Effecting Durable Change: A Team Approach to Improve Environmental Behavior in the Household

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EFFECTING DURABLE CHANGE
A Team Approach to Improve Environmental Behavior in the Household

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ABSTRACT: Interventions for voluntary proenvironmental behavior change usually target a limited number of behaviors and have difficulties in achieving durable change. The EcoTeam Program (ETP) is an intervention package that aims to overcome these flaws. Through a combination of information, feedback, and social interaction in a group—the EcoTeam—participants focus on the environmental consequences of their household behavior. The 3-year longitudinal study found that ETP participants (N = 150) changed half of the 38 household behaviors examined, with corresponding reductions on four physical measures of resource use. These improvements were maintained or enlarged 2 years after completion of the ETP, amounting to savings from 7% on water consumption to 32% on solid waste deposition. A detailed analysis of one behavior, means of transportation, suggests that change can be predicted from the interplay between behavioral intention and habitual performance before participation, and the degree of social influence experienced in the EcoTeam during participation.

Keywords: *proenvironmental behavior; intervention; intention; habit*

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Over the past 30 years, concern about the environment has led to an impressive number of actions intended to reduce or reverse environmental degradation. A host of initiatives are being taken, large scale and small scale, top down and bottom up, spanning the whole range from international agreements and legislation to gently suggesting that a neighbor recycle paper instead of throwing it away. This research report is concerned with the latter category: voluntary individual adoption of proenvironmental behavior in the household.

After summarizing the major findings concerning the effectiveness of interventions for voluntary proenvironmental behavior change, the introduction describes a combination of interventions that according to some theorists should improve on earlier efforts. A recently developed intervention package, the EcoTeam Program (ETP), seems to meet the criteria proposed by these theorists. This article evaluates what happened among those who responded favorably to an invitation to participate in the ETP.

THE EFFECTIVENESS OF INTERVENTIONS TO PROMOTE PROENVIRONMENTAL BEHAVIOR CHANGE

In the past 25 years, considerable research has been conducted investigating the effectiveness of intervention techniques to increase proenvironmental behavior. Three review articles (De Young, 1993; Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Schultz, Oskamp, & Mainieri, 1995) give an account of what has been accomplished in this field. Each article offers similar conclusions: (1) In the relatively few cases that behavioral maintenance was investigated, persistence of voluntary proenvironmental behavior change was rare. For example, Dwyer et al. (1993) concluded that out of 54 studies they analyzed, only 2 showed an intervention to retain its effectiveness 12 weeks after the treatment phase expired. (2) Intervention studies generally target only one or a few behaviors, and thus have limited scope.

Earlier studies (see, e.g., Luyben, 1980) reflected the hope that the conditions that affect some proenvironmental behaviors will make other behaviors

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also susceptible to change because of the shared elements of their respective supporting conditions. Recently, a less optimistic view prevails. Specifically, the authors of the three review articles (De Young, 1993; Dwyer et al., 1993; Schultz et al., 1995) stated that it is largely unknown, and probably very questionable, whether response generalization occurs from the specific behavior that is targeted by an intervention technique to other behaviors that affect the environment. In nonintervention studies a lack of commonality across proenvironmental behaviors was reported by Siegfried, Tedeschi, and Cann (1982), who found that four different proenvironmental behaviors (lowering thermostats, using less hot water, purchasing environmentally safe products, and avoiding the use of unnecessary lights) were explained by different predictor variables. Similar findings were reported by McKenzie-Mohr, Nemiroff, Beers, and Desmarais (1995; see also Stern & Oskamp, 1987). This lack of commonality seems to exist also among behaviors that have the same goal, such as reducing waste (Ebreo & Vining, 2001), and even among behaviors that imply similar acts, such as recycling aluminum cans when paper recycling is the target (Schultz et al., 1995). Ludwig and Geller (1997) suggest that response generalization may occur as a result of an intervention that employs a participative goal-setting technique. However, to our knowledge, use of this technique has not yet been documented in studies on proenvironmental behavior change (see also Vining & Ebreo, 2002, p. 551).

Considering the many behaviors that need to change if we are to achieve a sustainable society, the issues of durability and the behavioral scope of interventions are of utmost importance. Intervention techniques that only change one specific type of behavior, and then only for the duration of the intervention, have limited practical value (cf. Geller, 1987; Stern & Oskamp, 1987). De Young (1993) urged researchers to focus on developing intervention techniques that create self-sustaining change. Subsequently, De Young (1996) argued that durable proenvironmental changes can be facilitated by devising techniques that combine (a) detailed procedural information, (b) feedback about one's performance, and (c) a supportive social environment. Similar conditions to increase intervention effectiveness were proposed by Geller et al. (1990). Geller (2002, p.534) incorporated these intervention elements in a scheme, the "flow of behavior change" model, that described how to move an individual through the stages in which environmentally unfriendly habits are changed into environmentally friendly behavior and ultimately into environmentally friendly habits.

It is relevant to consider what we know about information, feedback, and social support.

Information is one of the most widely used means to promote proenvironmental behavior change. Information may serve to give practical advice (e.g.,

Austin, Hatfield, Grindle, & Bailey, 1993). Apart from that, information may also be used to increase problem awareness, which in turn can affect behavior (e.g., Vining & Ebreo, 1992), or to inform people about others' efforts, which may increase cooperation (Messick & Brewer, 1983).

Feedback about performance may increase the sense of individual and collective efficacy (Bandura, 1977). Feedback may also trigger change through appeals to social and personal norms (Schultz, 1998). In general, feedback has been helpful in changing behavior (Samuelson, 1990). However, information and feedback are rarely sufficient to establish maintenance of change. For example, Van Houwelingen and Van Raay (1989) provided weekly feedback for a year, but even after this long period, beneficial effects disappeared quickly. Staats, van Leeuwen, and Wit (2000) provided information and weekly feedback on two heating-related behaviors in offices during two 4-week intervention sessions a year apart. Although interventions were successful on a group level, even in the follow-up study 1 year later observations at the individual level showed that relapses had occurred in 50% of the cases, suggesting that periodic application of these instruments remained necessary.

The third condition mentioned by De Young (1996) and Geller (2002) to promote environmental behavior is a *supportive social environment*. This condition has rarely been implemented when promoting proenvironmental behavior (Dwyer et al., 1993). This lack of attention to interventions that employ social support is particularly striking given that one of the first social psychological studies to document the effects of an intervention technique focused on the impact of social interactions in a group setting (Lewin, 1947).

Lewin (1947) described the strong effects of participation in discussion groups, as compared to the minor effects of lectures, in promoting the preparation and consumption of types of food considered unattractive. In addition, the effects for participants in the discussion groups did not decrease with time, whereas effects disappeared for those in the lecture groups. In both the discussion and the lecture groups, identical information was given on the importance of diet change, as well as detailed procedural information regarding the preparation of the food. The difference between conditions was mainly due to the possibility to discuss freely the advantages and disadvantages of the new food prior to making an explicit decision.

Lewin concluded that being able to experience group standards before the explicit decision is made was the factor responsible for the success of changing behavior in a small group setting, as compared to that of lectures. Strong additional support for this hypothesis was derived from the finding that the effects of group discussions also compared favorably to the effects of individual instruction, ruling out the possibility that it was the amount of atten-

tion given to each person individually that was responsible for the change in behavior. This joint effect of group interaction and the explicit decision made in public by the group members to prepare and consume the new food was apparently quite successful in changing behavior.

A few studies have used Lewin's procedures to try to improve proenvironmental behavior. Hopper and Nielsen (1991) investigated the impact of social interaction to change group standards, or social norms, on recyling behavior. More specifically, they studied a "block leader approach" by identifying a person living in the neighborhood who personally informed people in the neighborhood about the program and actively encouraged them to recycle. The block leader condition was more effective than two other conditions, a monthly reminder and an information brochure distributed twice during the 7-month program. Thus, recycling appeared to increase partly as a result of increasing social and personal norms toward recycling.

Weenig and Midden (1991) studied whether decisions to adopt energy-saving appliances in the home could be stimulated by information spread through social interaction in neighborhoods. It appeared that adoption decisions were markedly influenced by the informal advice of neighbors who were friends or kin, that is, persons whose opinion the adopters considered relevant and reliable. So some evidence points to the positive influence of face-to-face interaction regarding proenvironmental behavior.

The other factor in Lewin's experiments, the explicit-decision procedure, strongly resembles what is currently called a commitment technique, whereby a pledge or promise is made regarding performance of future behavior. This technique has been applied as an intervention to promote proenvironmental behavior in several ways, for example, commitment expressed in public or in private (De Leon & Fuqua, 1995; McCaul & Kopp, 1982; Pallack, Cook, & Sullivan, 1980), in oral or written form (Cobern, Porter, Leeming, & Dwyer, 1995; Pardini & Katzev, 1983-1984), and as an individual or as member of a group (e.g., Burn & Oskamp, 1986; McCaul & Copp, 1982; Pallack et al., 1980; Wang & Katzev, 1990).

Compared to other techniques that rely on voluntary cooperation, commitment techniques have produced behavior changes that are relatively long lasting (De Young, 1993). In addition, two studies have reported favorable effects of commitment manipulations combined with feedback (De Leon & Fuqua, 1995; Pallack et al., 1980). The study by Pallack et al. (1980) reported effects lasting 1 year, a notable exception to the lack of maintenance of behavior change generally found.

The studies cited above suggest that intervention packages combining information, feedback, and social support (including social interaction and commitment) may be particularly successful in accomplishing long-term

proenvironmental behavior change. We evaluated an initiative of a group of environmental scientists and organizational consultants involved with the organization of the second national Earth Day held in 1990 in the United States (Geller, 1990). This group founded an organization, Global Action Plan for the Earth, and devised an intervention program for the realization of an environmental lifestyle whose design combines information, feedback, and social support.

This program aims to realize substantial and durable proenvironmental changes in the way a household is run. By targeting many of the behaviors (approximately 100) that together determine most of the ecological effects of a household, it expands the narrow behavioral scope of most interventions. The program is the ETP. Worldwide, 20,000 households have participated in the ETP.

THE ETP: DESCRIPTION OF THE INTERVENTION PACKAGE

The approach of the ETP is threefold: in a *group setting*, an EcoTeam discusses environmental household behavior, based on the *information* contained in a workbook. *Feedback* is then given periodically about the savings accomplished by relevant changes in household behavior.

EcoTeams are groups of 6 to 10 people who usually know each other already as neighbors, friends, club members, church members, and so forth. EcoTeams meet once a month. During these meetings, personal experiences, ideas, and achievements related to environmental household behavior are shared. Subsequently, the EcoTeams focus on the following six themes, each for 4 consecutive weeks, as presented in the *EcoTeam Workbook*: garbage, gas, electricity, water, transport, and consumer behavior. Usually, garbage is addressed first. Garbage is weighed for a period of approximately 1 month, and, by doing so, a database is established to reflect garbage-related outcomes of current lifestyles. The workbook provides background information about the environmental problems associated with garbage, makes clear what consequences specific behavior changes will have, and gives detailed practical information to help execute these changes.

After a month, participants meet again, report on the weight of garbage they produce, and exchange and discuss ideas for diminishing their garbage, aided by the list of actions suggested in the workbook. The participants explicitly indicate whether they intend to perform the suggested actions. Subsequently, they try to implement the methods they find acceptable. After 1 month, the EcoTeam meets again to (a) discuss their experiences while trying to reduce the weight of garbage, (b) report how much the weight of garbage had actually decreased, and (c) prepare for the next theme. This proce-

dure is followed for all six proenvironment themes while the actions related to previously treated themes, including registration of the output or consumption, continue. The program lasts approximately 8 months.

The results of the EcoTeam, in terms of reductions of garbage and savings of gas, electricity, and water, are recorded in the EcoTeam logbook. In this way, the team members gain insight into their own behavior with regard to the six themes and track their progress individually, as well as at the team level. In each EcoTeam the group results are sent to a central database at the national Global Action Plan office. At this office, the results of all active EcoTeams are compiled and used to give individual teams feedback about the amount of savings realized. During and after their active period, EcoTeam members also receive feedback about the accumulated results of all EcoTeams in the Netherlands and in other countries by means of the EcoTeam newsletter, which is distributed every 3 months.

TRACING THE EFFECTS OF THE ETP TO HABITS AND INTENTIONS

Many household behaviors occur frequently and in the stable context of the home. According to Ouellette and Wood (1998), high frequency and context stability are major conditions for behavior to become habitual. Habitual behavior is behavior that occurs automatically upon the presence of a goal, a direct goal-action link, not preceded by consciously developed intentions (see Aarts & Dijksterhuis, 2000). It could be argued that many of the behaviors targeted in the ETP are habitually performed and that an explanation for potential effects of the program might be its success in making behavior more reasoned. Reasoned behavior is more sensitive to new information and more liable to be changed on the basis of this information (Fishbein & Ajzen, 1975). Overruling a habit requires the intention to act differently and the attention to support the cognitive demands of executing a novel act (Bargh, 1996). Effects of participation, therefore, should operate on the intentional component of behavior.

An example of this interplay of habit and intention is found in a study by Verplanken, Aarts, Van Knippenberg, and Moonen (1998). They report an experiment on daily travel behavior in which the manipulation in the experimental group was designed to make travel mode choice more deliberate and, for that reason, more in line with previously expressed intentions. As hypothesized, deliberation increased the capacity of intention to predict travel mode. In another study (Verplanken, Aarts, & Van Knippenberg, 1997, Experiment 3), the authors demonstrated that people with a strong general travel-mode habit collect less travel-relevant information than people with weak travel-mode habits. This effect could be temporarily suppressed by

making participants attentive to the importance of a particular aspect (e.g., weather conditions) of each imaginary trip.

Together these two experiments suggest that a manipulation demanding attention to characteristics of the choice situation may decrease the habitual character of behavioral choices. This shift from automatic to deliberate performance of behavior becomes visible in the increased strength of intentions to predict subsequent behavior, at the cost of the prediction by habit.

In this study, the question is whether the information, feedback, and social influence from the ETP increased the strength of intentions to explain behavior change, irrespective of previously existing habits.

RESEARCH OBJECTIVES

This study examined the effects of participation in the ETP on changes in household behavior and environmental resources (i.e., the weight of garbage disposed of and the consumption of natural gas, electricity, and water). We were interested not only in short-term effects, directly after participation, but also and especially in long-term effects. Second, we investigated the expectation that the information, feedback, and social influence from the ETP increased the strength of intentions to explain behavior change, irrespective of previously existing habits.

METHOD

PARTICIPANTS

EcoTeam members. A group of 445 people who were ready to start the ETP in January or February 1994 received a request to participate in the research. Of this group, 289 (65%) cooperated prior to participation in the ETP by completing the first set of mail questionnaires (T0). In October 1994, 205 participants (71%) completed the post-ETP questionnaires (T1). In December 1996, this group was approached again with the request to complete a third set of mail questionnaires in order to obtain a similar set of data 2 years after participation (T2).

The sample of respondents who completed both T1 and T2 was reduced to 150. Nonresponse was related neither to sociodemographic characteristics nor to general environmental concern at T0 and T1. This sample of ETP participants had an average age of 52 years, a higher income and higher education level than the average Dutch population, and consisted of 85% women.

The high proportion of female participants was due to the fact that participants were recruited for the ETP mainly through a number of women's organizations.

Comparison group. The volume of information requested from ETP participants far exceeded what is considered feasible for mail surveys (Dillman, 2000). No attempt was made to collect the same amount of data from a control group. Instead, in the questionnaires administered at T0, T1, and T2, eight specific behaviors were phrased identically to those asked in a longitudinal study on environmental household behavior that is administered each year among a panel (N = 1,500) representative of the Dutch population (Couvret, 1996; Couvret & Reuling, 1997; De Kruijk & Couvret, 1995). Data collection for this annual survey occurred each time within 1 month of T0, T1, and T2. Comparison of the changes in these eight specific behaviors was deemed adequate to assess whether behavior changes assessed among the ETP participants could be attributed to the ETP or to influences external to the ETP.

A direct comparison indicated that ETP participants at T0 behaved more proenvironmentally than the general Dutch population. Therefore, a subsample (n = 332) was selected from this population sample, matched on identical performance (M and SD) of proenvironmental behavior at T0 on a Proenvironmental Behavior Index (PBI) created from the set of eight proenvironmental behaviors.[1] Scores of the ETP participants on the PBI were compared with the scores of this matched subsample of the Dutch population at T1 and T2. This subsample of the Dutch population had an average age of 47 years, a higher income and education level than the general population, and consisted of 60% women.

BEHAVIORAL MEASURES

The main body of the questionnaires administered to EcoTeam participants at T0, T1, and T2 was identical. At each phase, the survey contained questions about the performance of a series of 38 specific environmental household behaviors, measures of intention, perceived behavioral control, and habit strength for one of these behaviors, and registration forms for the weight of solid waste disposed of and the amount of gas, electricity, and water consumed during a 2-week period. Furthermore, at T1, participants evaluated the quality of the workbook, the feedback provided by the national Global Action Plan office, and the social influence experienced from their EcoTeam. Other measures were included that were not relevant for this study.

Behavior. Thirty-eight specific behaviors were measured by self-report to study developments of proenvironmental behavior of the ETP participants at T0, T1, and T2. These 38 behaviors were a selection of the 93 that were assessed at T0 and T1. A selection appeared necessary as ETP participants got tired of the long questionnaires they had completed at T0 and T1, as was evident from comments added on the questionnaires and communicated by telephone. The selection of behaviors was based on the following criteria: (a) an approximately equal number of behaviors that had changed and had not changed between T0 and T1. Of the original 93 behaviors assessed, 46 were changed in a proenvironmental direction and 47 remained stable between T0 and T1. (b) Behaviors that could be performed by the majority of participants were chosen over behaviors that only applied to a small group of participants (e.g., choice of means of transportation to bring children to school).

Eight of the 38 selected behaviors composed the PBI on which ETP participants were compared with the subsample from the Dutch population at T0, T1, and T2. The PBI consisted of the following 8 behaviors: separation of organic waste from solid waste, saving dirty laundry until the washing machine can be fully loaded, leaving the faucet running while doing the dishes, bringing a shopping bag from home when going shopping, using unbleached coffee filter bags, using detergents in refill packaging, using unbleached toilet paper, and refusing plastic bags or wrappings offered by shopkeepers. Scores on these 8 items, all on 7-point Likert-type scales ranging from 1 (*never*) to 7 (*always*) were averaged. (The scores of the 8 behaviors composing the PBI are included in Table 1, labeled *PBI* following the description of each of these 8 behaviors). All the 38 behaviors are described in Table 1.

Intention, Perceived Behavioral Control, and Habit

Intention, perceived behavioral control, and habit were measured for one specific behavior: using forms of transportation other than the car for distances below 5 kilometers. Given our interest in the degree to which reason-based and habitual components of behavior are able to explain behavior change, this behavior, for which habit could be expected to exist to some degree, was deemed a good choice (see Ouellette & Wood, 1998; Verplanken, Aarts, Van Knippenberg, & Van Knippenberg, 1994). The items measuring each of these concepts are given below.

Behavioral intention was phrased as, "During the next six months I intend to use forms of transportation other than the car for distances below 5 kilometers." Answers were given on a 7-point scale ranging from 1 (*most certainly not*) to 7 (*most certainly*).

TABLE 1
Environmental Behaviors in the Household. Performance at Time T0, T1, and T2

	T0	*T1*	*T2*
Separation of organic waste from solid waste (PBI)	5.96_a	6.68_b	6.74_b
Separation of textile waste from solid waste	6.17_a	6.77_b	6.68_b
Composting your organic waste	3.77	3.78	4.07†
Did you put aluminum foil behind central heating radiators where possible? (1 = nowhere, 4 = everywhere)	1.59	1.63	1.74†
Did you put insulation material around the pipes of your central heating system, apart from the rooms, in the corridors? (1 to 4)	2.87	2.94	2.87†
Do you have double glazed windows in your house? (1 to 4)	2.93	2.96	3.07†
Are the outer walls of your house insulated? (1 to 4)	2.27	2.23	2.26†
To what temperature do you set your central heating? (°C)	18.69_a	18.27_b	18.19_b
Do you have lights burning in nonoccupied rooms?	2.79_a	2.39_b	2.37_b
Is your television set on “off” instead of on “standby”?	5.10_a	5.55_b	5.85_c
Do you save your dirty laundry until you can load your washing machine fully? (PBI)	6.11_a	6.34_b	6.54_c
To what temperature do you set your water heater? (°C)	70.83	69.66	66.83†
How many energy-saving light bulbs do you use? (no.)	2.83_a	3.72_b	4.32_c
Do you close the faucet while washing hands?	2.82_a	4.26_b	4.77_c
Do you close the faucet while doing the dishes? (PBI)	5.83_a	6.15_b	6.38_c
Do you close the faucet while brushing your teeth?	5.36_a	5.95_b	5.91_b
How often do you take a bath? (1 = daily, 6 = <2 weekly)	5.20	5.32	5.35†
How often do you take a hot shower? (1 = > daily, 5 = < weekly)	2.17	2.19	2.32†
How long are you showering? (1 = < 3 min., 5 = > 20 min.)	3.66_a	2.97_b	2.98_b
Is there a low-flow showerhead installed in your shower? (1 = no, 2 = yes)	1.37_a	1.56_b	1.64_c
Did you reduce the volume of the toilet flusher? (1 to 2)	1.06	1.13	1.14†
How many toilets in your house have a toilet dam installed? (no.)	0.56_a	0.76_b	0.88_c
Do you engage in carpooling?	1.73	2.05	2.03†

(continued)

TABLE 1 (continued)

	T0	*T1*	*T2*
What is your regular speed on roads where 120 km/h is the speed limit? (km/h)	112.41	111.37	110.49†
On average, how much fuel does your car use? (km/l)	13.71	13.99	13.62†
To travel distances less than 5 km do you use alternatives for the car (or motorbike)?	4.63_{a}	5.14_{b}	4.90_{b}
How often do you eat a dinner without meat?	2.70_{a}	3.12_{b}	3.32_{b}
How much meat do you eat for dinner? (grams)	97.02_{a}	87.36_{b}	$94.88_{a, b}$
How often do you eat organically grown food?	3.81	4.03	4.06†
How often do you eat . . .			
Deep frozen vegetables?	2.79_{a}	2.41_{b}	2.42_{b}
Canned vegetables?	2.06	1.85	1.90†
When you go shopping do you bring a shopping bag from home? (PBI)	6.55	6.73	6.71†
How often do you use . . .			
Detergents in refill packaging? (PBI)	4.31_{a}	5.16_{b}	6.02_{c}
Unbleached toilet paper? (PBI)	4.99	5.23	4.89†
Unbleached writing paper?	3.75	4.34	4.00†
Unbleached coffee filter bags? (PBI)	5.76_{a}	5.83_{a}	6.20_{b}
Do you refuse plastic bags or wrappings of shopkeepers for environmental reasons? (PBI)	4.93_{a}	5.40_{b}	5.45_{b}
Are you inclined to repair products or have them repaired instead of buying them new?	5.47	5.68	5.75†

NOTE: C = Celsius; min. = minutes; km/h = kilometers per hour; km/l = kilometers per liter. Behaviors followed by (PBI) make up part of the Proenvironmental Behavior Index. Unless indicated otherwise, scales run from 1 (*never*) to 7 (*always*). Means in the same row with different subscripts differ at $p < .05$ in the *t* test comparisons.
†Overall *F* test nonsignificant at $p < .001$.

Perceived behavioral control was measured by the item, "If I want, I can in most instances use means of transportation other than the car for distances below 5 kilometers during the next six months." Answers were given on a scale ranging from 1 (*extremely likely*) to 7 (*extremely unlikely*).

Habit was measured with two items: "To me, using forms of transportation other than the car for distances below 5 kilometers, is a matter of course" and "I automatically use forms of transportation other than the car for distances below 5 kilometers." Answers were given on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Pearson correlation between these two items was .83. The two items were averaged to create the habit measure.

For correspondence among all measures, scores were recoded before analysis such that a higher score always reflected a more proenvironmental stance on an item.

USE OF ENVIRONMENTAL RESOURCES

In the household the environmental resources used as a consequence of the behaviors that are subject to the ETP are the production of solid waste and the consumption of natural gas, of electricity, and of water. All respondents were asked to register the weight of solid waste disposed of and the amount of gas, electricity, and water their household used at T0, T1, and T2 for a period of 2 weeks at each phase. Respondents' scores were corrected for special circumstances, such as the stay of guests or, conversely, the absence of household members for days during these 2-week periods.[2]

The data on gas consumption were corrected for variation in weather conditions (temperature, sunlight, and wind) and for weather-independent use of gas (cooking and hot water) during these periods, using the weighted degree-day method (EnergieNed, 1995; Zwetsloot, 1983; see Note 2). This correction method is considered quite reliable for natural gas consumption. Data for analysis were scores per person of kilograms of solid waste per day, cubic meters (m^3) natural gas per degree-day, m^3 of water per week, and kilowatt-hours (kWh) electricity per week.

To ensure the quality of the data, two decisions were made concerning outliers. The first was that respondents whose scores at T0, T1, or T2 were outside the interval of the average score plus or minus 2 standard deviations *and* whose change score (the scores of two registration periods subtracted) was outside an interval defined by the average change score plus or minus 2 standard deviations were excluded from the analyses. This accounted for 5 participants.

The second decision rule was that respondents' scores indicating an increase of more than 500%, compared with earlier registrations, were con-

sidered errors and excluded from the analyses. This also accounted for 5 participants. Comparable decisions are made by institutions that calculate the total use of environmental resources in Dutch households (Weegink, 1996a, 1996b).

EVALUATION OF THE ETP COMPONENTS

The workbook was evaluated by means of two items: "I found the workbook . . . " with responses from 1 (*very informative*) to 5 (*not informative*) and 1 (*very pleasant to read*) to 5 (*very unpleasant to read*). The Pearson correlation between the two items was .63 ($p < .001$). The items were averaged to form the Workbook Quality Scale.

The feedback was evaluated separately for each environmental domain. For transportation, the items were, "Keeping informed of the scores of kilometers traveled by car is . . . ." Responses on Likert-type scales ranged from 1 (*very useful*) to 5 (*not useful*), 1 (*very easy*) to 5 (*very difficult*), and 1 (*very pleasant*) to 5 (*very unpleasant*). Cronbach's alpha for the 3 items was .73. The items were averaged to form the Feedback Quality Scale.

The functioning of the EcoTeam was measured with three items, intended to measure social influence. The items were, "Were you stimulated by your team members to take proenvironmental action in your household?" "Did you feel obliged by your team to take proenvironmental action?" and "In your EcoTeam, did you experience a competitive attitude to achieve better than other team members?" Answers were given on scales ranging from 1 (*not at all*) to 5 (*very strongly*). Cronbach's alpha for the 3 items was .71. The items were averaged to form the Social Influence Scale.

RESULTS

BEHAVIOR CHANGES OF ETP PARTICIPANTS COMPARED WITH NONPARTICIPANTS

A comparison was made between ETP participants and the nonparticipating subsample of the Dutch population who had identical scores on the PBI (nonparticipants) at T0. Figure 1 displays the scores on the PBI of both groups at baseline (T0), at the moment of withdrawal of the intervention (T1), and during a follow-up 2 years afterwards (T2). Repeated measures analysis of variance (ANOVA) with participants (ETP participants, nonparticipants) and phase (T0, T1, T2) as factors showed a significant main effect of participants, $F(1, 428) = 20.03$, $p < .001$, a significant main effect of phase, $F(2, 427) =$

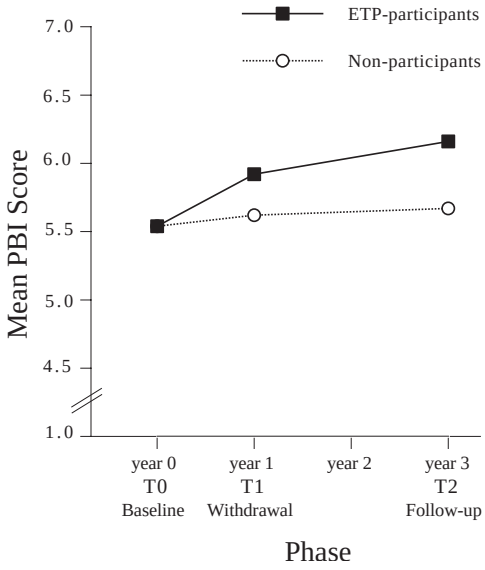

Figure 1: Mean Scores of ETP Participants and Nonparticipants on the Proenvironmental Behavior Index (PBI) Across the Phases of the Study

59.57, $p < .001$, and a significant Participants × Phase interaction, $F(2, 427) = 26.28$, $p < .001$.

The interaction captures the differences between ETP participants and nonparticipants emerging after T0. Separate *t* tests showed that ETP participants improved their proenvironmental behavior during the course of the program (M at T0 = 5.5, M at T1 = 5.9, $p < .05$) and again in the 2 years following participation (M at T2 = 6.2, $p < .05$). The subsample of the Dutch population slightly improved between T0 ($M = 5.5$) and T1 ($M = 5.6$, $p < .05$), but not to the same extent as the ETP participants ($p < .05$). No change was found for the subsample of the Dutch population between T1 ($M = 5.6$) and T2 ($M = 5.7$, *ns*). These findings clearly suggest that ETP participation is mainly responsible for the changes observed among participants.

CHANGE AND MAINTENANCE OF CHANGE OF 38 PROENVIRONMENTAL BEHAVIORS FOR ETP PARTICIPANTS

In Table 1, the scores of the ETP participants are displayed for 38 proenvironmental behaviors as performed before (T0), directly after (T1), and 2 years after participation (T2).[3] Differences in performance were initially tested by repeated measures ANOVA with time (T0, T1, T2) as factor. Signif-

icance levels for the 38 overall *F* tests were set to $p < .001$ (0.05 divided by 38), the conventional Bonferroni correction to protect against Type I error. A multivariate analysis with the 38 behaviors tested simultaneously was impossible to execute due to the number of missing values on many of the behavioral items. Only for behaviors for which the overall *F* test was significant at $p < .001$, *t* tests ($p < .05$) were performed between T0 and T1, T0 and T2, and T1 and T2.

For 20 of the 38 behaviors, significant changes were observed between T0 and T2. Of these 20 behaviors, 17 were frequently performed behaviors and 3 were one-time behaviors (e.g., installing a low-flow showerhead). Between T0 and T1, 19 behaviors changed in a proenvironmental direction. No behavior changed in an antienvironmental direction. Between T1 and T2, 11 earlier proenvironmental changes were maintained, whereas 8 further proenvironmental changes were observed for behaviors that already improved between T0 and T1. One behavior (using unbleached coffee filter bags) that was unaltered between T0 and T1 changed in the proenvironmental direction between T1 and T2.

USE OF ENVIRONMENTAL RESOURCES

The use of four environmental resources that were potentially influenced by the behaviors targeted in the ETP was assessed by the participants during three 2-week periods at T0, T1, and T2. The means based on the valid observations across these periods are given in Table 2. Between T0 and T1, significant savings were achieved for the deposition of solid waste and the consumption of natural gas, whereas at T2, as compared to T0, significant savings were obtained for all four environmental resources. None of the changes between T1 and T2 was significant.

EXPLAINING BEHAVIOR CHANGE BY INTENTION, HABIT, AND SOCIAL INFLUENCE

Attempting to understand what happened to ETP participants was explored by a detailed analysis of one behavior—using a means of transportation other than the car for distances less than 5 kilometers. Behavior of the ETP participants changed in a proenvironmental direction across the measurements at T0, T1, and T2, $F(2, 95) = 12.49$, $p < .001$, which was only due to the significant change from T0 ($M = 4.63$, $SD = 1.45$) to T1, ($M = 5.13$, $SD = 1.51$) $t(98) = 5.01$, $p < .001$. Therefore, the analysis focused on behavior change between T0 and T1.[4]

Based on the relevant literature described in the introduction (e.g., Verplanken et al., 1997, 1998) we expected intentions would become more important

TABLE 2
Use of Four Environmental Resources at Time T0, T1, and T2: Means, Standard Deviations (upper row), and Percentage of Change Compared to T0 (lower row)

	T0		*T1*		*T2*	
	M	SD	M	SD	M	SD
Solid waste deposition (kg per person per day)	0.216_a	0.15	0.153_b	0.12	0.145_b	0.12
	100%		–28.5%		–32.1%	
Natural gas consumption (m3 per person per degree day)	0.299_a	0.21	0.237_b	0.18	0.248_b	0.18
	100%		–20.5%		–16.9%	
Electricity consumption (kWh per person per week)	27.2_a	15.4	$25.9_{a, b}$	15.6	25.1_b	14.3
	100%		–4.6%		–7.6%	
Water consumption (m^3 per person per week)	0.854_a	0.38	$0.830_{a, b}$	0.38	0.796_b	0.33
	100%		–2.8%		–6.7%	

NOTE: kg = kilograms; m^3 = cubic meters; kWh = kilowatt-hours. Means in the same row with different subscripts differ at $p < .05$ in the *t* test comparisons.

TABLE 3
Using Forms of Transportation Other Than the Car: Means, Standard Deviations, and Correlations Between Behavior Change, Intention, Habit, Social Influence, and Their Interactions (*n* = 95)

	M	SD	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. Behavior change	0.46	0.98	.07	–.12	–.08	–.23*	.22*	–.18	.11
2. Intention	5.24	1.37	—	.58***	.09	–.13	–.03	–.00	–.11
3. Habit	5.21	1.58		—	.02	–.36***	.00	.02	.08
4. Social influence	2.49	0.74			—	–.05	–.03	.09	.32**
5. Intention × Habit						—	–.17	.08	.06
6. Intention × Social Influence							—	.36***	.16
7. Habit × Social Influence								—	–.06
8. Intention × Habit × Social Influence									—

NOTE: Means and standard deviations of interaction variables are not presented.
*$p < .05$. **$p < .01$. *** $p < .001$ (two-tailed).

and habit less important in the prediction of behavior change when the ETP elements increased active consideration of transportation choices. Operationally, active consideration of transportation choice was considered more likely when participants indicated higher appreciation of workbook quality and feedback quality and reported more social influence by members of their EcoTeam. Thus, effects of the three program elements were expected to interact positively with intention, negatively with habit, and/or negatively with the Intention × Habit interaction as predictors of behavior change.

None of the hypothesized effects on behavior change was found with regard to workbook quality and feedback quality. Therefore, further analyses focused on the effects of social influence.[5] Table 3 displays the relevant descriptives and intercorrelations.

Behavior change between T0 and T1 was regressed on habit and intention at T0 and on social influence. The 3 two-way interactions between habit, intention, and social influence, and the three-way interaction were also included in this analysis.[6]

Table 4 shows the results of the hierarchical regression analysis. Intention, habit, and social influence did not independently predict behavior change (Step 1). Adding the two-way interactions to the analysis (Step 2) significantly improved the prediction. Finally, adding the three-way interaction between intention, habit, and social influence (Step 3) further improved the prediction of reported behavior change.

TABLE 4
Using Forms of Transportation Other Than the Car: Regression of Behavior Change During Participation on Behavioral Intention and Habit Before Participation, Social Influence, and All Interactions

Step	*Predictor*	*Multiple* R	F *Change*	β *in Final Equation*
1	Intention	.23	1.72	.33***
	Habit			–.43***
	Social influence			–.17
2	Intention × Habit	.48	6.74***	–.32***
	Intention × Social Influence			.20
	Habit × Social Influence			–.18
3	Intention × Habit × Social Influence	.51	4.00*	.21*

NOTE: R^2 for the full model is 26%, adjusted R^2 for the full model is 21%.
*p < .05. **p < .01. ***p < .001 (two-tailed).

The final model (Step 3) shows that intention had a positive effect on behavior change, habit a negative effect, and two interaction effects had unique contributions: the Intention × Habit interaction and the Intention × Habit × Social Influence interaction. The two-way interaction suggests, as described by Verplanken et al. (1997, 1998), that intention was more important for behavior change when habits were weak. The three-way interaction suggests that social influence moderated the impact of the Intention × Habit interaction on behavior change.

To compare effects of intention and habit on behavior change for different levels of social influence, a median split was performed on the social influence ratings, creating a weak social influence group (M = 1.89, SD = .35, n = 48), and a strong social influence group (M = 3.07, SD = .47, n = 47). Descriptives for each social influence group are presented in Table 5.

For each of these groups, behavior change was regressed on intention, habit, and the Intention × Habit interaction. Results are displayed in Table 6. For the group that reported weak social influence (see Table 6, upper panel), only the Intention × Habit interaction predicted behavior change. To explore the nature of this Intention × Habit interaction, simple slope analyses were conducted for the weak social influence group following the procedure described by Aiken and West (1991). The regression weights of intention were computed for three levels of habit, that is, 1 standard deviation below the mean (= weak habit), the mean (= moderate habit), and 1 standard deviation above the mean (= strong habit). These were .79 (p < .05), .20 (*ns*), and –.38 (*ns*), respectively. This suggests that under weak social influence, the intention was only a significant positive predictor of proenvironmental

TABLE 5
Using Forms of Transportation Other Than the Car: Means, Standard Deviations, and Correlations Between Behavior Change, Intention, and Habit for Both Levels of Social Influence

	Weak Social Influence (n = 48)					*Strong Social Influence (n = 47)*				
	M	SD	*2*	*3*	*4*	M	SD	*2*	*3*	*4*
Behavior change	0.46	0.80	–.09	–.03	–.32*	0.47	1.14	.19	–.18	–.18
Intention	5.12	1.36	—	.57***	.08	5.36	1.37	—	.61***	–.34*
Habit	5.29	1.62		—	–.47***	5.13	1.55		—	–.24
Intention × Habit					—					—

NOTE: Means and standard deviations of interaction variable are not presented.
*p < .0. **p < .01. ***p < .001 (two-tailed).

TABLE 6
Using Forms of Transportation Other Than the Car: Regression of Behavior Change During Participation on Behavioral Intention, Habit, and the Intention × Habit Interaction, Separated for Weak and Strong Social Influence Groups

Step	*Predictor*	*Multiple* R	F *Change*	β *in Final Equation*
(a) Weak social influence (n = 48)				
1	Intention	.10	0.21	.15
	Habit			–.35
2	Intention × Habit	.40	7.81**	–.50**
(b) Strong social influence (n = 47)				
1	Intention	.43	4.91*	.49**
	Habit			–.48**
2	Intention × Habit	.45	0.98	–.14

*p < .05. **p < .01. ***p < .001 (two-tailed).

behavior change when habit was weak. When habit was moderate or strong, intentions did not significantly predict proenvironmental change.

In the group that reported strong social influence (see Table 6, lower panel), direct effects of intention and habit were significant, although there was no effect of the Intention × Habit interaction on behavior change. This suggests that irrespective of degree of habit, intention predicted behavior change when social influence was strong.

The combined results of the latter two analyses support the expectations with respect to social influence: Behavior change is better predicted by intention before participation if the ETP manages to keep participants actively considering their behavior choice.

DISCUSSION

Research in the past three decades has shown that intervention techniques that aim to change proenvironmental behavior generally face two problems that severely limit their effectiveness: a lack of response generalization from targeted to nontargeted behaviors and a very limited duration of proenvironmental change. With these limitations in mind, it was particularly interesting to study the effectiveness of the ETP, an intervention program whose approach deviates substantially from other intervention techniques in two ways.

First, approximately 100 behaviors are targeted in the ETP, together making up the way a household is run. This very large number contrasts sharply with other techniques that target a select group of behaviors, and thus strongly reduces the generalization problem.

Second, the ETP package includes, apart from information and feedback, the novelty of a team for organized social support. This combination of characteristics gave rise to expectations of behavior change beyond the intervention period. These were confirmed in this study. Out of the 38 behaviors studied longitudinally, 19 changed in a proenvironmental direction directly at the end of the ETP. Moreover, these changes were retained or increased further during the subsequent 2 years.

These changes and the duration of these changes were assessed in comparison with those of a group of nonparticipants who behaved equally proenvironmentally as ETP participants when they began the program. This comparison group also improved during the period that ETP participants were engaged in the program, but only very slightly. Moreover, the comparison group did not improve their behavior during the 2-year period after EcoTeam participation. This suggests it was the ETP, and not a proenvironmental change in the Dutch society, that was responsible for the behavior changes of the ETP participants. The self-reported behavior changes were validated by reductions in resource use as assessed by physical measures: the weight of solid waste disposed of and the amount of natural gas, electricity, and water consumed.

The behavior studied in detail (i.e., the use of alternatives to the car for short distances) provided information about what appears to have affected these changes. Apparently, the intentions of participants to try to establish proenvironmental changes in behavior, the main reason for enlistment in the ETP, were operating on this specific behavior. Participants changed their travel mode for short distances from the automobile to a more environmentally friendly mode of transportation. The specific behavioral intention expressed before participation predicted this change.

However, two other predictors qualified this result in a way that appears to shed light on the functioning of the EcoTeam. Similar to results of other studies (Ouellette & Wood, 1998; Verplanken et al., 1994, 1998), the effect of intention was qualified by the level of habit for the participants who reported having experienced weak social influence from their EcoTeam. Within this weak social influence group, proenvironmental change was predicted by intentions only for participants who reported having relatively weak habits. For the other group, who reported strong social influence from their EcoTeam members, social interaction with EcoTeam members appeared to have resulted in intentions predictive of proenvironmental behavior change, irrespective of the degree to which habits were consolidated. Although the results suggest that habit impeded behavior change, this occurred for all participants who experienced strong social influence, the outcome being that even those with a strong habit of travel mode managed to change their behavior according to their intentions.[7]

The self-report measures on the indicators of the ETP's impact prohibit strong conclusions about the nature of behavior change. Nevertheless, the process suggested by the results is plausible, given recent work on the way intentions interact with habit in the formation of behavior (Aarts, Verplanken, & Van Knippenberg, 1998) and given the character of the ETP, especially the importance of social support in proenvironmental behavior change (Geller, 2002; Hopper & Nielsen, 1991; Weenig & Midden, 1991).

An additional reason for caution is the fact that only one behavior was studied in detail, and so the results may not be representative of the majority of the behaviors targeted in the ETP. The category of proenvironmental behavior is a very heterogeneous set (e.g., McKenzie-Mohr et al., 1995), which makes generalization of the findings hazardous. On the other hand, this argument works both ways: Our findings are plausible despite the narrowness of the behavioral example. Other behaviors might have given even stronger support for our expectations.

In interpreting these findings, one should take into consideration that in fact, the behavior analyzed represents an aggregation of specific behaviors when considered from the perspective of goal-action links (Aarts & Dijksterhuis, 2000). Traveling less than 5 kilometers is not a goal in itself but is probably instrumental in realizing any of a number of goals located in the vicinity of the participants' homes. These may entail going to work, buying a newspaper, bringing one's children to school, getting a haircut, and so on.

Shah and Kruglanski (2000) describe how the mental representations of goal-action links may be attenuated when several goals are served by the same action. The "multifinality" (p. 89) of transportation choice may have weakened the relationships that exist among specific goal-action links. Com-

bining Shah and Kruglanski's and Aarts and Dijksterhuis's (2000) conceptions of goal-action links implies that goal-action links are similar to habits (i.e., the automatic activation of actions by goals). However, lacking is the distinction between less well-established goal-action links, indicated by a more reasoned character, and a larger number of goals served by the same action. Both describe weak goal-action links, but it is reasonable to question whether the two are psychologically equivalent. This seems to be an issue worthy of further theorizing and research.

A second issue for further research is inspired by Lewin's (1947) work, described in the introduction. Lewin's experiments were followed by the work of Bennett Pelz (1959), who set out to decompose the intervention package used by Lewin. Her conclusions were that two factors in the package were influential: making a decision and degree of group consensus. It seems that just like Lewin's package, the ETP deserves further investigation in a search for the factors that are decisive in its success. Geller (1987) also argues that complex intervention packages that are effective in real-life settings should be decomposed in experimental studies to find out what elements cause the package to be effective.

Apart from scientific reasons, the environment might benefit from such an endeavor. The ETP is rather demanding, both for participants and for the organization that disseminates and runs the program. The demands placed on participants result in recruiting participants who are already ahead of the population with respect to their proenvironmental behavior. This was demonstrated by the selection process needed to create a comparison group that behaved equally proenvironmentally as participants before enlistment. Only 20% of a sample of the general population met this criterion. If an instrument could be developed that is less demanding, this might appeal to broader segments of the population. Then not only degree of participation might increase, at lower per capita cost for the organization, but this might also result in enlisting people who could accomplish larger changes, given their lower initial level of proenvironmental behavior. Such a leaner instrument that nevertheless retains its original effectiveness would be a precious instrument in the struggle for proenvironmental change.

NOTES

1. Selection of a subsample with equivalent *M* and *SD* as the EcoTeam Program (ETP) participants at Time 0 (T0) was accomplished by first selecting all the respondents of the population sample with Proenvironmental Behavior Index (PBI) scores greater than 6 and consecutively

selecting randomly respondents in all other categories, making the percentages correspond to those of the distribution of the PBI of the ETP participants.

2. On the forms on which ETP participants registered their use of gas, water, electricity, and the amount of solid waste, they indicated whether in the 2 weeks members of the household were absent for a certain period or, conversely, guests were present. If, for example, in a household of four persons one person was absent for one of the 2 weeks, the number of persons per week was calculated as 4×1 plus $3 \times 1 = 7$. The consumption score per household member in this example was the total amount divided by 7, giving the average consumption per household member per week.

Degree-days are calculated using the average temperature per 24 hours (T), based on observations of the KNMI (Dutch Royal Meteorological Institute) at 12 places in the Netherlands. The home addresses of the ETP participants were used to employ the observations of the closest meteorological observation place. The number of degree-days is 18° Celsius minus T; for example, a day with a T of 16° Celsius has 2 degree-days. Weighted degree-days are degree-days that are corrected for (sun)light and wind speed. These two parameters are calculated by the KNMI per month of the year, thus taking into account seasonal variations that influence gas consumption for heating purposes, over and above average daily temperature.

3. Because participants in the ETP work in groups, differences between groups might lead to differences in the magnitude of behavioral effects. An impression of the extent to which behavioral effects are attributable to differences between groups was obtained by a calculation of the intraclass correlation (Kreft & De Leeuw, 1998). It appeared the intraclass correlation was close to 0 for the PBI at T0 (.09), on T1 (.00), and on T2 (.00). For this reason, we did not execute multilevel analyses in this study.

4. Behavior change scores were calculated by subtracting participants' score at T0 from their score at T1.

5. All variables were standardized before cross-products were computed, to reduce a possible bias due to multicollinearity (cf. Cohen & Cohen, 1983, p. 325).

6. According to the theory of planned behavior (Ajzen, 1991), perceived behavioral control can influence behavior independent of intention. To investigate this possibility, perceived behavioral control was added as a predictor, including all interactions with other predictor variables. The analyses demonstrated that perceived behavioral control was not a predictor of behavior change either directly or in interaction with the other predictors. Consequently, perceived behavioral control was omitted from the analyses reported here.

7. A concern regarding the conclusions about the nature of behavior change might be that the measure of habit referred to the degree of habitual *proenvironmental* behavior and that a weak proenvironmental habit could either be indicative of the absence of a habit for any means of transportation or a strong antienvironmental travel habit, (i.e., a habitual choice of the car for short distances). Regrettably, habitual car use was not measured. However, the existence of a strong antienvironmental habit does not seem likely. The mean of the habit measure was 5.2 on a 7-point scale, with only 7% of the sample indicating they did not (at all) agree (score 1 or 2) with having a proenvironmental habit for traveling short distances. When these participants were left out of the analyses, the pattern was identical to that reported in Table 6, upper panel, that is, nonsignificant main effects of intention and habit, and a significant interaction effect (β of the intention $\times$ habit interaction –.50, $p < .01$). Therefore, it can be concluded that low proenvironmental habit scores are indicative of more intentionally performed behavior.

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