

## 7 If-Then Plans and the Intentional Control of Thoughts, Feelings, and Actions

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Over a century ago, Baldwin (1897, as cited in Olson, Astington, and Zelazo 1999, p. 2) defined intentional action as “the emergence of desire, deliberation, and effort: the conscious representation of a goal, the active consideration of alternative means and ends, and the feeling accompanying the selection and execution of a plan.” The term “goal” or “intention” is used to refer to the idea that a mental representation has been formed to accomplish a task or direct behavior to achieve some desired state in the world. This concept of intention is central in human goal striving (e.g., Bandura 1991; Gollwitzer and Moskowitz 1996; Locke and Latham 1990; Wicklund and Gollwitzer 1982). In traditional theories of goal striving, the intention to achieve a certain goal is seen as an immediate determinant (or at least predictor) of goal-directed action. A related concept is the term “volition,” which is described as the power of choosing or determining and is assumed to be a necessary component of conscious goal-directed action. Based on these descriptions of intention, goal, and volition, one would expect that the strength of an intention (i.e., how much one wants to realize it) determines whether it is implemented or not (Ajzen 1991; Godin and Kok 1996; Sheeran 2002). However, intention-behavior relations are modest, largely due to the fact that people, despite having formed strong intentions, fail to act on them (Orbell and Sheeran 1998). Given this paradox, one wonders what people can do to facilitate the translation of intentions into successful goal attainment.

Over time, evidence accumulated showing that forming strong intentions does not guarantee goal attainment, as there are a host of subsequent implementation-related problems that have to be solved successfully (Gollwitzer 1996). For instance, after having set a goal, people may procrastinate in acting on their intentions and thus fail to initiate goal-directed behavior. Furthermore, in everyday life people often strive for multiple or even competing goals, many of which are not simple short-term goals but rather long-term projects that require repeated efforts (e.g., buying a new house). Also, in order to meet their goals, people have to seize viable opportunities to act, a task which becomes particularly difficult when attention is directed elsewhere (e.g., one is absorbed by competing goal pursuits, wrapped up in ruminations, gripped by intense

emotional experiences, or simply tired) and when these opportunities are not obvious at first sight or only present themselves briefly.

In the current chapter, it is suggested that people need to engage in a second act of willing that can help them circumvent these potential breakdowns in voluntary action. In many cases, goal pursuit may come to an early halt because competing projects have temporarily gained priority and the individual fails to successfully resume the original project. Automatic action control can be useful as established routines linked to a relevant context release the critical goal-directed behavior immediately, efficiently, and often without a conscious intent. Frequently, however, such routines are not established and the goal-directed behavior is not part of an everyday routine. Gollwitzer (1993, 1999) suggested that forming a certain type of intention called an "implementation intention" is a powerful self-regulatory strategy that alleviates such problems and thus promotes the execution of goal-directed behaviors. Implementation intentions take the format of "If Situation X is encountered, then I will perform Behavior Y!" In an implementation intention, a mental link is created between a specified future situation and the anticipated goal-directed response. Forming an implementation intention commits the individual to perform a certain goal-directed behavior once the critical situation is encountered.

Implementation intentions are to be distinguished from goal intentions (goals). Goal intentions have the structure of "I intend to reach Z!" whereby Z may relate to a certain outcome or behavior to which the individual feels committed. Goal intentions are the type of intentions with which the majority of theories of motivation are concerned. Implementation intentions, on the other hand, are formed in the service of goal intentions and specify the when, where, and how of goal-directed responses. For instance, a possible implementation intention in the service of the goal intention to eat healthy food would link a suitable situational context (e.g., one's favorite restaurant) to an appropriate behavior (e.g., order a vegetarian meal). In other words, implementation intentions link anticipated opportunities with goal-directed responses and thus commit a person to respond to a certain critical situation in a stipulated manner.

Forming implementation intentions is expected to facilitate goal attainment on the basis of psychological processes that relate to both the anticipated situation and the specified behavior. Because forming implementation intentions implies the selection of a critical future situation (i.e., a viable opportunity), it is assumed that the mental representation of this situation becomes highly activated and thus more easily accessible (Gollwitzer 1999). This heightened accessibility should, in turn, make it easier to detect the critical situation in the surrounding environment and readily attend to it, even when one is busy with other ongoing activity. Moreover, this heightened accessibility should facilitate the recall of the critical situation because a strong link had been formed between the two components (situation cue + response).

Forming implementation intentions also involves the selection of an effective goal-directed behavior, which is then linked to the selected critical situation. The mental

act of linking a critical situation to an intended behavior in the form of an if-then plan leads to automatic action initiation in the sense that action initiation becomes swift and efficient and does not require conscious intent once the critical situation is encountered. Thus, by forming implementation intentions, people can strategically switch from conscious and effortful action initiation (guided by goal intentions) to having their goal-directed actions directly elicited by the specified situational cues.

We argue that such plans produce automatic action control by intentionally delegating the control of one's goal-directed thoughts, feelings, and behaviors to specific situational cues. We use the word "automatic" in terms of John Bargh's (1994) definition. Bargh argues that "mental processes at the level of complexity studied by social psychologists are not exclusively automatic or exclusively controlled but are in fact combinations of the features of each" (p. 3). He suggests that there are three ways in which a person may be unaware of a mental process. First, individuals may be unaware of the stimuli itself (e.g., subliminal perception). Second, individuals may be unaware of the way in which they categorize a stimulus event (e.g., stereotyping). And third, individuals may be unaware of the way in which their judgments or subjective feeling states are determined or influenced. For example, one may feel ease when completing a task requiring perceptual categorization and misattribute this feeling of ease to an incorrect cause because it is readily available as an explanation. Therefore, when forming an implementation intention, a single act of will or volition results in the formation of an if-then plan that reduces the need for continued conscious control for attaining the desired outcome as soon as the previously specified cue is encountered. Thus, by forming implementation intentions, people can strategically switch from conscious and effortful control of their goal-directed behaviors to being automatically controlled by selected situational cues. We understand this type of automatic action control as *strategic automaticity* or *instant habits* (Gollwitzer 1999), as it originates from a single act of will rather than being produced by repeated and consistent selection of a certain course of action in the same situation (i.e., principles of routinization, Anderson 1987; Fitts and Posner 1967; Newell and Rosenbloom 1981).

### 7.1 Empirical Evidence for Automation of Action Initiation

This postulated automation of action initiation (also described as strategic "delegation of control to situational cues") has been supported by the results of various experiments that tested immediacy, efficiency, and the presence/absence of conscious intent (Brandstätter, Lengfelder, and Gollwitzer 2001; Gollwitzer and Brandstätter 1997, Study 1; Lengfelder and Gollwitzer 2001). Given that implementation intentions facilitate attending to, detecting, and recalling viable opportunities to act toward goal attainment, and in addition, automate action initiation in the presence of such opportunities, people who form implementation intentions should show higher goal attainment rates as compared to people who do not furnish their goal intentions with

implementation intentions. This hypothesis is supported by the results of a host of studies examining the attainment of various different types of goal intentions. As a general research strategy, goal intentions were selected for analysis that are not easily attained for various reasons (e.g., distractions, unpleasantness).

For instance, Gollwitzer and Brandstätter (1997, Study 2) analyzed a goal intention that had to be performed at a bad time (e.g., writing a report about Christmas Eve during the subsequent Christmas holiday). Students were asked to write a report about how they spent Christmas Eve and send it back to the experimenters as soon as possible. Half of the participants formed implementation intentions about where (e.g., father's desk) and when (e.g., after attending church) they intended to sit down and start writing; participants in the control condition did not form such plans. Results showed that 71 percent of the participants in the implementation intention condition wrote the report in the specified time, whereas only 32 percent of the control participants did so. The authors concluded that the higher success in the implementation intention condition was not due to participants' having their motivation increased. Rather, it was due to the fact that forming if-then plans helped them to meet their goal by facilitating action initiation, as measures that would indicate higher motivation (e.g., length of reports) did not differ between groups.

Other studies have examined the effects of implementation intentions on goal attainment rates with goal intentions that are somewhat unpleasant to perform. For instance, the goal intentions to perform regular breast examinations (Orbell, Hodgkins, and Sheeran 1997), cervical cancer screenings (Sheeran and Orbell 2000), resumption of functional activity after joint replacement surgery (Orbell and Sheeran 2000), and physical exercise (Milne, Orbell, and Sheeran 2002) were all more frequently acted upon when people had furnished these goals with implementation intentions. Furthermore, implementation intentions facilitated the attainment of goal intentions in patient populations that are known to have problems with the control of goal-directed behaviors (e.g., heroin addicts during withdrawal; Brandstätter et al. 2001, Study 1).

Evidence presented by Jordan Grafman and Frank Krueger (this volume) demonstrates that special populations such as frontal lobe lesion (FLL) patients have particular difficulty in tasks with ill-structured environments. They make a distinction between volition (ability to make a conscious choice or decision) and autonomy (ability to choose among viable alternatives), as volition may be intact in FLL individuals but autonomy is impaired. That is, FLL individuals have little difficulty making decisions on a more local level but decisions on a global level are more difficult. Grafman and Krueger (this volume) concluded based on their findings that almost all FLL patients have some preserved volitional ability. Impaired performance arises most in situations in which choices are more ambiguous and autonomy is required to choose among alternatives. In line with this analysis, Lengfelder and Gollwitzer (2001)

reasoned that patients with frontal lobe damage may be a population who would especially benefit from forming implementation intentions. Implementation intentions help to automate the link between a situational cue and a response, which decreases the need to rely on making choices on a higher or global level. Results by Lengfelder and Gollwitzer (2001) showed improved task performance on a go/no-go task in frontal lobe patients who had formed respective implementation intentions, and these benefits were even observed under conditions of high cognitive load.

The method involved having three groups of participants (patients with frontal lobe lesions, patients with nonfrontal lobe lesions, university students) perform a dual task (tracking task, go/no-go task) on the computer. In the tracking task, subjects had to enclose a wandering circle within a square (controlled by moving the mouse) requiring continuous attention allocation; the simultaneous go/no-go task required subjects to press the left mouse button each time that a number appeared within the circle and to not press the button when a letter appeared. Therefore, this second task required intermittent attention. All participants were told that they should try to press the mouse button especially fast when the number "3" appeared on the computer screen, thereby establishing a critical cue that could be compared to noncritical cues (i.e., other numbers between 1 and 9). Then, all participants were told that certain mental strategies can aid with their performance. Those in the familiarization condition (control group) were told that an efficient mental strategy was to familiarize themselves with the number 3 by writing it down several times. Participants in the implementation intention condition formed an implementation intention: "If the number 3 appears, I will press the button particularly fast!" The control condition (i.e., familiarization) was expected to control for priming the number 3 and potential experimenter demand. The prediction was that all three groups of participants would show a stronger speed-up effect and less interference in the implementation intention condition. This prediction was confirmed with both lesion groups and university students showing significant speed-up responding in the implementation intention condition as compared to the familiarization condition. Furthermore, this speed-up effect was not at a cost to overall performance in responding to noncritical numbers.

As Peter Liddle (this volume) emphasizes, schizophrenic patients experience both disorganized volition (e.g., disordered thought, bizarre thought) and diminished volition (flat affect, poverty of speech). Liddle outlines the challenges faced by schizophrenics as the difficulty of selecting among a set of possible responses. His results show that schizophrenics exhibit difficulty compared to controls in attending to relevant stimuli and ignoring irrelevant stimuli. Not surprisingly, therefore, schizophrenic patients could also be shown to benefit in their action control from forming implementation intentions (Brandstätter, Lengfelder, and Gollwitzer 2001, Study 2). The method involved asking a group of schizophrenics and a group of matched controls to perform a go/no-go task (similar to the one used in the Lengfelder and

Gollwitzer study with frontal lobe patients) in which they had to respond by pressing a button when a number appeared on the computer screen and to not press the button if a letter appeared. There were two conditions: a control condition in which participants familiarized themselves with the number 3 and an implementation intention condition in which they formed the if-then plan "If number 3 appears, I will press the button particularly fast!" Overall, results demonstrated that both controls ( $M = 43$  ms) and schizophrenics ( $M = 34$  ms) were significantly faster in responding to critical stimuli in the implementation intention condition versus the familiarization condition.

Even though the positive effects of implementation intentions on action initiation seem easy to come by, there are a number of moderators to these effects that need to be taken in account. Various studies have observed that the strength of commitment to the respective goal intention matters. For instance, Orbell et al. (1997) report that the beneficial effects of implementation intentions on compliance in performing a health-protecting behavior (i.e., regular breast self-examination) were observed only in those women who strongly intended to perform such self-examinations to begin with. This finding suggests that implementation intentions do not work when the respective goal intention is weak. A study by Sheeran, Webb, and Gollwitzer (2005, Study 2) points to a further moderator. Goals either related or unrelated to the implementation intention were primed, with the result that implementation intentions then facilitated goal-directed behavior only when the respective superordinate goal had been activated. This finding suggests that implementation intention effects are moderated by the situational activation of the respective superordinate goal. In support of this hypothesis, a recent experiment (Cohen, Bayer, Jaudas, and Gollwitzer submitted) using the Rogers and Monsell (1995) task-switch paradigm demonstrated that implementation intentions only affect a person's task performance if the task at hand is relevant to the superordinate goal in the service of which the implementation intention was formed.

## 7.2 Shielding Ongoing Goal Pursuits

Whereas past research on implementation intentions has focused almost exclusively on getting started with moving toward a desired goal, recent research analyzes how implementation intentions can be used to control unwanted derailing of an ongoing goal pursuit (summary by Gollwitzer, Bayer, and McCulloch 2002). The latter can be achieved in two different ways. As long as people are in a position to anticipate what could potentially make them stray off course (the relevant hindrances, barriers, distractions, and temptations), they can specify these critical situations in the "if" part of an implementation intention and link them to responses that facilitate goal attainment. The response specified in the "then" part of an implementation intention can

be geared at either ignoring disruptive stimuli, suppressing the impeding responses to them, or blocking obstructions to goal pursuit by engaging in it all the more.

This way of using implementation intentions to protect goal pursuit from straying off course necessitates that people know what kind of obstacles and distractions have to be watched for. Moreover, people need to know what kind of unwanted responses are potentially triggered (so that people can attempt to suppress them) or what kind of goal-directed responses are particularly effective in blocking these unwanted responses (so that people can engage in these goal-directed activities). In other words, using such implementation intentions to control unwanted straying off course requires much cognitive, clinical, and social-psychological knowledge. Otherwise no effective "if" and "then" components can be specified.

However, an alternative solution to protecting oneself from getting derailed is also available. Instead of concentrating on potential obstacles and various ways of effectively dealing with them, people may exclusively concern themselves with the intricacies of implementing the goal pursuit at hand. That is, an individual can plan out the goal pursuit by forming implementation intentions that determine how the various steps of goal attainment are to be executed. Such careful planning encapsulates goal pursuit, protecting it from the adverse influence of potential obstacles and distractions, whether internal or external. This use of implementation intentions allows the attainment of goals without having to change a noncooperative self (e.g., being in a state of irritation) or an unfavorable environment (e.g., disruptive intrusions). Critically, one does not need to possess any psychological knowledge on how to effectively deal with adverse self-states or situational contexts because it suffices if the person is aware of the demands of the current goal being pursued.

Research on how to use implementation intentions to shield an ongoing goal pursuit has thus analyzed two major strategies to control unwanted derailing: (a) directing one's implementation intentions toward the suppression of anticipated unwanted responses and (b) blocking all kinds of unwanted influences (even non-anticipated ones) from inside or outside the person by directing one's implementation intentions toward spelling out the wanted goal pursuit.

The first strategy of forming suppression-oriented implementation intentions can be executed in various different ways. If, for instance, a person wants to avoid being unfriendly to a friend who is known to make outrageous requests, she can protect herself from showing the unwanted unfriendly response by forming suppression-oriented implementation intentions that may take one of the following three different formats. The suppression-oriented implementation intention may focus on reducing the intensity of the unwanted response by intending not to show the unwanted response: "And if my friend approaches me with an outrageous request, then I will not respond in an unfriendly manner!" But it may also try to reduce the intensity of the unwanted response by specifying the initiation of the respective

antagonistic response: "And if my friend approaches me with an outrageous request, then I will respond in a friendly manner!" Finally, a suppression-oriented implementation intention may focus a person away from the critical situation: "And if my friend approaches me with an outrageous request, then I'll ignore it!"

Two lines of experiments analyzed the effects of suppression-oriented implementation intentions. The first line looked at the control of unwanted spontaneous attending to tempting distractions (Gollwitzer and Schaal 1998). Participants had to perform an intellectual task (i.e., perform a series of arithmetic problems) while being bombarded with attractive distractive stimuli (e.g., video clips of award-winning commercials). Whereas control participants were asked to form a mere goal intention ("I will not let myself get distracted!"), experimental participants in addition formed one of two implementation intentions: "And if a distraction arises, then I'll ignore it!" or "And if a distraction arises, then I will increase my effort at the task at hand!" The "ignore" implementation intention always helped participants to ward off the distractions (as assessed by the level of task performance), regardless of whether the motivation to perform the tedious task (as manipulated at the beginning of the task) was low or high. The effort-increase implementation intention, in contrast, was effective only when motivation to perform the tedious task was low. Apparently, when motivation is high to begin with, effort-increase implementation intentions may create overmotivation that hampers task performance. It seems appropriate therefore to advise motivated individuals who suffer from being distracted (e.g., ambitious students doing their homework) to resort to "ignore" implementation intentions, rather than to implementation intentions that focus on the strengthening of task effort.

The second line of experiments analyzing suppression-oriented implementation intentions studied the control of the automatic activation of stereotypical beliefs and prejudicial evaluations (Gollwitzer and Schaal 1998; Gollwitzer, Achtziger, Schaal, and Hammelbeck 2002). In various priming studies using short stimulus-onset asynchronies of less than 300 ms between primes (presentations of members of stigmatized groups) and targets (adjectives describing relevant positive/negative stereotypical attributes or neutral positive/negative adjectives), research participants using implementation intentions inhibited the activation of stereotypical beliefs and prejudicial evaluations about women, the elderly, the homeless, and soccer fans. The implementation intentions described a scenario of being confronted with a member of the critical group in the "if" part, and a "then I won't stereotype" (respectively: "then I won't evaluate negatively"), or a "then I will ignore the group membership" response in the "then" part. Regardless of which formats were used, both types of suppression-oriented implementation intentions were effective in suppressing the activation of stereotypical beliefs and prejudicial evaluations.

Suppression implementation intentions specify a critical situation or problem in the "if" part, which is then linked to a "then" part that describes an attempt at



suppressing the unwanted response. This type of self-regulation by implementation intentions implies that the person needs to anticipate potential hindrances to achieving the goal, and what kind of unwanted responses these hindrances elicit. However, implementation intentions can also be used to protect oneself against unwanted derailing of a goal pursuit by taking a quite different approach. Instead of directing one's implementation intentions toward anticipated potential hindrances and the unwanted responses triggered thereof, the person may form implementation intentions directed at stabilizing the goal pursuit at hand. Consider again the example of a tired person who is approached by her friend with an outrageous request and who will likely respond in an unfriendly manner: If this person has stipulated in advance in an implementation intention what she will converse about with her friend, the critical interaction should simply run off as planned, and the self-state of feeling provoked and angry should fail to affect the person's responding to the outrageous request in a negative, unwanted way. As is evident from this example, the present self-regulatory strategy should be of special value whenever the influence of detrimental self-states (e.g., being angry and irritated) on derailing one's goal-directed behavior has to be controlled. This should be true no matter whether such self-states and/or their influence on behavior reside in the person's consciousness or not.

Gollwitzer and Bayer (2000) tested this hypothesis in a series of experiments in which participants were asked to make plans (i.e., form implementation intentions) regarding their performance on an assigned task or not. Prior to beginning the task, participants' self-states were manipulated so that the task at hand became more difficult (e.g., a state of self-definitional incompleteness prior to a task that required perspective taking; Gollwitzer and Wicklund 1985; a good mood prior to a task that required evaluating others nonstereotypically; Bless and Fiedler 1995; a state of ego-depletion prior to solving difficult anagrams; Baumeister 2000; Muraven, Tice, and Baumeister 1998). The results suggested that the induced critical self-states negatively affected task performance (i.e., goal attainment) only for those participants who had not planned out working on the task at hand via implementation intentions (i.e., had only set themselves the goal to come up with a great performance). In other words, implementation intentions that spelled out how to perform the task at hand were effective in protecting the research participants from the negative effects associated with the induced detrimental self-states.

This research provides a new perspective on the psychology of self-regulation. Commonly, effective self-regulation is understood in terms of strengthening the self, so that the self can meet the challenge of being a powerful executive agent (Baumeister, Heatherton, and Tice 1994). Therefore, most research on goal-directed self-regulation focuses on strengthening the self in such a way that threats and irritations become less likely, or on restoring an already threatened or irritated self. It is important to recognize that all of these maneuvers focus on changing the self so that the self becomes

a better executive. The findings of Gollwitzer and Bayer (2000) suggest a perspective on goal-directed self-regulation that focuses on facilitating action control without changing the self. It assumes that action control becomes easier if a person's behavior is directly controlled by situational cues and that the forming of implementation intentions achieves such direct action control. As this mode of action control circumvents the self, it no longer matters if the self is threatened or secure, agitated or calm, because the self is effectively disconnected from its influence on behavior. The research by Gollwitzer and Bayer (2000) supports this line of reasoning by demonstrating that task performance (i.e., taking the perspective of another person, judging people in a nonstereotypical manner, solving difficult anagrams) does not suffer any impairment from the respective detrimental self-states (e.g., self-definitional incompleteness, mood, and ego-depletion) if performing these tasks has been planned in advance via implementation intentions.

People's goal pursuits, however, are threatened not only by detrimental self-states but also by adverse situational contexts. There are many situations that have negative effects on goal attainment unbeknownst to the person who is striving for the goal. A prime example is the social loafing phenomenon, where people show reduced effort in the face of work settings that produce a reduction of accountability (i.e., performance outcomes can no longer be checked at an individual level). As people are commonly not aware of this phenomenon, they cannot form implementation intentions that specify a social loafing situation as a critical situation, thereby rendering an implementation intention that focuses on suppressing the social loafing response as an unviable self-regulatory strategy. As an alternative, however, people may resort to forming implementation intentions that stipulate how the intended task is to be performed and thus effectively block any negative situational influences.

Supporting this contention, Endress (2001) performed a social loafing experiment that used a brain storming task (i.e., participants had to find as many different uses for a common knife as possible). She observed that implementation intentions ("And if I have found one solution, then I will immediately try to find a different solution!") but not goal intentions ("I will try to find as many different solutions as possible!") protected participants from social loafing effects. Findings reported by Trötschel and Gollwitzer (2003) also support the notion that goal pursuits planned by forming implementation intentions become invulnerable to adverse situational influences. In their experiments on the self-regulation of negotiation behavior, loss-framed negotiation settings failed to unfold their negative effects on fair and cooperative negotiation outcomes when the negotiators had in advance planned out their goal intentions to be fair and cooperative with if-then plans. Similarly, Gollwitzer (1998) reports experiments in which competing goal intentions (i.e., goal intentions contrary to an ongoing goal pursuit) were activated outside of a person's awareness using goal-priming procedures (Bargh 1990; Bargh, Gollwitzer, Lee-Chai, Barndollar, and

Troetschel 2001). In these studies, furnishing the ongoing goal pursuit with implementation intentions protected it from the intrusive influences of the primed competing goals.

It appears, then, that the self-regulatory strategy of planning out goal pursuit in advance via implementation intentions allows the person to reap the desired positive outcomes without having to change the environment from an adverse to a facilitative one. There are many situations in which it is impossible to influence the environment because environmental change may sometimes be very cumbersome (e.g., it takes the costly interventions of mediators to change the loss frames adopted by conflicting parties into gain frames) or not under the person's control. Moreover, people are often not aware of the adverse influences of the current environment (e.g., a deindividuated work setting or a loss-framed negotiation setting) or they do not know what alternative kind of environmental setting is actually facilitative (e.g., an individualized work setting or a gain-framed negotiation setting). In these situations, the self-regulatory strategy of specifying critical situations in the "if" part of an implementation intention and linking them to a coping response in the "then" part does not qualify as a viable alternative self-regulatory strategy. Rather, people need to resort to the strategy of planning out goal pursuit in advance via implementation intentions, thereby protecting it from adverse situational influences.

### 7.3 Remembering to Execute Intentions: Prospective Memory

Research on goal pursuit and implementation intentions is thematically similar to another related research domain known as prospective memory. Prospective memory focuses more on the memory aspect of carrying out intentions and is defined as the ability to remember to execute a delayed intention. An interesting conundrum frequently occurs in daily life in which we intend to remember to take some medication, keep an appointment, or mail a letter but find ourselves forgetting to carry out this previously encoded intention. Despite the strong intent or will or volition to remember to do something, these types of memory errors are reported as the most frequent form of memory failures. In recent years, this aspect of human cognition has been the focus of an increasing number of experimental paradigms.

Researchers McDaniel and Einstein (1992) proposed that successful prospective memory is supported by two related component processes. The prospective component is defined as the realization that some prospective action is to be performed when an appropriate cue is encountered. The retrospective component is defined as the ability to recall an intention when the prospective cue is detected. Thus, we must remember at an appropriate moment that we must do something (prospective component), and we have to recall what is to be done (retrospective component). For example, if an individual has to remember to give a friend a message, successful

prospective memory requires that the appearance of the friend trigger the memory that a message has to be given (prospective component). Successful prospective memory also requires that the individual remember the content of the message (retrospective component). Despite one's best intentions, prospective memory often fails in one of two ways. A person may completely forget upon seeing the friend that there is a message to give (failure of the prospective component) or may remember that there is a message to give but forget what the actual message is (failure of the retrospective component).

Implementation intentions can be decomposed into components similar to those specified in the McDaniel and Einstein (1992) distinction. For example, when participants form an implementation intention, they say: "If situation *X* arises, then I will perform response *Y*." Therefore, the first portion of the implementation intention, "if situation *X* arises," is focused on specifying a situational cue that will eventually be linked with the goal-directed behavior. It focuses on the "I will have to do *something* when I encounter *X*." Therefore, this first half of the implementation intention may serve to establish the noticing process or prospective component of prospective memory. The second part of the implementation intention, "I will perform response *Y*," may serve to establish or strengthen memory for the content of the intention. This enables the individual to remember what that "something" actually is; therefore, it strengthens the search process or retrospective component of prospective memory. By forming an implementation intention, participants establish a link between both components, and it may be this association that leads to a benefit in performance.

According to a model of prospective memory known as the automatic associative module model (McDaniel et al. 1998; see also Moscovitch 1994), successful prospective remembering occurs when there is sufficient interaction between a prospective cue and an associated memory trace. A module (subserved by the hippocampus) is thought to respond reflexively to cues. This results in the memory trace for the intended action being delivered automatically to consciousness (McDaniel et al. 1998). Thus, successful prospective remembering is determined by the strength of association between the cue and associated memory trace. If the cue does not automatically interact with a memory trace, then that memory trace is not retrieved unless another memory module (prefrontal component) initiates a strategic memory search. In this model, the planning and encoding stage of prospective memory is critical for successful performance because an association between a cue and an intention must be made to ensure successful prospective remembering. It is at this point that descriptions of prospective memory become conceptually similar to discussions of implementation intentions. Earlier in the chapter, we stated that forming an implementation intention causes the mental representation of the situational cue to become highly activated and thus more easily accessible (Gollwitzer 1999). And it is this heightened accessibility that makes it easier to detect the critical situation in the

surrounding environment and readily attend to it even when one is busy with other ongoing activity. Moreover, this heightened accessibility should facilitate the recall of the critical situation because a strong link had been formed between the two components (situation cue + response).

Findings from research on implementation intentions provide evidence that is consistent with predictions made by the automatic associative model. For example, the automatic associative model suggests that a cue must automatically interact with a memory trace for a prospective memory intention to be retrieved. In line with this claim, results from several studies on implementation intentions showed that successful goal completion was accomplished by establishing strong mental links between anticipated environmental cues and behaviors (Gollwitzer 1999). Furthermore, results from Lengfelder and Gollwitzer (2001) demonstrated that behavior was reflexive and did not require conscious deliberation once the critical situation cue is encountered. These studies showed that goal-directed behavior is initiated through links that are established between intended situations and goal-directed behavior. It may be that successful prospective remembering can be accomplished through similar reflexive associations between cues and previously encoded intentions. For example, in a study by Gynn, McDaniel, and Einstein (1998), participants were given various types of reminders during the retention interval of a prospective memory task. Based on their results, the authors concluded that the most effective reminders were those that served to improve both the prospective memory cues and the intended activity itself. According to their findings, reminders that activated this association were most beneficial for prospective memory performance.

We have discussed the various similarities between the domains of prospective memory and implementation intentions, but there are some significant differences between them as well. For example, implementation intentions are always formed within the context of serving a respective higher-order goal. Furthermore, the relationship between the implementation intention and the respective goal can determine the outcome—for example, it matters whether the person is strongly committed to the goal. Prospective memory, in contrast, has never been considered within the context of some higher order goal. Rather, successful retrieval and execution of the intention *itself* is the goal at issue.

When goals or intentions must be postponed or set aside temporarily, successful memory retrieval and execution of the intention can be especially difficult with increasing age. The ability to perform well in prospective memory tasks (e.g., remembering to take medication) is obviously essential for independent living.

The frontal lobes are assumed to play a critical role in cognitive activities such as planning actions, monitoring one's behavior, and keeping information active in working memory (Baddeley 1986; West 1996). There is neuropsychological and neuroanatomical evidence that changes in the aging brain are particularly pronounced in

the frontal areas (West 1996). The frontal lobe hypothesis posits that mental functions that rely on the frontal lobes will be particularly susceptible to declines with aging. However, results pertaining to age differences in prospective memory performance are mixed, with some studies reporting no deficits for older adults (e.g., Einstein and McDaniel 1990; Einstein, Holland, McDaniel, and Guynn 1992) and others observing significant age-related differences (e.g., Dobbs and Rule 1987; Einstein, McDaniel, Smith, and Shaw 1998; West and Craik 1999).

Paul Burgess, Sam J. Gilbert, Jiro Okuda, and Jon S. Simons (this volume) report results indicating that the rostral prefrontal cortex (PFC) supports delayed intention performance. More specifically, their findings showed that the lateral rostral PFC (Brodmann Area 10) seems to be involved in maintaining an intention (i.e., while engaged in an ongoing task) and medial Brodmann Area 10 is more involved when one is concentrating on the ongoing task alone. When maintaining an intention in mind, one must periodically switch conscious attention to one's internal representation of the intention, and the lateral regions appear to subserve this attention switch. In contrast, the medial region plays a role when one wants to put attentional focus on some external stimuli and minimize attention that is allocated to maintaining the intention. It may be that age differences in prospective memory are due to older adults' difficulty with switching attention between the ongoing activity of the primary task and the internal representation of the intention.

If we think of the retention interval in prospective memory as an effortful undertaking in which one must maintain the content of an intention in mind while continuing ongoing activities, one would predict that such cognitive operations may be vulnerable to age-related decline. Maylor (1996) claimed that prospective memory is inherently effortful because an intention must be retrieved when one is in the midst of some other competing activity. That is, retrieval of the intention must interrupt the ongoing flow of thought and activity in order to be properly executed. The person must disengage from an ongoing activity in order to carry out the action or intention at the appropriate time (Einstein and McDaniel 1990).

Despite the striking similarities between ideas elaborated within research on implementation intentions and prospective memory, few empirical investigations have examined how these two domains interact. It may be that the use of compensatory self-regulatory techniques such as implementation intentions could help alleviate the burden for older adults by causing intention-related behavior to become reflexive. Indeed, several studies (e.g., Cohen, Dixon, Lindsay, and Masson 2003; Cohen, West, and Craik 2001) have shown that older adults have particular difficulty with performance on the prospective component of prospective memory (ability to detect the prospective memory cue) as compared to the retrospective component (recalling the associated intention). Thus, implementation intentions that involve specifying in

advance a cue that will elicit a desired response may be especially helpful in such prospective memory contexts.

There is one published study within the prospective memory literature that explicitly tests whether forming implementation intentions provides a benefit to an older adult population. Chasteen, Park, and Schwarz (2001) showed that forming implementation intentions significantly enhanced older adults' prospective memory performance. The authors concluded that implementation intentions benefited older adults' prospective memory functioning by allowing them to take advantage of the fact that this technique recruits automatic rather than effortful controlled memory processes. Their results showed that creating an implementation intention allowed behavior to become reflexive, thus eliminating the need for conscious control once the prospective memory cue target was encountered. Therefore, encoding an implementation intention sets stored action schemas into a state of readiness, and when the appropriate trigger conditions are satisfied, the intention can be executed without mediation of a conscious recollection of the intention. This research demonstrated that implementation intentions facilitated the attainment of goal intentions in a situation where it was easy to forget to act on them.

#### 7.4 Conclusion

Much of the evidence reviewed in the current chapter suggests that implementation intentions help not only to promote initiation of goal pursuits but also to protect goal pursuits from being thwarted by various forms of distractions. As long as we are in a position to anticipate what could potentially make us stray off course (barriers, interruptions, distractions, and temptations), we can specify these critical situations in the "if" part of an implementation intention and link it to a response that facilitates goal attainment. The response specified in the "then" part of an implementation intention can then be geared at either ignoring disruptive stimuli, suppressing the impeding responses to them, or blocking obstructions to goal pursuit by engaging in it all the more. Alternatively, people may simply focus on spelling out the critical goal pursuit by forming respective implementation intentions, thus blocking it even from unanticipated distractions and disruptions.

Furthermore, while these plans can be formed instantly by an act of will, no such conscious effort is needed to carry out the planned goal-directed action. As goals are mentally represented as knowledge structures, these encapsulated plans too have a specific structure. Implementation intentions create cognitive links between select situational cues and intended goal-directed behaviors. Once this cue is actually encountered, the planned behavior runs off automatically, overriding and defying any habits or divisive spontaneous attentional responses. If we consider if-then plans in the

context of Prinz, Dennett, and Sebanz's (this volume) vision of a bottom-up mechanism, we would have to conclude that implementation intentions involve aspects of both top-down and bottom-up processing. For example, it can be thought of as a top-down approach in terms of the selection and purposeful formation of a plan, but then the plan runs off in a bottom-up automatic fashion when the previously specified situational cue is encountered.

The potential strength of implementation intentions can also be considered in the context of the self-model theory described by Metzinger (this volume). Implementation intentions can be thought of as a representational coding strategy that allows them to be integrated into a person's unconscious self model. Therefore, a goal is formed and incorporated into the self model, but future action initiation (carrying out the implementation intention) does not take place in the phenomenal self-model, which is highly sensitive to a multitude of overlapping contexts. Rather, implementation intentions can be thought of as "functionally encapsulated," allowing the system to be automatically driven via the self-generated cue-action association. Therefore, conscious effortful processing occurs when the implementation intention is encoded. But when the previously specified situational cue is encountered, the associated response is triggered automatically. We would hesitate to say that action initiation is unconscious *per se*; rather, it is obligatory once the associated cue is recognized.

The potential benefit of implementation intentions is important not only for the average individual's everyday goal-directed activities but for other populations such as brain-injured patients (e.g., Lengfelder and Gollwitzer 2001), opiate addicts, schizophrenics (e.g., Brandstätter et al. 2001), and older adults (e.g., Chasteen et al. 2001) who experience symptoms that interfere with goal attainment. A perfect testing ground for the effectiveness of implementation intentions on a difficult-to-implement behavior would be with individuals who are attempting to quit smoking. As Sayette (this volume) states, in the United States smoking remains the leading preventable cause of premature death with 25 percent of the population being identified as smokers. That is, a large proportion of people persist in the destructive behavior of smoking, despite the known risks. A smoking habit is a very repetitive, well-defined behavior for which one could easily establish a situational cue and response that would serve the higher goal of helping individuals quit smoking and ultimately improving their health. As Sayette reports, many aspects of smokers' cognitions about their smoking behavior are inaccurate (e.g., time perception, anticipated urge duration), and thus a self-regulatory strategy that relies on automatic action initiation should benefit smokers more so than consciously controlled strategies. Because the act of taking a cigarette out of its pack, lighting it, and taking the first drag is a well-practiced and familiar behavior, it would be fairly simple to set up an implementation intention that would establish a situational cue and response serving to help reduce smoking



behaviors. For example, a potential suppression-oriented implementation intention could be "If I light a cigarette, then I will think of my favourite uncle who died of lung cancer."

Other populations such as depressed patients may also benefit from the use of a strategy that improves goal-directed activity. As the contributions on depression in this volume show (Jouvent, Dubal, and Fossati, this volume; Nitschke and Mackiewicz, this volume; Schneider, this volume), the impact of depression on behavior results in loss of drive, decreased interest, and lower levels of overall activity. Furthermore, depression appears to reduce overall goal-directed behavior. Thus, there is a need for ameliorative techniques such as implementation intentions to facilitate goal-directed activity. Given the limited resources for conscious self-regulation in depressed individuals (given the burden produced by ruminative thought), delegating control to situational cues by one express act of will should be a particularly welcome way to bridge the gap that exists between good intentions and the successful attainment of them.

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