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Habit and information use in travel mode choices

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Abstract

This study focuses on the role of habit in the process of information use underlying daily travel mode choices. Based on the 'policy capturing' paradigm, eighty-two students performed a multiattribute travel mode judgment task, in which they could use information about travel circumstances in order to make a number of judgments. Measures of information use were obtained by performing multiple regression analyses for each subject. It was found that habit reduced the elaborateness of information use in judgments of travel mode use. This effect was independent of effects of manipulated accountability demands.

PsycINFO classification: 3000; 3600

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1. Introduction

Despite the observation that many behaviors are executed on a daily routine basis, the greater part of psychological research pursues to explain and understand behaviors that people do not perform frequently. As a consequence, decisions to perform a given behavior are often considered as being based on reasoned considerations of the good and bad consequences of that behavior. Expectancy-value models (see, e.g., Feather, 1982) describe how perceptions of these consequences are weighted and combined into a final

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decision. Thus, these models emphasize the deliberate character of individual decision making.

Although many routinized decisions may have originated from reasoning, individuals do not go through such a deliberate decisional process when they make the same decisions over and again (Aarts et al., in press). For instance, Triandis (1980) suggests that attitudes (which are supposed to be based on the reasoned considerations of performing the behavior) may become irrelevant in guiding behavior when the behavior has been performed repeatedly, and has become habitual (see also, Ronis et al., 1989). In other words, when the same behavior is performed many times, one does not need to weigh pros and cons, or to check one's attitudes in order to arrive at a choice. When habits are formed, subsequent behavior may be associated with, and automatically triggered by, the specific situational cues that normally precede it.

The present study focuses on travel mode choice behavior in order to test theoretical propositions as to *habitual decision making*. In particular, we are interested in the role of habit in information processing underlying daily travel mode choices. Like many behaviors routinely performed in every day life, travel mode decisions are supposed to be often made in a rather 'mindless', automatic fashion (e.g., Banister, 1978; Goodwin, 1977; Verplanken et al., 1994). In other words, travel behavior is often habitual.

Generally, psychologists conceptualize habits as the learning of sequences of acts that have become automatic responses to certain situations, which may be functional in order to achieve a given result, or to obtain specific goals (e.g., James, 1890; Triandis, 1980; Ronis et al., 1989; Watson, 1914). Habits are characterized by a goal-directed type of automaticity; habitual behaviors are instigated by a specific goal-directed state of mind in the presence of triggering stimulus cues, for instance kissing one's spouse when coming home from work, or as in the present context, taking the bicycle to travel to the university. Once evoked by the very goal to act, decisions on courses of actions and their subsequent execution may be enacted without much deliberation, and are therefore relatively independent of reasoned considerations. Thus, travel mode choice habit may be conceived of as the rather automatic and immediate activation of the habitual travel mode option upon the instigation of the goal to travel (cf. Bargh and Gollwitzer, 1994).

Research carried out in the last two decades in a variety of domains has witnessed the importance of the habit concept in the explanation of repeated behaviors. Several studies have demonstrated that a measure of past behavior or habit predicts repeated behavior along with traditional predictors, such as attitudes (see Eagly and Chaiken, 1993). Furthermore, there are a still growing number of studies that empirically corroborate the idea that habit and attitudes interact in the prediction of later decisions, i.e. attitudes are less predictive of behavior as habit increases in strength (e.g., Mittal, 1988; Montano and Taplin, 1991; Verplanken et al., 1994; cf. Triandis, 1980).

Theoretically, the relations between attitude, habit and later behavior, as discussed above, suggest that the decisional process underlying behavioral decisions is less elaborate as habit increases in strength. That is, when habit is strong, cognitive efforts may be reduced to a minimum, as incoming informational cues relevant for the decision to perform the behavior may be less scrutinized before individuals make a decision. Returning to the case of travel mode choice: the habitually used travel mode (e.g., bicycle) is capable of being immediately activated upon the instigation of a specific goal to travel (e.g., having to go to the university), without the need to ponder on the details of the trip. However, we rarely use a particular mode for one purpose only, but instead, may use the same mode of transportation repeatedly in a variety of circumstances and for many different travel goals. By the same token, that travel mode may be habitually used for all sort of trips, and thus immediately chosen upon the mere incitement of any goal to travel. One might say, therefore, that the habit of using a particular mode of transport is generalized across situations (Aarts, 1996; Verplanken et al., 1994), and the need to distinguish between travel purposes and circumstances may diminish (cf. the concept of stimulus generalization in learning theory, Hull, 1943). In the field of consumer choice behavior it is well recognized that repeated purchase behavior may be habitual under quite different circumstances (e.g., ordering the same drink, irrespective of the bar where you are), which is characterized by a limited process of information use in decision making (e.g., Engel et al., 1993).

However, to our knowledge, there is little research that has actually examined the process of *information use* that accompanies habitual decisions. Therefore, the present study investigates the effects of habit on information processing during judgments of travel mode use.

1.1. Habit and the use of information

One way to investigate decision makers' strategies of information use was to present them with choice options that systematically vary on a number of attributes to measure their evaluations of the options. One may subsequently infer decision strategies by means of multiple regression analyses based on within-subjects information – evaluation covariations. This paradigm is known as *policy capturing* (Brehmer and Joyce, 1988). The values of the attributes that are systematically varied yield a set of attribute combinations, which are referred to as profiles. In our case, the evaluation of using a travel mode for a specific travel goal consisted of attributes about the circumstances under which the journey is made, i.e., travel distance, departure time, weight of luggage, and weather conditions. A travel situation might be described, for example, as a distance over 2.5 kilometers, departure time at 9:00 a.m., weight of luggage of 4 kilograms, and rain. Given a sufficient number of different travel situations to be judged, a linear regression analysis can be performed for each individual to describe the relation between the informational input (attributes) and the judgments.

These regression analyses reveal for example how consistently the information is processed [as indicated by the proportion of variance (R^2) in a subject's judgments accounted for by a linear combination of the attributes], or which attributes are used for the evaluations of options (as indicated by the significance of their beta weights). The obtained beta weights represent the relative importance of attributes for a subject's judgments. A beta weight thus reflects the extent to which a judge has taken into account the value of that attribute in making the judgments. In short, the researcher attempts to draw inferences regarding the strategy the subject adopted in utilizing the presented informational cues on the basis of the latter's predictive value. The policy capturing paradigm has been applied to a variety of judgment tasks in many application fields (see for an overview Brehmer and Joyce, 1988).

For the present purpose, the number of cues used by a subject might be employed as a measure of cognitive effort or information use (e.g., Weldon and Gargano, 1988). A larger number of significant beta weights is indicative of relatively extensive information processing strategies. However, the number of significant beta weights may reflect different psychological aspects, for the measure may be related to other statistical features that can be derived from the regression analysis. That is, there may be distinctive cognitive processes that operate during decision making and affect the number of significant beta weights associated with the attributes. One possible reason has to do with consistency of attribute information processing. Higher levels of consistency (R^2) increase the accuracy of prediction, and thus the probability of significance of beta weights. Another, for the present purpose more relevant possibility concerns the extent to which subjects allocate equal importance to attributes, that is the subject's sensitivity to a broad range of potentially relevant trip-related cues. Taking the attributes more equally into account enhances the number of significant beta weights, basically because, other things being equal, the subject focuses on more attributes. Conversely, selective or unequal allocation of importance to attributes (or, taking less attributes into account) reduces the number of significant beta weights. Therefore, to scrutinize the process of information use in more detail, both consistency of information use and the equality of allocation of importance to attributes are used as complementary measures of information use.

In line with previous findings concerning the effects of habit on repeated decision making, it is the purpose of this study to test the hypothesis that habit is negatively related to the elaborateness of information processing preceding judgments of travel mode use. This study focused on the judgment of bicycle use for short distance trips. It is expected that individuals who have developed a strong bicycle choice habit apply less elaborate information processing strategies compared to those who have not developed such a habit.

Habit can be considered as a person-related, stable factor, which affects the decision making process on a recurrent basis. That is, once habits toward a particular behavior are formed, individuals will engage in minimal information processing each time when they encounter comparable situations that call for the same behavior. However, the depth of the decision making process may be also contingent on situational factors, for example, when the decision has significant consequences for the individual. For that reason, it seems conceivable that even people with strong habits may occasionally be motivated to base their decisions on relatively more extensive information processing. In the present study an attempt is made to experimentally enhance the depth of information processing that underlies travel mode choices by introducing situation-specific demands. This was done by manipulating perceived accountability for one's judgments. It is assumed that accountability motivates people to scrutinize informational input for its relevance to their judgment task in order to appear logical and thoughtful (e.g., Tetlock, 1985; Weldon and Gargano, 1988). We expect that both habit and accountability would be related to the process of information use, i.e. habit is expected to lead to less elaborate information processing, while accountability is expected to enhance the depth of information use.

2. Method

2.1. Subjects and design

Subjects were 82 students of the University of Nijmegen. Because their task was to evaluate the usefulness of the bicycle in different travel situations, only subjects who owned a bicycle were recruited. Subjects received Dfl. 7.50 for their participation. The design of the experiment is a 2 (Habit: strong versus weak) × 2 (Accountability: accountable versus not accountable) between-subjects design. ANOVAs were conducted according to this design. Subjects were randomly assigned to the accountability conditions.

2.2. The measurement of bicycle choice habit

Habit of bicycle use was measured by a method used in previous studies (see, Aarts, 1996; Verplanken et al., 1994, Verplanken et al., in press). Subjects were presented with 9 globally described trips (e.g., 'Going shopping to a supermarket', 'Visiting friends'), and were required to mention for each trip as quickly as possible the first mode of transportation that came to mind as the one they would use from four alternatives, i.e. walking, bicycle, train, and bus. The trips were randomly presented. It should be noted that the present instrument assesses the extent to which habit is generalized, rather than a goal (or trip) specific habit. The rationale underlying this operationalization is the assumption that habitual responses are guided by retrieved mental representations of past travel behavior (cf. schemas or scripts; Abelson, 1981). That is, when for example an individual habitually chooses and uses the bicycle for a great variety of travel goals, by the principle of associative learning, these travel goals may become capable of activating bicycle use automatically (Aarts and Dijksterhuis, 1995; cf. Bargh and Gollwitzer, 1994). The imposed time pressure and the instruction to respond with the choice that immediately comes to mind may further facilitate the automatic nature of responding and the reliance on cognitively available structures (Kruglanski and Freund, 1983). When the general habit of bicycle choice is strong, the choice of bicycle as travel mode may constitute a dominant element in the mental representations of travel behavior, which is supposed to be reflected in a relatively large number of bicycle choices across the presented journeys. Hence the frequency of mentioning the bicycle served as a measure of general habit for choosing the bike; the habit measure thus varies from 0 to 9. The mean score across the sample was 5.06, $sd = 1.44$.

The sizable correlation between the measure of general bicycle habit and an index of choice variability [computed as: $\sqrt{\Sigma(X_i)^2}$, where X_i is the frequency of mentioning each possible mode option across the 9 trips in the habit measure], $r = 0.89$, $p < 0.001$, suggests that a strong bike habit is associated with a high level of invariance across the presented trips (i.e., subjects chose the bike fairly invariantly), whereas a weak bike habit is reflected in a high variability of travel mode choices. In other words, when general habit of bicycle use increases in strength, that mode is tend to be chosen irrespective of the travel goal. Conversely, as general bike habit decreases in strength, subjects exhibit a more variable mobility pattern across the presented travel goals. This means that, at least in the present study, a weak bicycle habit tends to coincide with the absence of a specific travel mode habit rather than with the presence of another, competing, travel mode habit.

Furthermore, inspection of the distribution of the habit measure revealed a skewness to the left (skewness = −0.59). Only 5 subjects (6%) mentioned less than 2 times 'bicycle'. Given the a priori chance expectation of choosing a particular mode, i.e. 2.25 (9 trips/4 alternatives), these results suggest that lower scores on the habit measure indicate a relatively weak general habit of bicycle use, rather than a general habit of *not* using the bike. On the basis of a median split of the measure of bicycle habit subjects were categorized as weak, or strong concerning bicycle choice habit.

The habit measure has been used and validated in a study on commuters' car choice behavior concerning innercity job trips (Aarts, 1996). The results of this study showed that the habit measure (which was used to assess car use habit) correlates substantially with self-reported frequency of past car use in general ($r = 0.66$; $p < 0.001$), i.e. an important determinant of habit strength (Triandis, 1980). In addition, the habit measure could be differentiated from general preference or attitude toward car use, as indicated by a relatively low correlation between the two ($r = 0.32$; ns). Furthermore, the measure satisfactorily predicted the frequency of car use for commuting to one's job over a five days period ($r = 0.60$, $p < 0.001$), even when the measure was controlled for respondents' attitude toward using the car. Moreover, a sizable test-retest correlation over a 4 months period reveals the reliability of the habit measure ($r = 0.92$; $p < 0.001$). In sum, these findings suggest that the habit measure satisfies the criterion of both validity and reliability.

2.3. Procedure and task

The experiment was run on computers. Subjects worked in separate cubicles. First, habit of bicycle use was measured, which was followed by an unrelated fillertask to familiarize subjects with the computer and handling the 'mouse'. Subsequently, subjects received a description of the travel mode judgment task in which they learned to respond to a series of travel situations concerning the goal of picking up some goods somewhere and turning back. After instructions for the task, the experimental manipulations of *accountability* were implemented. Half of the subjects were told that they had to explain their judgments at the end of the experimental session to the researchers conducting the study. Subjects were then presented with the travel mode judgment task. For each travel situation subjects read the description of a travel situation and indicated their judgment of the favorability of using the bicycle in that particular situation. After the judgment task they responded to a manipulation check and were debriefed.

2.4. Stimulus material

The stimuli consisted of 16 descriptions of travel situations. Each situation was described with four attributes, each of which could have two values, i.e., weather conditions (rain, no rain), weight of luggage (4 kilograms, 20 kilograms), departure time (9:00 a.m., 2:00 p.m.) and distance (one way) to the destination (2.5 kilometers, 5 kilometers). The values were combined across the attributes according to a fully balanced design, resulting in the construction of 16 travel situations. In this particular design the attributes are uncorrelated. Multiple linear regression analyses will therefore yield direct estimates of attribute use. The order of presentation of attributes was varied. For half of the subjects the order in which the attributes were presented was: weather, weight, departure time, and distance, whereas the order for other subjects was: departure time, distance, weather, and weight. The 16 travel situation descriptions were randomly presented.

2.5. Dependent measures of information use

Subjects indicated their favorability of using the bicycle in each travel situation on a 10-point scale ranging from 'unfavorable' (1) to 'favorable' (10).

Three characteristics were assumed to reflect aspects of the process of information use: (1) the number of attributes used; (2) the consistency concerning the processing of attributes; and (3) the extent to which equal importance is allocated to attributes. All indices were obtained by two steps. First we performed a linear multiple regression analysis across the 16 judgments for each subject. In these analyses subjects' judgments of favorability of bicycle use were regressed on the attribute values (coded 1 or 2), as is the usual procedure in this paradigm. The obtained beta weights represent the direct contribution of each attribute in subjects' judgments across the 16 trips. Moreover, the significance of a beta weight indicates whether the attribute was actually used. Therefore, a measure of *the number of attributes used* is represented by the number of significant beta weights, which may thus vary between 0 and 4.

The proportion of variance in each subject's judgments accounted for by the four attributes (R^2) may serve as a measure of *consistency of information use*. When R^2 is large, there is little variance in the judgments that cannot be explained by a linear combination of the attributes.

Next, we calculated the standard deviation of the relative beta weights, which can be interpreted as the extent to which subjects allocate *equal importance to the attributes*. It should be noted that, contrary to the number of attributes used, the measure of the standard deviation of relative beta weights involves all beta weights, and not only significant ones. Procedurally, first the relative beta weights were computed as the ratio of the absolute beta weight for each attribute to the sum of absolute beta weights across all four attributes. Since the sum of the relative beta weights is one, each beta weight reflects the relative importance allocated to the respective attributes. Theoretically, when subjects weight the attributes as equally important the standard deviation is 0, and the relative beta weights are 0.25, 0.25, 0.25, 0.25. When subjects weight the attributes differently in importance, the standard deviation is high. In the extreme case the standard deviation is 0.5, and the relative beta weights are, for example, 1, 0, 0, 0 (one attribute is given all weight). A low value of the standard deviation therefore implies a relatively equal allocation of importance, whereas a high value of standard deviation reflects unequal or selective allocation of importance.

In the introduction section it was argued that the number of attributes used may be affected by consistency of information use and the equality of allocation of importance to attributes. Pearson correlations showed that the measures of R^2 and standard deviation of relative beta weights indeed significantly correlated with the number of significant beta weights, correlations being 0.37, $p < 0.001$, and -0.48, $p < 0.001$, respectively. These results thus suggest that when both the level of consistency and equality of allocation of importance to attributes increases, so does the number of attributes used.

3. Results

3.1. Manipulation check

As a check on the accountability manipulation, subjects were asked to respond to the question: "To what extent did you feel a need to make judgments that you could explain?" Responses were given at an 11-point scale ranging from "not at all" (1) to "very strongly" (11). Responses to the manipulation check suggested that accountable subjects felt a stronger need to explain their judgments ($m = 6.11$) than not-accountable subjects ($m = 4.55$), $t(78) = 2.82$, $p < 0.01$.

3.2. The use of information

Table 1 presents an overview of the means and standard deviations for the dependent measures for each cell in the design.

As Table 1 shows, on average the highest beta weight was obtained for weather conditions, followed by weight of luggage, distance and time of departure. On average 2.0 beta weights were significant. According to the average number of significant beta weights of the four attributes 92% of the subjects used information about the weather

Table 1
Means and standard deviations (between parentheses) for dependent variables by habit and accountability

	Weak habit		Strong habit		Grand mean
	Not account.	Account.	Not account.	Account.	
Beta weights for					
Weather	0.57 (0.24)	0.63 (0.20)	0.63 (0.18)	0.56 (0.30)	0.60 (0.23)
Weight	0.37 (0.27)	0.42 (0.20)	0.36 (0.27)	0.46 (0.31)	0.40 (0.26)
Distance	0.23 (0.17)	0.28 (0.14)	0.22 (0.19)	0.17 (0.16)	0.23 (0.17)
Departure time	0.14 (0.10)	0.09 (0.07)	0.09 (0.08)	0.10 (0.07)	0.10 (0.08)
Number of significant beta's	1.91 (0.89)	2.42 (0.65)	1.71 (0.46)	1.88 (0.62)	2.00 (0.72)
R^2: explained variance	0.70 (0.16)	0.76 (0.10)	0.72 (0.11)	0.77 (0.15)	0.74 (0.13)
Standard deviation betas	0.22 (0.09)	0.20 (0.05)	0.24 (0.04)	0.26 (0.07)	0.23 (0.07)
Mean judgment of favorability	6.40 (1.42)	5.21 (1.65)	6.90 (1.58)	6.33 (1.33)	6.17 (1.62)

conditions, 68% about the weight of the luggage, and 38% about the distance. Information about departure time was virtually not considered (2%). Inspection of the size of beta weights and their significance thus showed the same pattern of results as to the order of importance.

In an analysis of variance on the number of significant beta weights, the main effects of Habit and Accountability were both significant. Weak habit subjects used more attributes than strong habit subjects, $F(1,78) = 5.64$, $p < 0.03$ (mean scores respectively 2.18 and 1.78). Accountable subjects used more attributes than subjects who were not held accountable, $F(1,78) = 5.58$, $p < 0.03$ (mean scores respectively 2.20 and 1.81). The effects of habit and accountability on the number of attributes used were independent, as was indicated by a non-significant interaction, $F(1,78) = 1.35$, ns.

For accountable subjects R^2 was slightly higher than for not-accountable subjects, as was established by a marginal significant main effect, $F(1,78) = 3.68$, $p < 0.06$ (mean scores respectively 0.77 and 0.71). In the policy capturing paradigm, a larger R^2 is interpreted as indicating more consistent information processing. These results thus suggest that accountable subjects were more consistent information processors. There was no significant effect of Habit, $F(1,78) = 0.24$, ns, and no significant interaction, $F(1,78) = 0.09$, ns (overall $M = 0.74$; $sd = 0.13$). It may be argued, however, that a low R^2 does not necessarily imply that judges are inconsistent, but that they employ a strategy which cannot be captured by a linear additive model (Brehmer, 1994; Stewart, 1988). For instance, the effect of one attribute on an individual's judgment may depend on the specific level of a second attribute (i.e., the two attributes interact in the prediction of the judgments). Such strategy is described as noncompensatory, and can be measured by testing whether the increment in R^2 is significant when the interactions among attributes are added to the regression model (cf. Stone-Romero and Anderson, 1994). In order to test whether accountability is related to such an increment in R^2, for each subject all first-order interactions among attributes were added to the original predictors (i.e., main effects) in the regression analysis. However, simple t-test revealed no significant increment in R^2 due to accountability. Moreover, using a measure of total explained variance (i.e., adding the R^2 of interaction terms to the R^2 of main effects) in the analyses of variance yielded exactly the same pattern of results.

Concerning the standard deviation of the relative beta weights, the results of the analysis of variance revealed a significant main effect of Habit. The standard deviation was lower for weak habit subjects than for strong habit subjects, $F(1,78) = 6.52$, $p < 0.02$ (mean scores respectively 0.21 versus 0.25). This suggests that weak habit subjects divided their allocation of importance more equally across attributes compared to strong habit subjects, who were more selective in using the cues. No significant main effect of Accountability, $F(1,78) = 0.07$, ns, and no significant interaction, $F(1,78) = 1.97$, ns, was found on the standard deviation (overall $M = 0.23$; $sd = 0.07$).

The above pattern of results suggests that the effects of habit and accountability on the number of attributes used may have been produced by different processes, especially since no significant interaction was found on the dependent measures. Specifically, accountability may enhance the number of significant beta weights, due to an increase in consistency, whereas the effects of habit on the number of significant beta weights may be caused by a decrease (higher standard deviation) in equality of allocation of importance to attributes. Recall that the measures of consistency and equality were both significantly correlated with the number of attributes used.

To explore this line of reasoning the effects of habit and accountability on number of attributes used were subjected to two separate analyses of variance in which a hierarchical decomposition procedure was used. In this procedure, the subjects' scores on the number of attributes used (i.e., significant beta weights) were first controlled for either the measure of consistency or equality. Subsequently, the effects of habit and accountability were tested.

After partialling out the consistency measure there was no longer a significant effect of Accountability on the (corrected) number of attributes used, $F(1,77) = 2.63$, ns, while the main effect of Habit and non-significant interaction were retained, $F(1,77) = 7.59$, $p < 0.01$, and $F(1,77) = 1.27$, ns, respectively. This results suggests that the effect of accountability on the number of attributes used is produced by the increase in consistency of information use.

Conversely, after controlling for the equality measure, the analysis revealed the opposite pattern. As anticipated, now the effect of Habit on the (corrected) number of attributes used was no longer significant, $F(1,77) = 1.85$, ns, whereas the main effect of Accountability and non-significant interaction were retained, $F(1,77) = 5.78$, $p < 0.02$, and $F(1,77) = .36$, ns, respectively, suggesting that the effect of habit on the number of attributes used is caused indeed by the decrease in the equality of allocation of importance to the attributes.

3.3. Outcome of decisional process: judgments of bicycle use

As can be seen in Table 1, the mean judgment of favorability across the 16 trips was 6.17 ($sd = 1.62$), indicating a moderate preference for the bike. Subjecting the means across the 16 judgments to a multivariate analysis of variance (MANOVA) revealed that strong habit subjects judged the usefulness of bicycle slightly more favorable than weak habit subjects, $F(16,63)$, 1.73, $p < 0.07$ (mean scores respectively 6.66 and 5.77). Hence, habit does affect decision outcome. There was no significant effect of Accountability, $F(16,63) = 0.90$, ns, and no significant interaction, $F(16,63) = 0.41$, ns.

4. Discussion

In line with other studies on habitual behaviors the results of the present study indicates that habit affects the elaborateness of decision making concerning travel mode use. In comparison to weak habit students, strong habit students used fewer attributes about the circumstances under which the trip had to be made. In addition, strong habit individuals were more selective in using the information of the attributes of choice options than weak habit individuals. These results suggest that habitual travel mode choices are based on a small subset of trip-related cues necessary to make these choices. Moreover, this finding may bear on the strategies individuals employed in trading off the attributes' values. That is, when confronted with the goal to travel, strong habit persons tend to use heuristic and low effort strategies to arrive at decisions about using that mode, whereas weak habit persons seem to apply more complex and cognitively demanding strategies. More generally, habitual choices tend to follow cognitive shortcuts.

In addition to the effects of habit, accountability led to a more effortful mode of processing during judgment: subjects who had to explain their judgments used more attributes and seemed to process the information more consistently than those who were not accountable. This is generally consistent with studies demonstrating that people expend more cognitive effort on judgments and decisions for which they feel personally accountable (e.g., Chaiken, 1980; McAllister et al., 1979; Tetlock, 1983; Weldon and Gargano, 1988).

Habit and accountability demands were both related to the depth of information processing, though their effects were independent. Specifically, accountability increased the number of attributes used by subjects as well as their consistency in using the information, whereas the latter effect was not obtained for habit strength. On the other hand, it was found that the equality of allocation of importance to trip-related cues and the decision outcome was affected by habit, but not by accountability. These results thus suggest that both factors affect the process of information use in different ways. It may be that accountable students anticipated that they had to inform the experimenter about their judgment strategy, e.g., which attributes were considered and how those attributes influenced their judgments. Hagafors and Brehmer (1983) argued that people usually lack insight into such judgment processes (see also Nisbett and Wilson, 1977). However, when asked to describe how they arrive at their judgments, judges may switch to more analytical strategies, i.e., a mode which is consistent and retrievable, irrespective of the strength of habits to come to such conclusions (cf. Tetlock, 1985). Hagafors and Brehmer (1983) showed that having to justify one's judgment led to higher consistency in the use of information, which seems to have been the case in the present study as well. Whereas strong and weak habit subjects may have differed in the extensiveness of processing strategies, as has been argued before, the accountability manipulation may have motivated subjects to maintain consistency in their judgments. This line of argument was more or less supported by follow-up analyses.

In the present study, a policy capturing technique was used to establish, for each subject separately, how across 16 situations favorability judgments can be predicted on the basis of the 4 attributes of the travel situation. It may be argued that the within-subjects ratio of observations (16) to predictors (4) may have been too low to expect reliable estimates of beta, as a result of which any habit or accountability effect on the use of information in judgment may also have been unreliable. It should be noted, however, that our main analysis does not use magnitude of betas per se, but their significant deviation from zero which as such is not subject to chance capitalization biases. More importantly, in all effects described the multiple regression parameters were subjected to ANOVA in between-subjects design. Hence, all reported effects may be scrutinized in terms of the suitability of the use of ANOVA, whilst the reliability of beta or multiple correlation estimates is immaterial in assessing the validity or reliability of the ANOVA results.

It should be noted that the present study focused on judgment, rather than choice. Although choice and judgment are often treated as equivalent, it has been argued that the psychological processes underlying choice and judgment may not be equal (e.g., Abelson and Levi, 1985; Billings and Scherer, 1988; Einhorn and Hogarth, 1981). One point that may be particularly relevant for the present purpose is that judgment usually elicits a more deliberate mode of processing than choice, since judgment does not necessarily encourage subjects to use simplifying, heuristic strategies as may be often the case in a choice context. Therefore, judging the performance of a specific behavior may be less habitual than deciding to perform a specific course of action. In recent experiments (see, Verplanken et al., in press) we investigated the effects of habit on predecisional information search behavior in travel mode *choice* tasks. The results showed that, in comparison to weak habit persons, strong habit persons acquired less information about attributes of options as well as trip-related cues before they decided which travel mode to use. Thus, it appears that habit attenuates the elaborateness of information processing in both judgment and choice, suggesting that habit affects various parts or aspects of the decision process.

Another point that needs to be addressed is that, in the present study, the bicycle choice habit measure was only weakly related to favorability (or preference) ratings of bicycle use. However, it should be emphasized that the relationship between habit and favorability (or preference) should not be too strong (see also, e.g., Aarts, 1996, study 2; Verplanken et al., in press). That is, while favorability judgments and preferences usually cover the domain of reasoned thinking, habit strength is supposed to reflect much of the unreasoned, more or less automatic tendency to make choices or perform behaviors the way we did them in the past. Thus, habit should be distinguished from favorability (or preference) on both empirical and conceptual grounds. It is not implausible, though, that this past behavior as well as our current, habitual tendency to copy it, also contains a rudimentary component of what we explicitly prefer to do or tend to judge favorably (representing why we may have originally performed this behavior in the first place). The latter explains the low, sometimes significant, sometimes nonsignificant relationships observed between habit and favorability judgment (or preference).

Finally, in the present study we used an instrument to measure habit that relies on the assumption that habitual behavior is guided by automatically retrieved mental representations of past choices and actions in that behavioral domain (Bargh and Gollwitzer, 1994). Moreover, the instrument assesses the extent to which habit is generalized, rather than a goal specific habit. The measure satisfied the criterion of both validity and reliability (Aarts, 1996). Yet, it may be worthwhile to elaborate somewhat on the question what it really means to have a 'general habit'. First, general habit implies invariance of choices across situations within a behavioral domain: when general habit is strong the same behavioral option (e.g., bicycle) is chosen in quite different situations (e.g., travel goals), whereas a weak general habit may reveal in the use of multiple behavioral options in various situations. Secondly, it was found that general habit diminishes the need to explore the circumstances of the behavioral situation (e.g., traveling). Taken together then, when the habit of using a particular behavioral option is generalized, that behavioral option is capable of being activated immediately in the presence of a wide range of behavioral situations that are chronically encountered; and the decision to use this option can be made without pondering on the details of these situations. This may explain why subjects took the trip-related cues more equally into account (and thus used more cues) in the case of a weak (or absence of a) general habit, as they have to 'discriminate' more strongly between different travel purposes and circumstances to come to a choice than those indicating a strong general habit.

Of course, habitual behavior requires further study. First, the validity of the generalized measure of habit may be further established in for instance reaction time paradigms. It may be expected that habitual choices are more easily accessible and thus faster retrievable from memory. More importantly, further research should be conducted to shed more light onto the cognitive processes underlying habitual choices, particularly as regards how habitual behaviors are mentally represented and how these representations guide subsequent decisions.

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