

# Predicting Behavior From Actions in the Past: Repeated Decision Making or a Matter of Habit?

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This paper summarizes research on determinants of repeated behaviors, and the decision processes underlying them. The present research focuses on travel mode choices as an example of such behaviors. It is proposed that when behavior is performed repeatedly and becomes habitual, it is guided by automated cognitive processes, rather than being preceded by elaborate decision processes (i.e., a decision based on attitudes and intentions). First, current attitude-behavior models are discussed, and the role of habit in these models is examined. Second, research is presented on the decision processes preceding travel mode choices. Based on the present theoretical and empirical overview, it is concluded that frequently performed behavior is often a matter of habit, thereby establishing a boundary condition for the applicability of attitude-behavior models. However, more systematic research is required to disentangle the role of habit in attitude-behavior models and to learn more about the cognitive processes underlying habitual behavior.

Social psychology is concerned with gaining insight into the psychological antecedents of socially relevant behaviors and the processes underlying them. For instance, on a global level, investigators and practitioners attempt to understand the factors influencing individuals' decisions to engage in behaviors related to health (e.g., smoking, exercising), safety (e.g., following safety instructions at work, using seat belts), and the environment (e.g., recycling, using private cars) in order to prevent, promote, or change these behaviors. Indeed, in the last 25 years, considerable progress has been made in explaining and predicting the initiation of human behaviors as revealed by currently popular attitude-behavior models (e.g., Ajzen, 1991; Fishbein & Ajzen, 1975). In addition, models of individuals' decision to behave in a healthy way have been

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proposed and tested for a variety of health behaviors (health belief model, Janz & Becker, 1984; protection motivation theory, Rogers, 1983). Although these research efforts have thrown more light on the reason-based and deliberate nature of behavior, one important aspect has been overlooked in this research; namely, the fact that many of the aforementioned behaviors are executed on a daily, repetitive basis, and therefore may become routinized or habitual.

The present paper deals with the habitual nature of repeated behaviors. We will focus on travel mode choices as an example of a repetitive behavior that may be strongly driven by habit. This paper has two goals then. The first is to ponder the role of habit in attitude-behavior models. The second is to take a closer look at the decision processes underlying habitual behaviors.

We begin by discussing current theoretical and empirical research that models the reason-based determinants of behavior. Then we will elaborate on the concept of habit and examine the role of habit in these models. Finally, we focus on the decision-making process underlying habitual choices by describing a research program that we have conducted to empirically test the effects of habit on the process of information use preceding travel mode choices.

#### Deliberate Decision Making: The Reason-Based Nature of Human Behavior

In general, psychological research on the origins of goal-directed human behaviors relies on expectancy-value models of attitudes and decision making, rooted in theories of rational choice. Fishbein and Ajzen's (1975; Ajzen & Fishbein, 1980) attitude-behavior model, known as the *theory of reasoned action*, probably constitutes the most influential and well-documented model. The theory of reasoned action postulates that attitudes (the desirability of the behavior, which is considered to be a function of the sum of the perceived values of the expected consequences of the behavior), together with subjective norms (representing the experienced social pressure), are the antecedents of behavioral intentions, which in turn are supposed to precede behavior.

Because the attainment of behavioral goals is not always completely under volitional control, Ajzen (1985, 1991) has added a third concept to the prediction of behavior, perceived behavioral control, representing one's perception of how easy or difficult it is to perform the behavior. The inclusion of perceived behavioral control has resulted in the *theory of planned behavior*. According to Ajzen (1991), perceived behavioral control, which may encompass both internal factors (e.g., skills, knowledge, adequate planning) and external factors (e.g., facilitating conditions, availability of resources), influences behavior in two ways. First, it affects behavior indirectly; that is, through the mediating role of intentions. In this version, perceived behavioral control has motivational

implications for intentions. For instance, individuals who believe that they have neither the skills nor the opportunities to drive a car are unlikely to form intentions to engage in this behavior, even if they hold favorable attitudes and experience social pressure to use the car. Second, it may have a direct influence on behavior. This assumes that perceived behavioral control reflects actual behavioral control. Consequently, performance of an action (and hence the achievement of the behavioral goal) depends not only on motivation (i.e., intentions), but also on adequate control over the behavior in question at the very moment the behavior has to be exhibited.

The theory of planned behavior emphasizes the deliberate character of individual choice. The theory seems to assume that choices are made consciously. For example, people use a private car because they have consciously decided to so; their decision follows from their belief that using the car is associated with more favorable than unfavorable consequences, and their conviction that they have the opportunities and skills to use the car, thus obtaining the expected consequences. The predictive value of the theory is good, and it has been applied in a large number of studies covering a variety of behaviors (Ajzen, 1991; Sheppard, Hartwick, & Warshaw, 1988).

The theory of planned behavior has been challenged for its claim that attitude, subjective norm, and perceived control are the sole antecedents of intentions. For instance, some researchers have demonstrated that intentions are also determined by other variables, such as personal moral beliefs (e.g., Manstead & Parker, 1995; Schwartz & Tessler, 1972), self-identity (e.g., Biddle, Bank, & Slavings, 1987; Charng, Piliavin, & Callero, 1988), and affective evaluations of behavior (e.g., Manstead & Parker, 1995; Richard, van der Pligt, & de Vries, 1995). Although these extensions to the theory of planned behavior improve the understanding and prediction of behavior, they all assume that behavior is guided by reasoned considerations; that is, the most proximal cause of behavior is the intention that "represents the person's motivation in the sense of his or her conscious plan to exert effort to carry out a behavior" (Eagly & Chaiken, 1993, p. 168).

When considering many behaviors related to health, safety, and the environment, the research guided by the theory of planned behavior seems to ignore one important aspect, that is, their repetitive nature. If one day individuals perform a given behavior in order to achieve a specific goal (e.g., using car to travel to their work), they are likely to use the experiences of that behavior in making a decision concerning a similar opportunity to act on the next day. Thus, in the context of travel behavior, decisions to use a mode of transportation are influenced by experiences gained from previous journeys. Although Ajzen (1991) acknowledges that previous behavior may influence later behavior, he presumes that behavior produces feedback that influences subsequent

attitudes and perceptions of social norms and behavioral control. In other words, he suggests that the impact of past behavior on later behavior is, within the confines of his model, mediated by perceptions of desirability, norms, behavioral control, and intentions to execute the behavior. However, in the next section we will argue that this line of argument may not apply to behavioral domains where the behavior under consideration is similar, if not identical, to behaviors performed many times before and has, as a consequence, become habitual.

### Predicting Behavior From Actions in the Past: The Matter of Habit

An educated guess tells us that the majority of our behavioral repertoire is frequently exhibited in the same physical and social environment. In such cases, behavior usually acquires a habitual character (e.g., James, 1890; Ouellette & Wood, in press; Ronis, Yates, & Kirscht, 1989; Triandis, 1980). These habits enable us to perform our actions in a rather mindless fashion. As the characterization of habitual behavior as "mindless" suggests, habitual behavior may be conceived of as automatic behavior. Most habitual behavior arises and proceeds efficiently, effortlessly, and unconsciously. In everyday language, however, the term *habit* is also used interchangeably for behavior that is performed on a regular basis. In accordance with this, on an operational level, habit is often measured by self-reported frequency of past behavior (but see Aarts, 1996, for a discussion of alternative measures of habit). However, for present purposes, three characteristics of habit, as the concept is used here, are worth considering.

First, although habitual behaviors may not meet all criteria of automaticity (Bargh, 1989, 1994), habits do comprise a goal-directed type of automaticity. That is, habitual behaviors are instigated (by certain triggering stimuli) in the presence of a specific goal. For example, many well practiced and skilled behaviors such as typing, walking, driving, and even choosing a travel mode are usually qualified as automatic, but they do require a goal to engage in it in order to occur. In other words, these automatic actions are instrumental in obtaining a certain goal. So, we do not automatically take the bicycle out of the shed and subsequently ride to the university without having a goal to go there.

Second, in the traditional view of habit formation, satisfactory experiences enhance the tendency to repeat the same course of action because the instrumental action becomes more strongly associated with the goal one initially wished to attain (e.g., "Drinking a glass of water quenches my thirst" or, as in the present context, "Using the bicycle to get to the university leads to reaching my work"). Furthermore, the stronger the reinforcement, the stronger the association between

the goal and the instrumental action becomes. Conversely, dissatisfaction weakens the link between goal and behavior, decreasing the probability a person will continue the behavior (e.g., Bolles, 1972; Hull, 1943). In the common-sense interpretation of the term habit, one single reinforcement every now and then (e.g., monthly or annually) may not seem to enact much of a habit, even though the behavior may be classified as recurrent (see also Ouellette & Wood, *in press*). Therefore, habit strength only increases as a result of frequent repetitions of positive reinforcements (although it remains difficult to predict how regularly and frequently a behavior has to be executed in order to become a genuine habit).<sup>2</sup>

Third, since the concept of habit is strongly rooted in behaviorist approaches to learning theory, for a long time it was assumed that mental (cognitive) processes do not mediate the automatic activation of habitual responses to environmental stimuli. In contemporary research, however, it is often argued that cognition does play a role in the direct control of environmental cues over habitual behavior (e.g., Bargh & Gollwitzer, 1994; Norman & Shallice, 1986; Ronis et al., 1989; Triandis, 1980). For instance, Bargh (1990) suggests that when the same decisions are frequently pursued and implemented in a given situation, an association between the mental representation of that situation and the representation of the respective goal-directed choices will emerge. Frequent coactivation of a particular situation and particular choice increases the strength and accessibility of that association. Hence, frequent performance of an action in a specific situation facilitates the ease of activating the mental representations of this action (and hence the resulting action itself) by situational or environmental cues. It should be noted that similar principles have been proposed and empirically established for the activation of other mental representations, such as attitudes and stereotypes (Devine, 1989; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; see Higgins, 1996, for an overview). The source of a habitual response, like stereotypes and attitudes, can be thought of as a cognitive structure that is learned, stored in, and readily retrieved from memory upon the perception of appropriate stimuli.

Based on the conceptual features of habit described, we conceive of habits as goal-directed automatic behaviors that are mentally represented. And because of frequent performance in similar situations in the past, these mental representations and the resulting action can be automatically activated by environmental cues. An example in the domain of travel behavior may illustrate these ideas.

<sup>2</sup>For instance, Ronis et al. (1989) propose that the habitual nature of repeated behaviors is established only "if the behavior has been repeated both frequently (at least twice a month) and extensively (at least 10 times)" (p. 213). Obviously, many behaviors of interest to social scientists meet these two criteria.

A Dutch college student planning to attend lectures for the first time may deliberately choose to go to the university by bicycle; that is, a decision based on attitudes and intentions. Now, when this behavior is more frequently performed and becomes habitual, the travel destination "university" will be strongly associated with and can automatically activate the travel mode option "bicycle" in memory. Moreover, bicycle might be the obvious choice as mode of transport for different travel goals (e.g., attending lectures, visiting friends, going shopping at a mall) and thus for a set of similar trips and distances (e.g., inner-city trips). One may say, then, that the habit of using a particular mode of transport is generalized across situations (cf. the concept of stimulus generalization in learning theory; Hull, 1943). In more general terms, when travel behavior is habitual, the habitually chosen travel mode is strongly associated with specific travel destinations. However, and this is important, the automatic activation or "link" between destinations and bicycle will not be established by college students who hardly travel by bicycle or who hardly travel at all. In other words, frequent performance of a behavior is critical for the development of a habit. Thus, if a person frequently decides after breakfast to cycle from home to the university in order to attend lectures, the activation of the travel goal "I have to attend lectures" in that situation leads directly to "taking the bicycle out of the shed and cycling to the university." Hence, travel mode choice habit can be seen as the automatic and immediate activation of the habitual travel mode option upon instigation of the goal to travel (Aarts & Dijksterhuis, 1997).

To recapitulate, we argue here that when a behavior is performed many times, future decisions on courses of action and their subsequent execution are primarily guided by habits, rather than being based on evaluative interpretations, as is the case with attitudes or perceived control. Once established, habitual behaviors no longer require a process of reasoning or planning to occur. Instead, they are automatically evoked upon the instigation of the goal to act. More specifically, when the same decision has been made over and over again in the past under similar circumstances in order to attain a certain goal, one does not need to assess one's attitudes and behavioral control and to formulate a conscious intention at the time one has to act. Situational cues activate highly accessible mental structures of the behavior that subsequently guide the immediate initiation of the behavior. Such an activation principle is the result of frequent performance of the behavior in that situation. Accordingly, frequency of past behavior can directly influence subsequent behavior. This idea has been advanced by many researchers in the field of attitudes and decision making (e.g., Ronis et al., 1989; Tesser & Shaffer, 1990; Triandis, 1980).

Indeed, there is a substantial body of research showing that in the case of repeated behavior, a measure of self-reported frequency of past behavior or habit

contributes to the prediction of future behavior in addition to attitude, subjective norms, perceived behavioral control, and intention. This has been demonstrated for a variety of behaviors, such as students' class attendance, drinking milk, eating potato chips, physical exercise, condom use, drug use, seat-belt use, and, of course, travel mode choice behavior (see Ouellette & Wood, *in press*, for an admirable meta-analysis). In other words, a measure of past behavior or habit improves the prediction of later behaviors after the variance in the behavior attributable to the concepts in the theory of planned behavior has been accounted for.

#### Habit and Decision Making: Past Behavior Versus Intention as Predictors of Future Action

In an attempt to conceptualize the relationship between habit and decision making, Triandis (1980) proposed a model suggesting that intention and habit interact in their prediction of later behavior. In fact, Triandis hypothesized that because the same behavior has been more frequently executed in the past and increases in habit strength, it is less guided by intentions to perform that behavior. Habit strength may thus moderate the relationship between reason-based concepts (attitudes, intentions) and subsequent goal-directed behavior (Ronis et al., 1989).

Notice, however, that Triandis' (1980) line of reasoning suggests that although a person is goal oriented in performing the habitual behavior (e.g., attending lectures), the attainment of the goal is no longer guided by deliberately formed intentions regarding the instrumental action (i.e., the means) by which the goal might be achieved (e.g., taking the bike in order to travel to the university). Presumably, the goal-directed behavior is under direct control of the repository of knowledge about and experiences with that behavior, that is, decisions and actions executed with a specific purpose in a certain situation in the past, stored and ready to be retrieved from memory upon instigation. This idea coincides with the current conceptualization of the goal-directed automaticity of habitual behaviors (Bargh & Gollwitzer, 1994). Examining the interaction between measures of habit and intention in the prediction of later behavior is in our view a useful complement to demonstrations that the behavior in question is a matter of habit. That is, in addition to the direct impact of habit on future behavior, one should explicitly test whether intentions are less predictive of behavior as habit increases in strength.

Aarts (1996) conducted a longitudinal study designed to test this hypothesis in the domain of travel mode choices. In this study, attitude, subjective norm, perceived behavioral control, intention, and habit strength of car use were first measured in a questionnaire, and subsequently related to actual car choices.

Car choices were recorded by means of diaries over a 7-day period. Instead of traditional measures of self-reported frequency of past behavior, car use habit strength was measured by following a procedure that relies on the assumption that goals are capable of activating mental representations of habitual choices automatically. Respondents were asked to mention as quickly as possible the mode of transport that first comes to mind as the one they would use in response to a representative sample of travel goals. It is assumed that the imposed time pressure, and the instruction to respond with the mode that comes to mind first, will further facilitate the automatic nature of responding and the reliance on cognitively available structures. The frequency of responding with a particular behavioral alternative reflects the extent to which the habit of choosing that alternative mode is generalized across travel destinations. As the frequency of mentioning a specific transport mode increases, so does the habit strength of choosing that mode. This habit measure has been found to satisfy the criteria of both validity and reliability. For instance, the habit measure correlates substantially with a measure of frequency of past behavior ( $r = .66$ ), correlates relatively weakly with attitude measures ( $r = .32$ ), and has a sizable test-retest correlation ( $r = .92$ ) over a 4-month period (Aarts, Verplanken, & van Knippenberg, 1997).

As postulated by the theory of reasoned action, the results of the longitudinal study (Aarts, 1996) showed that intention was determined by both attitude and subjective norm. Although perceived behavioral control was significantly correlated with intention, it did not share unique variance with intention. Furthermore, in line with findings in other studies on repeated behaviors, it was found that future behavior was predicted by habit. Intention and perceived behavioral control were weakly but significantly related to behavior and did not add to the prediction of behavior when habit was included in the regression equation. More importantly, habit and intention significantly interacted in the prediction of behavior. That is, intentions became less predictive of behavior as the habit in that behavioral domain increased in strength (Triandis, 1980). In other words, when behavior is habitual or automatically performed, deliberate intentions cease to guide future behavior. These results corroborate the findings of other studies on repeated behaviors that explicitly tested interaction terms (Mittal, 1988; Montano & Taplin, 1991).

In a similar vein, Ouellette and Wood's (in press) meta-analysis of prior studies on habit showed that the direct influence of past behavior on future behavior was most pronounced for behaviors that are executed frequently (i.e., daily or weekly) and consistently in a stable context. Behaviors that are carried out less often were more accurately predicted by consciously formed intentions toward the behavior. This pattern of results indeed confirms the assumption that when behavior has been performed many times in the past, subsequent



behavior becomes more and more under control of an automated cognitive process, whereas behaviors executed less frequently are (still) guided by evaluative interpretations and considerations, as postulated in the theory of reasoned action.

Thus far we have established that repeated behaviors, such as car use, may often be a matter of habit. The following section focuses on the second goal of this paper; that is, learning more about the decision processes underlying habitual behaviors. We will describe the results of various studies on travel mode choices to illustrate the points we want to make.

### Habit and Decision Making: The Process of Information Use Preceding Habitual Choices

Theoretically, the relations between intention, habit, and future behavior, as discussed previously, suggest that the choice process underlying behavioral decisions becomes less elaborate as habit increases in strength (cf. Ronis et al., 1989). In effect, the habitual choice may immediately come to mind upon the instigation of the goal to act, without the need to scrutinize information relevant to choosing one of a number of alternatives. It should be noted, however, that in the previously described research on habitual behaviors, the decision processes mediating the relations between antecedent conditions and the resulting choice and behavior necessarily remain hidden. That is, these studies generally rely on the measurement of attitudes, intentions, habit, and later behavior, and conclusions concerning causality tend to be based on the observed statistical relations between the measured constructs. The idea that habit strength attenuates the decision process, therefore, has the status of an untested hypothesis.

We conducted a series of experiments to explore the processes underlying habitual choices. More specifically, we used *process tracing techniques* (information display board paradigms and the policy-capturing paradigm) to observe information use processes that precede travel mode choices. These techniques of experimentation are increasingly employed in the area of psychological decision theory to reveal the psychological processes intervening between stimulus input and decisional outcomes (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Jacoby, Jaccard, Kuss, Troutman, & Mazursky, 1987; Payne, 1976). It is assumed that predecisional information use reflects decision-making strategies underlying choice behavior.

In all experiments we followed a similar procedure. That is, the extent to which a particular mode of transport (e.g., bicycle, car) was habitually chosen was first measured by means of the procedure described earlier. On the basis of this measurement, participants could be categorized as having either a weak

habit or a strong one. After the measurement of habit, participants engaged in a filler task to familiarize them with the operation of the computer. Subsequently, they were confronted with a travel goal (e.g., going shopping in the city center) and were asked to indicate which travel mode they would choose to make the trip. Before indicating their choice, however, they were able to gather (and utilize) information relevant for making a travel mode choice. Our main test, then, involves a comparison between weak- and strong-habit persons with respect to the mode choices they made, and the amount of information they used before selecting a mode of transport. On the basis of the findings of other studies on habitual behaviors, two predictions were made: (a) Habit strength affects the decision individuals make; and (b) habit strength attenuates the amount of information acquired and utilized before that decision is made.

### Habit and Information Use Concerning Attributes of Choice Options

In research on behavioral decision making, the subjective representations of choice options are usually thought of as comprising sets of attributes characterizing them (the choice is therefore referred to as *multiattribute choice*; Abelson & Levi, 1985). For instance, the choice between traveling by bicycle or bus for a short journey may depend on the outcome of the trade-off between values concerning travel costs and travel time for the two options (cf. Jaccard, 1981). Thus, in terms of a decision process model, individual travel mode choices are supposed to be based on acquiring, weighing, and combining information about attributes of mode options before a mode of transport is actually selected.

Verplanken, Aarts, and van Knippenberg (1997, Study 1) investigated the effects of habit strength of bicycle use on predecisional information acquisition behavior concerning attributes of travel mode options by means of the information display board paradigm (e.g., Ford et al., 1989; Jacoby et al., 1987). The typical choice problem in this paradigm comprises an informational environment in which a set of choice options (e.g., walking, bicycle, bus) are described by values on a set of attributes (e.g., travel time, convenience, financial costs) in a matrix format. Information about the attributes of these options is initially hidden, and participants are allowed to collect this information in any amount and order they want. After acquiring sufficient information, they indicate their choice. In this way, the researcher gains insight into the amount of information individuals need to come to a decision, as well as the choices they make.

A group of undergraduate students were invited to visit our laboratory. Upon their arrival at the lab, the students' bicycle use habit strength was measured. Next, they worked on an exercise task, and they were then asked to imagine that they had to travel from their home to a specified shop in their town

center. In order to reach this destination, they could choose from four travel mode options (walking, bus, bicycle, or train). All participants owned a bicycle and were able to walk. Moreover, they were recruited from one particular student dormitory building approximately 3 km from the town center. This building was very close to a bus stop and a railway station with direct and regular connections to the town center. The four travel modes were, therefore, realistic options. They were then confronted with the information display board, gathered information about attributes of alternatives in any amount and order they wanted, and eventually indicated their choice.

The results of this experiment were straightforward. Bicycle choice habit influenced the choices participants made: Strong-habit participants chose the bicycle rather than an alternative option more frequently than did weak-habit participants. In addition, habit strength reduced the amount of predecisional information acquired about attributes of mode options, as predicted.

Although these findings are consistent with the hypothesis that habit strength attenuates the decision process, the reduced search may have been due to a possible covariation of habit with level of knowledge concerning the domain of interest. After all, the stimulus trip, which represented a realistic situation, was a familiar one. It is conceivable that strong-habit participants had little need for external information. Because of this possible confound of habit with relatively high levels of knowledge and experience concerning the decision problem, habit strength may not have been the critical variable that produced the pattern of results. We therefore recruited a new group of students and conducted a second experiment, this time using a relatively unfamiliar journey (Verplanken et al., 1997, Study 2). The procedure was the same as in the previous experiment.

As anticipated, the effects of habit replicated the results obtained in the previous study. First, it was found that habit was directly related to choice: Strong-habit participants more frequently chose to perform the habitual behavior rather than an alternative course of action, as compared with weak-habit participants. In addition, it was again found that habit strength reduced the need to consider information about the attributes of options. Therefore, the alternative explanation suggested earlier may be rejected. The results from the second experiment further showed that habit affects the variability of information searched across options. When habit was strong, higher levels of variability were observed than when habit was weak. More specifically, subjects with a strong bike use habit predominantly gathered information about cycling, whereas weak-habit subjects divided their attention more evenly across the alternatives.

Apparently, habit leads to increased focus on the habitually chosen option. In the traditional information display board paradigm, variability of information

search across options is considered to be an important indication of the decision strategies adopted by decision makers: An evenly distributed information search pattern (low variability) is associated with compensatory strategies (e.g., as proposed by the theory of reasoned action), whereas a selective information search pattern (high variability) reflects noncompensatory strategies (e.g., as suggested by Tversky's [1972] elimination-by-aspects rule). Thus, the present results suggest that when habit is strong, transport mode decisions are guided by simple, heuristic, noncompensatory rules—alternatives are rejected relatively early in the decision process—and, conversely, when habit is weak, decision makers adopt more cognitively demanding compensatory decision rules. In other words, habitual travel mode choices tend to follow cognitive shortcuts.

### Habit and Information Use Concerning Characteristics of the Choice Situation

In the case of habitual choices, *information about the attributes of choice options* may not be the only, or the most important, foundation on which a decision is based. That is, in the previous two experiments, we may have captured only a part of the decision process, and we may have missed a more important stage, the evaluation of characteristics of the choice situation (i.e., the journey). In actual choice situations, such basic features (e.g., weather conditions, travel distance) have to be perceived before any consideration of options can be made at all, and therefore they constitute an integral part of the choice process. In the previous two studies, the characteristics of the journey were given in the instructions prior to the information search task. In doing so, we were not able to trace whether habit affected the extent to which such basic information was considered in the choice process. We therefore examined the effects of habit on this earlier stage of decision making. It was hypothesized that, as the habit of choosing a particular mode increases in strength, the amount of information processed concerning such basic features of the trip would be reduced. A new experiment was carried out to test this hypothesis (Verplanken et al., 1997, Study 3).

In this third study, an information search paradigm was again used, but this time, the participants' task was to make travel mode decisions on the basis of information about the circumstances of the journey (e.g., distance, weather conditions, weight of luggage) that they could be obtained via the computer. Participants (this time a nonstudent sample of car owners) were informed that the journey involved collecting some goods from a shop, and were given the opportunity to search for trip-related information before deciding which mode of transport to use. Furthermore, rather than asking participants to

make a single choice, as was done in the previous two studies, they were presented with a large number of consecutive choice trials, representing the repetitive nature of decision making. For each trial, the values of the trip-related cues were different. Participants were allowed to gather any information they wanted, and subsequently indicated their choice. Car choice habit was measured before participants started the information search task. Participants were categorized as having either a weak or a strong car choice habit. The mean numbers of car choices and trip-related cues consulted served as the dependent variables.

The results showed that car choice habit was strongly related to the number of car choices, corroborating the findings of the previous two studies. Furthermore, it was found that the number of journey-related cues consulted by participants before making travel mode decisions was affected by habit. That is, strong-habit participants searched for less information concerning characteristics of the trip across all trials than did weak-habit participants, suggesting that habitual choices are based on a small subset of trip-related cues necessary to make these choices.

Although the results of this experiment demonstrate that habit attenuates information search in the early stages of the decision process preceding travel mode choices, the results do not provide conclusive evidence with respect to the question of whether habit exerts an impact on the amount of information actually processed or used in making the decision. That is, an experimental setting involving the acquisition of information may reveal individuals' need for information, but it does not necessarily imply that their choices are based on that information (Billings & Marcus, 1983). Therefore, a fourth experiment was conducted to examine the number of trip-related cues utilized in order to make decisions about the usefulness of travel modes (Aarts et al., 1997).

Participants (undergraduate students) were given the travel goal of collecting some goods from a shop, and their task was to judge the favorability of using a bicycle for this trip. The values of the characteristics of the journey (e.g., travel distance, weather conditions) of the stimulus trip were presented on a computer screen. Furthermore, the possible values of the trip-related cues (e.g., travel distance was said to be either 5 or 10 km) were systematically varied, resulting in a large set of cue combinations and thus different travel situations to be judged. Then multiple regression analyses based on within-subjects covariations between the judgment of bicycle use and the trip cues were used to assess the contributions of the latter to predictions of bicycle evaluation. This paradigm is known as *policy capturing* (Brehmer & Joyce, 1988). The number of significant predictors constituted the dependent variable in a subsequent ANOVA. Bicycle choice habit was measured before participants started the judgment task, and participants were classified as having either a weak or a

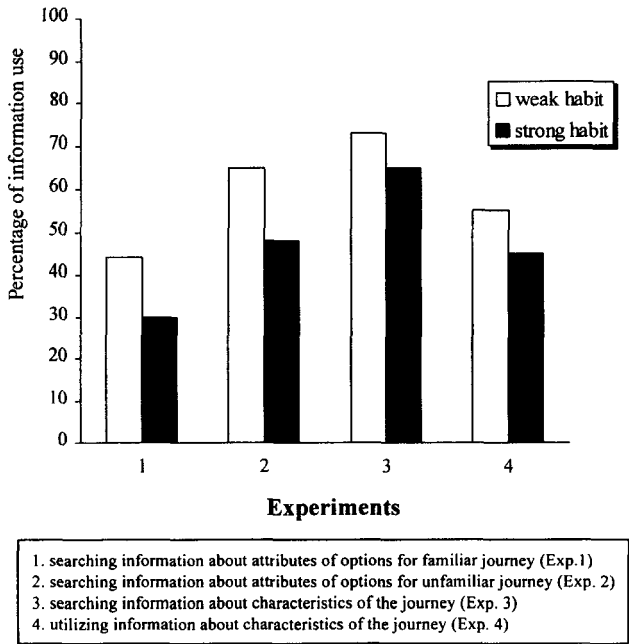


Figure 1. Percentage of information use as a function of habit strength for the different stages of the decision process.

strong bicycle use habit. The results showed that, on average, there were fewer significant predictors for strong-habit participants than for weak-habit participants. Moreover, strong-habit participants took the potentially relevant trip-related cues less consistently into account (i.e., there was greater variation in the beta weights for the predictors) than did weak-habit participants. These results indicate that when participants make decisions about the usefulness of a travel mode for a specific travel goal, strong-habit persons tend to use fewer relevant trip-related cues than do weak-habit persons.

In combination, then, the results of our four experiments suggest that when behavior is repeatedly executed and has become habitual, future decisions to perform that behavior are guided by a simple rule—doing things the way one did them frequently in the past. In other words, habitual choices tend to follow cognitive shortcuts, in the sense that little information is needed to consider options and to make a choice. Eventually, they may no longer require the consideration of characteristics of the choice situation and advantages and disadvantages of various alternatives. Instead, habitual behaviors are directly guided by highly accessible mental representations of the behavior upon goal

instigation. The mere activation of a goal may thus be sufficient to arrive at the habitual choice. Figure 1 presents an overview of the results of the four experiments in which the percentage of information use is displayed as a function of habit strength for the different stages of the decision process.

### Discussion

In the present article, we have considered several issues in attitude theory, behavioral decision-making theory, and theories about habitual and automatic behavior in discussing the role of habit in currently popular attitude-behavior models. We focused on the decisional processes underlying habits in terms of information use preceding habitual travel mode choices. It was argued that many important behaviors, such as travel mode choices, may become capable of being automatically activated by the situational context associated with that behavior. Such automatic activation will occur if an individual frequently and consistently pursues the same goal in similar settings; that is, if a behavior is performed many times in a stable context (Bargh & Gollwitzer, 1994; Ouellette & Wood, *in press*; Ronis et al., 1989). As noted before, frequent repetition of a behavior is critical for the development of a habit.

The point we would like to make is that as long as the same principles of learning and automatization apply, any type of repetitive behavior requires less and less mental effort and conscious attention, and may therefore eventually become habitual. Consequently, these behaviors may no longer be guided by deliberately formed intentions, but are accompanied by a rather limited process of decision making. Results of our own research program on travel mode choice behavior corroborate this proposition. Actually, the concept of habit may set a boundary condition for the applicability of the theories of reasoned or planned behavior in predicting and explaining repeated behaviors. When behavior is performed often and becomes habitual, subsequent actions need neither reasoning nor planning in order to occur. Instead, most habitual behavior arises without conscious intent, and proceeds efficiently and effortlessly. Of course, the recurrence of the behavior is contingent on the opportunity to perform that behavior under similar, if not identical circumstances. Therefore, habitual forces are probably less operational when behavior is novel or blocked by some objective constraints.

The literature on habitual behaviors draws attention to some important issues that need to be addressed in future research on habit. First, an important point concerns the direct impact of past behavior on later behavior. Obviously, the direct relation between past behavior and present behavior underscores the behaviorists' maxim that behavior is largely influenced by habit (e.g., Skinner, 1938; Watson, 1914). Behavior that has been performed repeatedly

and reinforced within a certain situational context tends to become habitual (i.e., as long as the behavior is frequently performed). As a consequence, subsequent behavior may be guided simply by stimulus-response associations. However, as some theorists have argued, prior and later behavior may correlate because other, unmeasured determinants (e.g., self-identity, personal moral beliefs) may operate on both occasions (Eagly & Chaiken, 1993; Ronis et al., 1989). Therefore, the observed shared variance between past behavior and future behavior does not provide strong evidence that the behavior in question is a matter of habit. On the other hand, studies finding an interaction between measures of habit and intention in the prediction of later behavior may reveal the role of habit more clearly. That is, deliberate intentions are less predictive of behavior as habit increases in strength (Triandis, 1980). Because this idea is seldom tested in studies of repeated behaviors, more research explicitly investigating the interaction between habit and intention in the prediction of future behavior is urgently needed.

Furthermore, most studies that examine the role of habit in repeated behaviors report statistical associations between measures of habit, attitudes, intentions, and behavior, but, as noted before, *do not* reveal the processes underlying these relations. In other words, little empirical attention is given to the cognitive processes underlying habitual behaviors. In the present paper, we presented the results of a series of experiments investigating different phases and aspects of the process of information use preceding habitual travel mode choice. To the extent that the observed pattern of predecisional information use captures decision processes underlying behavior, the results of the experiments suggest that habitual choices do indeed tend to follow cognitive shortcuts. Presumably, for strong-habit individuals, the instigation of the goal to act was sufficient to arrive at the habitual choice. Of course, the cognitive processes underlying habitual choices need to be studied further in other behavioral domains.

Another perhaps more specific way to investigate the automatized cognitive mechanism involved in habit is to employ a response time paradigm. For instance, individuals could be briefly presented or "primed" with a sample of representative situations (behavioral goals) eliciting a specific behavior (e.g., travel behavior). For each situation, they could be required to respond as quickly as possible with the behavioral alternative that first comes to mind (e.g., traveling to work may immediately evoke bicycle use). The speed of retrieving a specific action in response to the presented situations should be indicative of the strength of the habit of performing that behavior. In other words, it is assumed that the reaction time to make a behavioral decision in a specific situation is an index of habit strength because speed increases with stronger associations in memory between the situation and one's behavior (cf. the research on attitude strength; Fazio et al., 1986).



It is proposed, then, that as the frequency of performing a specific behavior in a given situation increases, so does the speed of retrieving the behavior in the presence of that situation. Indeed, in a recent series of experiments, we tested and confirmed this idea (Aarts & Dijksterhuis, 1997). Additionally, the frequency of responding with a particular behavioral alternative across the presented situations may reflect the extent to which the habit of choosing that alternative is generalized, and constitutes a dominant element in the mental representations of past choices and actions in that behavioral domain (Aarts et al., 1997; Verplanken, Aarts, van Knippenberg, & van Knippenberg, 1994; Verplanken et al., 1997).

Finally, despite the fact that many important behaviors are repeatedly and routinely executed in everyday life, for some reason the role of habit is relatively underrepresented in social psychological research on the determinants of goal-directed behaviors. This may be a result of the fact that the shared variance between past and future behavior does not add much to our understanding of the concept of habit, or of the fact that habits are difficult to study and to operationalize in terms of the cognitive processes involved. Nevertheless, going beyond the adage that "Past behavior is the best predictor of future behavior" (as we have attempted to do in the present paper) may be a first step to revive interest in the concept of habit. In an effort to understand the habitual nature of repeated decision making, one may no longer ask oneself what the reasons are for the decision, but rather how one arrives at that decision. It is hoped that the present analysis of habitual behaviors will encourage researchers and practitioners to find new pathways to understand repetitive performed behaviors in general, and habits related to health, safety, and the environment in particular.

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