that is relevant for goal attainment is attended to much more than information that is irrelevant. If one is thirsty, drinks attract more attention than things one cannot drink (e.g., Aarts et al. 2001).

As a general rule, attention in the service of goals involves two interconnected faculties that usually act in close harmony: stability or focus (the ability to keep information active for action or further processing) and flexibility (the ability to be flexible enough to switch to, and take advantage of, contextual variations). The balance between focus and flexibility is crucial for goals to do their work effectively. Disturbance of this balance, however, leads to inferior performance (e.g., Aston-Jones & Cohen 2005). This is elaborated upon below.

Defining consciousness is a complex and thorny issue that psychologists (and philosophers) have struggled with for a long time. In this contribution, we consider conscious processes as processes that are accompanied by awareness of certain aspects of the process and/or awareness of relevant contents. In experimental research, conscious awareness of process or content can be assessed by investigating whether people are able to verbalize processes or contents. If they are, a process can be said to be conscious. Driving is conscious, as when people drive they are (at times at least) consciously aware of sitting in a car, and they are able to verbalize this. It is enough to be aware of some aspects of the process for it to qualify as a conscious process (Dijksterhuis 2009). For instance, speaking is conscious because we are aware of our speaking while we do it. However, the processes guiding the production of speech are largely unconscious, and we are not aware of the search for each word. We are never aware of all aspects of a psychological process. Each and every conscious process is accompanied by (or is a residual of) unconscious processes.

In short, goals direct attention in the service of goal pursuit, and certain aspects of the attention process may enter consciousness or not. Although goals can control behavior in the absence of conscious awareness, goals guide these behavioral effects by modulating attention processes. In the next section, we examine how goals, attention, and consciousness are related.

THE RELATION BETWEEN ATTENTION AND CONSCIOUSNESS

It is important to realize that there is no one-to-one relation between attention and consciousness. Researchers who advocate the importance of unconscious processes by demonstrating that important psychological processes do not need any conscious guidance (e.g., Bargh et al. 1996, 2001; Dijksterhuis & Nordgren 2006; Libet et al. 1983; Reber 1967) often meet with resistance because it feels as if consciousness simply must be involved in these important processes. However, attention is the guiding principle here, not conscious awareness. Part of the confusion arises because attention (especially top-down attention) and consciousness are correlated in real-life experiences. When one pays more attention to an incoming stimulus, the probability that one becomes consciously aware of it increases.

However, attention and consciousness are distinct. More and more recent research and theorizing is aimed at understanding the distinction, and there is now some agreement that psychological processes can best be understood as falling into one of the cells of a 2×2 taxonomy based on whether stimuli are attended to or not and whether they are reportable or not (that is, whether one is consciously aware of them or not; Baars 1997, Damasio 1999, Dehaene et al. 2006, Koch & Tsuchiya 2006, Lamme 2003, Wegner & Smart 1997). An abundance of priming research shows that stimuli that do not reach conscious awareness can still influence various

psychological processes, including overt behavior (see, e.g., Dijksterhuis & Bargh 2001 for a review), but some degree of attention to these stimuli is necessary for these effects to occur. Likewise, recent research shows that people can engage in rather complicated activities in the absence of conscious awareness (Bargh et al. 2001, Dijksterhuis et al. 2006); however, these processes are goal dependent and most likely do require a certain degree of attention. Conversely, people can be (generally fleetingly) consciously aware of stimuli without paying much attention to them.

Whereas recent theorizing is mostly based on findings on visual perception, Wegner & Smart (1997) applied the 2 × 2 taxonomy to a broader domain. They distinguished between activation level and consciousness. Specifically, in addition to states of no activation (no attention and no consciousness) and full activation (both attention and consciousness), they also distinguished states of deep activation (stimuli that are attended to but are unconscious) and surface activation (stimuli that are not attended to but are conscious). An example of deep activation, based on Wegner's own work (e.g., Wegner 1994), is thoughts that are temporarily suppressed. Such thoughts are highly active but do not appear in consciousness, at least not as long as suppression is successful. Good examples of surface activation are the sort of fleeting thoughts we may have when we daydream or associate freely. We do not pay attention to them, but they can briefly appear in consciousness.

THE RELATION BETWEEN GOALS AND CONSCIOUSNESS

Volitional behavior was traditionally associated with consciousness, in that goal pursuit was assumed to be the consequence of a conscious intention to perform a specified behavior or to attain a goal. According to this notion, people experience themselves to be the agent of their behaviors and goal pursuits, as these experiences of self-agency are the result of consciously forming, pursuing, and attaining one's goals.

However, recent research challenges this view. There is a bulk of experimental work showing that the mere activation of a goal representation guides behavior and higher cognitive processes involved in goal-directed behavior in the absence of a person's conscious awareness. The idea that goals can direct behavior unconsciously is based on the notion that goals are part of knowledge networks that include representations of the goal itself, actions, procedures, and objects that may aid goal pursuit as well as situational or contextual features related to the goal (Aarts & Dijksterhuis 2000, 2003; Bargh & Gollwitzer 1994; Cooper & Shallice 2006; Kruglanski et al. 2002). These knowledge networks enable people to act on goals without intentional control or without explicit expectancies. Thus, goal-directed behavior can start outside of conscious awareness because goal representations can be primed by, and interact with, behavioral and contextual information.

Part of the research on unconscious goal pursuit deals with habit formation processes (Aarts & Dijksterhuis 2000, Bargh 1990, Fishbach et al. 2003, Moskowitz et al. 2004, Shah 2003). Specifically, for goal pursuit to become automatized, one needs some practice with the selection and execution of the most effective action in the goal-relevant situation. Indeed, there is evidence showing that people immediately activate the means to reach a goal upon the unconscious instigation of that goal, but only when that goal-directed behavior has been performed frequently in the past and has become a habit (Aarts & Dijksterhuis 2000, Hommel 2000, Sheeran et al. 2005).

Other studies have tested whether goal priming facilitates the utilization of skills associated with the goal even though these skills have not been previously applied to the task at hand. In a demonstration of this idea, Holland et al. (2005) examined whether the mere perception of odor is capable of directly activating goals. They exposed some participants to the scent of all-purpose cleaner without participants' conscious awareness of the presence of the scent. Because the scent of all-purpose cleaner was

assumed to enhance the accessibility of the goal of cleaning, Holland et al. (2005) hypothesized that participants exposed to the scent would spontaneously start to be cleaner. Participants were requested to eat a very crumbly cookie in the lab, and indeed, participants exposed to the scent put in more effort to keep their direct environment clean and crumb-free, even though the task and situation in which they applied their skills of cleaning were novel. These results indicate that goal activation can encourage people to exploit new opportunities in novel settings without awareness of the operation of the goal.

Goals inferred from another person's actions can also be activated in a perceiver and can control subsequent behavior without conscious intent, thus leading to goal contagion (Aarts et al. 2004, Dik & Aarts 2007, Loersch et al. 2008). As Hassin et al. (2005) have demonstrated, goal inferences can occur spontaneously, without conscious intentions and awareness. Building on this knowledge, Aarts and colleagues (2004) briefly exposed participants to a short script either implying the goal of earning money or not. After reading the goal-implying scenario, participants were told that they could participate in a lottery in which they could win money, but only if there was enough time left. They were then given a computer task, and the question was whether participants would speed up their performance as a means to ensure that they could participate in the goal-relevant task. Results showed that participants who were exposed to the behavior implying the goal of earning money were indeed faster than those in the control condition. These behavioral changes occurred without conscious intent and were more pronounced when the desire to earn money was relatively strong. These findings were replicated in another experiment with heterosexual male students and the goal of seeking casual sex.

Goals may also be automatically activated by being primed with significant others. Research has shown that goals and resultant actions are activated when people are exposed to the names of friends, parents, and spouses. Fitzsimons & Bargh (2003) showed that subliminal priming of the names of one's parents triggers the motivation to achieve and that exposure to names of good friends primes the habitual goal and resultant concrete behavior of helping (see also Shah 2003). A recent line of experimentation replicated and extended these subliminal goal-priming effects in the realm of social stereotypes (Aarts et al. 2005a, Custers et al. 2008). Specifically, it was tested and confirmed that priming members of social groups that contain the representation of a goal that is believed to be held by that group causes people to automatically pursue the goals (e.g., the goal of helping or making money that are stereotypical for nurses or stockbrokers, respectively). Finally, Fitzsimons et al. (2008) showed that goals can even be activated by the perception of objects that are associated with goals. For instance, exposing people to a Mac computer leads to the goal to be creative in comparison to exposing people to an IBM computer.

Taken together, the results of a large body of research over the past ten years indicate that goal-directed volitional behavior can be evoked outside of awareness. Specifically, goal priming causes us to initiate and exhibit lower-level acts and skills that are available in our repertoire and associated with the primed goal without conscious intent and awareness of the actual goal causing the behavior. Importantly, the observation that our goal pursuits can emerge unconsciously suggests that conscious intentions and goals are distinct concepts that can operate independently from each other, served by different processes and brain networks (Frith et al. 2000, Haynes et al. 2007, Lau et al. 2004). Whereas intentions refer to our conscious reflection or deliberation on attaining a behavioral goal, goals are representations of desired states or outcomes that guide overt behavior without conscious awareness.

The idea that our goal pursuits also materialize unconsciously may sound counterintuitive because the actions we conduct and the outcomes they produce are often accompanied with conscious experiences of self-agency. How can much of our behavior unfold outside

conscious awareness if we have those pervasive agency experiences? A possible way to understand this issue is to suggest that our conscious experience of self-agency is an inference that occurs fluently and perfunctorily after action performance and is not accurate per se (Prinz 2003, Wegner 2003). This inferential character of experiences of self-agency has become apparent in a number of recent studies (Aarts et al. 2005b, 2009a,b; Dijksterhuis et al. 2008; Jones et al. 2008; Sato 2009; Sato & Yasuda 2005; Wegner & Wheatley 1999) demonstrating that these experiences are the result of a match between the outcome of an action and knowledge about the outcome that was made active just prior to its occurrence.

In one study (Aarts et al. 2005b), participants and the computer each moved a single gray square in opposite directions on a rectangular path consisting of eight white tiles. Participants' task was to press a key to stop the rapid movement of the squares. This action turned one of the eight tiles black. In reality, the computer determined which of the tiles would turn black. From a participant's perspective, though, this black tile could represent the location of either her square or the computer's square at the time she pressed the stop key. Thus, the participant or computer could have caused the square to stop on the position (outcome), rendering the exclusivity of causes of outcomes ambiguous (Wegner & Wheatley 1999). Participants either consciously set the intention to stop on a position or were subliminally primed with that position before they saw the presented stop on the corresponding location. To measure experiences of self-agency, participants rated the extent to which they felt to have caused the square to stop on the presented location. Results showed that both intention and priming lead to an increased sense of self-agency, suggesting that online self-agency experiences were primarily based on a match between preactivated and actual outcomes, irrespective of the conscious or unconscious source of this activation. These and other findings indicate that agency experiences not only arise from our conscious goals, but also accompany the unconscious activation of goal representations, leading us to believe that the outcomes of our behaviors were consciously intended, whereas in fact they were influenced by cues in our environment outside our conscious awareness.

THE RELATION BETWEEN GOALS AND ATTENTION

Attention is a functional process that selects and biases the incoming flow of information and internal representations in the service of effective goal achievement. Thus, the content of attention represents the goals that are active at a specific moment in time. One of the most important roles for attention is to translate goals into overt behavior (Monsell & Driver 2000). If a goal can always be executed directly in the very same environment, attention would merely reflect the translation of a perceived relevant stimulus into a response in real-time. However, because goals cannot always be enacted directly in the same situation, we often have to take temporal and spatial aspects into account. Moreover, the social environment often poses conflicts on our goals such that interfering information needs to be ignored or inhibited for effective goal performance to proceed. In short, attention does not only orient and alert the person to goal-relevant information; it also plays a supervisory role in translating goals into behavior (Posner & Fan 2007).

Indeed, recent research has started to model goal-directed behavior in terms of executive control processes (Funahashi 2001, Miller & Cohen 2001, Miyake & Shah 1999). An important aim of this research is to understand how people maintain and manipulate information in the service of goal pursuit and to provide a neurocognitive account for the ability to guide attention and action in accord with goals. A common framework proposed in this research is that the prefrontal cortex (PFC), anterior cingulate cortex, and posterior parietal cortex are the main areas taking care of attentional and control processes, consistent with theories of PFC function and the involvement of these

areas in the distributed working memory system. Importantly, these cortical areas are believed to be part of a network for conscious processes, and hence are implicated in volitional behavior (Baars & Franklin 2003, Baddeley 1993, Haggard 2008, Smith & Jonides 1999). Thus, the functionality and structure of executive control and working memory are examined by presenting participants explicitly with materials that they explicitly have to work on. That is, participants are explicitly instructed to actively maintain goal information over time or to ignore irrelevant information to keep focused on the goal task at hand, thereby (often unstated) assuming that these processes also occur during self-motivated performance. However, under this working assumption, it is difficult to understand how goal pursuit is supported by attention and higher cognitive processes that make use of executive control structures without the person being aware of it. That is, how can goal-directed attention to, and transformation of, relevant information occur outside of conscious awareness?

One way to approach this issue is to propose that, in principle, the operation of higher cognitive processes does not care much about the conscious state of the individual. In other words, 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 translate goals into behavior (Aarts 2007, Badgaiyan 2000, Hassin et al. 2009). Thus, goals modulate attention processes, irrespective of the conscious or unconscious source of the activation of the goal. Although this may be a controversial proposition, there is some recent evidence for it.

First, from research on working memory, we know that the activation of semantic items decays in short-term memory over very short periods of time, usually within a couple of seconds, unless some intervention or goal holds the items active (Baddeley & Logie 1999, McKone 1995). Exploiting this notion, research has demonstrated that an unconsciously activated goal can maintain relevant information active as well. For instance, Aarts et al. (2007) examined how the mental accessibility of a desired goal after a short interval changes as a function of subliminally priming the goal. In one of their studies, participants were either primed with the goal to socialize or not, and after a delay of two minutes, the accessibility of the goal was tested in a lexical decision task by measuring the speed of recognizing words related to the goal. Results showed that the representation of the goal remained accessible when participants were primed to attain the goal, but that the sustained activation faded away quickly as soon as desire to attain that goal was gone. Similar persistent activation effects of unconsciously activated desired goal-states have been obtained in other studies (Aarts et al. 2004, Bargh et al. 2001), suggesting that some kind of focus or rehearsal process keeps goal-relevant information active unconsciously.

Furthermore, recent work has started to explore whether humans can keep their eyes on their ongoing goal pursuit in a unconscious manner when competing goals or temptations conflicts with these pursuits. For instance, if one wants to lose weight, one has to be able to resist the temptation to eat a late-night snack. People usually engage in this type of attention process when they have to deal with interference that stems from other goals or temptations that compete for attention and behavior, a process that is commonly conceived of as requiring conscious and intentional control (see, e.g., work on delay of gratification; Mischel et al. 1989). However, there are studies that tell a somewhat different story. For instance, Shah and colleagues (2002) demonstrated that when participants are unconsciously instigated to pursue a given goal (by subliminal exposure to words representing the goal, e.g., studying), they inhibited competing accessible goals (e.g., going out); moreover, this inhibition facilitated the achievement of the unconsciously activated goal. These findings provide support for the existence of an unconscious attention/inhibition mechanism that shields goals from distracting thoughts (see also Aarts et al. 2007, Fishbach et al. 2003, Papies et al. 2008).

In summary, several lines of research suggest that goals can be translated into overt behavior outside the person's awareness of the activation and operation of the goal. Furthermore, unconscious goal pursuit is supported by attention that operates on higher cognitive processes according to principles of executive control and working memory. And these processes (and the information on which they operate) seem to run below the threshold of consciousness.

In the next section, recent developments in three research areas are reviewed, with the above framework in mind. Specifically, we elaborate on implicit learning, on evaluative conditioning, and on unconscious thought, whereby we postulate that these processes are goal dependent, that they require some attention, but that they do not need conscious guidance.

IMPLICIT LEARNING

In order to stay one step ahead in the world, humans and other animals use the world's regularities in order to anticipate events. Furthermore, learning regularities that pertain to rules of predictive relations is especially important for optimal guidance of goal-directed behavior (e.g., one needs to know which action leads to the attainment of a goal). People are able to learn complex rules and relations between events that they encounter in a bottom-up fashion without being aware of them. In the seminal work by Reber (1967, 1993; for a recent review, see Frensch & Runger 2003) on implicit learning, participants were presented with sets of letter strings, such as "XXRTRXV" and "AABEBAP." These strings obey specific rules that are unbeknownst to the participants. However, after an initial learning phase during which participants are repeatedly presented with such strings, they can to some extent classify new strings as to whether they follow the learned rule or not. Interestingly, participants can do without being able to verbalize the rules, which reflects actual human speech: We follow grammatical rules, often without being able to explain these rules.

What exactly people can learn without conscious guidance is still a matter of debate, and we concede that to which implicit learning is dependent on goals and on attention still warrants further investigation. However, it is our contention that people can indeed learn complex rules and relations without being consciously aware of them (Halford et al. 2005, Lewicki et al. 1992, Nissen & Bullemer 1987), but that these learning processes are goal dependent and do require at least some attention. Jimenez & Mendez (1999), for instance, conducted various studies in which participants engaged in sequential learning under either single- or dual-task conditions. Although they found that general attentional load hardly affected learning, it also became clear that participants do need selective attention to the crucial information. In order to learn a relation between two components, participants had to be able to hold the two components in working memory simultaneously.

Recently, Eitam et al. (2008) extended this work by showing that implicit learning is influenced by goals. They primed half their participants with the goal to achieve, whereas the others were not primed. Participants then engaged in a dynamic, complex learning task, based on the research by Berry & Broadbent (1984). Their research clearly demonstrated that participants who were primed with achievement performed considerably better than control participants—that is, they implicitly learned more. However, the ability to consciously describe what they had learned was equally poor in both conditions. In other words, goals affected implicit learning without any improvement in conscious recognition of what was learned.

The principle of implicit learning has also been examined in the context of associative versus predictive relations. Whereas it is generally assumed that bidirectional structures (i.e., associations) can be learned automatically and without conscious awareness, the formation of more precise structures that capture the predictive relation between events (e.g., predictive or causal rules) are assumed to require strategic

processing and conscious awareness of the events and their relation (Berry & Dienes 1993, Sloman 1996). These assumptions mainly follow from the idea that learning mechanisms that rely on bottom-up processes (e.g., Hebbian associative learning) are able to operate outside of awareness, whereas top-down processes (e.g., predictive relations or rule-based learning) are generally assumed to require conscious awareness (e.g., Hayes & Broadbent 1988, Keele et al. 2003, Lewicki et al. 1987, Reber 1989). These assumptions were explicitly tested in recent research by Alonso et al. (2006). In a learning phase, in which participants had to categorize target words (e.g., dog, chair) as members of two categories (animal, furniture), each target was preceded by one of two additional category labels (body and plant) that were to be ignored by the participant, but fully predicted the category of the target word. Alonso and colleagues reasoned that the structure of the learned relation between primes and targets could be revealed by testing this relation in the reverse direction: If the learned relation was bidirectional (association), priming the target categories of the learning phase should facilitate members of the related category that served as a prime in the learning phase. This should not, however, be the case for unidirectional structures (predictive relation).

In order to investigate the role of awareness, participants were either explicitly asked to report the relation at the end of the experiment (Study 1) or conscious awareness was actively prevented by presenting the category primes in the learning phase subliminally (Study 2). It was found that when participants were consciously aware of the predictive relations in the learning phase, no facilitation in the reversed order was observed in the test phase, whereas such facilitation was demonstrated for participants who were unaware of the relation, or for participants for whom awareness was actively prevented by presenting the primes subliminally in the learning phase. These findings suggest that bidirectional memory structures (i.e., associations) are formed without awareness, whereas awareness of the predictive relation between events leads to the formation of unidirectional structures. Hence, these findings seem to support the general belief that the formation of bidirectional associations can occur without conscious awareness of the relation, but that such awareness is needed for the formation of unidirectional structures that capture the predictive relation between events.

The finding that learning of predictive relations requires conscious awareness of the relation seems to be at odds with the literature on implicit learning. Most relevant to the current discussion, it may be the case that awareness of the relations is confounded with attention, and hence, learning of predictive relations may occur without conscious awareness when, for example, participants are primed with the goal to process predictive relations. In a recent test of this idea, Custers & Aarts (2009) employed the learning and test phase utilized by Alonso et al. (2006). However, before participants engaged in the learning phase, they performed a task that either unobtrusively primed the goal to process co-occurring stimuli in terms of predictive relations or did not. The idea here is that the implicit goal that is used in a prior task transfers to the later learning phase and determines whether primes and targets are stored in unidirectional or bidirectional memory structures, even when awareness of the relation is actively prevented by presenting the category primes subliminally in the learning phase. Indeed, the data across three experiments showed that goal priming led to unidirectional memory structures: The target words from the learning phase speeded up the recognition of the category primes in the no-goal prime condition, whereas no such facilitation in the reversed order was observed in the goal prime condition. These effects even showed up when the category primes were presented subliminally in the learning phase. These results suggest that conscious awareness is not the critical moderator that determines how predictive relations are acquired. The acquisition relies on top-down processes in which attention is directed outside of awareness by processing goals relevant for the task at hand.

EVALUATIVE CONDITIONING

When an object (the conditioned stimulus, or CS) is repeatedly paired with a familiar object that already has a positive or negative valence (the unconditioned stimulus, or US), this object takes on the valence of the object it is paired with. Evaluative conditioning is fundamental to the shaping of preferences and goals, and it has been applied in many different domains. Most initial demonstrations (e.g., Razran 1940) were done in the context of persuasion, whereby a message was paired with a positive CS. Evaluative conditioning (EC) has been applied to heighten self-esteem (e.g., Baccus et al. 2004, Dijksterhuis 2004), to increase motivation strength in goal-directed behavior (e.g., Custers & Aarts 2005, Ferguson 2007), and to understand clinical phenomena such as spider phobia (Merkelbach et al. 1993). Jones and colleagues (2004) reported an engaging demonstration of the effects of evaluative conditioning. People generally find the letters in their own name more positive than other letters. Because of this, people like objects—including other people—more when they are associated with letters in their own name. For this reason, people are disproportionately likely to marry others whose first or last names resemble their own!

Early demonstrations of the effects were open to alternative explanations such as demand effects (Razran 1940, Staats & Staats 1958), as participants were often explicitly aware of the possible relation between the CS and the US and/or of the intentions of the experimenter. However, recent demonstrations have dealt with such problems. Various researchers have shown that evaluative conditioning occurs when either the CS or the US, or even both, are presented subliminally (e.g., Custers & Aarts 2005, Dijksterhuis 2004, Krosnick et al. 1992, Murphy et al. 1995, Niedenthal 1990), rendering any alternative explanation that requires conscious awareness highly unlikely. Krosnick et al. (1992), for instance, presented their participants with nine slides of a target person engaging in routine daily activities. These slides were preceded by slides of positive or negative events (e.g., a child with a Mickey Mouse doll versus a bloody shark) presented for a mere 13 milliseconds. Later, participants were asked to evaluate the target person. A target person paired with positive stimuli was evaluated more positively in general and was rated as having a nicer personality compared to a target person paired with negative stimuli.

Despite the findings with subliminal stimuli, whether conscious awareness of the contingencies is necessary for EC effects to occur is still a matter of debate. However, Field & Moore (2005) recently obtained evidence for the central role of attention rather than consciousness. In their first experiment, some participants could process the conditioned stimuli (CSi) under normal conditions, whereas for others attention was depleted with a distractor task. Indeed, only nondistracted participants—that is, participants who could pay sufficient attention to the CSi—demonstrated EC effects, whereas distracted participants did not. Awareness of the contingency between CSi and unconditioned stimuli (USi) did not affect the results. In a second experiment, Field & Moore (2005) manipulated attention while they presented the USi subliminally and found comparable effects: Attention drove the EC effects, whereas contingency awareness played no role.

Pleyers et al. (2007) correctly reasoned that the conclusions of Field & Moore (2005) were based on findings where participants were all aware of the contingencies (i.e., attention-enhanced condition) or where no evaluative conditioning effect was found (i.e., distraction condition). Such a strategy may be suboptimal, and Pleyers and colleagues (2007) have suggested that contingency awareness should not be measured for each participant, but rather on the level on each CS-US combination for each participant. In their experiments, they showed EC effects for CS-US combinations that participants were aware of, and no EC effects for CS-US combinations that participants were not aware of. Interestingly, a close reading of their data reveals that the vast majority of their participants were aware of all CS-US pairings,

whereas the remaining few were not aware of any pairings. There were no participants who were aware of roughly half the pairings and not the others. This suggests that the way in which the CS-US combinations were constructed (a picture of a consumer product together with another positive or negative feature) caused most participants to be aware of the relation, and that this awareness (including the few instances in which participants did not attend to or missed the relation) correlated with the evaluative conditioning effect. Given the results on conditioning with subliminal stimuli, it is more likely that the seeming contingency awareness is merely the consequence of some other factor that is necessary for conditioning, most likely attention. That is, it is likely that conditioning is goal dependent and that a certain degree of attention—driven by processing goals—is necessary during encoding for conditioning to be able to occur.

Later work by Corneille and colleagues (2009) supports this interpretation. If EC is dependent on attention rather than on consciousness, it should also be responsive to goals. They gave some participants CS-US pairings while instructing them to pay attention to similarities, whereas other were instructed to pay attention to differences. Indeed, they found larger EC effects among people who paid attention to the similarities, demonstrating that processing goals and thereby attention influence EC effects. Priluck & Till (2004) recently found that EC effects are stronger among highly involved people and people scoring high in need for cognition.

Given these findings, it is likely that EC effects are dependent on processing goals and on attention and that effects of contingency awareness are merely obtained because contingency awareness generally increases with more attention.

UNCONSCIOUS THOUGHT

Recently, evidence has been collected showing that an important stage of a decision process can also occur outside of conscious awareness. When people have processed information about various choice alternatives, how do they form a preference for one of the alternatives? Traditionally, people have thought that conscious deliberation is necessary. However, it is possible that people can engage in unconscious thought and that conscious thought is not necessary to arrive at a decision. In fact, because consciousness is often poor at weighting the relative importance of attributes (Wilson et al. 1993), unconscious thought may be preferable for arriving at a preference in a complex decision situation (Dijksterhuis 2004, Dijksterhuis et al. 2006, Dijksterhuis & Nordgren 2006).

In a typical experiment on unconscious thought, participants read information pertaining to a choice problem. More specifically, they would be presented with information about four different apartments, whereby each apartment was described by 12 different aspects (Dijksterhuis 2004). One apartment had many more positive attributes (and therefore fewer negative attributes) than the others. After participants had read all the information, some were asked to choose between the apartments immediately. Others were given some time to consciously think before they chose, whereas a third group was distracted for a while and then asked to choose. Participants in this latter group were performing a very taxing working memory task, preventing conscious thought. Instead, they were hypothesized to engage in unconscious thought. What was found with this paradigm is that unconscious thinkers make better decisions than do either conscious thinkers or immediate choosers, in that they choose alternatives with more positive and fewer negative characteristics (for more details, see Dijksterhuis 2004, Dijksterhuis et al. 2006, Dijksterhuis & Nordgren 2006, Ham et al. 2009). Moreover, similar effects were obtained with participants who chose an actual object (such as a poster) rather than a hypothetical one, with quality of choice operationalized as postchoice satisfaction (Dijksterhuis et al. 2006, Dijksterhuis & van Olden 2006).

In a recent set of experiments, it was shown that unconscious thought is a goal-dependent

process (Bos et al. 2008; see also Zhong et al. 2008). In the experiments, participants were again given information about a decision problem. All participants were distracted before they made a decision. However, one group was told that they would later be asked some questions about the decision problem before they were distracted (as in previous experiments). The other group was told that they were done with the decision problem and would not be asked anything about it later on. In other words, one group had the goal to further process the information, whereas the other group had no such goal. Results showed that the former group made better decisions than did the latter. Hence, unconscious thought is a goal-dependent process. Without a goal to reach a decision, unconscious thought is not elicited.

The idea that people can think unconsciously has met with considerable resistance (e.g., Payne et al. 2008, Weber & Johnston 2009). However, as our current framework suggests, the fact that we can think without consciousness does not mean it does not require attention. Indeed, the fact that unconscious thought is goal dependent but takes place without conscious guidance strongly suggests that it does require attention. Preliminary results (F. van Harreveld, A. Dijksterhuis, & M.W. Bos, manuscript in preparation) show that performance on the working memory task during unconscious thought covaries with the successfulness of unconscious thought, in that performance on the distracter task suffers from unconscious thought and vice versa. This indicates that unconscious thought uses working memory resources. This conclusion is corroborated by other recent findings showing that effects of unconscious goals on attention and behavior are impeded when people have to perform a secondary working memory task (Aarts et al. 2008, Oikawa 2004).

The conclusion of this section is that implicit learning, evaluative conditioning, and unconscious thought are almost certainly not dependent on conscious awareness. However, they are goal directed and they do require attention (Bargh et al. 2001, Bos et al. 2008, Custers & Aarts 2009, Eitam et al. 2008, Field & Moore 2005).

FOCUS, FLEXIBILITY, AND THE TWO-FACED ROLE OF CONSCIOUSNESS

Volitional behavior involves the initiation and maintenance of goal pursuit. However, in many cases this is only half the story. Once a goal has been established, people often have to compare their desired state with their actual state and react to arising discrepancies in order to maintain their goal (Powers 1973). Furthermore, new goals may enter the scene that may ask for action. Given the potential interference of distracting information on the one hand and the dynamic nature of our world on the other, people often face the challenge to remain focused to maintain and stabilize one's goals and, at the same time, to be flexible and to adjust behavior to adapt to changing circumstances. Although operating in an antagonistic way, both aspects of attention are needed for optimal goal pursuit. Adaptive volitional behavior requires a context-dependent balance between focus and flexibility.

Whereas recent research recognizes the importance of a balance between focus and flexibility for effective goal pursuit, little is known about the mechanisms involved in establishing this balance. Research with frontal-lobe patients suggests that the frontal brain areas are involved in this process. Frontal-lobe patients display rigid behaviors and less flexibility in tasks that require switching between cognitive rules (Luria 1973, Shallice 1988, Stuss & Levine 1992). Furthermore, these patients seem to be unable to suppress impulses and well-practiced habits in response to objects and tools, also known as utilization behavior (Lhermitte 1983).

The idea that frontal cortical areas are involved in the dynamic balance between focus and flexibility raises the possibility that consciousness plays a prominent role in this process. Although tempting, this suggestion is empirically questionable. For instance, studies

using a set-switching task or selective visual attention task have shown that the balance between focus and flexibility is modulated by the incidental activation of positive affect or reward cues (Della Libera & Chelazzi 2006, Dreisbach & Goschke 2004, Muller et al. 2007). According to Cohen and colleagues (Aston-Jones & Cohen 2005, Cohen et al. 2004), the regulation of the balance is hard-wired in the brain. Although the neurological basis is not yet fully delineated, it appears that flexible action is driven by subcortical output that releases dopamine in the PFC. This release is elicited by rewards or other positive cues that signal the incentive value of a goal (Berridge 2007). Furthermore, enhanced focus is more likely to ensue when action is required to keep the goal active and to shield it from distraction. Such goal-related monitoring processes are supposed to be controlled by the anterior cingulate cortex, which triggers the release of norepinephrine in the locus coeruleus, thereby enhancing focused attention processes in the PFC.

Thus, the balance between focus and flexibility is driven by the rewards and requirements associated with the goals that motivate the person to achieve them. Given the finding that reward-priming effects on decision making and resource recruitment can be brought about unconsciously (e.g., Bijleveld et al. 2009, Pessiglione et al. 2007) and given the human capacity to monitor goal-directed behavior unconsciously (e.g., Custers & Aarts 2007, Fourneret & Jeannerod 1998), it appears that the dynamic balance between focus and stability can occur in the absence of conscious awareness. This line of reasoning is consistent with research in social cognition that considers the motivation and attentional operation of goals to emerge from unconscious interactions of representations of goals and positive affect that can act as an incentive or effort mobilizer (Aarts et al. 2008, Custers & Aarts 2005).

The analysis above suggests that focus and flexibility are in good balance when unconscious goals interact with the environment in a proper way. However, this should not lead to the conclusion that consciousness does not play any role at all in goal-directed volitional behavior. Sometimes, the balance between focus and flexibility is imperfect or severely disturbed and people become aware of their unconscious goals. Indeed, research shows that the probability that unconsciously activated goals reach conscious awareness increases when goal progress is obstructed (Bongers et al. 2009), and it is this episode of conscious awareness that is said to typify a shift from unconscious, automated behavior to conscious, willful behavior (e.g., James 1890, Norman & Shallice 1986). However, how this state of conscious awareness unfolds and whether it serves a causal role in guiding volitional behavior is an essential problem in its own right and remains a topic of intriguing theorizing and empirical scrutiny (Aarts et al. 2007, Blackmore 2003, Bongers & Dijksterhuis 2009). Although we cannot solve the issue here, allow us to speculate on how conscious awareness of behavior may influence the balance between focus and flexibility.

Specifically, assuming that conscious awareness of goals directs attention in a similar way to that of unconscious goals, effects on behavior may depend on whether conscious attention co-occurs with and is directed at the imperfect balance between focus and flexibility during the process of goal pursuit. When conscious attention coincides with and is directed at restoring an imperfect balance, it may improve performance and adaptive behavior. However, when conscious awareness of goals emerges while the balance between focus and flexibility operates adequately—that is, when keeping one's eye on the goal and tuning behavior to changing circumstances act in close harmony—performance may not benefit from conscious awareness. In fact, it may even be jeopardized by conscious awareness. Such impairments may arise when people are explicitly forced to focus conscious attention on their behavior, thereby disturbing rather than promoting a good balance. A few examples of both beneficial and harmful effects of conscious awareness are given below.

Beneficial effects may occur when an imperfect balance during unconscious goal pursuit is

encountered that requires a mode of information processing that cannot be relied on outside of conscious awareness. Specifically, we may encounter a deadlock, such as when goal-directed behavior is obstructed in such a way that neither focus nor flexibility is adaptive to deal with the problem. Often, this implies the planning of a course of action that is totally new or that has never been executed before in the situation at hand. According to Global Workspace Theory (e.g., Baars 1997, 2002), conscious awareness then helps to mobilize and integrate brain functions that otherwise operate independently in the process of building up an action that is not available in the person's repertoire. It offers a "facility for accessing, disseminating, and exchanging information, and for exercising global coordination and control" (Baars 1997, p. 7).

In research on the cognitive underpinnings of action planning, it has been suggested that planning integrates sensori-motor information regarding one's future behavior into a novel action representation that should be capable of bridging the gap between goals and behavior (Hommel et al. 2001). Furthermore, various studies have shown that conscious planning can lead to more successful goal achievement when such plans establish links between representations of relevant actions and cues (Gollwitzer & Sheeran 2006). That is, forming implementation intentions as to when, where, and how one will act to attain one's goal helps the progress of goal pursuit. Importantly, once the plan is formed, subsequent action initiation and performance display features of automaticity, in the sense that the action can be directly triggered by and executed in the anticipated environment without much conscious intervention. Thus, it seems that the obstruction of unconscious goal pursuit can benefit from the conscious awareness it evokes by rendering plans that specify how one needs to proceed. As soon as goal pursuit is reinitiated, the imbalance between focus and flexibility is restored, and unconscious goals can continue to do their work.

Whereas conscious awareness can clearly help goal pursuit, there is also support for detrimental effects of externally forced conscious awareness on goals. We briefly discuss three examples here. The first example pertains to the attentional blink phenomenon (e.g., Chun & Potter 1995, Marois & Ivanoff 2005, Raymond et al. 1992). When participants are asked to detect two briefly presented target stimuli within a stream of distracter stimuli, they show an impaired ability to identify the second of the two targets when they are presented in close succession. Whereas this attentional blink effect is generally thought to reflect a fundamental cognitive limitation, recent research indicates that an overinvestment of conscious attention to the stream of stimuli may drive the effect (Colzato et al. 2008; Olivers & Nieuwenhuis 2005, 2006). This research has demonstrated that a reduction in conscious attention limits the number of items in the stream that are fully processed, and as a consequence, this reduces the attentional blink effect. Also, incidental activation of positive affect or higher central dopaminergic function during the task decreases the attentional blink effect, a finding that is in line with the idea that positive affect modulates the balance between rigidly focusing on a task and a more flexible mode of processing. In short, conscious attention to goals can cause people to concentrate too hard and this promotes rather than prevents the occurrence of a rigid mode of information processing as reflected in the attentional blink effect.

Another line of research that reveals the potential for impairment in performance as a result of externally cued conscious awareness comes from research on decision making. Whereas conscious thought about a decision problem is sometimes helpful to reach more rational decisions (see, e.g., Newell et al. 2007), an abundance of research shows that conscious thought can also interfere with sound decision making (Dijksterhuis & Nordgren 2006, Reyna & Brainerd 1995, Schooler et al. 1993, Wilson & Schooler 1991). Some consider these findings counterintuitive (see, e.g., Weber & Johnston 2009), and this reaction is probably evoked by the attempt of some people to maintain that consciousness plays a crucial causal role in decision making and behavior in

general. However, the findings on unconscious thought are fully in line with the current theorizing. When people make goal-directed decisions they can well deal with unconsciously (that is, when there is a good balance between focus and flexibility), conscious thought–elicited normative pressure or experimental instructions (Schooler et al. 1993) can interfere with decision making. One major problem is that people can often weight the relative importance of attributes quite well unconsciously (Dijksterhuis & Nordgren 2006, Wilson & Schooler 1991) and that conscious thought leads to biases in this weighting process, for instance because conscious thought tends to lead verbalizable information to receive too much weight and nonverbalizable information to receive too little weight (Reyna & Brainerd 1995, Schooler et al. 1993, Wilson & Schooler 1991). This jeopardizes the decision process.

A third area of study concerns skills. Skillful behavior can generally ensue without conscious awareness, and skills are often stored as abstract high-level patterns that serve a goal. When thirsty, for instance, grasping a glass and bringing it to one's mouth usually serves to take a sip. When goals guide attention in good balance between focus and flexibility, the person can unconsciously execute individual action sequences that capture the essential structure of the skill (e.g., when and how much a hand should be opened to reach for the glass) and adjust to changes in circumstances (e.g., different distance to and/or weight of the glass). It has been shown that consciously focusing on the execution of specific components of a complex motor skill can impair performance (e.g., Baumeister 1984, Beilock & Carr 2001, Lewis & Linder 1997). For instance, experienced soccer players handle the ball better with their dominant foot when they are distracted from executing a skill (e.g., dribbling) than when they are asked to consciously focus on specific action components. An explanation for this choking-under-pressure effect is that the conscious attention to separate components overrules the more efficient organizational structure of the skill. In other words, it disturbs the balance between focus and flexibility in the unconscious execution of a skill in the environment that usually is guided by the goal. This causes the building blocks of the skill to function as separate components, in a similar way as before the skill was acquired. Once the structure breaks down, each component is executed separately, which takes more time and leaves more room for error.

CONCLUSIONS

Goals are the tools with which people engage in volitional behavior. They define what we find desirable to attain and thereby what we strive for. Goals exert their effects on behavior by modulating attention. Generally, information that can serve goal attainment is attended to more than information that is irrelevant for achieving goals.

Whereas goal pursuit was traditionally assumed to be strongly related to consciousness, recent research strongly suggests this not to be the case. Indeed, goal pursuit often proceeds entirely unconsciously. The role of consciousness in domains such as implicit learning, evaluative conditioning, and unconscious thought is still debated, in that some are willing to accept the idea that such important processes can ensue without conscious guidance, whereas others are not willing to endorse the viewpoint. However, recent research from various areas strongly suggests such processes to be dependent on goals and on attention but not on conscious awareness per se.

When people try to attain goals, attention serves to maintain a balance between focus and flexibility. That is, when people engage in goal pursuit, they face the challenge to remain focused and, at the same time, to be flexible and to adjust behavior to adapt to changing circumstances. Sometimes this balance is imperfect, and when people become consciously aware of their goals or behaviors because of endogenous factors, this generally helps to restore the balance between focus and flexibility. However, when the balance is adequate but people become consciously aware of their goals or

behaviors for exogenous reasons (e.g., normative pressure, experimental instructions), the balance can be disturbed, which will jeopardize goal pursuit.

SUMMARY POINTS

1. Attention is largely determined by goals.
2. Consciousness and attention may be correlated in real life (such that stimuli that are attended to are more likely to enter consciousness), but they are independent.
3. Processes that we may think we need consciousness for are usually dependent on attention and not on consciousness.
4. Goal pursuit is dependent on both focus (the ability to keep the same information active) and flexibility (the ability to respond to changing circumstances).
5. Attention is responsible for a balance between focus and flexibility.
6. Conscious intervention may help to restore the balance between focus and flexibility. However, it can also disturb an already appropriate balance.

FUTURE ISSUES

1. The distinction between consciousness and attention should be more critically examined in studies showing that information processing and performance are dependent on goals.
2. The empirical study of the causal status of our conscious experiences of wilfulness in guiding behavior is underdeveloped.
3. What are the exact mechanisms that cause nonconscious goals to enter consciousness?
4. When exactly is consciousness helping the balance between focus and flexibility, and when is it harmful?

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A highly readable, though somewhat dated, introduction to what is now a dominant view on the role of consciousness.

A very comprehensive article by the father of automaticity research in social psychology.

The most influential article on unconscious goal activation, written by the people who thought of it first.

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