

Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions [☆]

Rob W. Holland ^{a,*}, Henk Aarts ^{b,*}, Daan Langendam ^a

^a Department of Social Psychology, Radboud University Nijmegen, Nijmegen, The Netherlands

^b Department of Social and Organizational Psychology, Utrecht University, Utrecht, The Netherlands

Received 25 July 2003; revised 29 May 2004

Available online 10 January 2006

Abstract

Previous research has shown that implementation intentions are effective tools to promote new behavior. The present study aimed to provide the first evidence that conscious planning is an effective tool in replacing well-learned habits with new habits. This was tested in a field-experiment on repetitive behavior in the domain of recycling, using 109 employees of a tele-company as participants. Recycling behavior of the participants was observed by the actual amount of paper and the number of plastic cups in their personal wastebaskets. Following a pre-measure, participants were assigned to either implementation intention conditions, conditions in which an eye-catching facility was placed to promote recycling behavior, or control conditions. Recycling behavior was substantially improved in the facility as well as the implementation intention conditions in week 1 and week 2 and still 2 months after the manipulation. These data supported our hypothesis that planning breaks down unwanted habits and creates new ones.

© 2005 Elsevier Inc. All rights reserved.

Keywords: Habit; Planning; Implementation intentions; Breaking habits; Goal-directed behavior; Field-experiment; Recycling; Environmental behavior; Self-regulation

Introduction

Habits are efficient modes of goal-pursuit. When our goal-directed behaviors are well-learned through repetition in stable environments, goal-relevant situational cues may automatically elicit these behaviors. This way, we may attain our goals without conscious thought. However, when we try to change our habits, e.g., because other contradictory goals or action programs have become more important in the habitual situation, it seems very difficult to alter our automatic habitual responses (Aarts & Dijksterhuis, 2000a; Heckhausen & Beckmann, 1990; Reason, 1990).

What kind of strategies would be successful for *breaking* unwanted habitual behavior and *creating* ‘wanted’ habits? Habits are considered to be situationally guided goal-directed behaviors, and hence, behavioral responses are automatically elicited when the situation arises (Aarts & Dijksterhuis, 2000b; Bargh & Gollwitzer, 1994). Theoretically, then, strategies to successfully break habits should fit in with these habitual processes. In the present paper, we will investigate two potentially powerful tools to change habitual behavior. The first refers to conscious planning. Strikingly resembling habitual processes, recent studies have shown that after forming an implementation intention, a goal-directed behavior becomes strongly linked to situational cues and becomes automatically activated because of these situational cues. The processes underlying effects of planning suggest that the formation of implementation intentions may be a strong tool in order to break habitual behavior and create new habits.

[☆] The work in this paper was supported by grants from the Netherlands Organization for Scientific Research (NWO, VENI-Grant 451-04-063, VIDI-Grant 452-02-047 and ZONMW-Grant 40160001).

* Corresponding authors.

E-mail addresses: r.holland@psych.ru.nl (R.W. Holland), h.aarts@fss.uu.nl (H. Aarts).

Second, the importance of situational cues in the onset of habitual behavior suggests that eye-catching changes in the situation may affect habitual behavior by facilitating the performance of alternative behaviors and turn them into new habits. Therefore, we also investigate the installation of such facilities as environmentally prepared cueing tools in breaking old unwanted habits and creating new ones, and to compare its effects with mentally prepared cueing—that is, by conscious planning.

Implementation intentions

Gollwitzer (1993, 1999) distinguishes *goal intentions*, which refer to intentions to achieve a certain goal, from *implementation intentions*, which refer to intentions that specify, *where*, *when*, and *how* these goals are acted upon. Goal intentions have the form of “I intend to do X (“I intend to exercise”) whereas implementation intentions follow the proposition “In situation Y, I will do Z” (e.g., “When I come home from work, I put on my sneakers and go for a run”).

Several studies have shown that furnishing goals with implementation intentions can have a strong effect on goal-pursuit. Typically, participants are first instructed to attain a certain goal and then asked to write and visualize when, where and how they will act on that goal. The impact of implementation plans on behavioral performance has been shown across various behaviors, ranging from completing an assignment (Gollwitzer & Brandstätter, 1997) to shopping at a bioshop (Bamberg, 2002; see for overviews Gollwitzer, 1999; Gollwitzer & Sheeran, *in press*) and can be stunningly strong. For example, Orbell, Hodgkins, and Sheeran (1997) showed that participants who had formed implementation intentions for performing breast self-examination performed at the level of 100%, compared to 53% for control participants.

Similarities between habits and implementation intentions

Subsequent studies have provided more clarity with regard to the mechanism producing these strong effects of planning. These studies revealed striking similarities in the processes underlying planning and habits. For example, Aarts and Dijksterhuis (2000b) established that non-habitual travel mode users who formed implementation intentions as to using the bicycle showed automatic bicycle responses to travel goal situations, just as habitual bike users. Forming implementation intentions creates a strong mental link between a situation and a behavioral response. Therefore, when the person encounters the goal-relevant situation specified in the implementation intention, the goal-directed behavior is automatically initiated (Aarts & Dijksterhuis, 2000b; Brandstätter, Lengfelder, & Gollwitzer, 2001; Webb & Sheeran, 2003).

Furthermore, forming implementation intentions increases the mental accessibility of situational cues, and thus facilitates the activation and subsequent execution of the associated behavior (Aarts, Dijksterhuis, & Midden,

1999). Hence, the onset and the proceeding of behavior have been delegated to the environment. Both habits and implementation intentions thus seem to consist of automatic behavioral responses elicited by situational cues. The former as a result of repeated actions in a stable environment, the latter as a result of a single act of planning (see also Bargh & Gollwitzer, 1994; Orbell et al., 1997).

Creating habits by forming implementation intentions

The similarities between the mental representation of habits and implementation intentions suggest that implementation intentions are potentially powerful tools to create new habits. If so, forming implementation intentions renders the desired and planned behavior more likely to be performed frequently over time. Tests for these effects are generally lacking.

In a study of Sheeran and Orbell (1999) on vitamin C supplement intake, it was shown that planning affected repetitive behavior across a period of 2 weeks. However, because participants were aware of the fact that their behavior was monitored, it is possible that their results were caused by processes of public commitment rather than planning. Studies on public commitment have shown that behavior is more in line with goals or intentions when (1) these intentions are explicitly stated in front of other people (e.g., a group or specific person) and (2) one is aware that these individuals will monitor the behavior (e.g., Schlenker, Dlugolecki, & Doherty, 1994). For participants within the implementation intention condition, both elements of public commitment were present. First, participants in the planning conditions expressed their intentions to take the vitamin pills in the presence of the experimenter, by responding to the questions concerning where, when and how they planned to take the vitamin pills. Second, they knew that the experimenter would visit the participants in their dormitories and, in the presence of the participants, would count the number of pills that were actually taken. This enhanced public behavioral commitment may have induced all kinds of motivational differences (e.g., self-presentation motives) that may explain the differences between the implementation intention and the control condition.

Thus, a strong test of the idea that planning may create habits is as yet not available. To convincingly demonstrate this idea, a study should contain a measure of overt behavior that is frequently performed. Furthermore, and importantly, participants should not be aware of the fact that their behavior is being monitored.

Breaking habits by forming implementation intentions

Is it also possible to break habits¹ by forming implementation intentions? Nearly, all studies on planning thus far

¹ Breaking habits is here defined as stably changing an old behavior that was frequently performed within a specific context into new behavior that is repeatedly performed within that same context.

focused on the facilitation of (new) behaviors (e.g., breast self-examination, completing an assignment). In these cases, the situations that are part of the plans are not yet strongly tied to a behavioral response (e.g., people may behave in these situations in multiple ways rather than showing one fixed response). In other words, prior to the planning, the context does not automatically elicit a behavioral response. In the case of a habit, however, the situation automatically instigates the habitual behavioral response. Hence, it is more difficult to override strong habitual responses than to learn a new behavior in a situation that was not strongly linked to a behavioral response. Indeed, it has been proven to be very difficult to break habitual behavior by means of changing goal intentions. For example, interventions aimed at changing habitual health and environmental behaviors are often unsuccessful, even though people have positive intentions to alter their behaviors (Aarts, Paulussen, & Schaalma, 1997; Aarts, Verplanken, & van Knippenberg, 1998; Gifford, 1997; Verplanken & Faes, 1999).

Although several authors have stressed the possibility that forming implementation intentions may break habits, there is no direct empirical evidence supporting this claim. Verplanken and Faes (1999) showed that forming implementation intentions to eat healthy, resulted in more healthy food intake, but it failed to overrule bad eating habits. Their null-findings can be considered as another example of the difficulty of breaking habitual behavior and may suggest that implementation intentions, though powerful tools to facilitate new behaviors, cannot break habits.

However, the absence of habit change in the Verplanken and Faes (1999) study may be interpreted in a different way. Participants formulated implementation intentions directed at a broad, abstract goal (“to eat healthy”). Because of the generality of the abstract goal, the implementation intentions may not directly *compete* with concrete bad eating habits in specific situations (e.g., eating a candy bar everyday at 4 p.m. during the break at school). In other words, by planning their healthy behavior, people probably linked new behavioral responses to situations (e.g., eating fruit at home) that were different from the habitual situations.

These ideas thus suggest that a prerequisite for planning to be effective in altering habitual behavior, is that planning links a new behavioral response to the same situational cues that elicit the habitual behavior. After planning, the situation now activates both the habitual and the planned response, which may compete for action control (Macrae & Johnston, 1998; Norman & Shallice, 1986). As implementation intentions are more recently installed, the planned response may be more accessible and, at least temporarily, override the habitual response.

In addition to these theoretical notions on the circumstances that make planning a strong candidate to alter habitual behavior, there are also several necessary empirical elements that should be included to provide convincing evidence for the idea that planning breaks habits. One such crucial element is a measure of behavior over a long period

of time. Bamberg (2002), for example, showed that habitual non-public transport users were more likely to use a new bus route after planning. Behavior was observed only once at the time the participants used their free bus-tickets that were provided by the experimenter. Since no subsequent behavior was measured, it is not clear whether habits were truly “broken.” It is very well possible that participants returned to their old habits after getting their single time free ride.

To sum up, to convincingly show that planning can break habits and people do not return to their old habits, it should be demonstrated that (1) the behavioral pattern to be broken is habitual in nature; (2) planning results in behavior change; (3) this behavioral change is enduring and stable; and (4) the link between previous behavior and future behavior is stably reduced.

Breaking and creating habits by changing the situation

Another potentially powerful way to alter habitual behavior is by changing the situation. Obviously, people are forced to act differently if their habitual behavior is blocked by changes in the situation. However, changes in the situation may also alter habitual behavior if the new situation facilitates alternative responses. For example, the very same person who habitually throws his old paperwork in a regular dustbin instead of recycling it by using a special paper-recycling box, may be propelled to do so if such a recycling box is placed at his own desk. Indeed, vivid reminders or “prompts” have been shown to turn trashy habits into pro-environmental action (Zimbardo & Leippe, 1991; see also Intons-Peterson & Newsome, 1992). Moreover, such attention-grasping facilities are likely to cause behavioral changes that should be stable and observable over a longer period of time, that is, they can turn a person’s paper-in-the-dustbin habit into a new paper-recycling habit (Aarts et al., 1997). In the present study, we thus investigated such a change in the situation as a tool to break old habits and create new ones.

The present research

In the present field-experiment, we directly tested the hypothesis that planning and situational modifications can break old habits and create new ones. Our study aimed to go beyond previous studies in multiple ways. First, planning was related to the same situational cues that elicited the habit. Second, participants were not aware of the fact that their behavior was observed. Third, we included a long-term measure of behavior.

The field-experiment was conducted at a telecom-company in the Netherlands, that wanted to reduce its negative impact on the environment, among other things by recycling old paper and plastic cups. On each department of company buildings general recycling boxes for old paperwork and for plastic cups were installed. The goal to use these recycling boxes was clearly and persuasively

communicated to the employees of the company. A special team repeatedly informed and instructed employees on different occasions about these recycling boxes and underscored the ease as well as the importance of using them (e.g., by special meetings and personal letters). Thus, by exploiting this real-world situation we could assume that all participants were given the goal to recycle their paper and cups. Despite the given goal however, the amount of paper and plastic cups in the personal wastebaskets at desk did not seem to be reduced. Apparently, the goal to use these special recycling boxes did not affect the habitual behavior. First, we studied whether furnishing employees' new recycling goal with implementation intentions would promote recycling behavior. Second, it was investigated whether situational changes that facilitate recycling behavior, placing an eye-catching personal recycling box at the desk of the employee, also break old habits and produce new ones.

In the study, the amount of paper and plastic cups in the personal dustbins of participants at several departments of the tele-company was unobtrusively measured at the end of each day. After a pre-measure of this recycling behavior, departments of the company were randomly assigned to one of six conditions, including control conditions, conditions in which participants made implementation intention plans for recycling paper and plastic cups, and facility conditions in which a personal paper recycling box was placed near the desk of each participant. One week, two weeks, and two months after these manipulations recycling behavior was observed again. It was hypothesized that in the implementation intention conditions recycling would be stably improved compared to the pre-measure and to control conditions. Furthermore, it was predicted in the implementation intention conditions that past behavior would no longer predict future behavior. Similar effects were expected with regard to paper recycling in the facility conditions.

Method

Participants and design

Participants were 109 employees of six different departments at a tele-company in the Netherlands. In selecting these departments, we ensured that there was no professional relation between members of the departments. All participants had an administrative job and spend an equal amount of time at their office. Each participant had a personal desk and a dustbin. Furthermore, on every department two central recycling boxes were available at a short-walking distance from their desks, one box for old paperwork, and one for used plastic cups.

The departments were randomly assigned to one of six conditions. Thus, we used a quasi-experimental design. We used a 6 (Condition) \times 4 (Time of behavior: pre-measure vs. week 1 vs. week 2 vs. 2 months) mixed factor design, with the latter factor being a within participants factor.

Procedure

Measuring recycling behavior

Recycling behavior was measured by the actual presence of paper and cups in each participant's dustbin, observed at the end of a working day (Monday to Friday). During observation weeks, the cleaning crew was called off and replaced by a member of our research team. He had the painstaking job to conscientiously count the amount of cups and to weigh, by a digital scale in grams, the amount of paper that was present in every single personal dustbin of the 109 participants. Importantly, to ensure that participants were not aware that their recycling behavior was being monitored, the behavior was observed after working-time hours when everybody had left the building.

Recycling behavior was observed during 5 working days before our experimental manipulations, 10 working days after the manipulations, and finally, during four working days 2 months after the manipulations. Mean scores for both paperwork and plastic cups were calculated for all four measurements.

Questionnaire

Participants individually filled out a questionnaire, including conventional measures of habits. These measures were assessed to check for possible convergence between self-reported habit and the actual observed recycling behavior. To control for possible effects of reporting these behaviors, the questionnaire was administered in four of the six conditions.

Participants were seated in a quiet room within the company building. All instructions and questions were provided by a program on a computer. Concealing our actual purpose of the study, the participants were explained that the study concerned efficiency and convenience of the company building. For this purpose, we also included a large number of questions referring to office location, parking space, office interior etc. Two types of habit measures were included: self-report of habit, and an estimation of behavioral frequency. Thus, participants were asked to indicate how often they put paper and plastic cups in their personal wastebasket on 7-point scales (1 = *never* to 7 = *always*). Furthermore, they were asked to provide, as accurately as possible, estimates (between 0 and 100) of the number of times they put paper and plastic cups in their dustbin each day.

Experimental manipulations

After the pre-measure of recycling behavior the departments were randomly assigned to one of six experimental conditions, following a quasi-experimental design. In the control group we only observed recycling behavior. In the control-questionnaire group, participants filled out the questionnaire. In the facility condition, participants received a personal recycling box for old paperwork, which was noticeably placed near each participant's desk after the pre-measure of behavior. In the facility-questionnaire

condition, the same paper box facility was placed a day after participants had filled out the questionnaire.

Participants in the implementation intention condition first all received the questionnaire. Subsequently, instructions for forming implementation intentions were provided on the computer screen. Participants were asked to plan when, where and how to recycle their old paper and used plastic cups. Participants were asked to visualize and write down their implementation plans (Gollwitzer & Brandstätter, 1997). In the implementation intention-facility condition, a day after participants had formed implementation intentions, the personal paper box facility was installed.

Results

Self-reported behavior

The self-reported habit measures correlated significantly with the pre-measure of behavior for both the amount of paper, $r(69) = .60, p < .001$, and the number of plastic cups, $r(69) = .41, p < .001$. Similarly, the estimation measures showed positive correlations, $r(69) = .30, p < .001$ and $r(69) = .30, p < .001$, for the amount of paper and number of plastic cups, respectively. Thus, our actual recycling-behavior measure fairly correlated with self-reported measures of non-recycling habit (cf. Aarts et al., 1998). Furthermore, frequency of trashing per day in the dustbin was rather high for both paper ($M = 6.23$) and plastic cups ($M = 3.41$). Accordingly, on average, employees performed these behaviors more than 17 times a week for plastic cups and more than 30 times a week for old paperwork. These high frequencies of action performance furthermore underscore that the behavior was strongly habitual (Ouellette & Wood, 1998; Ronis, Yates, & Kirscht, 1989).

Effects of implementation intentions on recycling behavior

Recycling of old paperwork

The amount of paper was subjected to a 6 (condition) \times 4 (time) multivariate analysis of variance. This analysis revealed main effects for condition, $F(5, 103) = 13.92, p < .001$ and time, $F(3, 103) = 32.86, p < .001$. Importantly, the predicted Condition \times Time interaction was also significant, $F(15, 309) = 4.80, p < .001$.

Separate analyses for each level of time, showed no differences between conditions on the pre-measure of behavior, $F(5, 103) = 1.18, ns$. However, as expected, condition significantly affected the scores for week 1, week 2, and 2 months after the manipulation, $F(5, 103) = 18.83, p < .001$, $F(5, 103) = 18.44, p < .001$, and $F(5, 103) = 26.75, p < .001$, respectively.

The means are depicted in Fig. 1, showing that within the control conditions the amount of paperwork is stable over time, $F < 1, ns$. In the implementation intention condition, however, the amount of paper in the dustbin was strongly reduced over time, $F(3, 324) = 6.65, p < .001$. A similar strong decline in the amount of paper was observed in the facility condition, $F(3, 324) = 8.24, p < .001$, in the facil-

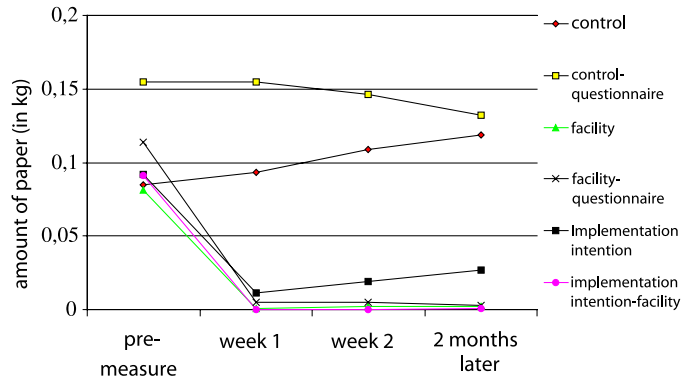


Fig. 1. The mean amount of paper (in kg/day) in the dustbins for implementation intention conditions, paperbox facility conditions, and control conditions one week before and one week, two weeks and two months after the experimental manipulations.

ity-questionnaire condition, $F(3, 324) = 13.83, p < .001$, and in the implementation intention-facility condition, $F(3, 324) = 11.01, p < .001$. These results suggest that both planning and situational accommodations were successful in breaking habits. No differences were obtained between the implementation intention and paper box conditions; they seemed to work equally well.

Recycling used cups

The number of cups that were present in the wastebaskets was subjected to a 6 (condition) \times 4 (time) multivariate analysis of variance. Again, the analysis revealed main effects for condition, $F(5, 103) = 6.11, p < .001$ and time, $F(3, 103) = 4.80, p < .001$. Also, the Condition \times Time interaction was significant, $F(15, 309) = 9.64, p < .001$.

Separate analyses for each level of time were conducted. As hypothesized, whereas the number of cups did not differ between conditions on the pre-measure of cups behavior, $F(5, 103) = .88, ns$, such differences were found for week 1, $F(5, 103) = 11.10, p < .001$, week 2, $F(5, 103) = 11.16, p < .001$, and two months after the implementation manipulation $F(5, 103) = 9.04, p < .001$.

The means for the number of cups are displayed in Fig. 2. These means were relatively stable over time in the control

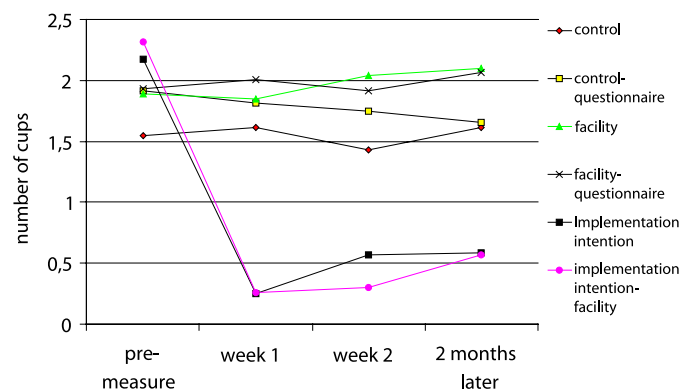


Fig. 2. The mean amount of cups per day for implementation intention conditions, paperbox facility conditions, and control conditions one week before and one week, two weeks and two months after the experimental manipulations.

and facility conditions, all F 's < 1, *ns*. However, within the implementation intention condition and the implementation intention-facility condition the amount of plastic in the dustbins was strongly reduced over time, $F(3,324) = 22.36$, $p < .001$ and $F(3,324) = 32.42$, $p < .001$, respectively. Post-manipulation scores did not significantly differ within the implementation intention conditions, suggesting stable effects. Indeed, the two conditions were significantly different from the control conditions in week 1, $F(1,107) = 55.54$, $p < .001$, week 2, $F(1,107) = 49.63$, $p < .001$, and 2 months after the manipulation $F(1,107) = 41.42$, $p < .001$.

Correlations between past behavior and future behavior

We further tested the idea that conscious planning and situational modifications can break habits by analyzing the correlations between past and future behavior within each condition, see Table 1. First, the table shows strong correlations between past behavior and future behavior within the control conditions, providing further evidence that the observed behavior is habitual. Second, the correlations between past and future behavior were attenuated and became non-significant in the implementation intention conditions. In fact, none of these correlations are significant and most are close to zero. The differences between the correlation in the control conditions and the implementation intentions were significant for both behaviors and for each level of time, all z -scores > 2.58, $p < .01$. Also, the table shows that the correlation between the pre-measure and the post-measures of the amount of paper was strongly attenuated in the paper basket conditions. The difference between these correlations and those in the control conditions was significant at each level of time, all z -scores > 1.96, $p < .05$.

Discussion

Previous studies have suggested that implementation intentions may simulate habits. The present research

revealed new and strong evidence that conscious planning can *break* old habitual behavior and *create* new habits. Many participants in our study frequently threw their plastic cups and old paper in their regular dustbin instead of the central recycling boxes. This environmental unfriendly behavior was strongly habitual as it was frequently performed in the same situation, predicted by self-report measures of habit, and very stable over time in control conditions. However, after planning where, when and how to recycle these items, recycling strongly improved. The number of cups and the amount of old paperwork in the dustbins was reduced by roughly 75 and 80%, respectively. These strong effects were obtained, despite the fact that the new behavior (walking to the recycling container) is less easy to perform than the old habit (throwing cups and paper in the personal dustbin). Importantly, behavioral change was stable over time, as it was still observable after 2 months. Furthermore, the correlation between previous behavior and behavior after 1 week, 2 weeks, and even 2 months was reduced to about zero in the planning conditions. Additionally, our manipulation of changing the situation did also influence paper recycling with almost flawless recycling scores when a personal paper-recycling box was placed near the desk of the participant.

Our research extended previous research on implementation intentions in several ways. First, our study provides the first clear empirical case for the idea that planning may create habits. Although previous work has shown similarities between the mental representation of habits and implementation intentions (e.g., Aarts & Dijksterhuis, 2000a), thus far it was not clear whether implementation intentions would have stable behavioral effects over time. The effects are stable across a time span of 2 months. Furthermore, since participants were not aware of the fact that their behavior was observed (behavior was observed at the office when every employee had gone home), alternative explanations such as public commitment that may have accounted for previous work in this area, cannot explain the present results.

Table 1

Correlations between the pre-measure of recycling behavior with recycling behavior 1 week, 2 weeks, and 2 months after the experimental manipulations within each condition

Experimental condition	Week 1		Week 2		2 months later	
	Paper	Cups	Paper	Cups	Paper	Cups
Control	.705***	.709***	.417*	.876***	.517*	.833***
Control and questionnaire	.731***	.746***	.875***	.856***	.662**	.832***
Paperbox facility	.320	.663***	.157	.378†	.059	.433*
Basket and questionnaire	.527*	.701**	-.019	.737***	-.083	.430†
Implementation intention	.266	.098	.163	.303	.169	-.122
Implementation + basket	— ^a	.009	— ^a	-.106	.327	.025

Note. The correlations between the pre-measure for paper and the measure in week 1 and week 2 could not be calculated because of a lack of variance in the latter cells.

^a Due to a lack of variance the correlations within these cells could not be calculated.

* $p \leq .05$.

** $p \leq .005$.

*** $p \leq .001$.

† $p \leq .10$.

Second, our research provides the first empirical demonstration that old habits may be replaced by alternative behavior as a result of planning. These results are particularly striking considering the general difficulty to alter habitual behavior. Our success is at least partly due to the fact that the new planned response could directly compete with the old habitual response, because the plans pertain to the same specific context as the context that elicits the habitual response. If we had, like a previous attempt (Verplanken & Faes, 1999), participants formulate implementation intentions towards general recycling goals (e.g., to enhance protection of the environment), rather than specific ones, we probably would have been less successful. These findings advance our knowledge with regard to the operation of implementation intentions, but also increase general insights into the control of social behavior when two behavioral alternatives may compete for behavioral guidance in a specific situation (e.g., Norman & Shallice, 1986).

The theoretical significance of the present findings lies in the emphasis on the possibility to change old habits into new ones by the mere act of planning. As such, our research advanced on recent studies showing that planning results in a higher sensitivity to situational cues (Aarts et al., 1999) and a stronger link between situational cues and a behavioral response (Aarts & Dijksterhuis, 2000b). These studies suggest that after planning, the situational cues (e.g., when my cup is empty) now automatically activate both the habitual response and the planned response. One might wonder how the new planned behavior wins this ‘battle’? Three possibilities are discussed here. First, the representation of the new action becomes more accessible in the specified situation than the habitual action, because the implementation intention may install (albeit temporarily) stronger mental associations between the situation and the new action. Second, the representation of the new action itself may be more accessible than the habitual one, because it was more recently activated and prepared. According to treatments of action control, the most accessible behavior representation ultimately “wins” the fight for dominance and guides overt behavior (e.g., Logan, 1989; Moskowitz, 2001; Norman & Shallice, 1986). A third possibility is that, as a consequence of forming an implementation intention, the habitual response may be actively inhibited, because it interferes with the planned response. An interesting avenue for further research, then, is to investigate these processes in more detail to fully understand and appreciate the way in which planning is capable of overruling habits.

Another issue that is worthwhile to ponder on relates to the process by which planning affects creating new habits. Although furnishing goals with planning may have direct effects on behavior even after several months (Sheeran & Orbell, 2000b; Sheeran & Silverman, 2003), it seems unlikely that implementation intentions in the present investigation still had *direct* effects on behavior after 2 months. Such direct effects seem crucially important in the first stage of habit change. For example, the first couple of

times a person is confronted with an empty plastic cup after having formed the implementation intention to recycle, this person may be automatically reminded about the new behavior, and as a consequence, directs oneself to the recycling boxes (see also recent work on prospective memory for a similar line of reasoning, McDaniel & Einstein, 2000). The new habit that is created as a result of these initial actions will be strengthened as the enactment of the implementation intention is repeatedly practiced and results in the performance of the desired actions, which contributes to the further automatization of initiating and performing the same behavior. Therefore, although the habit is induced by one’s own planning, after a while, there may be no direct effects of planning on behavior.

Our results indicate that both planning and situational adjustments are effective ways to break habits and create new ones. From a practical point of view, one may question the added value of psychological interventions such as planning, given the success of relatively simple adjustments to the situation. Indeed, in some cases it may be very useful to make small adjustments to the environment to alter habits. In fact, the case of placing a personal paper recycling box at the desk of each employee can be considered as a very simple, and efficient way of changing recycling habits. It should be noted, though, that the placement of the paper-recycling box did not affect the amount of recycled cups, suggesting that the effects of such eye-catching facilities are rather exclusive, especially when the desired behaviors operate independently and are not strongly related to each other. This implies that the promotion of each behavior requires a specific facility, which may often be impossible or very costly. In contrast, planning can be used in a broader variety of behaviors and situations.

We began our paper by stating that changing habits is often a cumbersome adventure. We observed that by forming implementation intentions or making situational modifications these difficulties can be overcome. This way, new wanted habits can be created and old unwanted ones can be overruled.

References

- Aarts, H., & Dijksterhuis, A. (2000a). On the automatic activation of goal-directed behavior: The case of travel habit. *Journal of Environmental Psychology*, 20, 75–82.
- Aarts, H., & Dijksterhuis, A. (2000b). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, 78, 53–63.
- Aarts, H., Dijksterhuis, A., & Midden, C. (1999). To plan or not to plan? Goal achievement or interrupting the performance of mundane behaviors. *European Journal of Social Psychology*, 29, 971–979.
- Aarts, H., Paulussen, T., & Schaalma, H. (1997). Physical exercise habit: On the conceptualization and formation of habitual health behaviours. *Health Education Research: Theory and Practice*, 12, 363–374.
- Aarts, H., Verplanken, B., & van Knippenberg, A. (1998). Predicting behavior from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology*, 28, 1356–1375.
- Bamberg, S. (2002). Effects of implementation intentions on the actual performance of new environmentally friendly behaviors—Results of two field-experiments. *Journal of Environmental Psychology*, 22, 399–411.

- Bargh, J. A., & Gollwitzer, P. M. (1994). Environmental control of goal-directed action: Automatic and strategic contingencies between situations and behavior. In W. D. Spaulding (Ed.), *Nebraska symposium on motivation* (Vol. 41, pp. 71–124). Lincoln: University of Nebraska Press.
- Brandstätter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation intentions and efficient action initiation. *Journal of Personality and Social Psychology*, *81*, 946–960.
- Gifford, R. (1997). *Environmental psychology: Principles and practice*. Boston: Allyn and Bacon.
- Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. 4, pp. 141–185). Chichester, England: Wiley.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*, 493–503.
- Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, *73*, 186–199.
- Gollwitzer, P. M., & Sheeran, P. (in press). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*.
- Heckhausen, H., & Beckmann, J. (1990). Intentional action and action slips. *Psychological Review*, *97*, 36–48.
- Intons-Peterson, M. J., & Newsome, G. L. (1992). External memory aids: Effects and effectiveness. In D. Herrmann, H. Weingartner, A. Searleman, & C. McEvoy (Eds.), *Memory improvement: Implications for memory theory*. New York: Springer-Verlag.
- Logan, G. D. (1989). Automaticity and cognitive control. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 52–74). New York: Guilford.
- Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *social cognition*, *16*, 400–417.
- McDaniel, M. A., & Einstein, G. O. (2000). Strategic and automatic processes in prospective memory retrieval: A multiprocess framework. *Applied Cognitive Psychology*, *14*, 127–144.
- Moskowitz, G. B. (2001). Preconscious control and compensatory cognition. In G. B. Moskowitz (Ed.), *Cognitive social psychology: The Princeton symposium on the legacy and future of social cognition* (pp. 333–358). NJ, Mahwah: Erlbaum.
- Norman, D. A., & Shallice, T. (1986). Attention and action: Willed and automatic control of behavior. In R. J. Davidson, G. E. Schwartz, & D. Shapiro (Eds.), *Consciousness and self-regulation: Advances in research and theory* (Vol. 4, pp. 1–18). New York: Plenum.
- Orbell, S., Hodgkins, S., & Sheeran, P. (1997). Implementation intentions and the theory of planned behavior. *Personality and Social Psychology Bulletin*, *23*, 945–954.
- Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, *124*, 54–74.
- Reason, J. (1990). *Human error*. Cambridge: Cambridge University Press.
- Ronis, D. L., Yates, J. F., & Kirscht, J. P. (1989). Attitudes, decisions, and habits as determinants of repeated behavior. In A. R. Pratkanis, S. J. Breckler, & A. G. Greenwald (Eds.), *Attitude structure and function* (pp. 213–239). NJ, Hillsdale: Erlbaum.
- Schlenker, B. R., Dlugolecki, D. W., & Doherty, K. (1994). The impact of self-presentations on self-appraisals and behavior. The power of public commitment. *Personality and Social Psychology Bulletin*, *20*, 20–33.
- Sheeran, P., & Orbell, S. (1999). Implementation intentions and repeated behaviour: Augmenting the predictive validity of the theory of planned behavior. *European Journal of Social Psychology*, *29*, 349–369.
- Sheeran, P., & Orbell, S. (2000b). Using implementation intentions to increase attendance for cervical cancer screening. *Health Psychology*, *18*, 283–289.
- Sheeran, P., & Silverman, M. (2003). Evaluation of three interventions to promote workplace health and safety: Evidence for the utility of implementation intentions. *Social Science and Medicine*, *56*, 2153–2163.
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology*, *29*, 591–604.
- Webb, T. J., & Sheeran, P. (2003). Can implementation intentions help to overcome ego-depletion? *Journal of Experimental Social Psychology*, *39*, 279–286.
- Zimbardo, P. G., & Leippe, M. R. (1991). *The psychology of attitude change and social influence*. New York, NY: McGraw-Hill.