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The Interplay Between Goal Intentions and Implementation Intentions

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Two studies tested whether action control by implementation intentions is sensitive to the activation and strength of participants' underlying goal intentions. In Study 1, participants formed implementation intentions (or did not) and their goal intentions were measured. Findings revealed a significant interaction between implementation intentions and the strength of respective goal intentions. Implementation intentions benefited the rate of goal attainment when participants had strong goal intentions but not when goal intentions were weak. Study 2 activated either a task-relevant or a neutral goal outside of participants' conscious awareness and found that implementation intentions affected performance only when the relevant goal had been activated. These findings indicate that the rate of goal attainment engendered by implementation intentions takes account of the state (strength, activation) of people's superordinate goal intentions.

Keywords: *implementation intentions; goals; automatic; self-control*

Gollwitzer's (1993, 1996, 1999) concept of implementation intentions is a recent development in intention-behavior relations. Whereas goal intentions specify what one wants to achieve (i.e., "I intend to achieve *X*!"), implementation intentions involve specifying the behavior one will perform in the service of the goal and the situational context in which one will enact it (i.e., "If situation *Y* arises, then I will initiate goal-directed behavior *Z*!"). Although implementation intentions are formed through a conscious act of will, there is evidence that action initiation proceeds in an automated manner (Gollwitzer, 1999). Consequently, forming an implementation intention increases the likelihood of attaining one's objectives compared to the formation of a goal intention on its own (summaries by Gollwitzer, 1999; Gollwitzer, Bayer, & McCulloch, in press; Sheeran, 2002). However, little attention has been paid to the prospect that implementation intentions could have costs for self-regulation (Gollwitzer et al., in press). Of particular concern here is the possibility that forming an implementation intention means that behavior is elicited by situational cues in a mechanistic fashion. That is, when the person encounters the opportunity to act that was specified in his or her implementation intention, behavior is initiated automatically, and in a manner that is not consistent with the underlying goal intention (e.g., one finds oneself selecting the low-fat meal at lunchtime as specified in one's plan despite a weak goal intention to diet). The aim of the present research is to test whether the rate of goal attainment engendered by implementation intentions is sensitive to the presence and absence of a superordinate goal intention.

Implementation Intentions: Effects and Processes

Numerous studies attest to the benefits of implementation intentions in promoting goal achievement. For example, Sheeran and Orbell (2000) asked one half of a sample of women to form an implementation intention that specified when, where, and how they would make an

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appointment for cervical cancer screening. Medical records showed that these women were much more likely to be screened than were women who did not form implementation intentions (rates were 92% and 69%, respectively). Implementation intentions have been shown to be effective in promoting (a) infrequently performed behaviors such as cancer screening and behaviors that are performed daily (e.g., supplement use; Sheeran & Orbell, 1999), (b) self-report and objective measures of performance (e.g., Gollwitzer & Brandstätter, 1997; Milne, Orbell, & Sheeran, 2002), and (c) behavioral performance among student, general public, and clinical samples (e.g., Lengfelder & Gollwitzer, 2000; Orbell, Hodgkins, & Sheeran, 1997; Orbell & Sheeran, 2000). A meta-analysis of the first 15 studies of the impact of implementation intentions on goal achievement (Sheeran, 2002) showed that implementation intentions had a highly significant effect of medium size, $d = .70$ (see also Koestner, Lekes, Powers, & Chicoine, 2002).

Why do implementation intentions benefit goal achievement? Two processes appear to be important. First, the critical situation (specified in the *if* component of the plan) becomes highly accessible when people form an implementation intention. The consequence is that these cues are detected swiftly and with precision (Aarts, Dijksterhuis, & Midden, 1999; Gollwitzer, Bayer, Steller, & Bargh, 2002; Webb & Sheeran, 2004). Second, the initiation of the intended behavior (specified in the *then* component of the plan) becomes automated when people form an implementation intention. That is, action control by implementation intentions exhibits key features of automaticity including immediacy, efficiency, and lack of awareness (cf. Bargh, 1992, 1994). For example, Gollwitzer and Brandstätter (1997, Experiment 3) showed that participants who formed implementation intentions to make counterarguments to racist remarks at specified opportunities did so more immediately (quickly) than did participants who only formed goal intentions. Brandstätter, Lengfelder, and Gollwitzer (2001) investigated the efficiency of implementation intentions by manipulating cognitive load either through their choice of sample (e.g., schizophrenic patients, heroin addicts under withdrawal) or by using a dual task paradigm in experiments with college students and found that load had no impact on the effectiveness of implementation intentions. Finally, Bayer, Moskowitz, and Gollwitzer (2002) obtained evidence that awareness of the situational cue is not required for the effective operation of implementation intentions. Participants who formed implementation intentions to tell an unfriendly experimenter what they thought of her exhibited slower responses to positive adjectives and faster responses to negative adjectives following subliminal presentation of a picture of the unfriendly experimenter; these effects were not obtained among participants who only formed goal intentions. In sum, forming an implementation intention promotes goal achievement because the person is perceptually ready to encounter the situational cues specified in the *if* component of his or her plan. Moreover, these cues evoke the specified then-response in a manner that does not require conscious awareness or effort on his or her part.

Action Control by Situational Cues Versus Goal Intentions

Forming an implementation intention means that people pass control of an intended behavior from the self to specified situational cues (Gollwitzer, 1993). One decides in advance what one will do (initiate behavior *Z*) and the conditions under which one will do it (if situation *Y* arises). As soon as the specified cues are encountered, behavior is elicited automatically—immediately, efficiently, and without need for conscious awareness. Forming an if-then plan thus switches action control from a conscious effortful mode (action control by goal intentions) to stimulus control of behavior (action control by implementation intentions). Our concern in the present research is whether the situational control of behavior engendered by implementation intentions is sensitive or indifferent to the state of the underlying goal intention. Thus, the question investigated here is whether people's goal intentions moderate automatic action initiation by implementation intentions.

The idea that implementation intentions could give rise to behavior irrespective of the state of the underlying goal intention finds support in research on action slips. Heckhausen and Beckmann (1990) described a particular type of slip where planning how one would achieve a goal brought about its immediate enactment—even though the underlying goal intention was to perform the action at another time. They reported an example where a man decides to buy a magazine at his local newsstand later and goes over in his mind what shelves he will need to inspect to find the particular magazine he wants. When the man crosses the street near the newsstand, however, he finds himself standing in front of the newsstand (and remembers he had decided to postpone purchasing the magazine until the end of the day). This example of performing an action one did not intend at the time is reminiscent of the action slips sometimes caused by habits—for instance, when one makes the usual left turn to the office even though it is Saturday and one's intention is to go shopping (cf. Heckhausen & Beckmann, 1990; Reason & Mycielska, 1982).

The relationship between intentional and situational control of behavior can be illuminated by examining the

parallels between implementation intentions and habits. Both implementation intentions and habits operate in a similar fashion. The automaticity of implementation intention effects is echoed by demonstrations that habitual behavior is immediate, efficient, and occurs outside of awareness (Aarts & Dijksterhuis, 2000a, 2000b; Wood & Quinn, in press; Wood, Quinn, & Kashy, 2002). There are also important similarities between implementation intentions and habits in terms of their underlying mechanism. In both cases, strong associations have developed between particular situational cues and particular behavioral responses. Of course, the origins of these strong associations are different. In the case of habits, frequent and consistent performance of a behavior in a particular context means that strong links develop between relevant contextual cues and the behavior. In the case of implementation intentions, the same linkage is achieved by getting participants to form this association mentally in an act of will (cf. Aarts & Dijksterhuis, 2000a, Experiment 2).

The concept of habit is rooted in a behaviorist tradition that sees no role for cognitive and motivational processes such as goal intentions in mediating the situational activation of habitual responses (e.g., Skinner, 1938; Watson, 1914). More recent theorizing also emphasizes the distinctiveness of intentional guidance of behavior and habitual performance (e.g., Ouellette & Wood, 1998; Wood et al., 2002; Wood & Quinn, in press). For instance, a meta-analysis by Ouellette and Wood (1998) showed that for behaviors performed frequently in stable contexts (i.e., circumstances conducive to habit formation), habits provided much better prediction of behavior than did intentions. However, the reverse was true for behaviors performed infrequently in unstable contexts (see also Albarracin, Kumkale, & Johnson, 2002; Ferguson & Bibby, 2002; Verplanken, Aarts, van Knippenberg, & Moonen, 1998; however, see Kashima, Gallois, & McCamish, 1993; Sheeran & Abraham, 2003, for exceptions). The implication of these analyses is that behavior is either controlled by habits or by goal intentions. In other words, goals have no role in explaining the environmental control of action that characterizes habits.

However, another strand of contemporary research argues that cognitive and motivational processes are indispensable for understanding the situational control of social behavior (e.g., Bargh & Chartrand, 1999; Bargh & Gollwitzer, 1994; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). For instance, Aarts and Dijksterhuis (2000a, 2000b) disputed the idea that because habits are characterized by effortlessness and lack of awareness, this must mean actors' goals have no role in habitual behavior. They argued that whether a goal is activated determines whether environmental cues automatically elicit habitual responses. Aarts and Dijksterhuis (2000a, Experiment 3) tested this idea by manipulating situational cues (presence vs. absence of location words), goal activation (activation of the goal to travel or not), and habit strength (habitual vs. nonhabitual cyclists). The dependent variable was the accessibility of mental representations of *cycling*, measured by response latencies to this action word in a lexical decision task. Findings indicated that habit strength was associated with faster response latencies to cycling, but only when the goal to travel had been activated. Without activation of the goal, habit strength had no impact on participants' mental readiness to cycle. Most important, situational cues had no main or interaction effects on responses. These findings are consistent with the idea that when habits are established, situational cues activate goals and goal activation in turn evokes behavior. The implication of this analysis is that goals have an important role in determining whether situational cues affect action (see also Sheeran et al., in press).

Thus, there are important parallels between implementation intentions and habits in terms of their operation (automatic) and underlying mechanism (cue-response associations), and there is debate about the role of goal activation in the situational control of behavior engendered by habits (Aarts & Dijksterhuis, 2000a, 2000b; Wood et al., 2002; Wood & Quinn, in press). The present research tests whether goal intentions moderate the situational control of behavior engendered by forming an implementation intention. To date, only a small number of studies have reported data relevant to this issue. A study of healthy eating by Verplanken and Faes (1999) obtained significant main effects for both goal intentions and implementation intentions but found that the interaction term was not statistically reliable. This finding suggests that implementation intentions promote action initiation in a manner that does not respect participants' goal intentions. However, it is important to note (as did Verplanken & Faes, 1999) that almost all participants in this study had strong goal intentions to eat healthily; this fact could have undermined the likelihood of detecting a significant interaction between goal intentions and implementation intentions.

Other evidence suggests that implementation intentions must be supported by relevant goal intentions for behavioral effects to emerge. Koestner et al. (2002) obtained significant interactions between self-concordant goals and implementation intentions in two studies of progress with personal projects. However, although the direction of the interaction supported the hypothesis that the effects of implementation intentions were more pronounced for more self-concordant than for less self-

concordant goals, Koestner et al. only tested the reverse effect (that self-concordance better predicted goal progress when participants had formed implementation intentions compared to when they had not, see p. 240). Finally, Orbell et al.'s (1997) analysis of the impact of implementation intentions on performance of a breast self-examination also is consistent with the idea that goal intentions determine the strength of implementation intention effects. Orbell et al. reported that 64% of all participants who formed implementation intentions (i.e., including both intenders and non-intenders) performed an exam, whereas among participants with strong goal intentions (i.e., participants whose intention scores were above the scale midpoint), 100% performed the exam.

The Present Research

As the foregoing discussion indicates, the interplay between goal intentions and implementation intentions is not well understood (Gollwitzer, 1993). Consequently, it is not clear whether action control by implementation intentions is sensitive to the presence or absence of the respective goal intention. Implementation intentions delegate behavioral control to situational cues, and behavior is initiated automatically when those cues are encountered. On one hand, this could imply that people act according to their plans regardless of their goal intentions because the respective situational cues elicit behavior in a mechanistic fashion. This idea finds support in certain analyses of habitual responding where situational and intentional control of behavior are construed as separate modes of self-regulation. This process also seemed to characterize Heckhausen and Beckmann's (1990) example of an action slip, where the man found himself standing in front of the newsstand despite the absence of the respective goal intention.

On the other hand, action slips—by definition—are exceptional and rare. Moreover, certain analyses of habits have pointed to the importance of goal activation for understanding this type of situational control of behavior. Action control by implementation intentions might therefore represent an instance of goal-dependent automaticity (cf. Bargh, 1992, 1994; see also Gollwitzer & Schaal, 1998). That is, although action control by implementation intentions exhibits features of automatic processes such as immediacy and efficiency, these effects are conditional on the presence of relevant goal intentions. This interpretation assumes that forming an implementation intention engenders action control that respects actors' underlying goal intentions. Thus, the prediction would be that strong behavioral effects of implementation intentions are obtained only when this type of planning is supported by relevant goal intentions.

The present studies acknowledge that there are two aspects to whether implementation intentions respect people's goals, one related to goal strength and the other to goal activation. Accordingly, our first study tests whether strong implementation intention effects occur only when people possess strong respective goal intentions. Our second study tests whether implementation intention effects depend on whether the respective goal intention is activated in the given situation. In both studies, failure to obtain a significant interaction between goal intentions and implementation intentions would speak to the rigidity of if-then planning effects (people stick to their plans regardless of the state of their goal intentions). In contrast, a significant interaction between goal intentions and implementation intentions supports the idea that implementation intentions are sensitive to the state of the respective goal intentions.

STUDY 1: IMPLEMENTATION INTENTIONS AND ENGAGING IN INDEPENDENT STUDY

Study 1 concerns an important goal for students, namely, the number of hours of independent study they undertake. To ensure scale correspondence between measures of intention and behavior, we used the number of hours of independent study engaged in by students as the measure of behavior and operationalized the strength of participants' goal intentions in terms of the number of hours of study that they intended to undertake (cf. Courneya, 1994). The prediction tested here is that strong effects of implementation intentions will only emerge when participants have strong goal intentions to study.

Method

Participants and design. Participants were undergraduates at a United Kingdom university who volunteered to take part in a research project about independent study ($N = 85$). Participants were randomly assigned to conditions in a between-participants design with two levels (implementation intentions: formed vs. not formed). The amount of independent study set in participants' goal intentions was measured.

Procedure. All of the participants completed three questionnaires about their independent study. The Time 1 and Time 2 questionnaires measured participants' views about independent study and were identical save for the order of items. The purpose of asking participants to complete the same questionnaire twice (in immediate succession) was to ensure that we obtained an accurate measure of participants' goal intentions and views about studying. The implementation intention manipulation came at the end of the second questionnaire. The third questionnaire comprised the

behavioral follow-up and was completed 1 week later (Time 3).

To reduce ambiguity about the meaning of independent study, the following definition was printed at the top of all questionnaires: "Independent study encompasses all time spent studying outside scheduled lectures and seminars. For example, time spent in the library, studying in your room, reading and searching for references, etc."

The first two questionnaires measured variables specified by the theory of planned behavior (TPB; Ajzen, 1991) with respect to independent study; both questionnaires were completed by all participants. To enhance the accuracy of responses, participants received the following passage immediately after completing the first questionnaire (Time 1):

> Evidence shows that many people complete questionnaires very quickly and do not give much thought to their answers. For this research to be a success, we must be sure that this is not the case with this questionnaire. For this reason, we would like you to take a moment to think about your answers. *Please do not consult your previous answers.* Instead, think carefully about your answer to each question.

Participants in both conditions then completed the measures of TPB variables again (Time 2).

The implementation intention manipulation came at the end of the second questionnaire. Participants received the following instruction—"Decide now where (e.g., library) and at what times (e.g., 2-3 p.m. and 4-5 p.m.) you will do your independent study in the next week"—and filled in their responses under the headings "where" and "when" for each day of the week. The second questionnaire completed by participants in the control condition was identical save for the omission of this instruction.

One week later (Time 3), participants in both conditions reported how much independent study they had undertaken during the previous week. Participants also completed measures of goal intention and perceived behavioral control. To reduce concerns about self-presentation, anonymous codes were used to match participants' questionnaires.

Initial questionnaires. The initial questionnaires were identical save for the order of attitude, subjective norm, and perceived behavioral control items (order was the same across conditions). The measure of *goal intention* came first on both questionnaires. Participants were asked, "How many hours do you intend to spend doing independent study during the next week?" and the number of hours of intended study for each day of the week were written down. Responses to the intention items were reliable (alphas = .89 and .88 at the first and second administrations, respectively). Participants then reported their attitude, subjective norm, and perceived behavioral control with respect to the number of hours that they had specified in their intention. Responses were all on 9-point scales. *Attitude* was measured by three items: "How effective do you think the number of hours you intend to study in the next week will be in getting good marks?" (*effective* to *ineffective*), "How useful do you think the number of hours you intend to study in the next week will be in getting you good marks?" (*not useful* to *very useful*), and "How likely is it that the number of hours you intend to study next week would be . . . " (*boring* to *interesting*). Reliabilities were satisfactory (alphas = .73 and .75). A single item measured *subjective norm*: "Would most people who are important to you approve or disapprove of the number of hours that you intend to study in the next week?" (*approve* to *disapprove*). *Perceived behavioral control* (PBC) was measured by two items: "How easy or difficult will it be for you to do the number of hours that you intend to study in the next week?" (*very difficult* to *very easy*) and "How confident are you that you will be able to do the number of hours that you intend to study in the next week?" (*very unconfident* to *very confident*) (alphas = .64 and .73).

Follow-up questionnaire. Behavior was measured by participants' reports of how many hours of independent study they had done each day during the previous week (alpha = .83). Participants also completed the same goal intention items that were in the initial questionnaire with respect to the following week (alpha = .88) and completed a single-item measure of PBC: "How easy or difficult will it be for you to do the number of hours that you intend to study in the next week?" (*very difficult* to *very easy*).

Results

Randomization check. We first tested whether participants in the experimental and control conditions had equivalent scores on goal intention and TPB variables and whether participants changed their ratings between the first and second administrations of the questionnaire using ANOVAs appropriate to the design. Findings showed that there was no significant main effect for experimental condition, Fs$(1, 83) < 1.98$, *ns*, ds$< .31$, and no significant interaction between condition and administration, Fs$(1, 83) < 3.25$, *ns*, ds$< .40$. There was one significant main effect of the within-participants factor (first vs. second questionnaire administration). Participants' PBC scores were higher at the second administration of the questionnaire ($M = 5.39$, $SD = 1.05$) compared to the first administration ($M = 4.35$, $SD = 1.15$), $F(1, 83) = 31.38$, $p < .001$, $d = .61$.

These findings indicate that experimental and control participants had equivalent motivation to study prior to the formation of implementation intentions. According to the second administration of the questionnaire, participants intended to engage in independent study for 2 to 3 hours per day ($M = 2.77$, $SD = 1.41$), had moderately positive evaluations of studying ($M = 4.94$, $SD = 1.04$), perceived some social pressure to study ($M = 5.55$, $SD = 2.42$), and thought that it would be fairly easy to study the number of hours set in their goal intentions ($M = 5.39$, $SD = 1.05$).

Moderated regression analyses. Moderated linear regression analysis was used to determine whether goal intention moderated the effect of implementation intentions on study behavior. Goal intention scores from the second administration of the questionnaire were standardized prior to computing the interaction term to reduce potential multicollinearity (Aiken & West, 1991). We then conducted a three-step hierarchical regression. Behavior was regressed on goal intention at Step 1, on goal intention and implementation intentions at Step 2, and the Goal Intention × Implementation Intention interaction term was added to the equation at Step 3.

Table 1 shows the results of these analyses. Goal intention on its own explained 55% of the variance in behavior. Implementation intentions contributed a significant increment in the variance accounted for ($\Delta R^2 = .08$, $p < .001$) and goal intentions and implementation intentions were both significant predictors of behavior at the second step. The final equation showed that the interaction term was associated with a significant improvement in the fit of the model ($\Delta R^2 = .02$, $p < .05$) and that the interaction term, goal intention, and the if-then plan all had significant regression coefficients.

The Goal Intention × Implementation Intention interaction was decomposed in the manner specified by Aiken and West (1991). We computed simple slopes for implementation intentions at three levels of the moderator: low goal intention (1 *SD* below the mean for goal intention), moderate goal intention (the mean goal intention), and high (1 *SD* above the mean). Figure 1 shows that when goal intentions were low, implementation intentions did not predict behavior ($B = .34$, $p > .15$). However, as goal intentions increased from low to moderate ($B = .74$, $p < .001$), and from moderate to high ($B = 1.41$, $p < .001$), the predictive validity of implementation intentions increased. These findings support our hypothesis: Implementation intentions especially benefit behavioral performance when participants have strong goal intentions.

Alternative explanation. An alternative explanation of our findings is that forming an implementation intention increased participants' goal intentions or PBC relative to the control group. If this explanation was correct, then one would anticipate differences between the experimental and control groups on goal intention and PBC scores measured at behavioral follow-up. Contrary to this idea, however, there were no differences between the groups on goal intention (*M*s = 2.70 and 2.96, *SD*s = 1.43 and 1.21, for the experimental and control groups, respectively), $F(1, 83) = 0.80$, *ns*, $d = .22$, or PBC (*M*s = 3.56 and 3.09, *SD*s = 2.15 and 1.88, respectively), $F(1, 83) = 0.58$, *ns* $d = .16$. These findings suggest that the impact of implementation intentions on study behavior is not attributable to potential differences in motivation that accrued from the formation of the if-then plan.

TABLE 1: Hierarchical Linear Regression of Behavior on Goal Intention, Implementation Intention, and Interaction Term (Study 1)

Step	*Variable Entered*	*Beta*	*Beta*	*Beta*
1	Goal intention	.74***	.79***	.62***
2	Implementation intention	—	.29***	.29***
3	Interaction	—	—	.22*
ΔR^2		.55	.08	.02
ΔF		100.16***	18.58***	4.85*
R^2		.55	.63	.65
Model F		100.16***	69.98***	50.46***

NOTE: Implementation intention is coded 1 = formed, 0 = not formed. Betas are standardized coefficients.
*$p < .05$. ***$p < .001$.

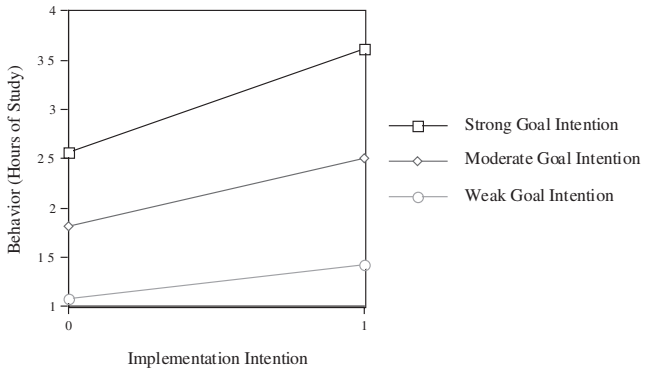

Figure 1 Simple slopes for implementation intention at three levels of goal intention (Study 1).
NOTE: Implementation intention is coded 1 = formed, 0 = not formed.

Discussion

Study 1 showed that main effects of both goal intentions and implementation intentions were qualified by a significant interaction effect. Findings showed that implementation intentions did not affect study behavior when participants had weak goal intentions; behavioral effects of implementation intentions emerged only when participants had goal intentions that strongly

favored performance of the behavior. These findings support the prediction that goal intentions moderate the behavioral effects of implementation intentions.[1]

We also obtained findings consistent with the idea that implementation intentions do not alter participants' motivation to perform a behavior. Comparisons of goal intention and PBC scores at follow-up for participants who formed versus those that did not form implementation intentions showed no significant differences between the groups. These results are consistent with several previous studies that measured motivational variables both prior to the formation of an implementation intention and measured these variables again after implementation intention formation—either before the measure of behavior (Milne & Sheeran, 2002; Sheeran & Orbell, 1999) or at the same time as the measure of behavior (Milne et al., 2002; Orbell et al., 1997). Regardless of when the second measurement of motivation was taken, implementation intentions were not associated with changes in goal intentions or other motivational constructs. These findings suggest that implementation intention effects are not based on changes in motivation. Instead, accumulated evidence supports the view that implementation intentions are effective because the specified situational cues automatically elicit behavior (Aarts et al., 1999; Brandstätter et al., 2001; Gollwitzer, 1993; Gollwitzer & Brandstätter, 1997).

Study 1 tested whether the effects of implementation intentions reflect the strength of participants' goal intentions (i.e., the number of hours participants intended to study). However, a further aspect of the flexibility of goal pursuit produced by implementation intentions is whether the relevance of the situational context is taken into account. In other words, implementation intentions should only trigger goal-directed responses when the given situational context activates the respective superordinate goal. Study 2, therefore, tested the sensitivity of implementation intention effects to the activation of the relevant goal. Moreover, in Study 1, participants were clearly aware of the goal guiding their behavior. However, the idea that implementation intentions produce automatic initiation of behavior implies that participants do not need to make a conscious decision that a given situation suits goal pursuit. Rather, implementation intention effects should be sensitive to the activation of the respective goal even if this activation occurs outside awareness.

STUDY 2: IMPLEMENTATION INTENTIONS, GOAL ACTIVATION, AND INTELLECTUAL PERFORMANCE

Participants' conscious task goal in Study 2 was to solve a series of puzzles as accurately as possible. To test whether implementation intention effects on performance are in line with respective activated goals, we primed either a task-relevant goal (i.e., the goal to respond quickly) outside of participants' awareness or we did not activate a goal. In addition, participants either formed an implementation intention to respond quickly (relevant implementation intention condition) or they formed an irrelevant implementation intention. We hypothesized that forming an implementation intention should only produce a speed-up effect if participants have been primed with the goal to respond quickly. In the neutral priming condition, participants' conscious task goal to be accurate should be active and the implementation intention to respond quickly should not affect speed of performance.

Method

Participants and design. Participants were 45 undergraduate psychology students who took part in return for experimental credits. Participants were randomly allocated to conditions in a 2 (implementation intention: relevant vs. irrelevant) × 2 (goal prime: speed vs. neutral) between-participants design.

Procedure. All tasks completed by participants were presented on a computer and the instructions for each task were presented on the screen. The main part of the experiment involved puzzles taken from the Matrix Reasoning Subtest of the Weschler Adult Intelligence Scale (WAIS III). Participants received the following instructions:

> You are going to be shown some pictures. For each picture there is a part missing. Please look at all aspects of each picture carefully and choose the missing part from the five choices. Please indicate your answer by pressing one of the number keys on the keyboard. The most important thing is to be as accurate as possible.

Participants then completed three (easy) practice puzzles and were told the correct answers (none of the participants made a mistake on the practice puzzles). After completing the practice puzzles, participants undertook two tasks that were designed to manipulate implementation intentions and prime the goal, respectively.

Manipulation of implementation intentions. Participants were told,

> In the main part of this experiment you will work on more puzzles like the ones you have just practiced. However, before you do so, we would like you to form a plan about how you will perform the task.

Participants in the *relevant implementation intention* condition were asked to tell themselves, "As soon as I think I have the answer, I will not deliberate but press the corresponding number key as quickly as possible!" Partici-

pants in the *irrelevant implementation intention* condition were asked to tell themselves, "As soon as I finish the experiment, I will complete the debriefing questions."

Goal priming manipulation. The goal priming manipulation comprised a word search puzzle similar to that used by Bargh et al. (2001). Participants were given the following instructions:

> We would like to measure your verbal ability using a word search puzzle. The puzzle comprises a grid of squares with a letter in each (10 squares across and 10 squares down). Embedded in the puzzle are words from the English language running either horizontally, vertically, or diagonally.

To ensure that participants did not focus on the meaning of the puzzle words, they were told, "We would like you to use the keyboard to type the first letter (e.g., 'T') and direction (e.g., across, down, or diagonal) of each word you find—the text will appear at the bottom of the screen." The word search contained 16 words, 8 of which varied by condition. In the *speed priming* condition, the word search contained the words *fast*, *hasten*, *rapid*, *brisk*, *swift*, *sprint*, *rush*, and *speed*. In the *neutral priming* condition, the puzzle contained words matched to the critical words for number of letters and Kucera-Francis written frequency (*tone*, *lavish*, *urban*, *polar*, *silent*, *offer*, *grip*, and *stuff*). Each puzzle also contained 8 filler words: *glee*, *watch*, *bold*, *flower*, *beach*, *gold*, *discuss*, and *cream*. As soon as participants had found 12 words, they were asked to press a key to advance to the next screen. Participants spent an average of 176 s working on the puzzle—this time did not differ as a function of the previously formed implementation intention, $F < 1$.

Dependent variables. For the main task, participants completed the first 12 puzzles of the Matrix Reasoning Subtest of the WAIS III. There were two dependent variables corresponding to the accuracy and speed of responses, respectively: (a) the number of correct responses and (b) the mean time spent on each puzzle.

Funnel debriefing. Once participants had completed the 12 puzzles, they were thanked for taking part and debriefed fully. Funnel debriefing (Chartrand & Bargh, 1996) indicated that three participants (6%) suspected that there was a relation between the prime (word search) and the experimental task or thought that there was a theme to the words in the word search. These participants were removed from further analyses.

Results

Two participants responded extremely slowly to the puzzles (response times were greater than 3 *SD*s above the mean) and were removed from subsequent analyses (cf. Fazio, 1990). Thus, data from 40 participants could be included in the analyses.

Accuracy of responses. We anticipated no significant effects of the experimental conditions on response accuracy. The number of puzzles correct (out of 12) was subjected to a 2 (implementation intention: related vs. unrelated) × 2 (goal-prime: neutral vs. speed) between-participants ANOVA. As expected, the main effects of both implementation intentions and goal prime were nonsignificant, as was the interaction term, Fs(1, 36) = 1.86, 0.30, and 0.12, *ns* (*d*s = .45, .18, and .12, respectively).

Speed of responses. The mean time taken to complete each puzzle (ms) was subjected to the same between-participants ANOVA (see Table 2). The ANOVA revealed a significant main effect of implementation intentions, $F(1, 36) = 13.01$, $p < .001$, $d = 1.21$. Participants who formed a relevant implementation intention spent less time on each puzzle ($M = 4843$, $SD = 1126$) compared to participants who formed an irrelevant implementation intention ($M = 6377$, $SD = 1675$). The main effect of goal prime was nonsignificant, $F(1, 36) = 1.04$, *ns*, $d = .35$. However, the expected interaction between implementation intention and goal prime was significant, $F(1, 36) = 4.39$, $p < .05$, $d = .68$. Analysis of simple main effects revealed a highly significant effect of implementation intentions in the speed prime condition, $F(1, 36) = 9.19$, $p < .005$, $d = 1.01$, but no significant implementation intention effect in the neutral prime condition, $F(1, 36) = 2.86$, $p = .10$, $d = .56$. We also tested the effect of goal prime within implementation intention conditions. Findings showed a main effect of goal prime in the relevant implementation intention condition, $F(1, 36) = 10.53$, $p < .003$, $d = 1.10$, but no effect in the irrelevant implementation intention condition, $F(1, 36) = 0.48$, *ns*, $d = .24$. These findings are consistent with predictions. Planning only affected response times when participants had been primed with the goal to respond quickly.

Discussion

Study 2 examined whether the effectiveness of an implementation intention to increase speed of performance on a puzzle task was contingent on the activation of the relevant goal intention to speed up responses. Consistent with predictions, findings showed that implementation intentions benefited performance only when the task-relevant goal had been activated; implementation intentions had no effect on response times when the situational context did not activate the respective goal intention (to speed up responses). Of importance, implementation intentions were sensitive to the state of the respective goal intention even though participants

TABLE 2: Mean Speed of Responses by Implementation Intention and Goal Activation (Study 2)

	Implementation Intention	
Goal Activation	*Irrelevant*	*Relevant*
Neutral	6122 (841)	5430 (1031)
Speed	6613 (2201)	4004 (628)

NOTE: Standard deviations are in parentheses.

were not aware of the activation of the goal to speed up responses.

It is notable that we did not observe an auto-motive effect (Bargh, 1990) in the irrelevant implementation intention condition; that is, situational activation of the goal to respond quickly had no effect on speed of performance when participants had formed an if-then plan that was not relevant to the task. We suspect that the primed goal had no effect on responses in this condition because participants' conscious task goal (to be accurate) overrode the impact of priming. This interpretation is consistent with findings from Macrae and Johnston (1998, Study 2). Their study showed that priming the goal to be helpful affected whether participants assisted the experimenter in picking up pens that she had dropped. However, when participants had been told to hurry to the next experiment, participants were much less likely to assist the experimenter—the conscious goal (to hurry) overrode the impact of the primed goal (to be helpful).

GENERAL DISCUSSION

The present research examined whether action control by implementation intentions respects participants' underlying goal intentions. We were concerned that forming an implementation intention could mean that action control becomes rigid and proceeds without reference to participants' goal intentions. When people make if-then plans, they pass control of behavior from the self to situational cues; moreover, when these cues are encountered, action initiation is swift, effortless, and does not require conscious awareness (Gollwitzer, 1993, 1999; Gollwitzer et al., in press). Delegation of action control to situational cues and automation of responding also characterize habitual behavior. Moreover, certain key analyses construe goal intentions as having little to do with the operation of habits (e.g., Wood et al., 2002). Consequently, it seemed plausible that implementation intention effects could be characterized by a mechanistic conception of situational control that posits no role for people's goal intentions in modifying the effects of this type of planning.

However, we drew on recent research that sees cognitive and motivational processes as crucial for understanding the automaticity of social behavior (see Bargh & Chartrand, 1999; Bargh & Ferguson, 2000, for a review) and Aarts and Dijksterhuis's (2000a) analysis of habit in particular. Aarts and Dijksterhuis's research suggested that habitual responding is not characterized by rigid elicitation of behavior in the presence of situational cues—automatic effects of habits take into account whether the respective goal is activated. Our research tested whether implementation intention effects are similarly sensitive to superordinate goals (i.e., the respective goal intention).

Because goal intentions have two features—activation and strength—both of these aspects were tested empirically. In Study 1, the strength of participants' goal intentions was measured before they formed implementation intentions (or not). Findings indicated that the main effects of goal intentions and implementation intentions were qualified by a significant interaction effect. Simple slopes analyses indicated that when participants had weak goal intentions, implementation intentions had no impact on behavioral performance. These findings are consistent with the idea that implementation intention effects are sensitive to the respective goal intention. Implementation intentions benefited goal achievement only when if-then plans were underpinned by strong goal intentions.

Study 2 tested whether implementation intention effects only emerge when the situational context is relevant to the goal pursuit at hand, that is, when the relevant goal intention is situationally activated. Participants were given a conscious task goal that favored one dimension of performance (accuracy) and either formed or did not form an implementation intention in relation to another dimension of performance (speed). In addition, we used a priming procedure to activate outside of awareness a goal intention that supported the implementation intention (i.e., to speed up responses); a control group did not get this goal activated. Findings indicated that implementation intention effects were sensitive to the activation of the relevant goal intention even though this activation occurred outside of awareness. Implementation intentions had no impact on speed of performance when the relevant goal to speed up responses was not activated; they only affected performance when the relevant goal was activated through the priming procedure.

The findings from these two studies undermine the idea that forming an implementation intention means that the moment people encounter the situational cue specified in the *if* component of their plan, the action specified in the *then* component is initiated in a mechanistic fashion. Our results show that action control by implementation intentions is sensitive to respective goal intentions—goal pursuit is modified by the particular

outcomes that actors desire and by the strength of those desires. These findings suggest that the beneficial effects of implementation intentions in promoting health goals such as breast self-examinations, cancer screening, and healthy eating may have been underpinned by strong goal intentions to achieve these outcomes by the participants (Orbell et al., 1997; Sheeran & Orbell, 2000; Verplanken & Faes, 1999). Future studies that obtain only weak effects of implementation intentions on goal achievement might therefore do well to test the interaction between goal intentions and implementation intentions to determine whether participants with strong goal intentions obtained particular benefit from if-then plan formation.

The present research grew from the idea that implementation intentions control action in a similar manner to habits. Similar to habits, implementation intentions involve situational control of behavior and instigate responses that are immediate, efficient, and do not require conscious awareness. However, it may be helpful to construe action control by implementation intentions as a particular subtype of automaticity, namely, what Gollwitzer and Schaal (1998) termed "strategic automaticity." The term "strategic" captures an important feature of the automaticity in implementation intentions that is different to the automaticity associated with habits. Unlike habits, implementation intentions can be formed on the spot through a conscious act of will and thus are best described as "instant habits" (Gollwitzer, 1999). An important avenue for future research will be to explore further the parallels between implementation intentions and habits. For example, it would be useful to examine whether cognitive rehearsal of an implementation intention increases the strength of cue-response links and thereby enhances the behavioral impact of planning—in the same way that greater frequency of performing a behavior strengthens cue-response associations and thus increases the impact of habit on future behavior (cf. Ouellette & Wood, 1998).

Two further contributions of the present research deserve mention. First, we obtained novel evidence concerning lack of awareness as a feature of the automaticity engendered by implementation intentions. Bayer et al. (2002) demonstrated that participants need not be aware of the situational cue specified in their implementation intentions to obtain automatic initiation of goal-directed responses. In the present research, we found that participants need not be aware of the respective goal intention for implementation intentions to exert their effects. This finding underlines the idea that people's conscious attention can be focused on other priorities but so long as the situational context activates the relevant goal intention, implementation intentions can be expected to benefit goal achievement. Second, the observation that people need not be aware of the activation of the relevant goal for implementation intentions to become effective is also in line with research on automotive theory (Bargh, 1990). As Bargh et al. (2001) demonstrated, goals need not be consciously held to lead to effective goal pursuit. Rather, activating the mental representation of a goal outside of a person's awareness suffices to instigate goal-directed behavior.

The practical implications of the present findings are also important. If it was the case that participants' goals are irrelevant, then manipulations of implementation intentions should have beneficial effects in promoting pro-social or health behaviors among all targeted participants—regardless of their goal intentions. The present findings make it clear, however, that implementation intentions are only likely to be effective among participants who possess the relevant goal. This suggests that researchers who set up intervention studies based on implementation intentions need to pilot test the target sample to ensure that there exist strong positive intentions. Otherwise, no reliable effects on behavior can be obtained. If no such intentions exist, it seems wise to start out with a motivational intervention designed to increase goal intentions before resources are invested in having people form implementation intentions.

In conclusion, the present research shows that implementation intentions are a strategic form of automatic action control that is sensitive to people's goals. Implementation intentions bring about action control that does not require conscious awareness or effort, but only if the person has formed an appropriate if-then plan *and* if the underlying goal intention is strong and activated. The present findings thus underline the instrumentality of implementation intentions in helping people meet their goals—possible costs in terms of rigid adherence to a course of action that does not serve a person's goals are not to be feared.

NOTE

1. Two aspects of Study 1 deserve comment. First, it was not possible to obtain an objective measure of behavior (amount of independent study) in this study. Second, intention strength was operationalized in terms of the number of hours of study participants intended to undertake, and not in terms of the degree of commitment participants had to studying for a certain number of hours. To test whether goal intentions moderate the effects of implementation intentions when both an objective measure of behavior and a standard intention measure are examined, we reanalyzed data from a previously published report on attending workplace health and safety training courses (Sheeran & Silverman, 2003). (The Goal Intention × Implementation Intention interaction term was not tested in that study.) Findings indicated the interaction term had a significant beta coefficient at the third step of a hierarchical logistic regression ($B = 1.06$, $p < .03$) after goal intentions and implementation intentions had entered the equation. Decomposition of interaction term indicated that implementation intentions were not associated with attendance behavior when participants had low goal intentions ($B = -.11$, $p > .80$) or when goal intentions were moderate ($B = .42$, $p = .06$). However, when participants had strong goal

intentions, implementation intentions were a highly significant predictor of behavior ($B = .95$, $p < .001$). These findings increase confidence in the idea that goal intentions and implementation intentions interact in predicting behavior.

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