Altruistic, Egoistic, and Normative Effects on Curbside Recycling
GORDON EWING 733

The Social Structure of Tel-Aviv–Jaffa Neighborhoods
IZHAK SCHNELL
RAVIT GOLDHABER 765

Changes in Drivers’ Perceptions and Use of Public Transport During a Freeway Closure: Effects of Temporary Structural Change on Cooperation in a Real-Life Social Dilemma
SATOSHI FUJII
TOMMY GÄRLING
RYUICHI KITAMURA 796

The Importance of Transportation and Prioritization of Environmental Needs to Sustain Well-Being Among Older Adults
YURI CVITKOVICH
ANDREW WISTER 809

Responsibility and Environment: Ecological Norm Orientation and External Factors in the Domain of Travel Mode Choice Behavior
MARCEL HUNECKE
ANKE BLÖBAUM
ELLEN MATTHIES
RAINER HÖGER 830
Book Review


ROGER MORTON

Index
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3. Studies relating to the beliefs, meanings, values, and attitudes of individuals or groups concerning various environments—e.g., the meanings and values attached to neighborhoods, cities, transport routes and devices, or recreational areas.

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ALTRUISTIC, EGOISTIC, AND NORMATIVE EFFECTS ON CURBSIDE RECYCLING

GORDON EWING is an associate professor of geography at McGill University, Montreal, Quebec, Canada. His research focuses on discrete choice modeling of individual and household decisions affecting, or affected by, environment and space. Recent research has been on Montreal commuters’ choices of travel modes and their potential demand for clean-fuel vehicles (Transportation Research D, 1999).

ABSTRACT: How altruistic, normative, and egoistic factors affect households’ participation in curbside recycling is shown to depend on how participation is measured. If expressed as whether a household participated, the importance of two normative factors (the expectations of household members and of friends and neighbors), an altruistic factor (that recycling helps protect the environment), and an egoistic factor (that recycling is inconvenient) appears similar. However, the altruistic factor has the greatest impact and the egoistic factor the least because of strong beliefs in curbside recycling’s environmental benefit and weak beliefs in its inconvenience. However, when measured by the proportion of different kinds of material a household recycles, the dominant influences are the expectations of other household members and inconvenience. The significance of egoistic concerns, namely, inconvenience and cost, is confirmed by negative attitudes toward user fees for garbage collection and toward drop-off depots as alternatives to curbside pickup.

To what extent does public concern for environmental protection translate into consumer action when households are provided with curbside collection of recyclable material? In particular, what are the relative influences of egoistic, altruistic, and normative considerations on how much households recycle? These questions are prompted by the commonly observed discrepancy between attitudes toward environmental issues and actual consumer

AUTHOR’S NOTE: The financial support of this research by the Social Sciences and Humanities Research Council of Canada is gratefully acknowledged, as are the comments of an anonymous referee.
behavior (Bickman, 1972), as evidenced currently, for example, by the continued stated concern for environment at the same time as sports utility vehicles, despite their low fuel economy, capture an increasingly large share of the market for new vehicles.

Evidence suggests that the amount consumers engage in environmentally benign behavior is an inverse function of the effort or inconvenience involved (Ajzen, 1988; Bagozzi, Baumgartner, & Yi, 1992; Cheung, Chan, & Wong, 1999; De Young, 1990; Margai, 1997) and a direct function of the personal benefit expected (Allen, Davis, & Soskin, 1993; Pieters & Verhallen, 1986). For example, a common type of environment-friendly behavior is investing in home improvements that reduce energy consumption and hence costs and may improve comfort. By 1991, 84% of Canadian households had double-glazed windows, 27% had low-flow showerheads, and 18% had programmable thermostats (Statistics Canada, 1991). By contrast, where there is little individual benefit but increased inconvenience, such as leaving a car at home to carpool or take transit, the percentages engaging in environment-friendly behavior remain low and continue to decrease as living standards rise. This evidence raises doubts not only about the validity of certain types of questions in opinion polls but also about the relative roles of altruism and self-interest in influencing environment-friendly behavior, an issue that has been much discussed in the recycling literature (Bratt, 1999a; Thøgersen, 1996).

American evidence suggests consumers are not very willing to “put their money where their mouth is” (Wasik, 1992). In a nationwide study by the Roper Organization (1991), consumers reported being willing to pay on average only 6% to 7.4% more for each of eight hypothetical green products that would cause much less pollution but that were in other respects identical to existing ones. The strong price sensitivity is confirmed elsewhere (Bennett, 1992). In a Canadian study of automobile commuters, 44% said they would not be willing to pay any more for a zero-emission vehicle (ZEV) than for a conventional vehicle that was otherwise identical (Ewing & Sarigollu, 1999). Even though the Roper study did find that postconsumption behavior was more environment friendly, the recycling rate for items with a refundable deposit, namely beverage cans and bottles, was double that of newspapers. This again suggests the influence of egoism on environment-friendly behavior. Two groups, constituting more than half the population, were identified as least likely to be environment friendly as consumers, and the main reason was the exculpatory one that large companies cause most environmental problems and hence should find the answers.

Although the above suggests that altruism plays a minor role in consumers' environmental behavior, there is evidence that about 10% of consumers
are willing to make inconvenient choices to reduce the harm their consumption does to the environment (J. Schwartz & Miller, 1991). Another 10% are willing to pay considerably more for environmentally safe products. This parallels findings by Ewing and Sarigollu (1999) that among a sample of suburban automobile commuters, 12% were willing to pay an additional $1,300 or more for a ZEV than for an otherwise identical conventional vehicle. However, the evidence about which types of people show environmentally sensitive behavior seems not to be generalizable across classes of behavior—for example, between purchasing and recycling behavior (Pickett, Kangun, & Grove, 1993).

This study examines the relative influence of three sets of factors on voluntary curbside recycling: environmental attitudes, attitudes toward cost and effort, and subjective norms.

The main hypothesis is that the effort and financial cost associated with curbside recycling must be perceived as slight for participation to be high and that many individuals are very sensitive to inconvenience and cost where no direct personal benefit is expected. If the latter part of this hypothesis is true, we can expect to find resistance to participating in depot-based recycling that involves more individual effort and even more resistance to personally demanding behaviors such as commuter carpooling and transit use. If the evidence supports this reasoning, then the many governments that claim to be serious about protecting the environment will need to be more imaginative in their search for politically acceptable ways of coercing and inducing citizens to behave in a more environment-friendly manner.

THEORETICAL DISCUSSION

Choice theory in psychology and demand theory in economics both typically characterize choice behavior as the outcome of a trade-off between perceived quantities of positive and negative attributes of alternatives. The trade-off is based on the relative importance of these attributes. Negative attributes generally relate to some generalized cost, which in the case of recycling can be defined in terms of the time and effort involved in separating recyclables from regular garbage and, in some cases, cleaning the items. A further possible negative attribute is the perception by some of an added tax burden associated with recycling. In this study, perceived inconvenience and fiscal cost are two factors hypothesized to have a negative influence on participation in curbside recycling.
In the case of recycling, because personal benefit is not involved, the main benefit relates to the environment. The magnitude of this factor’s importance to people can be construed as a measure of how altruism affects behavior.

The above two sets of factors relate both to a person’s belief that the behavior of recycling involves certain positive and negative outcomes and to his or her evaluation of the importance of these outcomes. In this case, the outcomes are personal inconvenience, fiscal cost, and environmental benefit. Ajzen and Fishbein (1980) proposed in their theory of reasoned action that an additional factor influences choices where a moral issue is involved, as in recycling. That factor is a person’s belief that specified others think the person should behave in a particular way and the person’s motivation to comply with these expectations. This subjective norm, if significant, would demonstrate a second nonegoistic effect on postconsumption behavior.

The primary purpose of the research was to test for all the above effects and estimate their relative roles in influencing self-reported recycling behavior. The relationship between the behavior and its hypothesized antecedents is shown in Figure 1 and mathematically in Equation 1. The decision to recycle depends on the strength of the various negative and positive influences on a person’s attitude toward recycling and the influence of other people (subjective norm) on the decision. The strength of each of these influences can be thought of as the product of each factor’s importance to a person and the amount of that factor perceived to be associated with recycling. For example, if a person thinks convenience is very important and believes recycling is very inconvenient, then the product of these two will have a large negative effect on the likelihood of recycling. However, if someone has a weak sense of obligation to comply with the town council’s expectations, then even if the person believes the council has a strong desire for him or her to recycle, the combination of these two factors will have only a modest influence on the likelihood of recycling. The additive combination of these products on the odds of recycling is expressed in Equation 1.

\[
\frac{p_i}{1-p_i} = \exp \left( a + \sum_{j=1}^{I} b_j x_{ij} + \sum_{k=1}^{K} c_k y_{ik} + e_i \right),
\]

where

- \( p_i \) is the \( i^{th} \) respondent’s probability of recycling, and therefore
- \( p_i/(1-p_i) \) is his or her odds of recycling;
$a$ is an alternative-specific constant measuring the inherent odds of recycling in the absence of the other effects;

$b_j$ is the average importance (across all respondents) of the $j^{th}$ attribute of the act of recycling;

$x_{ij}$ is respondent $i$’s perceived magnitude of that attribute;

$c_k$ is the average importance (across all respondents) of complying with the $k^{th}$ reference group’s expectations regarding recycling;

$y_{ik}$ is the size of respondent $i$’s belief that the $k^{th}$ reference group wants him or her to recycle; and

$e_i$ is a random error term explained below.

With no loss of generality the odds are expressed as an exponential function of each influencing factor, so that the equation may be linearized to permit estimation of $a$ and the vectors of coefficients $b$ and $c$. With suitable information on each respondent’s decision to recycle or not and on his or her perception of the magnitudes of the vectors $x_i$ and $y_i$, the natural log transformation of Equation 1 permits statistical estimation of $a$ and the vectors $b$ and $c$, using logit regression to determine the relative importance of these factors.

The behavioral theory underlying the above probabilistic expression of choice is random utility theory.¹ It posits that the attraction of any course of action consists of a systematic and a random component. The systematic
component includes those attributes associated with a course of action that are considered sufficiently important for individuals to weigh when making a choice between alternative behaviors. The random component relates to factors that prevent choice from being a wholly deterministic process, as is implied by the systematic component alone. It includes idiosyncratic, transitory, and myriad small influences on choice whose combined effects appear random and other random effects that could result in variation in an individual’s choice under identical circumstances. The probability of choosing one behavior over another depends therefore on the difference in size of the systematic components of the attraction of two behaviors, recycling and not recycling, compared to the size and sign of the difference in their random components. The more the systematic plus random components of one behavior’s attraction equal the sum of the same components of an alternative behavior, the more equal is the chance of either’s being chosen. However, the larger the difference in systematic components compared to the difference in random components, the more likely is the behavior with the larger systematic component to be chosen.

Taking the natural logarithm of Equation 1 gives

\[
\ln \left( \frac{p_i}{1-p_i} \right) = a + \sum_{j=1}^{K} b_j x_{ij} + \sum_{k=1}^{J} c_k y_{ik} + e_i. \tag{2}
\]

The equation is now linear in the parameters to be estimated, \(a\), \(b\), and \(c\), for which maximum likelihood estimates can be obtained using binomial logit regression, assuming respondents have provided information on the values of \(x_{ij}\) and \(y_{ik}\).

RESEARCH DESIGN

Curbside recycling using the “blue box” was introduced in stages within different municipalities on the island of Montreal beginning in the fall of 1990. At the time of the survey, it was available in only a few parts of the city of Montreal and in about a dozen other on-island municipalities, and, in all cases, it was still not available in apartment buildings. A door-to-door survey was conducted in three districts in the city of Montreal and in neighborhoods of three other island municipalities. Within selected census tracts, chosen to provide sufficient variance in socioeconomic and linguistic attributes, streets were selected at random and every second residential address, excluding...
apartment buildings, was visited by a trained interviewer. A total of 781 completed responses were obtained, of which only 6% did not use the box. Such a high percentage is consistent with Scott’s (1999) findings in suburban Toronto. Full interviews were refused at 661 addresses. Of these, 540 were at least willing to indicate whether they used the box, and 16% did not. This means the sample of 781 complete responses underestimates by about 4% all respondents’ (781 + 540) probability of not using curbside recycling. For the remaining 121 individuals contacted, there is no information, although in many cases, the absence of response is related to extraneous factors.

To probe attitudes toward curbside recycling, respondents were first asked how much environmental protection, ease of garbage disposal, and keeping down the cost of garbage disposal mattered to them on a 10-point scale, where 1 was defined as not at all and 10 as nothing matters more. These are equivalent to self-reported values of $b_j$ for each respondent. Using a 10-point scale where 1 meant not at all and 10 meant very much, respondents were asked their perception of (a) how much curbside recycling helped protect the environment; (b) how much it had a negative or positive impact on the overall cost of garbage disposal, assuming in both cases that most people recycled; and (c) how inconvenient curbside recycling was to use. These provided the values of $x_{ij}, j = 1, 3$ in the above equations. In addition, respondents were asked their overall attitude toward participating in curbside recycling.

To probe the role of others in influencing participation, respondents were asked how much they believed each of five different groups wanted them to use curbside recycling, which provides the values of $y_{ik}, k = 1, 5$ in the equations, and how important the respondents considered the opinions or recommendations of each of these groups when deciding whether or how much to use the blue box. The latter are equivalent to self-reported values of $c_k$ for each respondent. The five groups were household members, friends and neighbors, town councils, environmental groups, and businesses. Respondents were also asked how much they thought the people who really mattered to them wanted them to participate.

Answers to the above questions allowed an analysis of participation behavior from a variety of perspectives. These cognitive questions were followed by questions about participation in recycling, ranging from a simply binary question to questions about what percentage of each of five classes of material the respondents recycled. The five classes were newspapers, cardboard, nonrefundable glass containers, nonrefundable cans, and hard plastics. The reason for distinguishing between types of material was motivated by the hypothesis that materials that are less convenient to recycle will be recycled less.
RESULTS

SELF-REPORTED ATTITUDES AND BELIEFS

If one relies solely on respondents’ stated attitudes about the importance of the three factors—protecting the environment, having convenient garbage disposal, and keeping down its cost—by far the strongest attitude appears to be protecting the environment (see Table 1). About 80% gave it an importance rating of 8 or more on a 10-point scale, compared to about 60% who rated convenience of disposal as very important (8 or more on the scale) and about 50% who rated cost of disposal as very important. Whether the relative strengths of these stated attitudes are consistent with their relative strengths as revealed by actual recycling behavior is discussed below after estimating the values of $b_j$, $j = 1, \ldots, 3$ in Equation 2.

As to people’s beliefs about the effect of using the blue box, that is, their $x_{ij}$ values, more than 70% believed it was very beneficial to the environment (a score of 8 or more on the 10-point scale), assuming most people use it, whereas almost 80% thought it involved little effort (a score of 3 or less on the scale). By contrast, opinions about its effect on the overall cost of garbage disposal were much more uncertain and divided. Nearly 20% of respondents were uncertain about how it would affect costs, and of the rest, for every 3 who believed it would raise costs, 2 believed it would lower them. Overall, about 40% rated it as 5 or higher in terms of increasing cost.

### TABLE 1

<table>
<thead>
<tr>
<th>Rating</th>
<th>Protecting Environment</th>
<th>Convenience of Disposal</th>
<th>Cost of Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>46</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>9 or more</td>
<td>57</td>
<td>41</td>
<td>33</td>
</tr>
<tr>
<td>8 or more</td>
<td>79</td>
<td>59</td>
<td>51</td>
</tr>
<tr>
<td>7 or more</td>
<td>91</td>
<td>71</td>
<td>61</td>
</tr>
<tr>
<td>6 or more</td>
<td>95</td>
<td>76</td>
<td>68</td>
</tr>
<tr>
<td>5 or more</td>
<td>98</td>
<td>87</td>
<td>84</td>
</tr>
<tr>
<td>4 or more</td>
<td>99</td>
<td>90</td>
<td>87</td>
</tr>
<tr>
<td>3 or more</td>
<td>99</td>
<td>93</td>
<td>92</td>
</tr>
<tr>
<td>2 or more</td>
<td>99</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>1 or more</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
With respect to subjective norms, about half the respondents in family households (85% of the sample) claimed to value highly (8 or more on the scale) the opinions of household members when deciding how much to use the blue box (see Table 2). The exceptions were single parents and those living alone, where the proportion fell to a third and a quarter, respectively. Nevertheless, about a quarter of respondents claimed to attach no importance to the views of other household members on this matter. It is surprising that slightly more than half claimed to consider the recommendation of environmental groups as very important in the decision, whereas less than a fifth said it was unimportant. Whether this is supported by actual behavior will be revealed by the estimates of $c_k, k = 1, \ldots, 4$ in Equation 2.

Regarding their belief in how much each of the groups wanted them to use the blue box, more than 90% of respondents strongly believed environmental groups wanted them to use it, followed in decreasing order by household members (74%), city council (65%), friends and neighbors (52%), and businesses (31%). In response to a more general question, almost 80% said the people or groups who mattered to them most thought they should use the blue box, suggesting a high incentive to use the blue box if the opinions of others matter.

### Table 2

**Percentage Distribution of Stated Strengths of Attitude to Opinion of Household Members**

<table>
<thead>
<tr>
<th>Strength of Attitude</th>
<th>Couple Alone</th>
<th>Couple With Children</th>
<th>Single Parent</th>
<th>Person Alone(^a)</th>
<th>Other Households</th>
<th>All Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>29</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
<td>24</td>
<td>27</td>
<td>28</td>
<td>37</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>5</td>
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<tr>
<td>6</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>13</td>
<td>9</td>
<td>10</td>
<td>15</td>
<td>12</td>
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<tr>
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<td>11</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>27</td>
<td>27</td>
<td>25</td>
<td>14</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

**Percentage of sample**

24.4 55.3 5.7 9.3 5.3 100

\(^a\) Positive responses from those living alone may refer to family members not living with the respondent.

**NOTE:** Percentages in each column sum to 100, except for rounding error.
ATTITUDES REVEALED BY BEHAVIOR

Whether to Recycle

The simplest definition of participation in curbside recycling is whether someone uses the service or not. By way of exploratory data analysis, this binary response was cross-tabulated against the level, on a 10-point scale, of each of three beliefs about the effect of using the blue box and each of five beliefs about how much different groups wanted respondents to use it. The tables consistently revealed higher use of the blue box by those with scores higher than 5 on a belief scale. Therefore, for all eight independent variables, a dummy variable was created, with a value of 1 for belief scores higher than 5. A binomial logit regression equation in the form of Equation 2 was estimated (see Table 3, Initial Model), and stepwise elimination of variables based on the size of the \( t \) statistic resulted in the reduced model (see Table 3). Attention is directed to the odds ratios in the reduced model, which show by how much the odds of choosing to recycle would be multiplied if the value of a dummy variable, \( x \) or \( y \), changed from 0 to 1.

The odds ratio of 3.07 for the constant indicates that even an individual who scored 0 on all four significant variables in the reduced model would have an odds of about three to one of using the blue box. This translates into a base probability of .75. It indicates a high general inclination to participate in curbside recycling, even in the presence of weak beliefs about the desires of household members, friends, and neighbors and about recycling’s effect on the environment and the effort involved. A reasonable null hypothesis about the probability of recycling in the absence of any costs or benefits or social pressures would be .5, that is, a 50-50 chance. The fact that the estimated average probability is .75 can be seen as indicating a strong personal norm or internalized moral attitude (S. Schwartz & Howard, 1980) that recycling is the correct thing to do. For those who believe that recycling helps protect the environment, inserting the relevant regression coefficient, .86, together with the constant 1.12 into Equation 1 and solving for \( p \) increases the base probability by .12, which can be seen as the effect of altruism. For those who believe recycling is inconvenient, inserting its regression coefficient, -.65, reduces the probability by .14. The two social norms, the influence of what household members and friends and neighbors expect, increase the base probability by .14 and .12, respectively. From this, one can conclude that at the individual level, the average impact on recycling probability of each of the four significant beliefs (one altruistic, one egoistic, and two social norms) is similar. By contrast, Bagozzi and Dabholkar (1994) found both egoistic
and altruistic goals played a role in the decision to recycle, but the latter dominated.

At the level of the entire sample and the population it represents, the actual effect of these factors on the propensity to recycle depends on the distribution of respondents’ beliefs about the effects of recycling and about the expectations of significant others. Eighty-seven percent of respondents believed the blue box helps the environment, followed by 77% who believed their household members wanted them to use it, 61% who believed their friends and

| TABLE 3 |
| Parameter Estimates of a Binomial Logit Model of the Decision to Use Curbside Recycling |
| Model With Dummy Independent Variables | Initial Model | Reduced Model |
| Regression Coefficient | Regression Coefficient | Odds Ratio*
| Constant, $a$ | 0.8 (.065) | 1.12 (.001) | 3.07 |
| Believe using the blue box does the following: $\exp(bx)$ | | | |
| Helps protect environment | 0.83 (.022) | 0.86 (.017) | 2.36 |
| Causes personal inconvenience | -0.66 (.107) | -0.65 (.103) | 0.52 |
| Raises overall cost of garbage disposal | -0.07 (.849) | — | — |
| Believe the following want you to use the blue box: $\exp(cy)$ | | | |
| Household members | 0.94 (.008) | 1.03 (.003) | 2.81 |
| Friends and neighbors | 0.70 (.063) | 0.83 (.019) | 2.29 |
| Town council | 0.12 (.751) | — | — |
| Environmental groups | 0.44 (.328) | — | — |
| Businesses | 0.06 (.881) | — | — |

$n = 777$

Log-likelihood statistic = $L_{M} - 155.01$ ($L_{M1}$) - 155.92 ($L_{M2}$)

Restricted (slopes = 0) log-likelihood statistic = $L_{R} - 174.64$

$\chi^2$ statistic = $2 (L_{M} - L_{R}) = -174.64$

$df$, significance level 39.1, 8, .000 37.4, 4, .000

McFadden’s $p^2$ 0.11 0.11

$\chi^2$ statistic = $2 (L_{M1} - L_{M2}) = 1.82$; $df = 8 - 3 = 5$; probability = .87

NOTE: The probability that the sample regression coefficient is from a population whose coefficient is 0 is shown in parentheses.

a. The value by which the odds of recycling are multiplied if a constant or dummy variable, $x$ or $y$, equals 1.
neighbors wanted them to use it, and only 11% who thought it inconvenient to use. Overall, internalized social norms are the most important (given that there are two), and next in importance is an altruistic belief; the egoistic belief plays a minor role, simply because so few people consider curbside recycling inconvenient.

**How Much to Recycle**

The above findings need to be qualified by noting that no distinction is made as to the proportion of material each respondent recycled. Whether one household recycled 5% and another everything made no difference. Both were classified as participating in curbside recycling. This prompted examination of the proportion of each material that households reported recycling. Arguably, knowing why some households recycle a much larger proportion of their recyclables than others will provide greater insight into motivations than knowing why a small proportion of a population recycles nothing at all. In addition, one may hypothesize that certain materials are more convenient to recycle than others. For example, newspapers involve little effort compared to cans and plastic containers, which may need rinsing or be more inconvenient to store for the weekly pickup. Therefore, for each of five categories of recyclable material (newspapers, cardboard boxes and cartons, nonrefundable bottles and jars, nonrefundable cans, and hard plastics), respondents were asked what percentage they put in the blue box.

In each case, the distribution of percentages is bimodal (see Figure 2), and, indeed, the sample consists mostly of people who recycle either a very large or a very small proportion of any material. The five distributions are highly skewed toward 100%, with a much smaller peak at and near 0%. The bimodal and skewed distribution of these variables makes them unsuitable for ordinary least squares regression analysis, in that the error distribution is likely to be neither homoscedastic nor normal. The former affects estimation bias and the latter the estimation of the $t$ statistic. This prompted a decision to classify respondents into two groups: high recyclers, who recycled 80% or more of a material, and low recyclers, who recycled 20% or less. The resulting binary variable is coded as 1 for a high recycler and as 0 for a low recycler. The ratio of high to low recyclers (see Table 4) reveals newspapers to be by far the most recycled item. Nonrefundable glass containers and cardboard and cartons were the next most recycled materials, whereas cans and hard plastics, with ratios of 3.3, were the least. This evidence alone suggests convenience may be an issue, insofar as it is the least easily handled recyclables that have the lowest ratio of high to low recyclers.
The results of the stepwise logit regressions for each of the five classes of material (see Table 5) provide striking evidence that the decision to be a high or low recycler of each of the five materials is influenced by the same two factors, namely, the negative effect of the egoistic belief that using the blue box is inconvenient and the positive effect of the subjective norm that household members want the respondent to use it. The expectations of friends and neighbors influence only decisions to recycle newspapers and cardboard, whereas the altruistic belief that recycling helps protect the environment affects the decision for only the most easily recycled material, newspapers. These findings suggest environmental altruism plays little role in distinguishing between high and low recyclers, whereas personal utility and the
moral influence of valued others do. The wishes of town councils, businesses, and environmental groups have no detectable influence.

The reason that the expectations of environmental groups have no influence may have to do with the small variance in respondents’ beliefs about these groups’ expectations rather than with the degree to which people care about their views. Eighty-seven percent of respondents rated environmental groups’ desires for them to use the blue box at either 9 or 10 on a scale of 10. The small variance in that belief makes it statistically difficult to estimate its influence. Certainly, more than half the respondents claimed to care a great

TABLE 5
Odds Ratios for High Versus Low Recyclers

<table>
<thead>
<tr>
<th>Interval Scale</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0 to 9)</td>
<td>Newspaper Cardboard Glass Cans Plastics</td>
</tr>
<tr>
<td>Constant</td>
<td>2.05 (.089) 1.58 (.053) 2.94 (.000) 2.38 (.000) 2.02 (.001)</td>
</tr>
<tr>
<td>Believe that using the blue box does the following:</td>
<td></td>
</tr>
<tr>
<td>Helps protect environment</td>
<td>1.13 (.017)</td>
</tr>
<tr>
<td>Causes personal inconvenience</td>
<td>0.84 (.000) 0.88 (.003) 0.86 (.000) 0.90 (.004) 0.92 (.033)</td>
</tr>
<tr>
<td>Raises overall cost of disposal</td>
<td>0.96 (.044)</td>
</tr>
<tr>
<td>Believe the following want you to use the blue box:</td>
<td></td>
</tr>
<tr>
<td>Household members</td>
<td>1.11 (.016) 1.15 (.000) 1.12 (.000) 1.08 (.007) 1.10 (.001)</td>
</tr>
<tr>
<td>Friends and neighbors</td>
<td>1.12 (.014) 1.08 (.024)</td>
</tr>
<tr>
<td>McFadden’s $\rho^2$</td>
<td>0.12 0.09 0.05 0.02 0.03</td>
</tr>
</tbody>
</table>

n 723 632 698 669 655

NOTE: The probability that the sample regression coefficient is from a population whose coefficient is zero is shown in parentheses. Only variables whose odds ratios have a t statistic probability $\leq .05$ are retained.

a. The original interval scale values, 1 to 10, of the independent variables were rescaled to 0 to 9 so that 0, not 1, represented the absence of belief.

b. Beliefs about the desires of the other three groups had no significant effect and are not shown in the table.
deal about what environmental groups think when deciding to use the blue box.

The odds ratio for each constant, $a$, in Table 5 is the estimated average odds of being a high rather than low recycler of a material, assuming all eight beliefs are nonexistent. The differences between the five odds ratios are not statistically significant, but their average odds ratio of approximately 2 implies that a person with no beliefs in any of the factors would nevertheless have a two-to-one odds—equivalent to a two-thirds probability—of high rather than low recycling.

The estimated regression coefficient for each factor helps show how the probability of high recycling would change with growing belief in that factor. Using the regression coefficients from the models described above, the probability of high recycling is estimated using the logistic function

$$p = \frac{1}{1 + \exp[-(a + bx)]}, \tag{3}$$

where $a$ is the constant, $b$ is the regression coefficient indicating the importance of one of the five significant belief variables to the decision to recycle a lot, and $x$ is the strength of belief in that variable.

The function plots in Figure 3 show how the probability of recycling a lot of any material changes with the strength of belief. They also show the sample’s distribution of belief strengths in each of the five significant factors. The probabilities associated with a belief strength of 0 for each of the five factors in Figure 3 range between .61 and .75, indicating a strong inclination to high recycling even in the absence of any beliefs about the three effects of using the blue box and about the expectations of the two types of valued others.

Comparing the two factors that influence all five recycling decisions, the most noticeable feature is how much more negative is the effect of increasing inconvenience than is the positive effect of increasing belief that household members want one to use the blue box. Over the full range of beliefs, increasing inconvenience reduces the probability of recycling a lot by between .2 and .3 depending on the material. By comparison, increasing the belief that such behavior is expected by other household members generally increases the probability by about .15. Indeed, the function plots for inconvenience (see Figure 3b) are generally steeper than those for any of the other influences, suggesting that the probability of recycling a lot of any material is affected more by its perceived inconvenience than by any other belief. As Figure 3b shows, few people believe the current arrangement is inconvenient, but the results imply that implementing a much less convenient recycling scheme
Figure 3: Effect of Belief Strength on the Probability of Being a High Rather Than Low Recycler and Distribution of Belief Strengths in Five Factors Found to Be Significant in Recycling
would result in an appreciable reduction in recycling activity, especially of newspaper and cardboard. In effect, those items that are currently most recycled would be the most adversely affected by such a change.

TESTING THE RELIABILITY OF CLAIMS ABOUT ATTITUDES

In addition to being asked their beliefs about the three effects of using the blue box and how much each of five groups wanted them to use it, respondents were also asked what importance they attached to each of these eight factors. If self-reported attitudes are reliable predictors of behavior, one would expect that the inclusion of these attitude ratings would improve the fit of the models reported in Table 5. After all, each of the models in Table 5 estimates only one set of attitude weights (regression coefficients) for the entire sample, whereas allowing each respondent to specify his or her unique attitude weights effectively allows each respondent to have unique regression coefficients. A simple test of whether self-reporting on attitudes is a better basis for predicting recycling behavior is simply to multiply respondents’ stated attitude weights by their belief scores and then to reestimate the same models. The significant odds ratios in Table 6 are all very close to 1. This is because the effect of attitude, of which the odds ratio is an estimate, has already been incorporated into the model as a result of multiplying each respondent’s eight belief scores by the associated attitude scores. Nevertheless, although virtually the same factors emerge as significant, the goodness of fit, as measured by McFadden’s $\rho^2$, is inferior in all cases. The conclusion is that self-reported statements about the importance of these eight factors do a poorer job of predicting recycling behavior, and hence are poorer indicators of their behavioral effects, than does the estimated importance of each belief as inferred from actual recycling behavior.

ASSOCIATIONS BETWEEN RECYCLING BEHAVIOR AND SOCIODEMOGRAPHIC INDICATORS

Knowing which personal or household attributes are associated with high or low recycling behavior can assist in designing programs to encourage higher participation. Questions were asked about age, education, household type, and home language. Multivariate binomial logit regression using step-wise addition of significant variables was used to establish whether high and low recyclers of each of the five materials differed in any of the four characteristics. The odds ratios are shown in Table 7 for those characteristics that showed significant differences in odds, holding constant the effects of any other significant factors in the same column. For all five materials, those with
Postsecondary education had a 2 to 3 times higher odds of recycling. By contrast, those younger than 30 were only half as likely to recycle each material as were the rest of the population. The finding about the positive effect of education is consistent with findings in other studies of recycling behavior (Derksen & Gartrell, 1993; Jacobs, Bailey, & Crews, 1984; Katzev, Blake, & Messer, 1993; Weigel, 1977), as is, to some extent, the finding about age (Derksen & Gartrell, 1993; Lansana, 1992; Vining & Ebreo, 1990).

Just less than half the sample spoke French at home, a third spoke English, 5% Italian, and the remaining 15% other languages. In general, holding the other significant factors constant, those who used either English or languages other than French or Italian at home had 1.5 to 1.75 higher odds of recycling four of the five materials than those who used French or Italian. Additionally, in the case of glass, those who spoke Italian had half the odds of recycling it, compared to French speakers, and a third of the odds of the rest of the sample.
For the three less commonly recycled materials (glass, cans, and plastics), family households (85% of the sample) had up to twice the odds of recycling them as nonfamily households.

ASSOCIATIONS BETWEEN RECYCLING BEHAVIOR AND ENVIRONMENTAL COGNITION AND BEHAVIOR

Respondents were questioned about their knowledge and awareness of, and attitudes toward, environmental issues. The aim was to see if heightened sensitivity to and knowledge of environmental matters make a difference in recycling behavior.

Two questions about knowledge asked what the respondents knew about the level of sewage treatment on the island of Montreal, where all respondents lived, and what they thought was the main cause of global warming. The five alternatives in the latter ranged from those that reflected ignorance, such as “nuclear accidents” and “solar flares,” to more plausible causes such as “automobile exhausts” and “destruction of the Amazonian forest.” It was expected that those with greater knowledge would be more likely to recycle highly. The same multivariate logit regression approach was used as described above, with all variables related to knowledge, awareness, and attitudes included simultaneously in the model and removed if not significant. However, answers to these two questions did not help distinguish between high and low recyclers.

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>Paper</th>
<th>Cardboard</th>
<th>Glass</th>
<th>Cans</th>
<th>Plastics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education: junior college or higher</td>
<td>3.18 (.000)</td>
<td>2.37 (.001)</td>
<td>3.32 (.000)</td>
<td>2.19 (.002)</td>
<td>2.14 (.003)</td>
</tr>
<tr>
<td>Age: younger than 30</td>
<td>0.56 (.043)</td>
<td>0.53 (.004)</td>
<td>0.55 (.007)</td>
<td>0.58 (.008)</td>
<td>0.52 (.001)</td>
</tr>
<tr>
<td>Home language: English and other</td>
<td>1.73 (.051)</td>
<td>1.79 (.027)</td>
<td>1.46 (.089)</td>
<td>1.56 (.020)</td>
<td></td>
</tr>
<tr>
<td>Italian</td>
<td>0.47 (.055)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household: family</td>
<td>2.16 (.003)</td>
<td>1.72 (.023)</td>
<td>1.67 (.036)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The probability that the sample regression coefficient is from a population whose coefficient is zero is shown in parentheses. Only variables whose odds ratios have a t statistic probability ≤ .1 are retained.

a. Other includes all languages except French and Italian.

b. Family refers to couples with and without children and single-parent families.
The question measuring awareness inquired how often the respondents noticed environmental issues being covered in the media. It was thought that those who paid more attention to media coverage of these issues would be more likely to feel a need to do something about it. In fact, almost 75% noticed coverage at least several times a week. However, in only one instance, plastics, was that level of awareness positively associated with higher recycling (odds ratio of 1.63, see Table 8).

Three questions measured attitude toward environmental issues. One related to whether respondents thought the primary blame for environmental problems lay with ordinary people, governments, or corporations. It was supposed that the 35% who blamed themselves (ordinary people) would more likely be high recyclers than those who blamed either of the third parties.

<table>
<thead>
<tr>
<th>Belief, Attitude, or Behavior Change</th>
<th>Paper</th>
<th>Cardboard</th>
<th>Glass</th>
<th>Cans</th>
<th>Plastics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice environmental issues in the media at least several times a week</td>
<td>1.63 (.019)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which is the most urgent problem?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental degradation</td>
<td>1.45 (.088)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overpopulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The threat of war</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The state of the economy</td>
<td>0.56 (.054)</td>
<td>0.55 (.010)</td>
<td>0.52 (.005)</td>
<td>0.61 (.026)</td>
<td></td>
</tr>
<tr>
<td>The plight of Third World people</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior change since the environment became an issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>1.78 (.033)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food shopping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of home and garden care products</td>
<td>1.80 (.031)</td>
<td>1.80 (.005)</td>
<td>2.15 (.000)</td>
<td>1.76 (.004)</td>
<td>1.84 (.002)</td>
</tr>
</tbody>
</table>

NOTE: The probability that the sample regression coefficient is from a population whose coefficient is 0 is shown in parentheses. Only variables whose odds ratios have a t statistic probability ≤ .1 are retained.
There was no statistically significant relationship between answers to this question and recycling behavior.

A second question focused on what respondents believed was the most urgent problem. The five options (see Table 8) covered issues ranging from environmental degradation to global security, the state of the economy, and Third World problems. It was hypothesized that those citing environmental degradation, a third of the sample, would more likely be high recyclers, and those showing more concern about the economy, a fifth of the sample, would be low recyclers. Indeed, for four of the five materials, those citing the state of the economy as the most urgent problem had half the chance of being high recyclers compared to others, and in the case of the fifth material, plastics, those citing environmental degradation had 1.5 times the odds of being high recyclers.

A final set of three attitudinal questions asked if respondents had changed their behaviors in transport, food shopping, and the use of home and garden care products since the environment had become an issue. Because they focus on actual changes in environment-related behaviors stemming from a change in attitude, these questions were expected to be more effective predictors of recycling habits than simple attitude statements. Moreover, the more effective the predictor, the more an odds ratio will deviate from a value of 1. A change in use of home and garden care products (claimed by 58% of the sample) was associated with about twice as high odds of recycling all five materials highly as compared to those respondents who had not changed use of such products (see Table 8). There were additional links between changing food shopping habits (45% of the sample) and recycling nonrefundable cans (odds ratio of 1.58) and between changing transport habits (23%) and plastics recycling (odds ratio of 1.78). In the case of cans, where two of the three indicator behaviors are positively associated with high recycling, it means that individuals who had changed both their use of home and garden care products and their food shopping habits would have almost 3 times higher odds (1.76 \times 1.58 = 2.78) of being a high recycler of cans. By the same token, someone who had changed both use of home and garden products and transport habits would have 3.28 times higher (1.84 \times 1.78) odds of recycling most plastics than someone who had changed neither behavior.

Finally, respondents were asked if they were active in certain leisure activities, namely, gardening, hiking, camping, canoeing, naturalist pursuits, cross-country skiing, and volunteer work. The percentage engaged in each ranged from a high of 52% who gardened to 14% who canoed. The activities could be considered to reflect to varying degrees either a concern for nature or altruism. It was hypothesized that people engaged in these activities would be sufficiently environmentally sensitive or altruistic to be conscientious
recyclers. Multivariate logit regression models, which simultaneously included all leisure activity dummy variables, were estimated for each recyclable material. The one activity that best distinguished high from low recyclers of each of the five materials was gardening, with odds ratios ranging from 1.75 to 2.16 (see Table 9). In the case of two materials, glass and cans, volunteer activity (37% of the sample) had an additional significant positive association.

ATTITUDES TOWARD GARBAGE REDUCTION

To probe further how egoism may affect moral decisions about protecting the environment, respondents were asked whether they thought each household should pay a user fee based on the amount of garbage it produced. A positive response can be construed to indicate an awareness of the need to reduce domestic waste and agreement with financial incentives to do so. Only 26% of respondents agreed to the notion of such a user fee. Without the respondents having been given specifics as to whether they might pay more or less than they do at present through municipal taxes, it would seem that self-interest prompted many to respond negatively to the question. The answers certainly do not suggest great concern for garbage reduction.

Separate logit regression analyses were conducted between the binary responses to the user fee question and each of the three categories of respondent attributes discussed previously with respect to high and low recycling (Table 10, column 1). In the category encompassing age, education, home language, and household type, age and education played no significant role. Only one small group of households (6% of the sample) headed by single parents showed 1.77 times higher odds of favoring a user fee, holding other significant factors constant. Conceivably, this reflects the belief of some single parents that their households generate less garbage than the average, but this

<table>
<thead>
<tr>
<th>Activity</th>
<th>Paper</th>
<th>Cardboard</th>
<th>Glass</th>
<th>Cans</th>
<th>Plastics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardening</td>
<td>1.79 (.035)</td>
<td>1.88 (.002)</td>
<td>2.16 (.000)</td>
<td>1.64 (.008)</td>
<td>1.75 (.003)</td>
</tr>
<tr>
<td>Naturalist</td>
<td>1.63 (.010)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volunteer work</td>
<td></td>
<td></td>
<td>1.58 (.047)</td>
<td>1.45 (.067)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The probability that the sample regression coefficient is from a population whose coefficient is zero is shown in parentheses. Only variables whose odds ratios have a t statistic probability ≤ .1 are retained.
### TABLE 10
Regression Models of Factors Associated With Other Attitudes Toward Garbage Reduction and Recycling

<table>
<thead>
<tr>
<th>Model</th>
<th>User's Expected Extent of Recycling</th>
<th>User's Expected If Drop-Off Points Replaced</th>
<th>User Should Pay Fee Based on Quantity of Garbage Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(odds ratio) (regression coefficient)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(odds ratio)</td>
</tr>
<tr>
<td>A: Sociodemographic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.30 (.000)</td>
<td>50.48 (.000)</td>
<td></td>
</tr>
<tr>
<td>Age younger than 30</td>
<td>7.34 (.014)</td>
<td>7.34 (.014)</td>
<td></td>
</tr>
<tr>
<td>Home language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilingual (English and French)</td>
<td>11.02 (.037)</td>
<td>11.02 (.037)</td>
<td></td>
</tr>
<tr>
<td>Italian</td>
<td>0.18 (.021)</td>
<td>–15.34 (.012)</td>
<td></td>
</tr>
<tr>
<td>English and othera</td>
<td>1.43 (.035)</td>
<td>1.43 (.035)</td>
<td></td>
</tr>
<tr>
<td>Single-parent household</td>
<td>1.77 (.076)</td>
<td>1.77 (.076)</td>
<td></td>
</tr>
<tr>
<td>B: Belief, attitude, or behavior change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.19 (.000)</td>
<td>49.4 (.000)</td>
<td></td>
</tr>
<tr>
<td>Notice environmental issues in the media at least several times a week</td>
<td>1.48 (.060)</td>
<td>1.48 (.060)</td>
<td></td>
</tr>
<tr>
<td>Which is the main cause of global warming?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ozone hole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear accidents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Destruction of the Amazon forest</td>
<td>2.31 (.004)</td>
<td>9.33 (.040)</td>
<td></td>
</tr>
<tr>
<td>Automobile exhausts</td>
<td>1.38 (.094)</td>
<td>1.38 (.094)</td>
<td></td>
</tr>
<tr>
<td>Solar flares/sunspots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which is the most urgent problem?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental degradation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overpopulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The threat of war</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The state of the economy</td>
<td>–10.60 (.002)</td>
<td>–10.60 (.002)</td>
<td></td>
</tr>
<tr>
<td>The plight of Third World people</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior change since the environment became an issue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>1.67 (.010)</td>
<td>10.83 (.001)</td>
<td></td>
</tr>
<tr>
<td>Food shopping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of home and garden care products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C: Leisure activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.31 (.000)</td>
<td>48.47 (.000)</td>
<td></td>
</tr>
<tr>
<td>Hiking</td>
<td>1.43 (.033)</td>
<td>1.43 (.033)</td>
<td></td>
</tr>
<tr>
<td>Camping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-country skiing</td>
<td>6.12 (.037)</td>
<td>6.12 (.037)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Only significant coefficients of logit regression models in column 1 and ordinary least squares regression models in column 2, using backwards elimination, are shown. Only variables whose coefficients have a t statistic probability ≤ .1 are retained.

a. Other includes all languages except French and Italian.
trait is surely shared by those living alone (9%), who showed no tendency to favor a user fee system. Two home-language groups showed significant differences from the French majority. The odds of Italian-speaking households (5% of the sample) favoring a user-pay system were a fifth of those of French-speaking households (46%), whereas for all other households (49%), predominantly English-speaking (34%), the odds were 1.43 times greater. That the latter are about 1.5 times more inclined to favor a user-pay system than French-speaking households is consistent with the evidence in Table 7 regarding the same group’s being higher recyclers of four of the five types of material. However, by comparison with Italian-speaking households, where only 5% favor a user-pay system, the difference between the two main language groups is only moderate, with 23.6% of French-speaking households and 31.3% of English-speaking households favoring a user-pay system.

From the group of questions about environmental beliefs, attitudes, and related behavioral changes, the best predictor of willingness to pay was the belief that Amazon forest destruction was the main cause of global warming, a view held by only 10% of respondents. Their odds ratio of being in favor was 2.31 times higher than others, holding constant other significant variables in the model. The largest group (48%), who thought automobile exhausts were the primary cause, had 1.38 times higher odds of being in favor. Therefore, those best informed about global warming, in terms of the alternatives presented, were the most likely to favor households paying according to their contribution to the garbage stream. This is reinforced by the evidence from a third significant factor in this group of questions: awareness of media coverage of environmental issues. Individuals aware of frequent coverage had 1.48 times higher odds than others of favoring a user-fee system. However, the second best predictor of willingness to pay in this group of factors, with an odds ratio of 1.67, was whether someone had changed travel behavior habits since the environment had become an issue. Therefore, environmental knowledge and relevant behavior changes better predicted a willingness to pay proportionately for garbage generation than an expression of concern about general environmental degradation.

In a separate analysis of leisure activities, only those who were active hikers were significantly more likely to favor a user-fee system, with an odds ratio of 1.43.

ATTITUDES TOWARD DROP-OFF RECYCLING

A criticism of curbside recycling is that a large diesel truck traveling around residential streets and stopping every few yards to collect recyclables is unnecessarily polluting and wasteful of energy, compared to a truck
picking up materials from drop-off locations near where people have to travel regularly to shop. To probe whether people were willing to put the effort into transporting or carrying their recyclables to a drop-off point near their grocery store, they were asked the percentage they would recycle compared to what they were currently doing if that arrangement replaced curbside pickup. Almost a quarter believed they would recycle as much, with a further quarter expecting to recycle only a half, and a third of them less than a third (see Figure 4). The median response was 50%. This evidence supports the view that most people are not willing to put much effort into recycling, even though a large majority probably do their primary grocery shopping by car and need not make an additional trip to recycle. This corroborates the findings of Brothers, Krantz, and McClannahan (1994), who found a much higher level of paper recycling in an office when containers were placed close to participants compared to when one central container was used. It also agrees with Margai’s (1997) findings in public housing in New York but does not agree with the findings of Katz et al. (1993) regarding multifamily housing units in Portland, Oregon.

Multiple regression analysis was performed on respondents’ expected drop-off recycling rates with relation to the three categories of attributes in Table 10. Of the four household attributes, education and household type had no bearing on drop-off rates. Respondents younger than 30 were on average willing to drop off 7% more than the average (Table 10, column 2). Among language groups, those who spoke Italian at home were on average willing to recycle 15% less, whereas for bilingual households (7% of the sample), the figure was 11% more than average.

One environmental belief and one economic attitude had a bearing on this issue. People who thought destruction of the Amazon forest was the main
cause of global warming (10% of the sample) were on average willing to drop off about 10% more material to a collection point than the average respondent. By contrast, people who thought the state of the economy was the most urgent problem (20% of the sample) were on average willing to bring 10% less than average. Finally, those who were campers (26%) and cross-country skiers (31%) were likely in each instance to bring 6% to 7% more recyclables to a drop-off point than other respondents.

LINKAGES OF USER-FEE AND DROP-OFF ATTITUDES WITH RECYCLING BEHAVIOR

Whereas about a quarter of respondents believed they would recycle virtually as much if curbside recycling was replaced by a drop-off system, a quarter also believed in a user-fee system for garbage collection. However, it was not the same quarter: Only 10% of the sample belonged to both categories. If there were no association at all, the latter percentage would be 6.5. Therefore, the link between the two attitudes is only modest. Moreover, compared to the 10% who shared the two positive attitudes, a quarter not only opposed a user-fee system but also thought they would recycle less than a third of current amounts if a drop-off point were to replace curbside pickup. Therefore, overall support for a combined fee-based garbage reduction system and more sustainable recycling methods is slight. More people prefer the status quo.

Examination of the association between responses to the above two questions and current recycling behavior revealed negligible and statistically insignificant positive associations. The only exception was a weak but statistically significant positive association between a respondent’s level of glass recycling and the expected level of use of a hypothetical drop-off point for recyclables. Therefore, current levels of curbside recycling are poor indicators of likely public response to more inconvenient methods of recycling and personally costly methods of reducing garbage. This lends additional credence to Bratt’s (1999b) claim that there is no “general” environmental behavior. It also lends support to the view that personal utility considerations greatly outweigh altruistic motives in the matter of protecting the environment.

DISCUSSION

The central aim of the research was to estimate the relative strengths of altruism, egoism, and subjective norms in influencing householders’ curbside recycling decisions. The influence of any factor on behavior always
depends on a combination of the importance someone attaches to a factor (e.g., convenience or the wishes of household members) and on the perceived magnitude of a factor (e.g., low inconvenience or a strong belief that certain others want one to recycle). Therefore, it was necessary to infer from behavior how important people thought each of the factors was and to ask what their perceptions were of the magnitudes of these factors.

Inferences were drawn on the basis of self-reported information about respondents' recycling behavior and about their beliefs regarding recycling's effect and how much others wished them to recycle. Recycling behavior was defined in two ways, namely, whether the blue box was used at all and what proportion of each class of material was recycled.

With respect to beliefs, three factors stand out (see Figure 3). Among those factors that mattered to respondents, a large majority strongly believed that using the blue box did help protect the environment, that curbside recycling was convenient, and that household members wanted them to recycle.

In deciding whether to recycle at all, two subjective norms, the wishes of household members and of friends and neighbors, and the altruistic attitude that recycling was good for the environment were all of similar importance to people (odds ratios between 2.29 and 2.81, Table 3), whereas inconvenience was a little less important, in negative terms, with an odds ratio of .52. However, because the perceived inconvenience of curbside recycling was slight, this mitigated the actual effect of inconvenience. By contrast, the importance people attached to helping protect the environment by recycling and the importance they attached to the associated expectations of household members were compounded by a very strong belief that recycling did indeed help the environment and by a generally strong belief that household members wanted them to recycle. This explains why 94% of the sample recycled to some degree. So, with regard to the decision to participate in curbside recycling, at whatever level, the dominant influences were altruistic and normative not egoistic. However, the importance attached to convenience suggests that less convenient methods of recycling would encounter much less support.

The above definition of participation does not distinguish between token and committed recycling. The data revealed that for each of the five categories of material recycled, the large majority of respondents recycled 80% or more, and a minority recycled none or very little. Therefore, the analysis was repeated, with those reporting that they recycled 80% or more of a category of material distinguished from those recycling 20% or less. This is arguably a more meaningful basis for judging how attitudes affect recycling behavior than distinguishing the small percentage who did not participate at all from the rest of the sample. The evidence from this analysis relegates environmental protection and the wishes of friends and neighbors to minor roles.
leaving inconvenience and the wishes of household members as the dominant influences. Therefore, the initial conclusion, based on this measure of participation, is that altruism plays a minor role, and egoism and subjective norms are central to the decision about whether to be a high recycler. However, although the significance of inconvenience is evident, the fact is that at least two thirds of respondents claimed to recycle 80% or more. This can be explained by the fact that most people found recycling convenient (see Figure 3b). However, an examination of the probability function in Figure 3b indicates that any change toward a less convenient program would likely result in a substantial reduction in recycling levels, particularly of newspaper and cardboard. Therefore, in the final analysis, it is because a large majority of the sample strongly believed household members wanted them to recycle (see Figure 3d), combined with the importance attached to this norm, that this factor is the single most important (besides any prior personal norm) in explaining who are the high recyclers of all classes of recyclables. This leads to the conclusion that for a convenient form of recycling such as this, it is a social norm that most accounts for individual variance in recycling rates, followed by an egoistic motive.

Two policy implications can be drawn from both analyses. First, given the clear deterrent role of inconvenience, any attempt to replace curbside recycling with something that would be perceived as more inconvenient is likely to result in a marked reduction in quantities recycled. Second, given the importance of the wishes of household members in influencing these decisions, policies aimed at increasing the stimulus from other household members to be serious about recycling may well be effective.

One further salient feature of both sets of models is how high the intrinsic odds are of recycling either at all or highly in the case of specific materials. In the absence of belief in any of the three identified consequences of recycling and in the wishes of the five groups, the odds are between about 1.6 and 3 of being a high recycler and 3 of being a recycler. This is revealed by the odds ratios derived from the constants in the logit models (see Tables 3 and 5). These translate into base recycling probabilities of between .61 and .75. In modeling individual travel choice behavior, this constant is referred to as an alternative-specific constant and is said to subsume all effects on an alternative’s choice probability that are not estimated by other variables in the model. The present model includes the major personal costs and environmental benefit of recycling and the main groups of people thought to affect subject norms related to recycling. In the absence of any other hypothesized influences on the decision to recycle, the high inherent odds of recycling, as estimated by these constants, are presumed to reflect a strong personal norm.
In addition to the above, a variety of ancillary analyses was conducted. Evidence was presented (see Table 6) to show that using individuals’ self-reported importance ratings of the same three hypothesized effects of recycling and of the expectations of the five groups to estimate behavior, rather than statistically inferring their importance from actual recycling behavior, produced poorer goodness-of-fit to the behavior. The result suggests that self-reported importance ratings are not a reliable basis for predicting recycling behavior.

Efforts were made to determine what dimensions of respondents’ characteristics were associated with variance in recycling behavior. Three classes of characteristics were examined.

Among the sociodemographic variables, the strongest correlate of high recycling was postsecondary education, which doubled or tripled the odds depending on the material. The second strongest correlate was age, where those younger than 30 had half the rest of the sample’s odds of recycling all five materials. Between the two major language groups in the city, English and French, the former had moderately higher odds of being high recyclers, holding other socioeconomic factors constant. Without further evidence, it is difficult to know whether this is attributable to cultural differences or differences in the level of external stimuli, such as media coverage of environmental issues. Finally, family households were significantly more likely than nonfamily households to recycle the three materials that are most inconvenient to recycle, suggesting the effect of subjective norms, particularly where close relatives are involved.

The second group of respondent characteristics related to environmental knowledge, attitudes, beliefs, and related behaviors. Within that set, two factors had a consistently significant relationship with households’ recycling rates. The 20% of respondents who were more concerned with the state of the economy—a presumably egoistic concern—than with environmental or other issues of an altruistic nature were almost half as likely to be high recyclers of four of the five materials. By contrast, the 58% of the sample who had changed their consumption patterns of home and garden care products, most of which contain environmentally toxic chemicals, were almost twice as likely to be high recyclers, revealing the role played by altruism in a much larger proportion of the sample. Environmental knowledge, as measured by awareness of media coverage, possible causes of global warming, and the level of sewage treatment in the community, had little connection to recycling behavior.

The third set of characteristics referred to a predefined set of leisure activities that were thought to be possible correlates of more altruistic recycling behavior. Only those respondents who cited gardening as an activity (51% of
the sample) had consistently much higher odds ratios of being high recyclers of all five materials. This can be taken to mean that being a gardener is a good indicator of environmental awareness and concern. Although these high odds ratios were similar to those for the group who said they had changed their use of home and garden care products, there was only a moderate link between the two categories of respondents. In addition, the 36% who claimed to do some kind of volunteer work, an altruistic activity, had about 1.5 times higher odds of recycling two of the less conveniently recycled materials: glass and cans.

The final analyses examined attitudes toward a quantity-based garbage disposal system and a more inconvenient mode of recycling involving drop-off points near grocery stores. Responses to both hypothetical questions suggest a strong disinclination to making additional effort to recycle or to accept a user-pay principle for garbage disposal. Only a quarter of respondents agreed with the latter. Sixty percent said they would recycle half or less of what they currently did if required to use the drop-off points. Egoistic motives predominate in both cases and lend further support to the notion that curbside recycling with its high convenience is the only practical way of encouraging high levels of domestic waste recycling under current conditions.

Analysis of people’s attitudes toward user fees for garbage disposal further suggests a positive link with environmental knowledge (media coverage and causes of global warming) and with altruistically motivated changes in travel behavior (see Table 10). Some of the same altruistic and environmental knowledge factors play a role in explaining above average expected levels of use of drop-off points. In addition, those who considered the state of the economy the most urgent problem, an egoistic issue, were likely to deposit 10% less material at drop-off points than others. Therefore, prior environment-friendly altruistic behavior with respect to other activities is a likely indicator of future environment-friendly behavior. Nevertheless, the overriding indication is that egoistic attitudes will severely limit the adoption of environment-friendly behavior involving individuals in much cost or effort.

The major conclusion is that a subjective norm and an egoistic motive are the two most important variables explaining variation in recycling levels. Altruism plays a minor role by comparison. Yet, when the focus changes to a less demanding measure of environment-friendly behavior (the simple choice between recycling or not), altruism appears to play an equally important role as the other two factors. When the focus changes again, to more demanding measures (user fees and drop-off points), altruism, egoism, and environmental knowledge all play a role. Clearly, the relative roles played by
different classes of behavioral antecedents are contingent on exactly how the environment-friendly behavior is defined.

NOTES

1. Fuller discussions of the concepts described in this section can be found in Ben-Akiva and Lerman (1985), Louviere (1988), McFadden (1981), Train (1986), and Wrigley (1985).
2. An odds ratio of .5 has the effect of reducing preexisting odds by the same proportion as an odds ratio of 2 has of increasing odds.

REFERENCES


THE SOCIAL STRUCTURE OF
TEL-AVIV–JAFFA NEIGHBORHOODS

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ABSTRACT: This article investigates residents’ sense of neighborliness in different types of neighborhoods in Tel-Aviv. Five different residential areas were investigated, representing different social classes, ethnic groups, and lifestyles. Residents’ sense of neighborliness and social restructuring of neighborhoods’ characteristics were investigated based on questionnaires. The analysis led to the following conclusions. First, neighborhoods are relevant but relatively marginal in importance to all five groups in Tel-Aviv. Second, all the respondents mentioned the importance of sense of territoriality and social interactions with some others in their neighborhood. Third, two types of neighborhoods have been identified: neighborhoods that are perceived as centers of identification and neighborhoods that are perceived as territorial units of daily services. Fourth, identification with the neighborhood represents the largest variability among neighborhoods, and lower class neighborhoods were assigned relatively low rates of sense of neighborliness.

During the 1970s, increasing numbers of scholars rejected the notion that the neighborhood was fundamental to urban sociospatial structure. They relied on two parallel arguments. One group of researchers claimed that the temporal and spatial compression that characterizes the modern world obviates the need for a neighborhood as a territorial base that provides routine, everyday services, enables primary social relations, and acts as a focus for identity and identification (Porteous, 1977). Webber (1963) went further, to

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predict the emergence of cosmopolitan human beings unimpeded by emotional or functional fetters with places. Other researchers taught that although people continue to require neighborhood services, city dwellers would receive these from the entire metropolitan region’s wide variety of possibilities (Fischer, 1982). In the wake of this challenge, academic interest in the relevance of the neighborhood to modern, urban life also waned. Studies that investigated which communities tend to preserve neighborhood perception replaced the diminishing efforts of devising comprehensive neighborhood models. Researchers also examined the influence of a number of external factors on neighborhood perception, such as house ownership (Rohe & Basolo, 1997), sense of privacy and territoriality (Wilson & Baldassare, 1996), and the decisive importance of neighborhood and environmental quality on child development (Gaster, 1991; Holaday, Swan, & Turner-Henson, 1997).

The emergence of a postmodernistic standpoint that endorses local autonomy with the decentralization of political power to the community, and the partition of society into different communities that respect others’ otherness, may raise again the relevance of the neighborhood to urban life (Hasson, Schory, & Adiv, 1995; Walker, 1989). This new position is likely to return the neighborhood also to the focus of the academic discussion of urban social space. Hence, the question arises whether the residents of Tel-Aviv perceive their residential areas as neighborhoods: The purpose of this article is to investigate the extent to which the inhabitants of five such areas or quarters do so. The investigation selected five residential areas that, according to neighborhood studies, should represent dissimilar examples of neighborhoods with different degrees of neighborliness.

Tel-Aviv was selected as the object of the research because the intensive restructuring that it had undergone was similar to that in large metropolitan cities in the world. This restoration brought into confrontation original and new residents, two populations polarized by differences in their social status, lifestyle, and patterns of everyday behavior (Carmon & Erez, 1996; Schnell & Graicer, 1994; Short, 1989). Traditionally, an anonymous lifestyle has characterized metropolitan inner cities, and, thus, the neighborhood is not a meaningful territorial unit for the residents (Michelson, 1970). However, the area seems to have become a focus, consolidating a new lifestyle—frequently considered postmodernistic—suggesting an increasing trend to neighborliness in which each group in shared spaces constitutes its separate neighborhood (Walker, 1989). Hence, the metropolitan inner city is of particular importance when analyzing the relevance of the concept of neighborhood to the everyday life of the city’s residents in the third millennium.

The next section constructs the theoretical foundation for examining neighborliness and the following section proposes a methodology for examining
<table>
<thead>
<tr>
<th>Primary Dimensions</th>
<th>Secondary Dimensions</th>
<th>Characteristics</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Territory</td>
<td>Boundaries Demarcation</td>
<td>Past Rootedness</td>
<td>Neighborhood Boundaries</td>
</tr>
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<td></td>
<td></td>
<td>Present Rootedness</td>
<td>Five Significant Streets</td>
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<tr>
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<td></td>
<td>Future Expectations</td>
<td>Five Significant Landmarks</td>
</tr>
<tr>
<td>Spatio-Temporal</td>
<td></td>
<td>Satisfaction from Services</td>
<td>Number of Years in Neighborhood</td>
</tr>
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<td></td>
<td>Use of Services</td>
<td>Residence Ownership</td>
</tr>
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<td></td>
<td></td>
<td>Accessibility to Services</td>
<td>Plans for Staying in the Neighborhood</td>
</tr>
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<td>Social Control</td>
<td>Social Norms</td>
<td>Social Control</td>
<td>Variety of Education Institutes</td>
</tr>
<tr>
<td></td>
<td>Integration</td>
<td>Public Order</td>
<td>Participation Community Activities</td>
</tr>
<tr>
<td></td>
<td>Involvement</td>
<td>Meeting With Friends in the Neighborhood</td>
<td>Use of Public Services</td>
</tr>
<tr>
<td>Neighborhood Identity</td>
<td>Neighborhood Uniqueness</td>
<td>Dominant Characters of Social Groups in the Neighborhood</td>
<td></td>
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<tr>
<td>Identification with</td>
<td>Sense of Belonging</td>
<td>Unfavorable Social Groups</td>
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<td>Sense of Alienation</td>
<td>Sources of Pride Within the Neighborhood</td>
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<td>Sources of Inconvenience Within the Neighborhood</td>
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**Figure 1:** A General Model of Neighborhoods
this concept regarding Tel-Aviv. The discussion of the findings of the research are divided into three more paragraphs: The first focuses on the neighborhood’s territorial structure, the second identifies characteristics associated with neighborhood territory, and the third analyzes the factors that encourage neighborliness.

THE NEIGHBORHOOD AS A THEORETICAL CONCEPT

By definition, neighborhoods are major urban territorial units with networks of reciprocal associations, where residents develop some degree of identification with territory and with each other. Neighborhoods also provide routine daily services. Hence, a neighborhood is identified as a spatial unit that offers its inhabitants a sense of homeliness in their performance of their everyday lives (Krupat, 1985). A number of scholars have proposed neighborhood models having, usually, seven major dimensions (Fischer, 1982; Krupat, 1985; Taylor, 1982). These seven dimensions group into three super dimensions relating to the different modes of human experiential existence: spatiotemporal, social, and perceived (May, 1983). Figure 1 summarizes the different dimensions relating to neighborliness, indicating the gauges that we have used to examine the degree to which neighborliness has become institutionalized or embodied in the daily life of Tel-Aviv residents. In this model, the spatiotemporal super dimension includes three dimensions, commencing from the residents’ exploiting community functions within the neighborhood, mainly educational and social services, and ending with institutionalizing joint awareness by the residents regarding the neighborhood’s territory. The social dimensions refer both to institutionalizing the social control mechanisms and to social relations among the residents, and the internal perception dimension refers to institutionalizing neighborhood identity and identification with this identity.

Scholars agree that neighborhoods do not include all these characteristics within defined territorial limits today, and one should distinguish between different types of neighborhoods that can develop around some of these characteristics in different places, according to the community lifestyle and the surroundings. Several researchers have suggested a variety of criteria for classifying neighborhood types, of which the most important referred to a number of matters. These include systems of social relations both within and outside the neighborhood, the extent to which the residents had established their roots in the neighborhood, and the strength of their identification with it (Riger & Lavarakas, 1981; Warren, 1978). During the 1990s, a few more
criteria for the classification of neighborhood types were offered. Weening, Schmidt, and Midden (1990) have emphasized the efficiency of the flow of information among the residents and of social control in the neighborhood as distinguishing among different types of neighborhoods. Brower (1996) added to the former criteria the quality of the physical environment of neighborhoods. Other scholars have claimed that only a few of the elements characterizing neighborliness occur in modern urban neighborhoods (Fischer, 1982). We suggest typifying neighborhoods as spatial units that residents identify as a territory whose meaning for them may be expressed by one of the many possible combinations of the dimensions defined in the model. In principle, one can classify the seven major dimensions in three groups: those that, according to the residents’ perceptions, characterize all the Tel-Aviv neighborhoods, those that are not relevant to the definition of neighborliness in Tel-Aviv, and those that differentiate between different types of neighborhood.

There is, furthermore, occasion to investigate whether the degree of communality is greater in some types of neighborhood and smaller in others. Hunter’s (1975) research shows that the demand for community cooperation to achieve functional needs encourages an inclination among the residents to establish a neighborhood lifestyle. This tendency is even stronger among families with children who find it difficult for whatever reason to move out of the neighborhood, and among residents united socially by connections that are more than mere neighborliness, such as blood ties, religion, ideology, or ethnic origins. Sociospatial seclusion and isolation from the rest of the region by means of clearly defined and relatively closed physical or social borders may also strengthen the residents’ inclination toward neighborliness. Hence, minority neighborhoods and distressed ones with high unemployment and poverty are likely to reveal a stronger degree of neighborliness, because the residents have less mobility and are relatively isolated from outside sources of expenditure and culture. This may be reversed if violence or crime isolates members of such neighborhoods in their homes. There is also much evidence of positive correlation between length of residence and social stability in a neighborhood and strength of neighborliness (Sampson & Laub, 1993).

Three major questions for research arise from the previous discussion:

First, do the residents of Tel-Aviv perceive neighborhoods as meaningful territorial units, and what is the relative importance of neighborhoods in their everyday life?
Second, what are the types of neighborhoods that are developing in the urban area of Tel-Aviv and what are the criteria of distinction among them?
Third, what kinds of factors differentiate among territories perceived and not perceived as neighborhoods?
Neighborliness is defined here as the communal institutionalization of the perception that the immediate residential vicinity has at least some of the characteristics that the model ascribes to neighborhoods. The hypotheses in the above discussion derive from this. Hence, neighborliness may be defined as a perception that divides urban space into socioterritorial units that play a significant role in the lives of urban residents. Furthermore, the research reports cited here demonstrate the possibility of institutionalizing different types of neighborhoods and varying orders of neighborliness. Thus, the main hypotheses are:

**Hypothesis 1:** Residents perceive neighborhoods as sociospatial units that are significant in their everyday life.

**Hypothesis 2:** Tel-Aviv includes a wide range of neighborhood types, differentiated by the extent that residents have established local roots, by their social relations with each other, and by the degree of their identification with their residential area.

**Hypothesis 3:** People whose socioeconomic status is high are more likely to ascribe a low neighborliness to their residential area than are those whose socioeconomic status is low.

**Hypothesis 4:** There will be more people with deep local roots in residential areas where families with children or the elderly make up a significant proportion of the populace.

**Hypothesis 5:** Ethnic minorities indicate a relatively high measure of neighborliness.

### METHOD

**SAMPLE**

The research covered five residential districts that seemed to present different degrees and types of neighborliness in Tel-Aviv–Jaffa according to the theoretical discussion. Two of the selected districts exemplify the upper-middle class: Kikar Ha-Medinah and the Old North, with populaces at different stages of their life cycle. The interviewees in the Old North were mobile and young (Schnitt & Graicer, 1994) and were expected to have weak roots in their residential area. In Kikar Ha-Medina, on the other hand, we interviewed mainly heads of well-off families who might be expected to feel a greater attachment to their neighborhood than the young residents of the Old North but less than the inhabitants of Ajami or Yad-Eliyahu. The third district is the Neve Zedeq residential quarter, characterized by recent upper-class immigrants to Tel-Aviv residing alongside the original lower-class inhabitants. In
addition, there are some new mobile middle-class young people. Here we anticipated an intermediate degree of neighborhood awareness arising from the conflicting attitudes of the mobile middle-class young people with low neighborhood empathy and of the upper-class and lower-class inhabitants with high neighborhood empathy. Yad-Eliyahu represents a neighborhood of lower-middle-class families, where we expected to discover a high measure of neighborhood awareness. In addition, we selected Ajami, which has a lower-class Arab population. We assumed that in Ajami, the awareness of neighborliness among a segregated ethnonational minority population would be the highest of all. This hypothesis is based on Fischer’s (1984) and Krupat’s (1985) argument that isolated and homogeneous minority neighborhoods may be more cohesive. Nevertheless, violence and other social pressures may force people to isolate themselves from their neighbors, thus reducing any sense of neighborliness.

In each residential quarter, the canvassed population consisted of 40 householders resident in a defined area of some 10 adjacent road sections, for a total of 200 interviewees. The sample is relatively small, with a statistical error of 7%; hence, it would be advisable to broaden the research in the future to include larger sample populations from additional diverse residential quarters. The rationale for selecting a limited area in each residential quarter was to ensure that although residents may identify a personal neighborhood in their vicinity, it would be possible to determine whether their neighbors are developing mutual perceptions regarding neighborhood space. Selecting a larger area where the roads surveyed were more dispersed might have resulted in each interviewee’s identifying a separate neighborhood in a limited area around his house, in which case we might not have identified community accord regarding the attributes of the neighborhood despite the agreement of close neighbors. The roads in each area were selected within the limits of one or two adjacent blocks in the same statistical area. We sampled some 3 households systematically on either side of each road section. In each household, 1 person answered the questionnaire.

DATA COLLECTION

The research used data from a questionnaire that students of the Department of Geography distributed in the winter of 1997 (January, February, and March), which contained 32 questions relating to neighborhood features and factors affecting neighborliness. The survey examined each of the seven dimensions, using two or three questions based on a preliminary questionnaire with 60 questions that included six or seven for each dimension and several general questions. The yardstick for each particular dimension included
The most appropriate questions that would demonstrate relative variations within the residential quarters and between them. At that stage, we assembled the yardstick data for each dimension and recorded their distribution, which made it possible to analyze the internal variance of each question and to distinguish between those questions that revealed no variance and those that did. The analysis ignored questions that produced no significant results. The yardsticks chosen appear in Figure 1.

DATA PROCESSING

In the past, studies of neighborliness were either objective or subjective (Krupat, 1985). The objective approach examined the relevance between the lifestyle of the inhabitants of a defined residential area and a previously defined model of neighborliness (Keller, 1968; Taylor, 1982). The subjective approach used interviews, open questionnaires, or mental maps to get householders to characterize their residential quarters, without any suggestion that the interviewees apply a previously determined set of classification factors (Lee, 1968). We chose to use a combination of elements from both approaches. Thus, the research focused on the residents’ perception that their residential quarters are significant territorial units within the urban social space. On the other hand, we find it important to examine the relevance of all the dimensions that define neighborhoods according to their residents’ perceptions. This combined approach provided us with the opportunity to examine residents’ perceptions of their neighborhood in the context of the set of meanings attributed to it as a sociospatial unit. We defined a socially structured sense of neighborhood as the extent of agreement among area residents concerning the relevant neighborhood dimensions. One may see the degree of agreement among residents about the characteristics that apply to a neighborhood as an index of neighborhood social restructuring.

This definition relies on the hypothesis that community perceptions crystallize through processes of restructuring that occur in the daily life of the community (Giddens, 1984). Hence, widespread agreement among the interviewees about the characteristics of their neighborhood is evidence of social restructuring and of institutionalizing a common interpretation of the nature of the neighborhood. Consequently, we used the degree of agreement among the neighborhood residents about the neighborhood’s major features to define the index of neighborliness. In the case of the territory and unique identity dimensions, we calculated the degree of accord with the most common characteristic of the relevant index. For example, agreement among many residents about the social identity of the neighborhood indicated a high degree of neighborliness, irrespective of the nature of the characteristic
representing the neighborhood’s unique identity. The rest of the dimensions’ concern with neighborliness—rootedness, social relations, social control, community functions, and identification with the neighborhood—are treated differently. Only if there was substantial agreement about a positive attitude toward neighborliness was a residential area considered as a neighborhood by the respective dimension. The existence of a powerful network of interactivity with others in the residential quarter may exemplify an attitude that enhances neighborliness.

In processing the data, we bore in mind that they appeared on various scales: nominal, ordinal, or interval; we, therefore, used nominal research methods in our analysis. We examined the distribution of all the variables by neighborhood to grade neighborliness or the degree of its restructuring in each of the seven dimensions. Initially, we examined the degree of neighborliness for each dimension separately and afterwards in combination for each neighborhood. Finally, we examined the correlation between the degree of neighborliness and outside factors that promote this. The statistical methodology that we utilized included $\chi^2$ and cross-tabulation. The purpose was to determine whether there was any connection between the discrete variables. Positive results indicated that such a connection did exist. We used cross-tabulation tests to examine the possibility of correlation between discrete and continuous variables. For the purpose of the tests, the level of significance was set at 0.5%. The $\chi^2$ test was used to check differences in the average data among the neighborhoods. The expected value was set as the distribution of the total sample and compared with the measures of neighborliness for each of the five residential quarters.

The neighborhood-status index is the cumulative value of each of the dimensional indices. For every residential quarter, the index calculation was made for each of the seven subdimensions: territory, rootedness, community functions, social control, social relations, identity, and identification. For each subdimension, we selected the reply that represented the character of the neighborhood according to the index, whereas we measured the degree of neighborliness according to the percentage of interviewees that accepted this reply. Wide agreement about the characteristics of the neighborhood indicated that neighborliness had become institutionalized in the course of the social restructuring that the area was undergoing. The test was dichotomous: A relatively high measure of agreement among the inhabitants of a residential quarter about neighborhood characteristics for all seven dimensions indicated neighborliness, whereas a low measure indicated its absence. Thus, we examined whether each interviewee exhibited an affinity with the neighborhood. If the answer indicated neighborliness, the interviewee was defined as a participant in the world of meanings that had crystallized in the neighborhood.
and, hence, as a neighborhood person (an active member of the neighborhood community). If the reply was different, the individual’s attitude was defined as uninvolved. This article defines a neighborhood person as a person who in most cases displays an attitude that conforms to the general neighborhood community’s position regarding the neighborhood’s characteristic features. The index was constructed from the scale of points awarded to the dimensions, ranging between 0 and 140 so that in the weighting of the final evaluation, each dimension had the same weight or significance. Each of the seven dimensions can accumulate a maximum of 20 points, making 140 together. The points that each dimension received were determined according to the questions that received statistically significant results.

RESULTS

THE TERRITORIAL ASPECT OF THE NEIGHBORHOOD

Treating the neighborhood as a territorial unit implies that one must examine whether Tel-Aviv residents experience their residential area as a perceptible territory, that is, essentially, whether the neighborhood as a meaningful feature finds expression in the residents’ mental maps. To overcome difficulties arising from varied aptitude to draw maps displayed by interviewees (Krupat, 1985), we requested them to indicate the main components in the structure of their perceptual space, such as neighborhood landmarks, boundaries, and roads within those boundaries (Schnell, 1994). This research examined the level of social restructuring in the neighborhoods, as expressed in the agreement about elements defining neighborhood territories. Tables 1 through 3 summarize the percentage of interviewees who agreed about this.

The analysis leads to the preliminary conclusion that, on average, about half the residents agree about the main components of their neighborhoods according to three territorial features: key neighborhood landmarks (54%), main roads, (52%) and boundaries (50%). One can observe a very great measure of variation among the different neighborhoods arising from significant differences in their types and in the degree of significance of the components of neighborliness in each of them. Central landmarks such as Kikar Ha-Medinah Circus and the Susan Dellal Dance and Ballet Performance Center that have become well-known centers of symbolic value for the general population were perceived very clearly by the neighborhood residents, and these landmarks are perceived as neighborhood gathering places as well. Iben Gabirol Street, one of the main roads in Tel-Aviv—Jaffa is defined as the
boundary between the Old North and Kikar Ha-Medinah by more than 80% of the interviewees in both neighborhoods.

The character of the elements of the neighborhood, too, can provide information about the neighborhood’s meaning for the residents. It was possible to identify two main trends in the choice of the roads that enclose the neighborhoods. In three neighborhoods—Kikar Ha-Medinah, The Old North, and Neve Zedeq—most interviewees described a combined network of roads that connect the neighborhoods’ major landmarks as defining the framework of the neighborhood territory. Thus, for example, Shabazi Street and the roads crossing it, Ahuzah and Chelouche, in addition to Deganiah, constitute the neighborhood road framework of Neve Zedeq (see Figures 4 through 8 for all the neighborhoods). In the Old North, the road network forms around a framework that includes Bazel Street and the roads crossing it: Sokolov, Ishtori Ha-Parhi, and Ha-Shiloh. In Kikar Ha-Medinah, the neighborhood is around the circus; thus the neighborhood framework consists of two concentric rings around the circus, Heh Biyar and Sharett and the roads crossing, Jabotinsky and Weitzman. In two neighborhoods, Ajami and Yad-Eliyahu,
the interviewees mentioned two or three key roads on the outskirts of the neighborhood and the main road running through it. This is particularly so in Yad-Eliyahu, where some of the interviewees perceived La Guardia Road as a boundary, whereas others perceived it as the main road through the neighborhood. Most of the residents regarded the other roads, Harakabi Abraham and Moshe Dayan, as on the outskirts of the neighborhood or outside its borders. For the Ajami interviewees, Kedem and Yefet Roads represented both the boundaries of the neighborhood and the main roads running through it from north to south, whereas the roads Nicanor and Donolo Ha-Rofeh were the main east-west axes of movement connecting with the main roads on the boundaries. Hence, in the second group of neighborhoods, although a communal perception of roads had become institutionalized in the neighborhood, this did not refer to an integrated system of roads composing the overall neighborhood structure but rather a limited number of roads within the neighborhood area. This probably indicates less actualization of neighborhood territory in the residents’ cognition, an argument that finds some support in the relatively low level of agreement about neighborhood boundaries and communal centers.

Relatively important roads define neighborhood boundaries. The Ajami residents expressed their opinion about the boundary separating Arab and Jewish areas very strongly. In the other neighborhoods, the residents perceived boundaries in technical terms without attributing to them any real social or historical significance. Even where the boundary separated two different sociogeographical units, as where Pinnes Road separates Neve Zedeq from Ahuzat-Bayit, the residents did not assign the boundary any clear social or historical meaning.

It is of particular interest that the interviewees described only six of the 21 landmarks as specifically serving the local communities. A number of relatively frequently specified centers are urban or even supra-urban centers that

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Mode</th>
<th>Secondary</th>
<th>Tertiary</th>
<th>M</th>
</tr>
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<td>61</td>
<td>37</td>
<td>56</td>
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<tr>
<td>Neve Zedeq</td>
<td>65</td>
<td>40</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>Old North</td>
<td>78</td>
<td>61</td>
<td>50</td>
<td>63</td>
</tr>
<tr>
<td>Ajami</td>
<td>48</td>
<td>35</td>
<td>30</td>
<td>38</td>
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</table>
have become important for the neighborhood community, which makes incidental use of them. A good example of this is the Susan Dellal Dance and Ballet Performance Center, which the neighborhood residents have turned into a neighborhood park and meeting place. During the afternoon, parents and children from the neighborhood meet in the park, as do dog owners. During the evening, neighborhood residents mingle in the center’s cafés and restaurants with the audiences attending performances. At the same time, only a few mentioned the neighborhood community center as a significant landmark. Yad-Eliyahu Stadium, Beit Lessin Theatre, and comparable places are similar centers. Urban circuses and parks have a potential to become public centers, as happened in Yad-Eliyahu and Kikar Ha-Medinah. There are no real parks in the other neighborhoods that could have suitably become such centers. The remaining centers are either significant places of recreation for some of the inhabitants, such as market places or coffeehouses, or prominent landmarks that do not function as neighborhood centers. Beit Gil Ha-Zahav, an elderly house, in Yad-Eliyahu and Merom Bazel Towers are examples of this. Ajami is an anomaly in this respect in that a number of important monuments have religious significance, such as the Tomb of Sheikh Ajami, the
Moslem Cemetery, and the Church of St. Peter. The emphasis on centers having religious rather than nationalistic significance underlines the divisions within the Arab community of Ajami.

The analysis revealed that the most significant landmarks in the neighborhoods are either meeting places for leisure and recreation or symbolic monuments. In most neighborhoods, the interviewees considered the importance
of community centers to be no better than secondary. This is evident chiefly in Ajami, where the Jewish-Arab center has not succeeded in establishing a status of importance among the Arab residents, and in Neve Zedeq, where the residents did not designate the community center as a neighborhood center. In addition, the residents did not perceive the road systems as constructed necessarily around neighborhood centers. Only a little more than half of these landmarks are located on the roads that constitute the framework of the
neighborhood road network. These findings suggest that besides the difference between them, the neighborhoods are not infrastructures for the realization of united, organized communities but rather territorial substrata of status symbols and fields of weak, neighborly association. Detailed territorial examination revealed that about one half of the residents agreed on a defined territory as their residential neighborhood. They defined such a neighbor-
hood by means of a framework of a number of roads linked together in one system, a group of three or four central landmarks acting for them as identification and orientation focuses, and boundaries that delimit the territory, at least partially.

NEIGHBORHOOD FEATURES AND TYPES

The primary matter that this research targets is how strongly residents perceive that they inhabit a neighborhood and what the specific features of neighborliness are in the case of Tel-Aviv. Figure 2 summarizes the average number of points awarded to each dimension of neighborliness, points derived from the analysis of the residents’ positions and of the interneighborhood variances for each dimension. The summary reveals that not more
than about half of the interviewees selected the dimensions that residents, more often than nonresidents, tended to identify as characterizing neighborhoods. The index of social relations exhibits the highest average value, 12 out of a possible 20, and low intraneighborhood and interneighborhood variances. The depth of rootedness index is second in importance. It, too, displays a high average value, 10 out of a possible 20, and an exceptionally low variance.

The rest of the dimension indices have lower average values, 8 or less out of a possible 20. From this, we may conclude that social relations and depth of rootedness are the most important features in the neighborhood concept in the Tel-Aviv—Jaffa metropolitan area. Furthermore, in accord with the findings of Guest and Wierzbicki (1999), we found that social relations with some meaningful others in the neighborhood continue to characterize all
Figure 8: Map of Ajami
neighborhoods regardless of their other characteristics. According to the
findings, in spite of the relevance of the neighborhood as a sociospatial unit
for its residents, this was only of secondary importance. Only in Kikar Ha-
Medinah did the degree of neighborliness reach 55% of the maximal value,
namely 77 marks out of the 140 that represent total agreement among the res-
idents. In two other neighborhoods, Yad-Eliyahu and Neve Zedeq, the degree
of neighborliness reached 47% of the maximal value, compared to Ajami and
the Old North, with 35% of the maximal value (Table 4). The high value for
Kikar Ha-Medinah was mainly due to the restructuring of status identity and
the residents’ close identification with their neighborhood; this was in addi-
tion to the dimensions common to all the neighborhoods: social relations and
depth of rootedness. The values recorded for the territorial dimension, too,
were high. The interviewees identified the residents of their neighborhood as
belonging to the high socioeconomic class, which informed it with a superi-
ority that they can identify with. The only case recorded of low marks was for
social control, similar to that found in the other neighborhoods.

In Neve Zedeq, too, the residents’ identification with their neighborhood
was close, with two different population groups that are supposed to have
neighborhood lifestyles: old-timer, lower-class families and newcomer,
upper-middle-class families. Both groups related to the neighborhood as a
village in the heart of the town that is conspicuous for the intimate relations
among its residents. Furthermore, the old-timers’ identification with the
neighborhood derived from their deep roots in it, whereas the identification
of the newcomers derived from their desire to establish roots in it. The fact
that neighborhood service standards are low and that the residents do not
identify clear-cut neighborhood boundaries or agreed on reference points
other than the Susan Delall Dance and Ballet Performance Center in no way
vitiated the perceptions of neighborliness in the other dimensions.

Yad-Eliyahu is a different kind of neighborhood. Like most of the others,
it features relatively powerful social relations, but it is noticeable mainly for
its community functions. This finding conforms with the intentions of the
town planners, who tried to encourage neighborliness in public housing dur-
ing the 1950s and 1960s by means of a neighborhood design that allocates
considerable importance to public space and accessibility to community
functions. It is of interest that it was precisely in the territorial dimension that
residents were unable to establish a community agreement on clear-cut
boundaries. The main disagreement was whether there were two separate
neighborhoods on either side of the main road or a combined neighborhood
taking form around the main road, La Guardia.

In addition to the social relations that are a common characteristic of all
the neighborhoods, the main features of the Arab neighborhood in Ajami are
<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Territory</th>
<th>Rootedness</th>
<th>Community Function</th>
<th>Social Control</th>
<th>Social Relations</th>
<th>Identity</th>
<th>Identification With</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kikar Ha-Medinah</td>
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<td>9.4</td>
<td>11.2</td>
<td>6.5</td>
<td>10.6</td>
<td>12.0</td>
<td>15.0</td>
<td>77.2</td>
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<tr>
<td>Yad-Eliyahu</td>
<td>3.0</td>
<td>8.9</td>
<td>17.0</td>
<td>6.0</td>
<td>12.3</td>
<td>8.0</td>
<td>10.0</td>
<td>65.2</td>
</tr>
<tr>
<td>Neve Zedeq</td>
<td>4.5</td>
<td>11.3</td>
<td>3.9</td>
<td>8.2</td>
<td>14.6</td>
<td>8.0</td>
<td>15.0</td>
<td>65.5</td>
</tr>
<tr>
<td>Old North</td>
<td>15.0</td>
<td>9.6</td>
<td>4.2</td>
<td>5.6</td>
<td>10.2</td>
<td>4.0</td>
<td>0.0</td>
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<tr>
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<td>7.1</td>
<td>11.1</td>
<td>12.6</td>
<td>4.0</td>
<td>0.0</td>
<td>53.4</td>
</tr>
<tr>
<td>M</td>
<td>8.4</td>
<td>10.2</td>
<td>5.7</td>
<td>8.7</td>
<td>12.1</td>
<td>7.2</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Scores are based on a scale of 0 to 20: 0 indicates the lowest level of neighborliness; 20 indicates the highest level of neighborliness.
the Arab residents’ local roots and the existence of cultural standards that affect their lifestyle. In contrast, there was an obvious leaning toward a total absence of any self-identification with the neighborhood because it is of both inferior status and a ghetto by constraint. In this context, one should remark that most of the Ajami residents felt a strong sense of estrangement from the place, for although it was originally a symbol of their Arab identity, it has changed and is now ranked by its Jewish character. Hence, in spite of what one might have considered self-evident from the existence of social supervision mechanisms among the Arab residents, no restructuring of ethno-national identity associated with the neighborhood has taken place. In the Old North neighborhood, too, the measure of neighborliness was of low degree, although the residents did create for themselves a clear-cut spatial cognition of their housing area. As with all the other neighborhoods, the concept of neighborhood territory in the perception of the Old North residents relates principally to the neighborhood as a setting for social relations. Additional neighborhood concepts, such as a clear-cut neighborhood identity with which it is possible to identify or the special use of functions existing within the neighborhood limits, have no particular interest for the mobile young residents of the Old North.

This section has revealed that the inhabitants of Tel-Aviv—Jaffa perceive neighborhood as referring to a meaningful territorial unit related to features traditionally associated with neighborliness. Nonetheless, this would appear to play only a secondary role in the everyday life of the inhabitants. The principal characteristics of the town’s neighborhoods are social relations and the tendency for the inhabitants to establish roots in their neighborhoods. Beyond this, differences between neighborhoods derived primarily from the degree of resident identification with them, which is a function of their socioeconomic status.

The second subject of the current research refers to the analysis of neighborhood category. This revealed four distinctive dimensions among neighborhoods, which appear to be suitable criteria to characterize their different types. Among them, only two—identity and identification with—prognosticate the overall degree of neighborliness clearly. Because the inter-neighborhood variance of the identification index is higher and the correlation between the two is high, we have selected the latter as the most relevant index for comprehending the disparity in levels of neighborliness among the different neighborhoods. We corroborated this decision with the help of a $\chi^2$ test having two degrees of freedom and a significance level of .05, with which we calculated the relations of each of the dimension levels in the neighborhoods with the overall level of neighborliness. The two other criteria—territoriality and community functions—reveal rather different
distributions from each other, although the two characterize the Ajami neighborhood. Hence, from the analysis of all five neighborhoods, it is possible to detect two principal types of neighborhood.

1. Neighborhoods that represent focuses for identification: Kikar Ha-Medinah and Neve Zedeq. In Kikar Ha-Medinah, the intensity of identification with the neighborhood relates to the latter’s being a status symbol, whereas in Neve Zedeq, the intensity of identification relates to strong perceptions of communal solidarity.

2. Neighborhoods that represent a meaningful territorial unit for residents’ daily life: Ajami, Yad-Eliyahu, and the Old North. Residents tend to identify the neighborhood as a discernible territory that provides them with neighborhood services and within which they have some social relations with their neighbors. In the Old North, where they are better educated, the residents emphasize territoriality, whereas in Yad-Eliyahu, which from the first was intended to supply neighborhood services, the emphasis is more on the neighborhood as a service focus.

FACTORS ENCOURAGING NEIGHBORLINESS

From the theoretical analysis, one could expect differences in the degree of neighborliness according to four independent variables: socioeconomic status, accessibility, minority grouping, and families with children. For each of the 200 interviewees, we calculated a neighborliness dependent variable for each of its separate dimensions. Examination of the four independent variables by means of one-way multiple range tests showed that three variables influenced the level of neighborliness to varying degrees. These were socioeconomic status, percentage of families with children, and ethnic origin. The influence of socioeconomic status on neighborliness was measured by means of the variables length of education and employment status. This revealed the most significant positive relations between social position and both territoriality and identification with the neighborhood, and showed negative relations between social position and established rootedness, social relations, and social control. The influence of families with children on neighborliness was unambiguous only in connection with community functions, but there is no evidence of more intensive exploitation of community services that strengthened perceptions of neighborliness among families with children in the other dimensions. The ethnic origin variable throws light on the significant difference between Jews and Arabs in the context of social control. The Arabs of Ajami display a greater involvement in political
organizations and are more sensitive to the arrival of strangers into the neigh-
borhood. Their political involvement results from firm convictions that the
Jewish establishment disregards Arab interests, whereas their awareness of
strangers stems from social conventions that perceive the public area as com-
munal. Furthermore, Arabs have deeper neighborhood rootedness and more
developed systems for the exchange of ideas than do the Jews. Some differ-
ences occur between Jews of Oriental and European origin, too. Whereas the
Europeans tend to have more pronounced apperception of territoriality, the
Oriental Jews tend to put down deeper neighborhood rootedness. The mea-
sure of the accessibility variable derives from car ownership and the resi-
dents’ perceptions concerning the role of public transport in providing
transportation within the neighborhood. From the statistical analysis, it
appears that there is no significant relation between accessibility and the
degree of neighborliness.

We diagnosed the most significant characteristics of residents with the
greatest and those with the least perceptions of neighborliness with the help
of a $\chi^2$ test having two degrees of freedom and a significance level of .05.
Analysis reveals that upper-class, well-educated residents of the privileged,
free, academic, professional, and managerial classes perceive the neighbor-
hood more as a territory with which they identify because it is a status symbol.
In comparison, lower-class residents have stronger neighborhood rootedness
and tend to utilize communal functions and reveal greater involvement in
neighborhood politics. Nevertheless, the upper-class residents in Kikar Ha-
Medinah, too, made much use of communal services. At the same time, fami-
lies with children have a greater tendency to establish roots, to have social
relations within the neighborhood, and to utilize communal functions.

We graded the neighborhoods according to these data by the average score
achieved by the residents of each neighborhood for each of the independent
variables that predicted neighborliness and by the dependent variable of
neighborliness as measured in this research. The neighborhood grading was
made according to the average score that each relevant variable achieved,
with the number 5 indicating the highest level of neighborliness and 1 indi-
cating the lowest. In the case of social status (class), we graded the neighbor-
hoods according to the percentage of free professional, academic, managerial,
or similar employment and average length of education among the residents.
The children variable measurements were made according to the percentage
of children between the ages of 1 and 15 years among the interviewees in
each neighborhood. This ranged between 38% in Ajami and 11% in Kikar
Ha-Medinah. We compared only Ajami with the rest of the neighborhoods
regarding the ethnic variable. Table 5 summarizes the expected and the
observed levels of neighborliness of the neighborhoods in this research.
Two variables—status and percentage of families with children—grade the examined neighborhoods identically, and the two coincide with the minority status variable. Therefore, theoretically, one may expect the strongest neighborliness in Ajami, where there are long-established, lower-class families who are bringing up children and who segregate themselves to preserve their ethnominority identity. One may expect the lowest degree of neighborliness in Kikar Ha-Medinah, with its upper-class families, most of whose children have left home. In the Old North, too, one may expect a degree of neighborliness that is even lower than what the independent variables imply, because of the yuppie lifestyle of a significant proportion of the interviewees. The mobile young people do not have deep roots in the neighborhood, they are not committed to living a long time in it, they are not bringing up children in the neighborhood, and they prefer the urban lifestyle offered by the city. The expected degree of neighborliness is higher in Yad-Eliyahu and Neve Zedeq, where families are rearing children and where well-developed neighborhood services are provided. Furthermore, Yad-Eliyahu’s populace consists of lower-middle-class households and Neve Zedeq’s consists in part of upper-class households who have chosen a lifestyle requiring neighborliness. This supports the assumption that one may expect to find a relatively strong perception of neighborliness in these areas.

The analysis reveals that variables previously suggested by researchers do not explain the degree of neighborliness in the five examined residential districts. Their theories explain this only partially in three of our five neighborhoods: the Old North, Yad-Eliyahu, and Neve Zedeq. In Ajami and Kikar Ha-Medinah, the actual degree of neighborliness was the reverse of the expected (Figure 9). This derives from two facts: (a) Identity and identification with

<table>
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<th>Weighted Value</th>
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<td>5</td>
<td>5.0</td>
<td>2</td>
<td>−3.0</td>
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</table>

NOTE: Scores are based on a scale of 1 to 5, with 1 indicating the lowest level of neighborliness and 5 indicating the highest.
are the principal characteristics differentiating between degrees of neighbor-
liness in the various residential areas, and (b) the extent that residents identify
with their neighborhood increases the more the neighborhood is identified
with prestigious social groups. The wealthy residents of Kikar Ha-Medinah
identify the neighborhood as one of standing and are proud of it as a symbol
of high socioeconomic status. Conversely, the Arab inhabitants in Jaffa feel
estranged from their neighborhood, which after years of neglect is now
undergoing renewal and gentrification for new Jewish upper-class residents.
In the process, it is losing its original Arab character and leading to the exile
of the native inhabitants to the periphery and to some extent to other settlements.

SUMMARY AND CONCLUSIONS

The research propounds a methodology for examining the restructuring of neighborliness in residential areas. In constructing the index, we assumed that a broad consensus among the inhabitants of a residential area about neighborhood characteristics indicated the presence of efficient social restructuring, leading to neighborhood patterns crystallizing out. This article defines high level of neighborliness as a broad consensus among residents about neighborhood characteristics, and we identify different types of neighborhood according to the characteristics that gained high grades for neighborliness in the different residential areas.

The principal conclusion of the research is that the neighborhood continues to be a significant, if marginal, component in the structuring of urban social space. The residents personally define a neighborhood territory with a wealth of social implications, primarily as a basis for the development of neighborly relations and through one’s deep roots in one’s neighborhood. Beyond this, some neighborhoods are also focuses of identification and status symbols, whereas others are territorial units of communal functions. Nearly all the interviewees offered personal definitions of neighborhood territory complete with an abundance of relevant social features. Almost half the sample population of interviewees defined their neighborhood in a manner similar to how their neighbors did, indicating the existence of neighborhood social restructuring. The measure of variance among the neighborhoods, although important, was relatively low. The level of neighborliness according to the weighted index ranged between 34% and 55% of the maximal value, which would express complete agreement among the neighborhood residents about the total number of neighborhood characteristics. The results of the research reveal that the measure of neighborliness was highest in Kikar Ha-Medinah, at somewhat more than 55%. In Yad-Eliyahu and Neve Zedeq the measure, at 46.5%, was slightly below the average, whereas in Ajami and the Old North, it was relatively low, 38.1% and 34.7%, respectively.

The intensity of social restructuring may be higher, but this does not find expression in the present study because the population consists of two different social groups with unlike mental maps of their neighborhood in Neve Zedek and in Yad-Eliyahu. This state of affairs in which two very different populations live in close proximity has become very characteristic of the
inner cities of the large, Western metropolises. The phenomenon is very noticeable in Neve Zedeq, where there is intense polarization between the original, lower-class inhabitants and the upper-middle-class newcomers. It seems that future research with larger samples will have to investigate neighborhood perceptions separately for the different social groups who share the same residential areas.

The neighborhood dimensions fit into three categories. The first includes social relations and rootedness, which are acknowledged as the most prominent characteristics of neighborliness in the Tel-Aviv–Jaffa metropolis. This conclusion supports those of studies from the 1960s and 1970s, which held that neighborhoods provide social links: both neighborly relations of reciprocal help and some of the primary human relations. These results also demonstrate that most of the inhabitants of Tel-Aviv–Jaffa have well-established neighborhood roots, with the exception of the “mobile young people” who continue their mobile lifestyle until older than 30, at least. The second dimensional category consists of social control and identity, which may be regarded to be marginal in the urban neighborhoods. The third category consists of identification with neighborhood, territoriality, and functional systems. These characteristics exhibit a high degree of variance among the neighborhoods and therefore are suitable criteria for differentiation between the various types of neighborhood. Our findings are rather different from those in the studies of North American cities described by researchers such as Warren (1978) and others (Krupat, 1985). The American studies reported that the variables of established roots, internal and external social relations, and identification with the neighborhood differentiate between the different types of neighborhood. In our research, the two dimensions of social relations and rootedness characterize all the neighborhoods that we studied and cannot, therefore, act as a basis for categorization. Neither is the suggestion of Weening et al. (1990) to characterize neighborhoods according to social control in addition to social relations suitable to the reality of Tel-Aviv, where we found a relatively low degree of social control in all the neighborhoods. Comparision between our results and those of Brower (1996)—in which we both start our analysis with a wide range of attitudinal indicators (32 vs. 33)—leads to somewhat different results. In Tel-Aviv, social relations characterize all neighborhoods and not just some types of them. The physical elements of the neighborhoods were not included in our questionnaire. Instead, we stressed the territorial aspect, which is highly correlated to community functions. Except for these differences, community functions and identification with the neighborhood typify neighborhoods both in the United States and Israel in the 1990s.
Similar to the case in North American research, the intensity of the index of identification with the neighborhood was conspicuous as a means of determining the degree of neighborliness in the different neighborhoods. We did, however, record a high degree of neighborliness precisely among the residents of Kikar Ha-Medinah, who are proud of their neighborhood and identify with it. This was contrary to Hunter’s (1975) findings, according to which Kikar Ha-Medinah would have been predicted to show a low measure of neighborliness. At the same time, in Ajami, where outside intervention had upset Arab residents’ identification with their neighborhood, the perception of neighborliness had become undermined, contrary to what one would expect considering the residents’ ethnonational minority status and established roots in the district. This demands the attention of responsible city authorities. Experience shows that marginalizing minority groups to the extent of loss of neighborliness perceptions and destabilizing their ethnic identity may encourage the adoption of deviational patterns and social disorder. Such phenomena are likely to worsen because of disillusionment resulting from the results of the urban restoration and rent increases that, before being implemented, had raised expectations about the improvement of local Arab conditions. The knowledge that urban restoration and reconstruction processes had forced the Arab residents even further into the periphery is liable to excite outbursts of protest and even violence.

Some have thought that wealthy residents require the neighborhood less by virtue of their high mobility and their ability to employ extensive communication networks. From the analysis, it is clear that this assertion does not stand the test of reality. Furthermore, residents of prestigious neighborhoods tend to turn these neighborhoods into focal points for identification, adopting at the same time a lifestyle requiring neighborliness. The upper-class inhabitants of Kikar Ha-Medinah and the residents of Neve Zedeq exhibit a lifestyle that prefers to emphasize neighborliness. In contrast, two population groups fail to achieve a neighborhood lifestyle. Ten percent of the sample consisted of householders who have no friends either in or outside of the neighborhood. Most of these are elderly people, the remnant of the original population of the neighborhood. The second population consists of mobile young people who have chosen an urban lifestyle that emphasizes yuppie anonymity.

A further, particularly interesting conclusion of this research concerns the claim that the “new middle class” participates in the structuring of a new lifestyle requiring neighborliness. In the case of Tel-Aviv—Jaffa, empirical tests do not support this claim. On one hand, the new residents of Neve Zedeq did exhibit tendencies to prefer neighborliness, perceiving the neighborhood as a territory that encouraged intimate community life in a rural environment situated in the center of the metropolis. On the other hand, however, the mobile...
young people displayed strong tendencies to refrain from neighborliness while exploiting the urban environment to carry out an anonymous lifestyle. This enables them to exchange social frameworks and “masks” at will, while at the same time exploiting the wide range of choice that the inner city offers in a limited, relatively accessible space. Thus, this study confirms Michelson’s (1970) findings that young people and families conduct contrasting lifestyles in the context of neighborliness. This study also leads us to the conclusion that it is doubtful whether members of the new upper class have returned to a neighborhood lifestyle.

REFERENCES


CHANGES IN DRIVERS’ PERCEPTIONS
AND USE OF PUBLIC TRANSPORT
DURING A FREEWAY CLOSURE
Effects of Temporary Structural Change on
Cooperation in a Real-Life Social Dilemma

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ABSTRACT: The aim of this study was to investigate how cooperation can be facilitated in the real-world social dilemma of choosing to commute by automobile rather than by public transport. A survey of 335 drivers was carried out before and during an 8-day temporary freeway closure in Osaka, Japan. The results showed that the frequency of switching to public transport during the closure was inversely related to the frequency of automobile commuting before the closure. Furthermore, drivers who more frequently commuted by automobile overestimated commuting time by public transport to a larger extent than did drivers who commuted less frequently by automobile. At the same time, the larger the overestimation the more likely were drivers to change their perception of commute time. It is suggested that a temporary structural change, such as a freeway closure, may be an important catalyst that triggers cooperation in a social dilemma.

AUTHORS’ NOTE: The reported survey was funded by the Hanshin Expressway Public Corporation, Osaka, Japan. The article was written while Satoshi Fujii was...
There is little doubt that air pollution caused by motorized transport is a serious threat to public health (Lowe, 1990; Sperling, 1995). This threat is most likely to become more acute in the future unless private car use for daily travel is substantially reduced (Goodwin, 1996). Although everyone probably would agree that reducing private car use is highly desirable, sacrificing the convenience, individual freedom, and time savings a private car offers may at the same time appear to be arduous. Like many environmental problems, this conflict of self-interest and public interest has the character of a social dilemma or social trap (Cope, 1995; Dawes, 1980; Hardin, 1968; Messick & Brewer, 1983; Platt, 1973; Yamagishi, 1986).

In social dilemmas, each individual receives a higher payoff if acting in self-interest than if acting in the public interest, but everyone is worse off if all act in self-interest than if all act in the public interest. In the literature related to social dilemmas, acting in public interest is referred to as cooperation, whereas acting in self-interest is referred to as defection. In social dilemmas in transportation, driving is defection because it results in air pollution, energy consumption, and traffic congestion threatening everyone’s welfare, whereas using public transport is cooperation because it reduces these impacts on the environment (Gärling & Sandberg, 1997; Garvill, 1999; Van Vugt, Van Lange, & Meertens, 1996).

Vlek (1996) argues that any one single strategy for increasing cooperation may be insufficient but that combinations of strategies may lead to the solution for or successful management of many real-life social dilemmas. This appears to apply in particular to automobile commuting. Because many drivers develop a habit or routine of regularly commuting by automobile, it may require several steps to influence drivers to choose a pro-environmental travel mode such as public transport, including train and bus (Dahlstrand & Biel, 1997; Prochaska, DiClemente, & Norcross, 1992). Perhaps some strategies make commuting drivers aware of the detrimental effects of their own travel behavior. Such strategies may be used to trigger a behavior change, whereas other strategies are needed to make commuting drivers develop a new habit of, for instance, using public transport through repeated practice (Gärling, Boe, & Fujii, 2001; Ronis, Yates, & Kirscht, 1989; Watson & Tharp, 1997).

The present study investigates whether a temporary change in the pay-off determining individuals’ behavior or choice triggers cooperation in a real-world social dilemma. We call this a temporary structural change. We took advantage of a temporary freeway closure to study how it affected drivers’
public transport use. Several other similar examples of potential, cost-effective temporary structural changes include offering free public transport on selected days, distributing free public transport tickets to frequent drivers, and implementing road pricing on a temporary basis. Such strategies would be effective in increasing public transport use as indicated by previous research (see Cone & Hayes, 1980; Everett & Watson, 1987; Geller, Winett, & Everett, 1982). Although we also investigate whether the intervention of freeway closure increases public transport use, our main research objective is to investigate the psychological and behavioral consequences of using public transport after being triggered to do so by a temporary structural change. More specifically, the question we pose is how a freeway closure affects drivers who have not frequently used public transport before but who do so during the freeway closure.

Potential positive consequences of adopting a new behavior triggered by a temporary structural change is a more positive perception of that behavior (Bolles, 1972; Watson & Tharp, 1997), and such a change in perception may therefore facilitate the establishment of a new habit that replaces the old one (Dahlstrand & Biel, 1997). For example, Foxx and Hake (1977) reported that temporary positive incentives induced more frequent bus use and that the frequency after the intervention was still higher than before. Accordingly, a temporary structural change that induces cooperation may have a lasting positive effect in solving or managing social dilemmas if the consequences of cooperation are evaluated as positive.

HYPOTHESES

Because drivers have to detour to use other routes during a freeway closure, commute time by automobile would increase. Accordingly, some commuting drivers may switch to public transport such as train travel. Hypothesis 1 states that the frequency of automobile commuting before the temporary structural change is negatively related to the frequency of switching to public transport, that is, the higher the frequency of automobile commuting, the less likely it is that drivers would switch. This hypothesis is based on the assumption that the frequency of automobile commuting reflects the strength of the habit of choosing to drive. Verplanken, Aarts, and Van Knippenberg (1997) have shown that the more habitual the driving choice is, the less information is searched. Thus, drivers who have developed a strong habit of driving may, to a larger extent than drivers with a weak habit, lack the knowledge they would need to temporarily switch to public transport.

According to Hypothesis 2, the more frequent automobile commuting was before the closure, the more inaccurate perceptions drivers will have of
commute time by public transport. It is presupposed that commuting drivers perceive commute times by public transport to be longer than they actually are. When first choosing to drive, commuting drivers may have justified their choice in terms of shorter commute time (Van Vugt, Van Lange, Meertens, & Joireman, 1996). Because few instances have later been experienced that correct inaccurate perceptions of commute time by public transport, overestimation may persist in frequent drivers who seldom use public transport. The same rationale underlies Hypothesis 3: Commuting drivers who use public transport will change their perceptions of commute time from overestimates to more accurate estimates.

Finally, Hypothesis 4 states that those drivers whose perceptions of commute time change will continue to use public transport to a larger extent than those drivers whose perceptions do not change. The hypothesis is based on the assumption that the change of perception of commute time leads to a change of attitude toward public transport in a positive direction. Furthermore, the attitudinal change makes the driver use public transport more frequently, as implied by, for instance, the theory of planned behavior (Ajzen, 1985, 1991). The hypothesis is also in line with social learning theories that assume that behavioral consequences determine behavioral change (Cone & Hayes, 1980; Everett & Watson, 1987; Geller et al., 1982).

METHOD

SAMPLE AND SURVEY

The survey was conducted during a temporary closure of the Hanshin Expressway Sakai Route, a toll road connecting the central business district of Osaka (the third largest city in Japan) and Sakai City, located approximately 20 km south of Osaka. The freeway was closed for maintenance from November 1 to 8, 1998. The public was informed about the closure through TV, radio, newspapers, and leaflets that indicated the objectives of the closure and when and where it would take place. Similar freeway closures occur annually in different parts of the Osaka metropolitan area.

To recruit drivers who commuted regularly on the Sakai Route, 5,000 postcards were distributed to drivers at three toll gates from 6:00 a.m. to 8:30 a.m. on October 15, 1998. The postcard described the objective of the survey and solicited survey participation among those who commuted by the Sakai Route at least once a week. The postcards indicated that all participants...
would have to fill out a questionnaire every day during the 8-day freeway closure.

A total of 704 postcards were mailed back by those who were willing to participate in the survey (a response rate of 14.1%). The questionnaires employed in the main survey were sent to participants approximately a week before the freeway closure. Respondents were offered as incentive a choice of a telephone card, a prepaid freeway toll card, or a book coupon, each worth 1,000 yen (approximately $9 U.S.).

During the closure, at least one telephone call was made to each of the respondents, reminding them to fill out the questionnaire every day. At the conclusion of the survey period, a total of 335 usable questionnaires had been returned, yielding a response rate of 47.5%. The respondents’ mean age was 42.1 years (SD = 9.9). A large majority (90.2%) were men. A large-scale survey of freeway users (n = 4,094) conducted by the Hanshin Expressway Public Cooperation in 1998 yielded comparable results, with a mean user age of 42.7 years and 91.0% of the sample consisting of men.

The respondents were requested to answer questions every day during the freeway closure (from November 1 to November 8) and also on the day before the closure (October 31). The questions answered on the day before the closure addressed respondents’ demographics and regular commuting behaviors. The questions answered during the freeway closure concerned the commuting behavior on each day.

MEASURES

In the questionnaire delivered on the day before the freeway closure, respondents were asked to indicate the frequencies of commuting to the same destination that they were heading toward on the day when they received the recruitment postcard, by automobile, by public transport (bus or train), or by other modes. Out of all 335 respondents, 214 (63.9%) indicated that they commuted by automobile every weekday. These respondents were labeled high-frequency drivers. The remaining respondents were split into moderate-frequency drivers (80, or 23.9% of the respondents), who indicated that they commuted by automobile 80% of the time or more, and low-frequency drivers (34, or 10.1% of the respondents), who indicated that they commuted by automobile less than 80% of the time.

On each day during the freeway closure, the respondents were asked to indicate which mode they chose (train, bus, automobile, motorcycle, taxi, or other), what time they departed home and arrived at work, and what they expected at the time of departure to be the earliest and latest possible arrival times of their commute trips. Travel-time information was collected by
requesting respondents to fill in the spaces between the brackets (which were blanks in the survey questionnaire) in the following sentence: "I left home to work at [A]. When I left home, I anticipated that I would arrive at the office between [B] and [C]. My actual arrive time was [D]." The expected commute time was calculated as the difference between the departure time and the mean of the expected arrival times, that is, \((B + C) / 2 - A\). The actual commute time was calculated as the difference between the departure and arrival times, that is, \(D - A\).

**RESULTS**

Hypothesis 1 implies that the increase in commuting by public transport during the freeway closure varies inversely with the frequency of commuting by automobile before the closure. To test this hypothesis, the frequency of commuting by public transport was calculated before and during the freeway closure.\(^3\) Table 1 indicates that this frequency was larger during than before the closure in all three groups of respondents. Furthermore, as expected, the increase was highest for the low-frequency drivers, next highest for the moderate-frequency drivers, and lowest for the high-frequency drivers. A 3 (frequency of automobile commuting before closure) by 2 (before vs. during closure) analysis of variance (ANOVA) with repeated measurement on the last factor yielded a significant effect of frequency of automobile commuting before the closure, \(F(2, 325) = 197.12, p < .001\), and a significant effect of before versus during closure, \(F(1, 325) = 43.07, p < .001\). The interaction effect was marginally significant,\(^6\) \(F(1, 325) = 2.57, p = .08\). Separate t tests showed that the frequency of public transport use during the closure was significantly greater than before closure for all groups: \(t(215) = 4.98, p < .001\), for high-frequency drivers; \(t(77) = 3.28, p < .01\), for moderate-frequency drivers; and \(t(33) = 3.26, p < .01\), for low-frequency drivers. All pairwise mean differences among the groups were significant during the closure: High-frequency drivers used public transport significantly less than both moderate-frequency drivers, \(t(292) = 5.41, p < .001\), and low-frequency drivers, \(t(248) = 12.37, p < .001\), and moderate-frequency drivers used public transport significantly less than low-frequency drivers, \(t(110) = 5.22, p < .001\).

To test Hypothesis 2, that the perception of commute time by public transport increases with the frequency of automobile commuting before the closure, 95 respondents who used public transport at least once during the freeway closure were selected.\(^7\) For those respondents’ first commute with
public transport, the mean expected and actual commute times were calculated. Table 2 shows that there were almost no differences in actual commute time by frequency of automobile commuting, that the mean expected commute times are larger than actual commute times, and that the difference between expected and actual commute times increases with the frequency of automobile commuting. These observations were confirmed by a 3 (frequency of automobile commuting before the closure) by 2 (expected vs. actual commute time) ANOVA with repeated measurement on the last factor, which yielded a significant effect of expected versus actual commute time, $F(1, 93) = 17.35, p < .001$, as well as a significant interaction between this factor and the frequency of automobile commuting before the closure, $F(2, 93) = 4.59, p < .05$. Separate $t$ tests showed that the expected commute time was significantly larger than the actual commute time only for high-frequency drivers, $t(28) = 3.69, p = .01$. The difference was marginally significant for moderate-frequency drivers, $t(33) = 1.77, p = .09$, but was far from significant for low-frequency drivers, $t(32) = 0.96, p = .35$.

### TABLE 1
**Relative Frequency of Commuting by Public Transport Before and During Freeway Closure Related to Frequency of Commuting by Automobile Before the Closure**

<table>
<thead>
<tr>
<th>Frequency of Automobile Commuting Before the Closure</th>
<th>Low-Frequency Drivers ($n = 34$)</th>
<th>Moderate-Frequency Drivers ($n = 78$)</th>
<th>High-Frequency Drivers ($n = 216$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Before closure</td>
<td>0.49</td>
<td>0.20</td>
<td>0.16</td>
</tr>
<tr>
<td>During closure</td>
<td>0.69</td>
<td>0.31</td>
<td>0.30</td>
</tr>
</tbody>
</table>

### TABLE 2
**Expected and Actual Commute Times by Public Transport (in minutes) Related to Frequency of Commuting by Automobile Before the Closure**

<table>
<thead>
<tr>
<th>Commute Time</th>
<th>Low-Frequency Drivers ($n = 33$)</th>
<th>Moderate-Frequency Drivers ($n = 34$)</th>
<th>High-Frequency Drivers ($n = 29$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Expected</td>
<td>72.3</td>
<td>17.7</td>
<td>71.0</td>
</tr>
<tr>
<td>Actual</td>
<td>71.5</td>
<td>18.1</td>
<td>68.9</td>
</tr>
</tbody>
</table>
According to Hypothesis 3, overestimation of commute time via public transport would be corrected by actual experience of public transport use. To test this hypothesis, 67 respondents were selected who made at least two commute trips by public transport during the closure. Table 3 indicates that high-frequency drivers’ differences in expected commute times between the first and the second commute by public transport were larger than those of the other groups of drivers because high-frequency drivers’ overestimations were larger than those of the other drivers. A 3 (frequency of automobile commuting before the closure) by 2 (first vs. second commute) analysis of covariance (ANCOVA) was performed with the difference between expected and actual commute time for the first commute trip (the degree of overestimation) as a covariate. In support of the conjectures, this analysis showed that the covariate was significant, $F(1, 63) = 10.45, p < .05$, whereas the interaction between the frequency of automobile commuting before the closure and first versus second commute was marginally significant, $F(2, 63) = 2.39, p = .10$. This result suggests that overestimation of commute time was corrected by the experience of using public transport and that the correction was not dependent on the driving frequency before the closure.

According to Hypothesis 4, drivers whose overestimations of commute time were corrected would be more likely to continue to use public transport than would those whose overestimations were not corrected. This implication was tested by comparing the frequency of continued choice of public transport during the closure after the first commute by public transport for respondents with large and small differences between expected and actual commute times at the first public transport commute. Eighty-nine respondents were selected who made at least one commute by public transport. They were divided into two groups, those with a large difference (> 5 minutes) between expected and actual commute times and those with a small difference (≤ 5 minutes). As may be seen in Table 4, there is an expected

---

**TABLE 3**

<table>
<thead>
<tr>
<th>Commute</th>
<th>Low-Frequency Drivers (n = 27)</th>
<th>Moderate-Frequency Drivers (n = 18)</th>
<th>High-Frequency Drivers (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>First</td>
<td>74.0</td>
<td>23.7</td>
<td>71.3</td>
</tr>
<tr>
<td>Second</td>
<td>73.1</td>
<td>17.2</td>
<td>73.4</td>
</tr>
</tbody>
</table>
difference between the group with a large difference and the group with a small difference. However, a 3 (frequency of automobile commuting before the closure) by 2 (large vs. small difference) ANOVA yielded only a marginally significant effect, $F(1, 88) = 2.90, p = .09$. Because sample sizes for low- and moderate-frequency drivers who experienced a large difference were very small, they were combined in an additional 2 (high- vs. low- and moderate-frequency drivers) by 2 (large vs. small difference) ANOVA. The effect of large versus small difference was then significant, $F(1, 88) = 4.52, p < .05$, whereas the relative frequency of automobile commuting had no effect, $F(1, 88) = 0.86, p = .36$. Separate $t$ tests showed that the frequency of continued choice of public transport by high-frequency drivers with large differences between actual and expected commute times was significantly greater than the frequency by high-frequency drivers with small differences, $t(25) = 2.27, p < .05$. The difference for low- and moderate-frequency drivers was not significant, $t(60) = 0.86, p = .39$.

### DISCUSSION

Although further empirical research is required to confirm the present results, our survey data aiming at assessing the impact of a temporary freeway closure confirmed all four hypotheses regarding the effectiveness of a temporary structural change in triggering cooperation in a real-life social dilemma. With regard to Hypothesis 1, the results showed that the 8-day freeway closure increased public transport use by commuting drivers from 9% to 20%. This is comparable to the results of some previous research (see Cone & Hayes, 1980; Everett & Watson, 1987; Geller et al., 1982). In addition, as Hypothesis 1 predicted, the relative frequency of automobile commuting

<table>
<thead>
<tr>
<th>Difference</th>
<th>Low-Frequency Drivers (n = 33)</th>
<th>Moderate-Frequency Drivers (n = 34)</th>
<th>High-Frequency Drivers (n = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Small (≤5 minutes)</td>
<td>31</td>
<td>0.66</td>
<td>0.39</td>
</tr>
<tr>
<td>Large (&gt;5 minutes)</td>
<td>2</td>
<td>0.75</td>
<td>0.35</td>
</tr>
</tbody>
</table>
before the closure was inversely related to the increase of public transport. It is plausible that the frequency is positively related to the strength of a habit of automobile commuting, implying automatic information processing as shown in experimental research on travel-mode choice (Gärling et al., 2001; Ronis et al., 1989; Verplanken & Aarts, 1999). This is also consistent with the results of other experimental research (Verplanken & Faes, 1999). Accordingly, our result implies that a habit of automobile commuting impedes cooperation.

Confirming Hypothesis 2, the results showed that the expected commute time by public transport was overestimated by automobile commuters, and to a higher degree when driving frequency was higher. In line with Hypothesis 3, the results confirmed that after the drivers’ first public transport use during the closure, overestimates of commute times by public transport were corrected. Finally, the results confirmed Hypothesis 4: Those whose overestimates were corrected continued to use public transport (during the freeway closure) to a larger extent than those whose overestimates were not corrected. One may also ask whether the increase in public transport use due to the correction of the overestimates of commute times was impeded by the frequency of automobile commuting before the closure. However, such an interaction effect was not observed. These findings then suggest that if high-frequency drivers use public transport at least once, their overestimates of public transport commute time are corrected, leading to an increase in the frequency of public transport use.

Although we were not able to investigate the long-term consequences of the correction of overestimates of commute times by public transport, we assume that it makes commuting drivers more inclined to choose public transport in the future, as is implied by, for instance, the theory of planned behavior (Ajzen, 1985, 1991) and social learning theories that assume that behavioral consequences determine behavior change (Cone & Hayes, 1980; Everett & Watson, 1987; Geller et al., 1982). Accordingly, it may be inferred that an effect of a temporary structural change is not only to induce temporary behavior change but possibly also to facilitate changes in the future. Thus, a temporary structural change is a potential strategy for influencing individuals’ future choices and for inducing lasting behavior change (Foxx & Hake, 1977).

To summarize, the results of the present study suggest that a freeway closure, that is, a temporary structural change, triggers a change in public transport use (see Figure 1). Automobile commuting causes overestimation of commute times by public transport that may strengthen continued automobile commuting. A temporary structural change that induces public transport use may, however, correct drivers’ overestimations of commute times by
public transport. This correction may in turn increase public transport use. Although implementing temporary structural changes thus appears to be a promising approach, further research is needed to explore several issues, including public acceptance of such changes, effects of the length of such changes, and effects of the extent to which such changes eliminate feasible alternatives (e.g., an alternative route to drive).

NOTES

1. This figure underestimates the true response rate because those who received postcards at the tollgate did not all commute on the freeway at least once a week.

2. The questions answered on the day before the closure were related to demographics (age, sex, occupation, type of owned vehicle, home address, and workplace address); regular commuting behavior (frequencies of commute by modes, that is, by automobile, public transport, or some other mode; the beliefs of longest and shortest commute times by modes; commuting costs by modes; departure times if commuting by different modes; routes if commuting by different modes); information on when and by what means the respondents learned about the closure; frequency of use of the Hanshin Expressway; and frequency of automobile use. The questions answered during the freeway closure were related to commuting behavior on each day (route, travel mode, departure time, the latest and earliest anticipated arrival time before the departure, anticipated cost before the departure, actual arrival time, actual costs, and required arrival time) and information acquisition with respect to traffic condition (whether the respondent obtained new information through acquaintances, TV, radio, newspaper, or telephone service).
3. The cover page of the questionnaire emphasized in large red letters that the respondents were to fill out the questionnaire every day during the closure. Telephone calls made to the respondents reminded them to do so.

4. A large majority of respondents used train or automobile. Other modes—including motorcycle, taxi, and bus—were so infrequently mentioned that they can be ignored.

5. The calculation was as follows: (relative frequency of commuting by public transport before the closure) = (commuting days in a month by public transport before the closure) / (commuting days in a month); (relative frequency of commuting by public transport during the closure) = (commuting days by public transport during the closure) / (commuting days during the closure).

6. A $p$ value of less than .05 is regarded as significant. We refer to a $p$ value equal to or greater than .05 but not greater than .1 as marginally significant.

7. According to Hypotheses 1 and 2, it is conjectured that the respondents who did not use public transport during the closure were likely to have strong negative beliefs about public transport use. However, our data cannot certify this.

8. The calculation was as follows: (relative frequency of continued choices of public transport during the closure after the first commute by public transport) = (commuting days by public transport during the closure after the first commute day) / (commuting days after the first commute by public transport)

9. The calculation was as follows: (differences between expected and actual commute times at the first public transport commute) = (expected commute time by public transport at the first public transport commute) – (actual commute time by public transport at the first public transport commute)

REFERENCES


THE IMPORTANCE OF TRANSPORTATION AND PRIORITIZATION OF ENVIRONMENTAL NEEDS TO SUSTAIN WELL-BEING AMONG OLDER ADULTS

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ABSTRACT: This study examines the influence of transportation dependence and fulfillment of transportation needs on well-being based on a community sample (N = 174). The majority (54.4%) of transportation-dependent participants had unfulfilled transportation needs, whereas this was the case for very few (7.1%) of those independent of transportation support. Regression analyses revealed that the transportation needs variable was statistically significant, whereas the transportation dependence factor was not. In terms of the prioritization of environmental components, elderly dependent on transportation support placed higher importance on housing than on neighborhood or community elements compared to more mobile seniors. Participants with unmet transportation needs were more likely to depend solely on family to provide transportation, whereas participants with fulfilled transportation needs...
were more likely to include friends or neighbors for providing transportation support. Results suggest that prioritization of needs enables seniors to maintain positive well-being despite experiencing functional limitations or being dependent on transportation services.

A major focus of research in psychology and gerontology since the mid-20th century has centered on how the individual interacts with his or her environment throughout the life course. Lawton and Simon (1968) proposed that a person’s ability to cope with the environment declines significantly with age and/or disability across several domains (the structural environment, social support, coping strategies) and called this the *environmental docility hypothesis*. Carp and Carp (1984) found that resources/supports in the environment may compensate somewhat for the age-related declines in competence. More recently, Cvikovich and Wister (2001) established that weighting environmental needs, according to the subjective prioritization of the individual, improves the prediction of well-being compared to other models of person-environment (P-E) fit that only use objective measures and a single environmental domain. Yet, there are a number of environmental areas that have not been specifically examined. This article considers the impact of transportation on the P-E fit experienced by the individual.

Transportation needs and transportation dependence both involve environmental factors in which individual competence and environmental demands interact. In fact, Joseph and Fuller (1991) found that transportation, housing, and service usage are strongly interrelated and influence quality of life. When the individual is transportation dependent, the extent he or she can interact with the environment is greatly restricted and this adversely influences quality of life. This article specifically examines the degree to which transportation dependence and transportation needs affect well-being and/or alter the prioritization of environmental needs among older adults.

TRANSPORTATION AS A KEY SUPPORT TO ENVIRONMENTAL DOMAINS

The World Health Organization (WHO, 2000), as well as other researchers (Schaie & Pietrucha, 2000), professionals, and seniors, assert that effective transportation systems are crucial for minimizing social isolation, maintaining connections with the community, increasing access to health promotion and social programs, and improving access to medical services for the elderly. Indeed, Vezina and Pelletier (1997) found that seniors who have access to one or more viable modes of transportation report higher levels of
satisfaction with their quality of life and exhibit lower levels of social isolation. In addition, they found that seniors with limited mobility are more transportation dependent compared to more mobile seniors (Vezina & Pelletier, 1997). Furthermore, Silverstein and Wu (1997) uncovered increases in participation levels at seniors’ centers among community-dwelling older adults when transportation access was improved. However, many older people do not have the means to sustain full independence: They are increasingly transport dependent and become “passengers” who have to purchase or negotiate rides with providers (Joseph & Fuller, 1991).

In most jurisdictions, the focus of social/health policy is to facilitate seniors to live independently in their communities for as long as possible. Given this ubiquitous policy, more consideration and funding must be allocated to transportation services that connect seniors to their communities and to the services that enhance their social, mental, and physical health (Vezina & Pelletier, 1997).

P-E fit theory helps elucidate how transportation support may be considered salient to well-being. Research in this area shows that as an individual experiences decline in function, his or her environment becomes increasingly important in affecting well-being (Lawton & Nahemow, 1973). Moreover, Kahana (1982) proposed that if important needs are unfulfilled, they will have greater influence on well-being than less important unmet needs. Cvitkovich and Wister (2001) further contended that the saliency of needs associated with an individual’s prioritization of environmental domains (structural environment, informal support, and formal services) may help to explain the tendency of older adults to rate well-being relatively high in the face of deteriorating environmental conditions. Weighting needs according to prioritization contributed 14% to the explanation of variance in well-being beyond the 33% explained by age, marital status, health, requirement for help with activities of daily living (ADLs), and stress in the environmental domains (Cvitkovich & Wister, 2001). However, transportation needs were not incorporated into that particular research.

Figure 1 illustrates a schematic in which transportation variables are seen to filter predisposing variables and thereby affect P-E fit and prioritization of need. This article will examine if transportation dependence (Model 2) and transportation needs (Model 3) explain well-being beyond that contributed by the predisposing variables (Model 1). This study tests two hypotheses. The first hypothesis states that transportation dependence and/or transportation needs mediate the association between the sociodemographic/health factors (Model 1) and valuation of life (VOL). The second hypothesis states that transportation dependence and/or transportation needs will influence the prioritization of needs, which in turn affects well-being.
A sample of 174 community-dwelling seniors (65 years and older) was recruited from lists provided by Vancouver area seniors’ programs coordinators at adult day centers, seniors’ centers, and Meals-On-Wheels programs in 1998 and 1999. Face-to-face interviews ascertained seniors’ perceptions of their priority of needs and their P-E fit. Although the sample was collected by means of a nonrandom purposive method, the very high response rates (95%) and the diversity of distribution among frail and mobile seniors provide confidence that this case study is representative of seniors’ transportation issues in the Vancouver area. Furthermore, one of the author’s collaboration on several transportation working groups substantiated the principal concerns voiced by seniors in this study.

MEASURES

Dependent Variable

The dependent variable is derived from the Lawton et al. (1998) VOL Scale, used as a measure of well-being. Lawton described VOL as representing the subjectively experienced worth of a person’s life, weighted by the multitude of positive and negative factors whose locus may be either within the person or in the environment. People perform a very complex calculation in which positive and negative factors counterbalance each other to produce a schema for coping with their life situations. Lawton et al. proposed that adaptive behaviors demand sensitivity to changes in the environment, but these...
behaviors also express the ability to maintain some degree of stability by assimilating changes within limits. The cognitive schema represented by this new VOL Scale illustrates the dynamic accommodation and assimilation process by which people adapt present, past, and contextual inputs to summarize the meaning and purpose of their lives and enables each individual to meet the threat of illness and decline. For many, VOL is a positive state where assimilative adaptation occurs in the form of compensating for distress.

Lawton et al. (1998) chose a construct that was more situation specific than current global well-being scales based on traits or long-standing personality characteristics. Based on their review of literature, it was determined that existing scales did not adequately measure positive mental health. The content areas of the resulting scale include the following: hope, purpose of life, a sense of futurity, persistence, and self-efficacy. The scale items were developed to capture subjective well-being or self-evaluation without being limited by health status, life span expectations, or any external object or domain of life (i.e., activity, interpersonal ties, economic status).

The VOL measure consists of 13 positive statements and 6 negatively worded statements scored on a 5-point Likert-type scale. Reliability analysis has supported the replicability of scales, producing an alpha of .94 for the 13-item positive statements and an alpha of .83 for the 6-item negative statements (Lawton et al., 1998). In the current study, reliability analysis for the 19-item composite scale VOL (see Table 1) revealed an alpha value of .81 for the limited mobility group and .88 for the mobile group. The VOL score produces an interval variable summing responses to the VOL statements.

P-E Fit Measures

Examination of P-E interactions requires comprehensive measurement of fit with the environment. A review of the literature indicates that P-E fit is best described by three domains, each consisting of three subdomains (see Figure 2): a structural domain composed of housing, neighborhood, and community subdomains (Golant, 1984); an informal domain (social support) including family, friends, and neighbors (Connidis, 1989; Lazarus & Folkman, 1984; Parmelee, 1998); and a formal domain (services) composed of home care, community agencies, and medical services (Carp & Carp, 1984; WHO, 2000).

Degree of P-E fit is described by scores on a P-E fit scale ranging from 0 to 10, measuring how each subdomain meets the participant’s needs (see Figure 2). Each P-E fit score produces an interval variable. The P-E fit is composed of the sum of the subdomain scores weighted according to their
priority. To produce a prioritization scheme, the needs (subdomains) within each of the domains were ranked according to importance for life satisfaction. To minimize cognitive dissonance, participants were subsequently asked to prioritize the importance of domains.

Transportation Variables

To describe the transportation characteristics of participants, two dummy variables were created: transportation dependence and transportation needs. Transportation dependence is represented by a dichotomous variable. Participants who could drive or take conventional public transit without difficulty were coded as independent. If participants could not take buses or were dependent on others for transportation, they were coded as dependent. Transportation needs is represented by a dichotomous variable based on whether participants indicated that their transportation needs were fulfilled.

Demographic Characteristics of Participants

Age and gender are measured in the usual manner. Living arrangement is collapsed into “alone” or “other.” To reflect availability of family support outside the marital relationship, marital status is examined using “married,” “widowed,” “separated/divorced,” and “never married” categories. For regression analysis, family support is represented as two discrete categories: “widowed/married” and “separated/divorced/never married.” Widowed or married individuals were assumed to have more family support available than the separated, divorced, or never married (Connidis, 1989). Tenure is categorized

<table>
<thead>
<tr>
<th>Valuation of Life</th>
<th>Total Sample (N = 174)</th>
<th>Limited Mobility (n = 78)</th>
<th>Mobile (n = 96)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>19-item scale</td>
<td>.8575</td>
<td>71.09</td>
<td>8.46</td>
</tr>
<tr>
<td>13-item scale</td>
<td>.8408</td>
<td>50.59</td>
<td>5.79</td>
</tr>
<tr>
<td>6-item scale</td>
<td>.7485</td>
<td>20.50</td>
<td>3.97</td>
</tr>
<tr>
<td>STRUCTURAL DOMAIN</td>
<td>INFORMAL DOMAIN</td>
<td>FORMAL DOMAIN</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Housing needs</td>
<td>Support by Family</td>
<td>Services by homecare</td>
<td></td>
</tr>
<tr>
<td>Neighborhood needs</td>
<td>Support by Friends</td>
<td>Services by community agencies</td>
<td></td>
</tr>
<tr>
<td>Options for Community Participation</td>
<td>Support by Neighbors</td>
<td>Health Services</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRIORITY WITHIN STRUCTURAL DOMAIN</th>
<th>PRIORITY WITHIN INFORMAL DOMAIN</th>
<th>PRIORITY WITHIN FORMAL DOMAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Priority</td>
<td>1st Priority</td>
<td>1st Priority</td>
</tr>
<tr>
<td>2nd Priority</td>
<td>2nd Priority</td>
<td>2nd Priority</td>
</tr>
<tr>
<td>3rd Priority</td>
<td>3rd Priority</td>
<td>3rd Priority</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRIORITY BETWEEN DOMAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st PRIORITY DOMAIN</td>
</tr>
</tbody>
</table>

Figure 2: Diagram of Domain and Priority Variables
into “owner” and “other.” Type of residence is measured as “house” or “other.” Length of stay in current residence is measured in years.

**Mobility and Health Characteristics**

Participants were categorized as having good mobility or limited mobility (difficulty with balance, limited endurance when walking less than one level block, or having mobility only with the assistance of technical aids) based on the face-to-face interview data. The sample was fairly evenly divided between mobile seniors ($n = 96$) and those with mobility limitations ($n = 78$). Self-appraised health status is dichotomized in “poor/fair” and “good/excellent” categories. Help with ADLs incorporates personal care and help with meal preparation. Help with meal preparation was consigned to ADLs because it was deemed more pertinent to daily living than if placed as an instrumental activity of daily living (IADL) as is the more common practice. A dichotomous variable was computed such that “no help required with ADLs” equals 0 and “some help” equals 1. A dichotomous variable was similarly computed for help with IADLs.

Stress in each domain is measured as an interval variable using a perceived-stress scale ranging from 0 = no stress to 10 = high stress. These stress variables are kept as continuous variables for the multiple regression and recoded for bivariate analysis as “none-low” for 0 to 4 values and “moderate-high” for 5 to 10 on the stress scale.

**RESULTS**

First, in the descriptive analysis, we examine participants’ characteristics relative to the two transportation variables. Second, we conduct regression analyses to examine the correlation between variables as well as to reveal the contribution of variables in predicting variance in the dependent variable (VOL). Finally, bivariate analysis is used to reveal any differences in prioritization of environmental needs relative to the transportation variables.

**SECTION 1: PARTICIPANT PROFILES**

In the study, 51.7% of participants ($n = 90$) demonstrate transportation dependence compared to 48.3% ($n = 84$) who were independent concerning transportation usage. We found that 119 (68.4%) participants had their transportation needs fulfilled and 55 (31.6%) had unfulfilled transportation needs.
Comparing transportation dependence to transportation needs revealed statistically significant differences in unfulfilled transportation needs between groups. Only 6 (7.1%) of the transportation-independent seniors had unfulfilled transportation needs compared to more than half (54.4%) of transportation-dependent seniors (see Table 2).

As expected, most (91.0%) participants with mobility limitations were also transportation dependent and 52.6% had unfulfilled transportation needs. Participants who were transportation dependent were more likely to be older (mean age of 82.2 years compared to a mean age of 78.1 years for participants independent with respect to transportation), in poor/fair health (70.8%), experience mobility limitations (91.0%), require help with ADLs (83.3%), require help with IADLs (68.8%), and experience moderate/high levels of stress in each environmental domain. In addition, participants who had unfulfilled transportation needs were more likely to be transportation dependent (54.4%), living alone (41.7%), and older (mean age of 82.5 years, compared to 79.2 years for participants with fulfilled transportation needs). “Living arrangement” was an important factor in determining if transportation needs were fulfilled. It was noted that the vast majority (84.8%) of participants living with others had their transportation needs fulfilled, whereas this was the case for only a slim majority (58.3%) of participants living alone. There were no statistically significant differences between transportation categories relative to gender, type of residence, tenure, or length of stay.

SECTION 2: REGRESSION ANALYSIS

Regression analysis was conducted to reveal the unique contribution of variables on VOL as well as the shared contribution arising from combinations of the variables. The effect of transportation on VOL is examined by con-

---

### TABLE 2
**Bivariate Analysis of Transportation Variables and Predisposing Factors**

<table>
<thead>
<tr>
<th>Transportation Dependence</th>
<th>Independent (n = 84, 48.3%)</th>
<th>Dependent (n = 90, 51.7%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation needs, $\chi^2(2)$</td>
<td>44.97***</td>
<td></td>
</tr>
<tr>
<td>Needs met</td>
<td>78 (92.9%)</td>
<td>41 (45.6%)</td>
</tr>
<tr>
<td>Needs unmet</td>
<td>6 (7.1%)</td>
<td>49 (54.4%)</td>
</tr>
</tbody>
</table>

NOTE: The number in parentheses represents the degrees of freedom.

$**p < .01.$
ducting multivariate regression analyses. As a first step, all statistically significant covariates with VOL were identified (see Table 3) and subsequently were entered as predisposing factors (excluding the transportation variables). The IADLs variable and the mobility-limitations variable were excluded in the regression because they were collinear with the transportation variables and health variables. After screening for collinearity, only five predisposing variables were found to produce statistically significant contributions to well-being: age, family support, health status, help required for ADLs, and informal domain stress. Separate regression analyses (see Table 4) were conducted for transportation dependence (Model 2) and transportation needs (Model 3) categories because these variables are collinear.

Table 4 presents each statistically significant factor in descending order showing the unique contribution in predicting well-being (i.e., VOL). This table reveals that transportation dependence (Model 2) did not contribute any unique variability in explaining VOL when added to the predisposing factors (Model 1). However, the transportation-needs variable (Model 3) adds 2.17% of unique variability to the explanation of variance in the dependent variable (adjusted $R^2$ of 28.77%) after the predisposing factors were included. With the inclusion of Model 3, the unique contribution of the predisposing factors was diminished slightly, but the shared variabilities compensated with an increase to 17.38% from the 12.92% shared variability for Model 1. Model 3 increased the $R^2$ to 32.07% compared to 29.9% for Model 1. The adjusted $R^2$ was highest for Model 3 and lowest for Model 2. This suggests that transportation dependence is less important for well-being than predisposing factors. On the other hand, fulfillment of transportation needs seems to override the impact of the predisposing factors in determining well-being.

Although the range of unique variability among the predisposing factors (Model 1) was fairly narrow (with a high of 4.09% for age to 2.36% for help with ADLs), it was noted that the relative impact of the predisposing factors changed depending on the inclusion of the transportation-dependence or the transportation-needs variable. In every model, age, family support, and stress in the informal domain were the predominant predictors of well-being. Considering the predisposing factors independently (Model 1) revealed that age was the predominant factor, as expected. When transportation dependence was included, informal domain stress and age provided an equal impact. When fulfillment of transportation needs was examined, family support and informal domain stress actually had a greater impact than age. Requiring help with ADLs did not contribute to any unique variability to well-being (VOL) when model 3 was considered. Thus, for seniors, the extent of family support or transportation support was each more significant than health factors or frailty in predicting well-being.
### TABLE 3
Correlation Matrix, Total Sample

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Family Support</th>
<th>No ADLs</th>
<th>Health</th>
<th>StressIS</th>
<th>Transmet</th>
<th>Transdep</th>
<th>Mobility</th>
<th>VOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family support</td>
<td>-.342**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ADLs</td>
<td>-.247**</td>
<td>.097</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>-.041</td>
<td>-.104</td>
<td>.150*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>StressIS</td>
<td>-.073</td>
<td>.081</td>
<td>.042</td>
<td>-.256**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmet</td>
<td>.209**</td>
<td>-.042</td>
<td>-.265**</td>
<td>-.165*</td>
<td>.161*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transdep</td>
<td>.282**</td>
<td>-.131</td>
<td>-.424**</td>
<td>-.294**</td>
<td>.089</td>
<td>.508**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>.285**</td>
<td>-.118</td>
<td>-.594**</td>
<td>-.427**</td>
<td>.031</td>
<td>.406**</td>
<td>.709**</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>VOL</td>
<td>-.165*</td>
<td>-.167*</td>
<td>.234**</td>
<td>.347**</td>
<td>-.339**</td>
<td>-.312**</td>
<td>-.219**</td>
<td>-.263**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

NOTE: No ADLs = no help required for activities of daily living; StressIS = stress arising in the informal domain; Transmet = fulfillment of transportation needs; Transdep = dependence on the provision of transportation; VOL = valuation of life.

*p < .05. **p < .01.
### TABLE 4
Impact of Predisposing Factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>( s^2 )</th>
<th>Factor</th>
<th>B</th>
<th>( s^2 )</th>
<th>Factor</th>
<th>B</th>
<th>( s^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.2273**</td>
<td>.0409</td>
<td>Informal domain stress</td>
<td>-.2304**</td>
<td>.0388</td>
<td>Family support</td>
<td>-.2012**</td>
<td>.0349</td>
</tr>
<tr>
<td>Informal domain stress</td>
<td>-.2312**</td>
<td>.0392</td>
<td>Age</td>
<td>-.2238**</td>
<td>.0383</td>
<td>Informal domain stress</td>
<td>-.2162**</td>
<td>.0340</td>
</tr>
<tr>
<td>Family support</td>
<td>-.2045**</td>
<td>.0361</td>
<td>Family support</td>
<td>-.2060**</td>
<td>.0364</td>
<td>Age</td>
<td>-.1952**</td>
<td>.0290</td>
</tr>
<tr>
<td>Health status</td>
<td>.1878**</td>
<td>.0300</td>
<td>Health status</td>
<td>.1835*</td>
<td>.0272</td>
<td>Health status</td>
<td>.1793*</td>
<td>.0273</td>
</tr>
<tr>
<td>Help with ADLs</td>
<td>.1628*</td>
<td>.0236</td>
<td>Help with ADLs</td>
<td>.1563*</td>
<td>.0191</td>
<td>T dependent</td>
<td>-.0197</td>
<td>ns</td>
</tr>
<tr>
<td>T dependent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Help with ADLs</td>
<td></td>
<td>.1301</td>
</tr>
</tbody>
</table>

| Sum of \( s^2 \) =  | .1698  |           | Sum of \( s^2 \) =  | .1598  |           | Sum of \( s^2 \) =  | .1394  | .1738     |

**NOTE:** \( B \) represents the standardized regression coefficient; \( s^2 \) represents the unique variability of each factor. This is the amount by which \( R^2 \) would be reduced if the independent variable were omitted from the regression (see Tabachnick & Fidell, 1989). Shared variability is the mathematical difference between \( R^2 \) and the sum of significant unique variabilities. Informal domain stress is stress arising from interactions with family, friends, or neighbors. T dependent is the variable representing the participant’s dependence on transportation. T met is the variable that measures fulfillment of transportation needs. ADLs are activities of daily living such as personal care and meal preparation.

* \( p < .05 \). ** \( p < .01 \).
SECTION 3: GROUP COMPARISON OF PRIORITIES VARIABLES

To test Hypothesis 2 (that transportation dependence and/or transportation needs will influence the prioritization of needs, which in turn affects well-being), we examined the priorities of participants relative to each respective transportation variable.

Priorities According to Transportation Needs

Table 5 summarizes the statistically significant differences in priority of needs relative to the transportation-needs variable. The prioritization of environmental needs according to Model 3 shows statistically significant differences relative to the following: the last priority domain ($\chi^2 = 6.65, df = 2, p < .05$), the second ($\chi^2 = 6.99, df = 2, p < .05$), and third priority ($\chi^2 = 10.89, df = 2, p < .01$) within the informal domain. Model 3 also demonstrated statistically significant differences in priority of needs for the first choice ($\chi^2 = 8.61, df = 2, p < .001$), as well as the third choice ($\chi^2 = 16.53, df = 2, p < .001$) within the formal domain.

Participants with unmet transportation needs were more likely to choose the informal domain as least important for well-being (43.6%) compared to participants with fulfilled transportation needs who chose the formal domain (37.8%) or the structural domain (36.1%) as the least important for well-being. An equivalent proportion of participants with fulfilled transportation needs perceived that the informal domain or the structural domain was their first choice in importance for influencing well-being. This difference in prioritization of domains suggests that if the informal domain cannot meet their transportation needs, then participants determine that social support is of less importance compared to the structural domain or the formal domain for influencing well-being. There were no statistically significant differences in prioritization of transportation needs relative to subdomains within the structural domain. The general trend within the informal domain was that family was predominantly the first priority, friends predominant as second choice, and neighbors predominantly chosen as the last priority. Experiencing unfulfilled transportation needs resulted in participants being more likely than seniors with fulfilled transportation needs to choose neighbors as second choice in the informal domain (32.7% compared to 16.0%) and friends as third choice (27.3% compared to 8.4%). This suggests that participants who broaden their sources of transportation to friends and neighbors are more likely to have their transportation needs met, whereas participants who depend primarily on family to provide their transportation needs are more likely to experience unfulfilled transportation needs.
Within the formal domain, the general pattern of priority for participants with fulfilled transportation needs was to predominantly choose health services as the first priority, community agencies as the second priority, and homecare as the last priority. However, participants with unfulfilled transportation needs were more likely to choose home care and community agencies in equal proportions as the first priority, community agencies predominantly as the second priority, and home care predominantly as the third priority. The predominance of home care as the third priority is understandable because this service is delivered in the home and therefore less

<table>
<thead>
<tr>
<th>Choice as third domain</th>
<th>Needs Met (n = 119, 68.4%)</th>
<th>Needs Unmet (n = 55, 31.6%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal</td>
<td>37.8</td>
<td>21.8</td>
</tr>
<tr>
<td>Structural</td>
<td>36.1</td>
<td>34.5</td>
</tr>
<tr>
<td>Informal</td>
<td>26.1</td>
<td>43.6</td>
</tr>
<tr>
<td>χ²(2) = 6.65*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second priority within informal domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends</td>
<td>64.7</td>
<td>56.4</td>
</tr>
<tr>
<td>Family</td>
<td>19.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Neighbors</td>
<td>16.0</td>
<td>32.7</td>
</tr>
<tr>
<td>χ²(2) = 6.99*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third priority within informal domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbors</td>
<td>75.6</td>
<td>60.0</td>
</tr>
<tr>
<td>Family</td>
<td>16.0</td>
<td>12.7</td>
</tr>
<tr>
<td>Friends</td>
<td>8.4</td>
<td>27.3</td>
</tr>
<tr>
<td>χ²(2) = 10.89**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First priority within formal domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health services</td>
<td>52.1</td>
<td>30.9</td>
</tr>
<tr>
<td>Community agencies</td>
<td>30.3</td>
<td>34.5</td>
</tr>
<tr>
<td>Homecare</td>
<td>17.6</td>
<td>34.5</td>
</tr>
<tr>
<td>χ²(2) = 8.61***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third priority within formal domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homecare</td>
<td>51.3</td>
<td>59.3</td>
</tr>
<tr>
<td>Health services</td>
<td>27.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Community agencies</td>
<td>21.7</td>
<td>32.2</td>
</tr>
<tr>
<td>χ²(2) = 16.53**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The degrees of freedom are represented in parentheses.

*p < .05. **p < .01. ***p < .001.

### TABLE 5
Bivariate Analysis of Transportation Variables and Priorities Between Domains
(in percentages)

<table>
<thead>
<tr>
<th>Transportation Needs (Model 3)</th>
<th>Needs Met (n = 119, 68.4%)</th>
<th>Needs Unmet (n = 55, 31.6%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First priority within formal domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health services</td>
<td>52.1</td>
<td>30.9</td>
</tr>
<tr>
<td>Community agencies</td>
<td>30.3</td>
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</tr>
<tr>
<td>Homecare</td>
<td>17.6</td>
<td>34.5</td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>Friends</td>
<td>64.7</td>
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<td>19.3</td>
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<tr>
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<td>16.0</td>
<td>32.7</td>
</tr>
<tr>
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</tr>
<tr>
<td>Neighbors</td>
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</tr>
<tr>
<td>Family</td>
<td>16.0</td>
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</tr>
<tr>
<td>Friends</td>
<td>8.4</td>
<td>27.3</td>
</tr>
<tr>
<td>χ²(2) = 6.99*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third priority within formal domain</td>
<td></td>
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<tr>
<td>Health services</td>
<td>51.3</td>
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<td>Homecare</td>
<td>21.7</td>
<td>32.2</td>
</tr>
<tr>
<td>χ²(2) = 16.53**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
dependent on transportation support. The high priority given to community agencies is possibly explained by the fact that agencies such as handyDART (handy Dial-A-Ride Transit) and adult day centers help connect seniors to their communities by providing nonconventional transportation services to seniors with mobility limitations.

Priorities According to Transportation Dependence

Table 6 summarizes the statistically significant differences in priority of needs relative to the transportation-dependence variable. Prioritization of environmental needs according to Model 2 indicates statistically significant differences relative to the first ($\chi^2 = 9.94, df = 2, p < .01$) and third priority ($\chi^2 = 7.16, df = 2, p < .05$) within the structural domain. Model 2 also demonstrated statistically significant differences in priority of needs for the first

<table>
<thead>
<tr>
<th>Table 6</th>
<th>Bivariate Analysis of Transportation Variables and Priorities Between Domains (in percentages)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transportation Dependence (Model 2)</strong></td>
<td><strong>Independent</strong> ((n = 84, 48.3%))</td>
</tr>
<tr>
<td>First priority within structural domain</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>52.4</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>25.0</td>
</tr>
<tr>
<td>Community</td>
<td>22.6</td>
</tr>
<tr>
<td>(\chi^2(2) = 9.94^{**})</td>
<td></td>
</tr>
<tr>
<td>Third priority within structural domain</td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td>50.0</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>31.0</td>
</tr>
<tr>
<td>Housing</td>
<td>19.0</td>
</tr>
<tr>
<td>(\chi^2(2) = 7.16^{*})</td>
<td></td>
</tr>
<tr>
<td>First priority within formal domain</td>
<td></td>
</tr>
<tr>
<td>Health services</td>
<td>58.3</td>
</tr>
<tr>
<td>Community agencies</td>
<td>27.4</td>
</tr>
<tr>
<td>Home care</td>
<td>14.3</td>
</tr>
<tr>
<td>(\chi^2(2) = 12.25^{**})</td>
<td></td>
</tr>
<tr>
<td>Third priority within formal domain</td>
<td></td>
</tr>
<tr>
<td>Home care</td>
<td>64.3</td>
</tr>
<tr>
<td>Health services</td>
<td>27.4</td>
</tr>
<tr>
<td>Community agencies</td>
<td>8.3</td>
</tr>
<tr>
<td>(\chi^2(2) = 15.43^{**})</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The degrees of freedom are represented in parentheses.

\(*p < .05. \; **p < .01.\)
choice ($\chi^2 = 12.25, df = 2, p < .01$) as well as the third choice ($\chi^2 = 15.43, df = 2, p < .01$) within the formal domain.

Both transportation-dependence categories demonstrate a similar pattern of choosing housing as the first priority within the structural domain, neighborhood as the second priority, and community as the last priority. Transportation-dependent seniors were less likely than independent seniors to choose community as the first priority (6.7% compared to 22.6%) and housing as the last priority (7.8% compared to 19.0%). This suggests that as participants become more dependent on transportation, they focus on their housing and tend to become less connected to their neighborhoods and less involved with their communities. This difference in social isolation is statistically significant in the structural domain, although it is not evident in the informal (social support) domain.

Within the formal domain, the general pattern for seniors able to use conventional transit was to choose health services as the first priority, community agencies as the second priority, and home care as the last priority. However, the prioritization of independent participants was significantly different from dependent seniors, where health services was selected as the predominant first choice (58.3%) among independent seniors compared to community agencies as the predominant first choice (35.6%) for those dependent on transportation support. These community agencies provide transportation that enables the frail seniors to access health services and other community agencies through nonconventional transit systems and thus facilitate maintenance of well-being.

DISCUSSION

Transportation issues were pervasive in all three environmental domains (structural, informal, and formal). More than half (54.4%) of the participants deemed transportation dependent ($n = 90$) had unfulfilled transportation needs. These seniors could not take conventional transit due to mobility limitations and were largely dependent on nonconventional transit (such as handyDART) to connect to their communities. Qualitative data revealed that limited mobility affected interactions in the informal domain, limited opportunities to take advantage of amenities in the structural domain, and limited access to services in the formal domain. For those with mobility problems, convenience of amenities was a major determinant affecting satisfaction with environmental fit in neighborhoods. Relative to the informal domain, the most frequently mentioned supports were transportation and help with
Shopping. Lack of appropriate transportation was a problem repeatedly identified when individuals referred to being limited in their frequency of interaction with family, friends, and neighbors, as well as limiting their participation in community activities. In the formal domain, access to handyDART, eligibility for taxi-saver coupons, and availability of transportation supports were cited as affecting the activity levels of seniors.

Examination of VOL scores revealed no statistically significant difference in well-being between participants who were transportation dependent and those able to use conventional transit. Regression analysis revealed no contribution to well-being due to transportation dependence. Regardless of their dependence on transportation, seniors were able to sustain positive well-being as long as transportation needs were fulfilled. Indeed, the transportation-needs variable (Model 3) was a good predictor of well-being scores (contributing 2.17% unique variance) and, combined with age, family support, health, and informal domain stress, predicted 28.8% of the variance in well-being. These results parallel research conducted by Kahana (1982) suggesting that a moderating influence might stem from the priority the individual places on the separate domains that generate transportation dependence. The predominance of family support and informal domain stress over health status and functional ability suggests that allocation of resources should be re-evaluated to balance health-related needs with those that are social in nature. Indeed, the importance of social support and transportation support has been largely underappreciated in comparison to emphasis on health status, disability, and function.

A further question that arises is, Does priority of needs differ between categories of the specific transportation variables? Despite the numerous predisposing factors that impose restrictions on vulnerable seniors, it appears that prioritization moderates the effect of these factors and enables seniors to focus their energies on priority domains that maintain well-being. When Model 3 was applied, we found statistically significant difference in prioritization relative to needs within the informal domain and the formal domain. Prioritization of environmental needs in each domain, however, was insufficient to overcome the impact on well-being resulting from unfulfilled transportation needs.

When Model 2 was applied, the prioritization of environmental needs enabled participants to maintain positive valuations of life despite experiencing transportation dependence. Frail participants (transportation dependent) focused energy toward health-related needs but were also influenced by resources in the structural and informal domains. Furthermore, there were many indications that seniors were proactive in making their environments more amenable. Most transportation-dependent seniors had installed grab
bars and used technical aids to compensate for deficits in mobility, sight, or hearing. These participants perceived all services in the formal domain as equally important to their well-being in contrast to the emphasis on health services by the less frail. In the structural domain, the transportation-dependent older adults focused priority on housing to the detriment of participating in community activities. Participants who did not require transportation support, on the other hand, differed from the transportation-dependent seniors by placing slightly less emphasis on housing as the first priority in the structural domain and more emphasis on participation in the community. These differences in prioritization of environmental needs suggest that the more vulnerable (transportation-dependent) participants focus on areas in which they can gain satisfaction more easily. Their more restricted mobility appears to become the baseline from which their expectations are determined. By adjusting their expectations to the transportation resources available to meet their immediate physical and social needs, the individuals are able to channel their limited energy to achieve the most gain in well-being within the context of their “lifespaces.” Seniors seem to consolidate their efforts and activities within a smaller locus closer to their homes. If sufficient transportation resources are not made available, there is increased likelihood that the vulnerable individual will eventually become housebound and in danger of requiring institutionalization. Thus, although it appears that many individuals successfully adapt to apparent incongruence in their P-E constellation, some individuals may expose themselves to risk and maladaptive behavior.

POLICY IMPLICATIONS

Lawton (1998) asserted that “preferences may be described as needs of the moment” (p. 20). He suggested that a person’s perception of his or her life situation is determined largely by how preferred needs are fulfilled. If social and health policy is to maintain seniors independently in their homes as long as possible, more consideration and funding must be provided to help them to participate more fully in the social, recreational, and religious activities of their communities. Lewin (1951) articulated that the life situation is composed not only of the physical environment but also the social and psychological environment. In this study, it was found that seniors striving to adapt despite health and mobility limitations were greatly supported by having a strong social network as well as appropriate transportation resources to access community supports. The shrinking of social networks appears to be one of the main reasons that the informal domain initiated the highest stress and contributed the greatest number of unmet needs. Thus, our findings suggest that seniors centers and adult day centers fill an important gap in the life
of seniors because they provide activities and a means to socialize. An additional advantage of adult day centers is that they provide transportation to those who need it. The formal services environment, which includes home care, community agencies, and medical services, has enabled seniors to cope with functional deficits while maintaining their independence and remaining in their communities for as long as possible. As driving becomes more difficult, alternative modes of transportation will be needed to link the older individual to his or her community.

CONCLUSION

The results in this study suggest that targeting transportation resources where the individual prioritizes environmental needs will significantly improve well-being. By understanding the importance of transportation in facilitating positive valuations of life, society can make better use of limited resources to help individuals maintain involvement with their communities. If people stay in their homes longer, it is incumbent on society to provide resources that will minimize risks and increase accessibility to services. Compared to all the services provided for seniors, comparatively little funding has been allocated for transportation.

As we begin the new millennium and populations continue to age, research is needed to expand our understanding of the causes and consequences of subjective and objective P-E interactions. It is essential to elaborate how transportation resources are positioned within these models and how they together affect well-being. This research hopefully will generate new inquiry into the influence of transportation on P-E fit interactions and well-being among older persons.

NOTE

1. Tabachnick and Fidell (1989) asserted that $R^2$ discounts chance fluctuations in the negative direction by adding them in the positive direction, thereby increasing the magnitude of $R$ and thus overestimating the prediction of the dependent variable. The $R^2$ adjusted ($R^2_{adj}$) in the SPSS output data corrects for this overestimation. Adjusted $R^2$ was further broken down into components of unique variance and shared variance to further differentiate contribution to well-being. Tabachnick and Fidell recommended that "the semipartial correlations be used in analysis because when squared these values indicate the amount by which $R^2$ would be reduced if an independent variable were omitted from the regression equation" (p. 180). The sum of the significant
unique contribution (each squared semipartial correlation) of independent variables is the
amount of variability in $R^2$ attributed to unique sources. The semipartial correlations are shown
in Cvitkovich (1999) and are used to obtain the unique variance ($\sigma^2$) for each variable. The
shared variability, contributed by all the variables in the regression, is the mathematical differ-
ence between significant variabilities and $R^2$. Because of the interactive nature of the life situa-
tion, the shared variability provides an important component to predictive power. By increasing
shared variability, a variable might act as a catalyst to improve the contribution of other variables
without having a significant unique contribution of its own.

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RESPONSIBILITY AND ENVIRONMENT
Ecological Norm Orientation
and External Factors in the Domain
of Travel Mode Choice Behavior

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ABSTRACT: In the domain of travel mode choice behavior, the interaction between ecological norm orientation and the external aspects “fare” and “subway station
range” was investigated in an experimental field study. The ecological norm orientation is conceptualized based on the Schwartz theory on altruistic behavior, which is then applied to the environmental context. In a random sample of 160 persons, fare was experimentally manipulated by distributing free public transport tickets, whereas the station range was varied by selecting test participants at different distances from a station. Within the norm activation model, the mobility-specific personal ecological norm proves to be the strongest predictor of travel mode choice as recorded in standardized questionnaires. Reducing the fare by distributing free tickets has a quantitatively similar effect. The results suggest that the “economy-plus-moral” formula best describes the fact that the integrative mechanism (external factor fare plus normative ecological orientation) is the determinant of travel mode choice.

The intensified application of social psychology–based action models explaining environmental behavior has effected a significant reduction of the “theory deficit” (Fuhrer, 1995) in the investigation of environmental concern in the past few years. One theoretical perspective follows norm activation models, which have been transferred to the environmental context with reference to the Schwartz theory of altruistic behavior (Schwartz, 1977). Starting with the Heberlein (1972) study, which furnishes unprecedented evidence of the hypothesis that recycling behavior is a type of prosocial action, the behavioral relevance of some details in the Schwartz theory within the environmental context could be empirically proven (Black, Stern, & Elworth, 1985; Fuhrer & Wölfing, 1997; Guagnano, Stern, & Dietz, 1995; Hopper & Nielsen, 1991; Stern, Dietz, & Black, 1986; Stern, Dietz, & Kalof, 1993; Van Liere & Dunlap, 1978; Vining & Ebreo, 1992; Widegren, 1998).

In this study, the Schwartz norm activation model (Schwartz, 1977) was applied to a special kind of environmental behavior, namely travel mode behavior. Travel mode choice has become an important topic within the research of environmentally relevant behavior, because the carbon dioxide (CO₂) emissions resulting from car use contribute to the greenhouse effect. Due to its lower CO₂ emissions, the use of public transport is a more environmentally protective type of behavior. The Schwartz norm activation model was modified in two ways. First, the number of variables postulated by Schwartz was reduced. This reduction was based on an explorative study, which had already been carried out in Bochum (Germany) to test the possibility of transferring the Schwartz norm activation theory to the environmental context (Blöbaum, Hunecke, Matthies, & Höger, 1997). In this study, the operationalization of the model constructs for the environmental scope followed Schwartz’s theoretical assumptions explaining altruistic behavior. The following model constructs were recorded in a standardized survey: perception of global ecological problems, awareness of global environmental
changes caused by humans as a whole, awareness of global environmental changes as a consequence of personal behavior, personal capability for environmentally friendly behavior, contribution to the conservation of the environment made by personal behavior as compared to other persons, personal ecological norm, ascription of responsibility by other persons, appeals for environmental protection made by organizations, and strategies used to deny responsibility. As a result, the study shows that these model constructs cannot be satisfactorily differentiated from one another. Therefore, the model proved to be too differentiated and had to be simplified. The second modification consists of renaming the resulting variables to link the Schwartz model to other action theories. The modified norm activation model is depicted in Figure 1.

In the modified norm activation model, the personal norm (PN) is regarded as the central integrative variable in the environmental behavior process. It refers to a specific motivational basis for the realization of behavior, which manifests itself in a feeling of moral obligation. According to Schwartz, the PN, as opposed to a social norm, can be described as an inner moral conviction that is defended irrespective of the expectations of others. Therefore, the behavioral relevance of PNs is restricted to behavior involving a moral dimension. Seeing as how environmental behavior is connected with a moral dimension, a reconstruction of environmental behavior from the perspective of a norm activation model allows more in-depth insight into ecological behavior.

Awareness of consequences (AC) is postulated as a predictor of a personal ecological norm. AC is a central variable originating from the Schwartz norm activation process. It has been verified several times as a predictor of
environmental behavior in empirical studies (Dietz, Stern, & Guagnano, 1998; Guagnano et al., 1995; Hopper & Nielsen, 1991; Tarrant & Cordell, 1997; Vining & Ebreo, 1992). Whereas the PN denotes the moral dimension of behavior, the AC describes the causal relation between behavior and environmental consequences. The operationalization of AC in this study does not focus on the general correlation between behavior and environmental consequences. Instead, it refers to the individual and therefore stresses the consequences that individual behavior has on the environment.

Apart from the AC, the perception of ecological problems (PP) had already proven to be the second strongest predictor of PN in the explorative preliminary study (Blöbaum et al., 1997).

Furthermore, an influence of subjective norm (SN) on the activation of PN is postulated in the modified norm activation model. In the explorative study, it could already be empirically proven that the subjectively perceived expectations of significant others function as intensifiers of PN. In the Schwartz model terminology, this variable is called social norm and essentially characterizes the same external normative expectations as “subjective norm” in the theory of planned behavior (TPB) (Ajzen, 1991).

In addition, the modified norm activation model was complemented by the TPB construct perceived behavior control (PBC). This registers the subjective evaluation of the difficulties involved in the realization of the target behavior. In the TPB, perceived behavior control has a direct effect on behavior as well as an indirect effect by means of behavioral intention. Although personal ecological norm is explicitly not behavioral intention (Schwartz, 1977, p. 227), the intensity of personal ecological norm is to be regarded as dependent on PBC in the modified norm activation model.

In former studies applying the Schwartz theory to the domain of ecological behavior, the variable ascription of responsibility (AR) was seen to play a central role (Guagnano et al., 1995; Stern et al., 1986, 1993; Vining & Ebreo, 1992). Vining and Ebreo (1992), as well as Guagnano et al. (1995), operationalized the AR as a causal relation between individual behavior and environmental consequences. In this study, AR was not regarded as an autonomous construct because the causal effects of individual behavior on the environment are already contained in the AC.

In explaining environmental behavior, sociopsychological action models focus on intrapsychic data processing and data evaluation. Concerning the explanation of factual environmental behavior, it seems necessary to consider the influence of the external situation. Therefore, the most important extension of the modified norm activation model is the integration of behavioral costs as external factors moderating the influence of PN on behavior.
A systematic analysis of the influence of objective behavior restrictions has been carried out in studies concerned with the costs of environmental behavior. Costs in this context refer to monetary costs as well as behavioral costs, the latter referring to the efforts required by ecological behavior. If the costs of ecological behavior are known, the influence of ecological attitudes on behavior in relation to these costs can also be defined. Concerning the domain of environmental behavior, two different models of the interaction between internal and external factors are discussed: the so-called “low-cost hypothesis” (Diekmann & Preisendörfer, 1998) and the A-B-C model of Guagnano et al. (1995).

Based on a household poll in the city of Bern (Switzerland) and the city of Munich (Germany), the low-cost hypothesis was formulated by Diekmann and Preisendörfer (1998) to describe the relation between ecological attitudes and situational behavioral costs concerning environmental behavior. In this context, the low-cost hypothesis implies that the influence of ecological consciousness on environmental behavior continually decreases proportional to rising behavioral costs. Their study is problematic in so far as they fail to state concrete a priori criteria allowing a practical differentiation of high- and low-cost situations. They only provide a post hoc definition based on the empirical results. A systematic analysis of the influence of situational factors can be found in a study on recycling behavior by Guagnano et al. (1995). Their study investigates the effects of absence or presence of curbside recycling bins on recycling behavior. Guagnano et al. postulated an A-B-C model directly related to the Schwartz (1977) norm activation model and to the Stern and Oskamp (1987) model, which describes a specific relationship between A (attitudes), B (behavior), and C (external situational conditions). In this case, A and C may adopt negative as well as positive values. Referring to B, the most important aspect of the model is the value relation between A and C. Thus, B can be depicted as a monotonic function of internal and external factors, whereas the interrelation between A and B is curvilinear. According to this, the maximum influence of A on B is expected to occur with a medium intensity of C. Analogous to the low-cost hypothesis by Diekmann and Preisendörfer, little influence of ecological attitudes on environmental behavior is expected in situations where the behavior is costly. Contradicting Diekmann and Preisendörfer, ecological attitudes do not exert a strong influence on environmental behavior in situations permitting easy realization of ecological behavior. In this case, behavior is not performed due to ecological norm orientation. Instead, it is due to low behavioral costs, which means that the behavior is easier to perform. Concerning the relation between internal and external factors of influence, Guagnano et al. came to the conclusion that
the Schwartz norm activation model does not possess sufficient explanatory quality in behavioral settings characterized by strong constraints on behavior (high-cost situations).

This study is designed to investigate in more detail how the personal ecological norm affects environmental behavior with different amounts of expense. For this purpose, the modified norm activation model has been expanded by adding external factors. The study addresses the following questions:

1. To what extent do external costs influence the relation between personal ecological norm and environmental behavior? Does personal ecological norm orientation only affect behavior with a medium amount of external costs, whereas with low and high external costs behavior is predominantly determined by situational components?

2. Is it possible to confirm the modified norm activation model empirically, and how intimate is the relation between a mobility-specific personal norm and actual travel mode choice?

To answer these questions, a field experiment was carried out, in which external factors were varied experimentally and quasiexperimentally.

**METHOD**

**DESIGN AND PROCEDURE**

Both monetary costs for using the subway and station range were selected as external factors in the field experiment. Monetary costs were experimentally modified by handing out free tickets to half of the participants. Thus, for the participants given a free ticket, the subway ride was free of charge, whereas the other half of the participants had to pay regular fares. Station range was quasiexperimentally modified by deliberately selecting participants by means of the distance between their residences and the subway station. The exact distance between residence and station was calculated for each participant by telemeter on master plans (1:1000). Within the collection area, the participants had no opportunity to use alternative lines (e.g., bus or tram) to get to the city business district.

The dichotomous variable fare (free ticket vs. no free ticket) and the dichotomization of the variable station range (a distance of less than 500 m vs. a distance of more than 500 m) lead to a $2 \times 2$ factorial design in which the
different levels of effort/expense for subway use are reflected by the four
cells of the experimental setup. A so-called high-cost situation arises if no
free ticket is available and the subway station is at a distance of more than
500 m from the residence. If a free ticket is available for the period of investiga-
tion and the residence is at a distance of less than 500 m from the subway sta-
tion, this is defined as a low-cost situation. For the two remaining experimental
conditions (free ticket plus long distance to the station and no free ticket plus
short distance to the station), a medium-cost situation is assumed.

The investigation took place in Bochum, a German town of approximately
400,000 inhabitants, situated in the Ruhr area. For the sample recruitment,
3,700 persons were randomly selected from the Bochum telephone directory
in January 1998. Two thousand of these persons came from residential dis-
tricts a short distance from the station and 1,700 from residential districts a
long distance from the station. All selected participants received a personal
letter requesting participation in a forthcoming telephone poll concerning
travel mode choice. The telephone interviews were carried out primarily to
inquire the willingness of the participants to take part in a further extensive
personal interview and to request that they record their travel mode choice
over a period of 4 weeks. The interviews also had to be implemented to clarify
additional criteria for further participation in the investigation (no com-
muter’s ticket for public transport, use of private car more frequent than use
of bicycle,1 use of public transport more frequent than use of bicycle). The
selected participants did not have to be regular subway users, but persons
who absolutely never use the subway to go to the city business district were
excluded. Also, persons without driver’s licenses or without access to a pri-
ivate car were excluded. Out of 3,700 contacted persons, fully valuable inter-
views could be carried out with 1,206 participants in January 1998. In these
telephone interviews, 320 persons declared their willingness to further par-
ticipate in the investigation. Finally, 203 persons took part in the extensive
personal interview recording the model variables of the modified norm acti-
vation model. At the end of the personal interview, the standardized logbook
was handed out and explained to each of the test participants. At the begin-
ing of the 4-week recording period of travel mode choice in March 1998,
one half of the participants from each district were given free tickets in a ran-
dom selection (experimental group). The participants were provided with a
sufficient number of free tickets, but in case they depleted this supply, they
could request more from the investigators. The other half of the participants
formed the control group and were not informed that other participants were
issued free tickets as part of the investigation.

During the behavior recording period, all participants were contacted at
home by their interviewer at weekly intervals. On this occasion, they were
supplied with new record sheets and free tickets for the next week if necessary. At the same time, the already completed sheets and those tickets cancelled the week before were collected. In doing this, the behavioral data from 160 persons could be collected throughout the entire investigation period. These data included rides to the city business district (41 persons from the short distance group with ticket, 42 persons from the long distance group with ticket, 41 persons from the short distance group without ticket, and 36 persons from the long distance group without ticket).

PARTICIPANTS

A comparison of the sociodemographic variables of the 160 participants and the total population of Bochum shows only slight differences. The proportion of women was 46.3%, which is smaller than in the total population (51.2%). This deviation can be explained by the fact that in Germany, women generally have less access to private cars (see Matthies, Kuhn, & Klöckner, in press). The average age of the random sample is almost identical to the average age of Bochum inhabitants. A closer look at the age distribution of participants indicates that the group of younger persons (age 18-25) is underrepresented as compared to all citizens of the German Federal Republic with private car access. On the other hand, the group of persons aged 40 and older is overrepresented in the investigation.

DEVELOPMENT OF THE QUESTIONNAIRES

To measure the variables of the modified norm activation model, a standardized questionnaire was developed, which was tested in a random sample including 128 persons in the city of Bochum in autumn 1997. On this occasion, it was shown that the constructs of the norm activation model could be recorded very satisfactorily in the context of travel mode choice. Furthermore, a significant differentiation in the operationalization of the PN became evident. Originally, it had been planned to record the PN using items that refer to feelings of ecological responsibility, obligation, and guilt. However, testing the one-dimensionality of the PN scale by factor analysis revealed that feelings of guilt represent an independent dimension. Obviously, feelings of ecological guilt (EG) play a special role in the process of adopting ecological responsibility. For this reason, the feelings of EG are included as a new variable with a specific measuring scale in the further course of the investigation. The measuring scale for the PN is still composed of items concerning feelings of responsibility and obligation. A list containing the items for the prevailing constructs can be found in the appendix.
MEASURES

All of the standardized questionnaire items were specifically formulated for the domain of travel mode choice, resulting from the use of (private) cars or specific subway connections in Bochum. All items, except the PBC items, were answered on a 5-point scale (do not agree at all, agree slightly, agree moderately, agree very much, or agree extremely). Furthermore, socio-demographic data stating sex, age, education, occupation, income, and household size were recorded. The survey, in which the constructs of the modified norm activation model were recorded, was carried out before the behavior measurement was made.

BEHAVIOR MEASUREMENT

Travel mode choice was chosen as a dependent variable because of its relevance to global ecological problems. CO₂ emissions caused by traffic play a major role in the greenhouse effect, which in turn results in global climatic warming. Compared to the use of private cars, the use of public transportation produces less CO₂ emissions. Therefore, public transport is to be regarded as an individual contribution to the protection of climate. A specific aspect of individual mobility behavior was investigated as a dependent variable. Therefore, the use of specific public transport facilities was observed in relation to the use of private cars on a standard route. The standard route was defined by a selected subway line connecting various residential districts in Bochum with the city center. The test participants have recorded their rides to the central business district during a period of 4 weeks using a standardized logbook. In the logbook, the test participants have to record the purpose of the ride, the chosen travel mode, the duration and final destination of the ride, and whether the central business district was approached by subway only as an intermediate destination. Rides were recorded for working days as well as for weekends and holidays.

To control the recording of the rides, all participants were visited once a week by a contact person, who answered questions concerning the completion of the logbook sheets, collected the filled-in sheets, and distributed new record sheets. Travel mode choice was recorded as one of two categorical variables (subway = 1, private car/motorcycle = 2). The sum of all reported city rides using the subway was then divided by the total number of reported city rides. The ratio was used as the dependent behavioral variable in the following analysis.
DESCRIPTIVE RESULTS AND TEST OF THE MEASUREMENT MODEL

First of all, the measuring qualities of the developed scales were tested. Therefore, the distribution of answers and the internal consistency of the scales were determined (see Table 1).

All scales except PBC exhibited satisfactory internal consistencies. A closer look at the distribution of responses can explain the low internal
consistency of PBC. Almost all test participants estimated their behavior control for travel mode choice as very high in the given situation. Due to the lack of variance in response, the PBC was excluded from the further course of the analysis.8

In a second step, a principal component analysis with varimax rotation was carried out with the five remaining variables of the model to confirm the differentiability of the single model variables. This analysis indicated that with a postulate of a five-factorial solution, the variable PP cannot be definitely differentiated from the other variables (see Table 2).

For this reason, the independence of PP is to be doubted in the present set of data, and PP was therefore excluded from further analysis in favor of a

| TABLE 2 | Results of Principal Component Analysis After Exclusion of the Items on Perceived Behavior Control |
|-----------------|---------------------------------|-----------------|-----------------|-----------------|
|                | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
| Personal ecological norm (PN) |          |          |          |          |
| PN1             | .25      | .44      | .56      | .28      |
| PN2             | .24      | .19      | .52      | .36      |
| PN3             | .36      | .18      | .59      | .25      |
| PN4             | .18      | .38      | .53      | .09      |
| PN5             | .22      | .54      | .44      | .19      |
| PN6             | .24      | .39      | .66      | .20      |
| Feeling of ecological guilt (EG) |          |          |          |          |
| EG1             | .23      | .78      | .12      | .17      |
| EG2             | .17      | .86      | .16      | .22      |
| EG3             | .27      | .70      | .29      | .07      |
| Perception of the ecological problem (PP) |          |          |          |          |
| PP1             | .48      | .53      | .26      | .16      |
| PP2             | -.52     | -.44     | -.06     | .00      |
| PP3             | .79      | .17      | .08      | .18      |
| PP4             | -.44     | -.31     | .54      | -.18     |
| Awareness of consequences (AC) |          |          |          |          |
| AC1             | .57      | .30      | .21      | -.09     |
| AC2             | .66      | .36      | .02      | -.06     |
| AC3             | .73      | .08      | .27      | .14      |
| AC4             | .74      | .10      | .31      | .11      |
| Subjective norm (SN) |          |          |          |          |
| S1              | .19      | .07      | .28      | .71      |
| S2              | .17      | .12      | .08      | .75      |
| S3              | .00      | .19      | .08      | .76      |

NOTE: See Table 1 for an explanation of items.
precise model test. After the exclusion of the items referring to PP, a further principal component analysis with varimax rotation was carried out to prove the four-factorial solution. The four constructs postulated in the model could be clearly identified\(^9\) (see Table 3).

Thus, 15 items for recording the four model constructs of the modified norm activation model entered further analysis. These consisted of the following: 5 items for PN, 3 items for EG, 3 items for SN, and 4 items for AC.

### Multivariate Analysis

To test the influence of the two external factors on the travel mode choice, a two-factorial analysis of variance was performed. In this analysis, the dependent variable travel mode choice is operationalized as the relationship between the number of subway rides and the number of all rides.\(^{10}\) Both factors were recorded on two levels (possession of a free ticket vs. no free ticket and station range within less than 500 m vs. more than 500 m). In doing so, the free ticket proved to have a significant effect, \(F(1, 156) = 6.00, p < .01.\)

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Results of Principal Component Analysis After Exclusion of the Items on Perceived Behavior Control and Perception of the Ecological Problem</th>
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<tbody>
<tr>
<td></td>
<td>Factor 1</td>
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<tr>
<td>Personal ecological norm (PN)</td>
<td></td>
</tr>
<tr>
<td>PN1</td>
<td>.61</td>
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<tr>
<td>PN2</td>
<td>.60</td>
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<tr>
<td>PN3</td>
<td>.71</td>
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<td>PN4</td>
<td>.69</td>
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<tr>
<td>PN6</td>
<td>.73</td>
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<tr>
<td>Feeling of ecological guilt (EG)</td>
<td></td>
</tr>
<tr>
<td>EG1</td>
<td>.25</td>
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<tr>
<td>EG2</td>
<td>.24</td>
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<tr>
<td>EG3</td>
<td>.30</td>
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<tr>
<td>Awareness of consequences (AC)</td>
<td></td>
</tr>
<tr>
<td>AC1</td>
<td>.21</td>
</tr>
<tr>
<td>AC2</td>
<td>.01</td>
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<tr>
<td>AC3</td>
<td>.24</td>
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<td>AC4</td>
<td>.39</td>
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<tr>
<td>Subjective norm (SN)</td>
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<td>S1</td>
<td>.35</td>
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<td>S2</td>
<td>.17</td>
</tr>
<tr>
<td>S3</td>
<td>.04</td>
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</table>

**NOTE:** See Table 1 for an explanation of items.
From the values presented in Figure 2, the following conclusions concerning the effect of a free ticket can be deduced: Participants who received a free ticket and could therefore use the subway free of charge decided to use the subway for 61% of their trips to the Bochum central business district. For the remaining 39% of rides, they either used a private car or motorcycle. The participants in the control group without free tickets decided in favor of the subway in 43% and in favor of a private car or motorcycle in 57% of the cases. The group of free ticket holders took a monthly average of 8.24 rides by subway and 6.34 by car or motorcycle. In comparison, the group without free tickets only took 5.94 rides by subway and 8.27 by car or motorcycle. Both groups continued to take a monthly average of 15 rides to the Bochum central business district. Therefore, it can be concluded that all participants with free tickets chose to undertake an average of 2 rides more by subway than by car or motorcycle.

Against theoretical hypotheses, station range proved to have no effect on the choice of transport, $F(1, 156) = 1.63, p = .20$. This result also corresponds to the reports that the participants made themselves. Almost all of them judged the station to be easily accessible, irrespective of its actual distance. As a consequence of this unexpected result, the intended two-factorial design, in which low-, middle-, and high-cost situations were intended to be varied, had to be abandoned. Therefore, the two-factorial design was reduced.
to a one-factorial design characterizing the two different cost situations by either possession or lack of a free ticket.

EFFECTS OF INTERACTION BETWEEN PERSONAL ECOLOGICAL NORM AND THE EXTERNAL FACTORS

To prove the moderating effect of monetary costs on the relation between ecological norm and travel mode choice, a two-factorial analysis of variance was performed first. In this analysis, both variables, ticket possession and personal ecological norm (low vs. high personal norm dichotomized via median), entered predictions about the travel mode choice as two-level factors. The analysis revealed two significant main effects of ticket possession, $F(1, 156) = 16.23, p = .02$, and personal ecological norm, $F(1, 156) = 16.72, p < .001$. The interaction term was not significant, $F(1, 156) = .03, p = .58$. The average values for the four different conditions listed in Figure 3 reflect the combined effects of external and internal factors.

To determine the strength of the correlation between PN and travel mode choice, a correlation statistic was applied to the data. Within this analysis, the PN is a continuous variable and any loss of information that resulted from the dichotomization of the PN in the analysis of variance can be avoided. Correlations between PN and travel mode choice were calculated separately for the group of ticket holders and the group without tickets. As a result, a substantial correlation between PN and travel mode choice became evident in both groups. For the group of participants without free tickets in a high-cost situation, a Pearson correlation coefficient of $r = .40 (n = 77, p < .001)$ was found. For the group of participants with free tickets, which is equivalent to the low-cost situation, the coefficient was $r = .30 (n = 83, p < .001)$. The difference between these two correlations was not statistically significant ($z = .708, p = .24$, one-tailed). This result confirms the findings of the analysis of variance. Based on these results, the hypothesis of a moderating influence of external costs on the relationship between PN and travel mode choice has to be rejected. What becomes evident is a rather additive effect of external costs and internal normative beliefs.

VERIFICATION OF THE MODIFIED NORM ACTIVATION MODEL

The additive effect of the external factor ticket possession and the internal factor personal ecological norm is a partial aspect of the modified norm activation model. Apart from verifying the behavioral relevance of personal ecological norm, the modified norm activation model postulates specific mental
processes of evaluation. Thus, the model postulates that AC, EG, and SN cause the activation of PN, which affects travel mode choice in conjunction with the external factors (see Figure 1). To confirm the causal structure postulated in the modified norm activation model, a path analysis using the correlation matrix of the model variables as input matrix was carried out according to the maximum likelihood method. Figure 4 reflects the empirically proven interrelations of the model variables. The fit statistics of this model are satisfactory, $\chi^2 (6, N = 160) = 1.694, p = .946; GFI = .996$. Fifty-two percent of PN variance can be explained by means of the three variables AC, EG, SN, whereas 17% of variance in travel mode choice can be explained by means of PN and free ticket. PN and free ticket are comparably strong predictors.

**DISCUSSION**

Often, the importance of situational determinants of action and its external factors is not sufficiently considered. If objective situational factors are considered within the explanatory model, they are usually introduced in the form of subjectively perceived environment (such as PBC in the TPB, which does not record the objective but only the perceived scope of action).
The results of this study show that PN as well as external costs influence travel mode choice. It is interesting that the observed interaction between these variables is additive. Before explaining this aspect in detail, the role of the internal and external variables is discussed separately. At first, there is a significant effect (β = 0.22) of mobility-specific personal ecological norm orientation on travel mode choice (see Figure 4). This value is fairly close to the relation between environmentally related responsibility norms and environmental behavior reported by Hines, Hungerford, and Tomera (1986/1987) in their meta-analysis. In addition to the influence of internal norm orientation on travel mode choice, a similar effect of the external factor free ticket could be verified. This effect can be explained by a decrease of the external costs of using the ecological mode subway via free tickets. The monetary cost of fare is reduced to zero, and at the same time behavior expense for the purchase of subway tickets is dropped. Against expectations, station range has not proven to be a behavior-relevant external factor. This result can be explained through the investigation of specific behavior in this study. The behavior selected was comparatively easy to perform, a judgment that was shared by the participants in estimating their perceived behavior control, which was generally regarded to be very high. Only routes from the residence to the central business district facilitating good and direct connection were

Figure 4: Path Model of the Modified Norm Activation Model
NOTE: All standardized regression coefficients are significant at *p < .05; all others p < .01.
taken into account, so that participants did not have to consider further connections. Furthermore, the 5-minute frequency of subway trains was most convenient, so that participants probably did not mind the time it took to get to the station.

The expected effect of interaction between PN and external factors could not be verified. Instead, the current results suggest that internal and external influences produce an additive effect on environmental behavior. This result does not serve to affirm the moderating function of external factors between PN and environmental behavior as postulated by Guagnano et al. (1995) in the A-B-C model. According to this model, PN is supposed to achieve behavioral relevance only with a medium amount of external costs, whereas with low and high external costs behavior is supposed to be determined mainly by situational components. However, a complete rejection of the A-B-C model based on the current data is not possible. As the originally planned high-, middle-, low-cost design could not be maintained in the evaluation due to the lack of behavioral relevance concerning station range, it was transformed into a high-, low-cost design with a double gradation of behavioral costs in this study. The detected relation between ecological norm and behavior in low-cost situations clearly contradicts the postulates of a low-cost hypothesis (Diekmann & Preisendörfer, 1998). According to the low-cost hypothesis, cooperation between ecological attitudes and environmental behavior is to be stronger in low-cost situations than in middle-cost situations.

The basic postulates of the modified norm activation model could be verified in this study. Together with relevant external costs, PN influences behavior, whereas the activation of PN depends on other variables of the modified norm activation model. AC is of special importance here. It has proven to be the central variable within a norm activation model in several empirical studies (Guagnano et al., 1995; Vining & Ebreo, 1992; Widegren, 1998) designed to explain environmentally relevant behavior. The SN activates the PN but simultaneously influences the travel mode choice in a direct way. This result does not correspond to the original postulates made by Schwartz (1977), who regarded PN as the relevant behavioral link between social norms and altruistic behavior. Schwartz modified the model himself so that the subjectively perceived normative expectations of significant others influence the prosocial behavior parallel to the moral motives (Schwartz & Howard, 1981, p. 204) in the motivation phase. Overall, the influence of the SN on the behavior is lower than the influence of the PN. Therefore, the PN functions best as an integrative variable in the empirically verified path model. PN is to be regarded as a basic behavior predictor.

A further dimension of ecological norm orientation is represented by feelings of EG, which must not be interpreted as an integral component of PN.
These findings question operationalizations of a personal norm aimed at feelings of guilt (e.g., Widegren, 1998). However, until now it could not be decided whether EGs or PN constituted the starting point in the process of ecological norm activation. The data of this study best correspond with a path model in which EGs function as a predictor for PN. This result is also consistent with the findings of Kaiser and Shimoda (1999). From a theoretical perspective, the opposite case would also be possible, if EGs were situation-specifically activated emotions and PN contained situation overriding normative orientation. In this study, however, PN and EGs were both operationalized as domain-specific and situation-specific emotional states. Thus, the causal relation between EG and PN needs to be clarified in further studies.

By verifying the modified norm activation model in this study, a basic theoretical starting point for the explanation of norm-oriented environmental behavior has been created. The modified norm activation model corresponds to major parts of research dealing with action models in the environmental domain. The multitude of variables, most of which currently lack coherent operationalization, can be narrowed down to some few key variables. Thus, the modified model is capable of providing a conceptual framework for environmental research in the social sciences defining environmental behavior as a result of human decision processes (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). However, the norm activation model as presented in this study needs to be further improved in future research with respect to four aspects.

First of all, its causality hypotheses have to be investigated in more detail, especially concerning the context of feelings of moral obligation and guilt. Second, the relation between SN and PN in additional domains of behavior should be investigated in further studies, especially in those situations with higher social pressure (SN). For example, curbside recycling might be relevant in this context, as it involves observable behavior carried out in public spaces. Under such circumstances, the strength of influence of PN and SN might become inverted, so that the SN will prove to be the central normative integrative variable (see “integrated waste management model,” Taylor & Todd, 1995).

Third, a more detailed analysis concerning the relevance of subjectively perceived behavioral costs is of major importance. There is probably no general law as to how subjective costs influence behavior, because every situation has specific characteristics that influence the subjective perception of the behavioral costs. Presumably, several types of situations with different behavioral costs can nevertheless be classified. These might be approximately described as low-, middle-, and high-cost situations. This study definitely deals with a subjectively perceived low-cost situation, which is proven by the fact that participants judge PBC to be high. Therefore, further
studies need to investigate types of environmental behavior that are more difficult to perform and that are consequently also perceived as being so (e.g., renunciation of a private car). It needs to be investigated whether the modified activation model also stands the test in those areas of behavior.

Fourth, it should be emphasized that the perception of PP does not gain autonomous importance in the modified norm activation model because of overlaps with other constructs, especially with the construct AC.

The derivation of measures promoting ecological behavior is the major aim of behavioral and social scientific environmental research. By means of the results of this study, the effect of free tickets on travel mode choice can be quantified. The achieved switch of a monthly average of two rides gains economic relevance for city transport only if people stick to their changed travel mode choice and can therefore be kept as paying customers after the distribution of free tickets. Subsequent to this study, a test was made to determine which long-term behavioral changes can be expected after the period of ticket distribution. This test was carried out on behalf of the local transportation services. A time-series analysis with subsequent measuring times was used. The results show that the travel mode choice remains at a similarly high level after the ticket distribution as compared to the time of free ticket distribution. The control group, however, which had never received free tickets, also used the subway more frequently during the 3-month period of the postexperimental measure. This result leads to the assumption that the recording of behavior alone results in a change of travel mode choice among the participants. A procedure for observing the travel mode behavior in a nonreactive way should be developed to provide a solution to this methodical problem.

Besides free tickets, personal ecological norm has also proven to be a relevant predictor of travel mode choice. Therefore, an increase in ecological behavior is also to be expected from the application of norm-centered intervention strategies aimed at implementing environmental responsibility norms (Hopper & Nielsen, 1991). One of the most prominent results of this study is the insight that the influence of PN is not negatively affected by external rewards such as the distribution of free tickets. A long-term prognosis for the development of PN cannot be derived based on the data collected in this study, as intrinsic motivations are in danger of being successively tempered by external stimuli (“crowding out effect,” Frey, 1993; “reframing,” Thøgersen, 1996). However, in view of the short-term results, it seems that the economy-plus-moral strategy is most likely to induce people to switch from car/motorcycle travel to the more ecological travel mode of subway transportation.
### APPENDIX

<table>
<thead>
<tr>
<th>Personal ecological norm (PN)</th>
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<tbody>
<tr>
<td>PN1 I feel obliged to use a car as seldom as possible in my leisure time for environmental reasons.</td>
<td></td>
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<tr>
<td>PN2 I feel obliged to support initiatives that show commitment to ecologically sound transport planning.</td>
<td></td>
</tr>
<tr>
<td>PN3 I feel obliged to use bicycle or subway for trips to the city business district for environmental reasons.</td>
<td></td>
</tr>
<tr>
<td>PN4 I feel responsible for not impairing the quality of life in my dwelling area by using a car.</td>
<td></td>
</tr>
<tr>
<td>PN5 I feel responsible for not endangering other people's health by pollutions caused by my car.</td>
<td></td>
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<tr>
<td>PN6 I feel responsible for preserving the environment in my choice of daily means of transport.</td>
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</table>

<table>
<thead>
<tr>
<th>Feelings of ecological guilt (EG)</th>
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<tbody>
<tr>
<td>EG1 I have a bad conscience when I think of the injuries to health I might cause others by using my car.</td>
<td></td>
</tr>
<tr>
<td>EG2 I have a bad conscience toward the environment when I frequently use my car.</td>
<td></td>
</tr>
<tr>
<td>EG3 When I use my car, I feel guilty in view of the environment.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Perception of the ecological problem (PP)</th>
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<tbody>
<tr>
<td>PP1 Increasing car traffic is a big problem for the protection of the environment.</td>
<td></td>
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<tr>
<td>PP2 Concerning the environment, car traffic does not really worry me. (recoded positively)</td>
<td></td>
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<tr>
<td>PP3 I am worried about the destruction of the environment caused by cars.</td>
<td></td>
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<tr>
<td>PP4 The relevance of car traffic for the destruction of the environment is unnecessarily exaggerated by the media. (recoded positively)</td>
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<table>
<thead>
<tr>
<th>Awareness of consequences (AC)</th>
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<tbody>
<tr>
<td>AC1 I am aware that my traffic habits influence the change of climate caused by the greenhouse effect.</td>
<td></td>
</tr>
<tr>
<td>AC2 My travel mode choice can be a contribution to the protection of the environment.</td>
<td></td>
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<tr>
<td>AC3 When using a car, I contribute to the pollution of the environment in my hometown.</td>
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<tr>
<td>AC4 I think that my use of public transport contributes to the protection of the environment.</td>
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</table>

<table>
<thead>
<tr>
<th>Subjective norm (SN)</th>
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<tbody>
<tr>
<td>Please name three persons (A, B, C) who you regard as being particularly close to you:</td>
<td></td>
</tr>
<tr>
<td>S1 Person A thinks you should use subway instead of a car for a trip to town.</td>
<td></td>
</tr>
<tr>
<td>S2 Person B thinks you should use subway instead of a car for a trip to town.</td>
<td></td>
</tr>
<tr>
<td>S3 Person C thinks you should use subway instead of a car for a trip to town.</td>
<td></td>
</tr>
</tbody>
</table>
Perceived behavior control (PBC)

PBC1 Using subway for trips to the city center would be easy/difficult for me.

PBC2 My freedom of choice in using subway for trips into the city business district: little/complete.

NOTES

1. Cyclists ought to be excluded from the study, as a switch from bicycle to subway is not ecological behavior as compared to the switch from car to subway.

2. To verify the comparability of the random sample in this investigation to the total population of Bochum concerning the criteria sex and household size, the population statistics of the city of Bochum current at that time were employed (State 1.1.1995). Concerning the age distribution, data from the German Ministry of Transport from 1996 were used as there were no data on the availability of private cars for the population of Bochum. Data concerning education refer to results of a census carried out in 1987.

3. Out of the 128 interviewed persons, 77 were selected in a random sample from the citizens of Bochum. These people had good subway access. The remaining 51 participants were students of the University of Bochum. There were no significant differences between these two groups concerning the constructs of the norm activation model.

4. The operationalization of the subjective norm follows the modal normative belief strategy suggested by Ajzen and Fishbein (1980). According to this strategy, the interviewed participants are asked to name three persons who are particularly close to them or whose opinion they regard to be of special importance. In a second step, the participants are asked to judge, for each of the persons named, whether they hold the opinion that the participant should use the subway instead of the car for rides into the city. Finally, the three answers are summed up in an unweighted way. Perceived behavior control was operationalized in a general way with the help of two items suggested by Ajzen (1988). The first of these items refers to the estimated difficulty, whereas the second refers to the anticipated freedom of choice for the realization of behavior. Item 1 was answered on a 7-point scale with the poles easy/difficult, whereas Item 2 was answered on a 7-point scale with the poles complete/very little.

5. The equidistance of the German version of this answer scale was validated by Rohrmann (1978).

6. The questionnaire of the so-called KONTIV poll served as a model. This poll was carried out in the western part of Germany on the mandate of the Ministry of Transport as a continuous record of transportation behavior since 1976.

7. In calculating the scores for single model constructs, sum scores were formed by addition of corresponding single item scores. Negatively formulated items entered the sum score only after having been recorded.

8. Furthermore, perceived behavior control was recorded alternatively by means of seven items each concerning one specific aspect of using the subway (frequency, fare, punctuality, availability of seats, station range, and risk of molestation). The participants were also asked about their parking space options. In doing so, all items have been answered on a 5-point scale of affirmation. Finally, an additive index integrating restrictions of subway use, measured by the
listed attributes of means of transportation and the importance paid to the single attributes, was
extracted from the eight items. But, as this index did not stand the empirical test in subsequent
analyses, it is not considered in detail here. Nevertheless, these items provide significant insights
with regard to the subjective representation of the objective traffic situation.

9. In the four-factor solution, 76.5% of the variation can be explained.

10. No systematic differences were found in the travel mode choice between working days
and holidays.

11. Despite specific selection of areas and participants, 5.5% of all trips to the city center
were made on foot or by bicycle during the investigation period. These trips were excluded from
further calculation to achieve a total of 100% for subway trips and trips by car or motorcycle.

12. This is according to the method of testing moderating effects suggested by Baron and
Kenny (1986).

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BOOK REVIEW


The Western environmentalist movement is facing a difficult ethical dilemma. The United States and Europe have already had their environmentally destructive industrial revolutions that led them to substantial prosperity and riches. Most of the rest of the world have not. Therefore, attempts by Western environmentalists to convince people in China, India, Latin America, or Africa to be more environmentally conscious tend to fall on deaf ears because they fear it will mean more years of poverty. In What Works: A Guide to Environmental Education and Communication Projects for Practitioners and Donors, Martha C. Monroe documents successful efforts by nongovernmental organizations to educate people at the grassroots level about environmental issues in a way that is sensitive to the issues and hopes of those who remain on the other side of prosperity.

What Works is a practical guide to successful environmental education and communication projects. This succinct 120-page manual summarizes presentations at the GreenCOM International Environmental Education and Communication Workshop at the 1996 Annual Conference of the North American Association for Environmental Education. The goal of this volume is that funders and donors will be better educated about where best to invest their resources and be given the broad parameters of projects that are likely to be successful, thereby avoiding those proposals for projects that have strategies that are likely to fail. Conversely, practitioners can use these templates to create successful projects of their own.

What Works strives to provide an easy-to-use resource that can be read in a day or kept as a reference when evaluating proposals. The Introduction begins with a compilation of the general trends of successful projects. One common observation from several projects concerns how the gender role of women affected their receptivity to different kinds of environmental messages: Local deforestation and erosion led to rural Pakistani women being more open to an adult literacy project because they are the ones who have to walk further to find usable firewood and water when the environment is degraded.

Forty-one two-page descriptions of projects that demonstrate various successful methodologies and approaches, applied to a variety of audiences, are organized in the following chapters: Fostering Sustainable Development in Communities, Creating Change in School Systems, Using Mass Media, Fostering Environmental Policy, Sup-
plementing Formal Education, Organizing Nonformal Environmental Education, and Building Local Capacity. Each description contains a short analysis of “the situation,” a brief explanation of “the project,” and a concise summary of “the results.” In addition, each description contains insights and themes derived from the project that generalize observations and answer the overall question, “What works?”

What Works does an excellent job of providing a practical guide to both researchers and a general nonspecialist audience. Avoiding technical jargon, while effectively presenting the sophistication of knowledgeable practitioners, What Works allows the reader to quickly understand each project and situation and to get a general idea of what happened at each location. For example, market research to record impressions of a planned media campaign in three Nile River farming communities resulted in significant adaptations that recognized and reinforced the ways farmers were already practicing water conservation to ensure present and future family food needs. In another example, forest management policies in the Philippines became a higher political priority for the Filipino Congress when a survey concerning political constraints facing legislators was combined with a face-to-face dialogue between constituents and their representatives.

In addition, What Works pulls no punches in describing project disappointments in an effort to learn from failures. One description describes how a 2-year attempt to implement a problem-solving approach in rural primary schools in Zimbabwe failed due to both external factors (e.g., lack of a nationwide syllabus, poverty, and usage of the English language) and internal factors (e.g., lack of teacher subject matter knowledge and experience and counterproductive incentives to teach through rote procedures to enhance test scores that enhance the upward mobility of instructors). Such honesty in this book recognizes that discovering what works is as much a function of recognizing success as learning from failure.

Despite the strengths of the book, there were a few items that could have been improved on. First, the descriptions of each project contained varying levels of detail about each project. Some are too sketchy whereas others are more in-depth. Second, and more important, there needs to be a better distinction between projects that have produced long-term, permanent, verifiable results and others that are still exploratory, tentative, and dependent on future choices and actions made by others following program implementation. For example, one educational project attempts to influence children in school now and may or may not result in adults who are environmentally conscious and willing to work for a more ecologically sound society in the future. In contrast, other environmental communication projects focus on policy changes that result in identifiable environmental benefits here and now.

What Works successfully advances the field of environmental education and communication by providing a concise guide to successful projects for donors and funders and by providing practitioners with models to help design projects of their own. What Works demonstrates that there certainly is no lack of knowledge about how to address the questions of environmental sustainability. The unique contribution of What Works is its sensitive presentation of successful, and not-so-successful, applications of what
is known about environmental education and sustainability to the less industrialized parts of our world.

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INDEX

to

ENVIRONMENT AND BEHAVIOR

Volume 33

Number 1 (January 2001) pp. 1-160
Number 2 (March 2001) pp. 161-320
Number 3 (May 2001) pp. 321-472
Number 4 (July 2001) pp. 473-608
Number 5 (September 2001) pp. 609-728
Number 6 (November 2001) pp. 729-860

Authors:
ABOUD, ROGER, see Levi, D.
BAKER, DOUG, see Ewert, A.
BECKMANN, SUZANNE C., see Kilbourne, W. E.
BERTO, RITA, see Purcell, T.
BLÖBAUM, ANKE, see Hunecke, M.
BOWLER, PETER A., see Hartig, T.
CASTRO, PAULA, and MARIA LUÍSA LIMA, “Old and New Ideas About the Environment and Science: An Exploratory Study,” 400.
COOPERMAN, JANA L., see Evans, G. W.
CORROYER, DENIS, see Moser, G.
CVITKOVICH, YURI, and ANDREW WISTER, “The Importance of Transportation and Prioritization of Environmental Needs to Sustain Well-Being Among Older Adults,” 809.


ELIAS, JEFFERY W., see Dickinson, J. I.

ENGELEN, MIRJAM, see Daamen, D.D.L.

ENGLAND, MARIJANE E., see Yan, X. W.

ERKIP, FEYZAN, see Kaya, N.

EVANS, GARY W., HEIDI SALTMAN, and JANA L. COOPERMAN, “Housing Quality and Children’s Socioeconomic Health,” 389.

EVANS, GARY W., SUSAN SAEGERT, and REBECCA HARRIS, “Residential Density and Psychological Health Among Children in Low-Income Families,” 165.


FLYNN-SMITH, JENNIFER A., see Herzog, T. R.

FUHRER, URS, see Korpela, K. M.

FUJII, SATOSHI, TOMMY GÄRLING, and RYUICHI KITAMURA, “Changes in Drivers’ Perceptions and Use of Public Transport During a Freeway Closure: Effects of Temporary Structural Change on Cooperation in a Real-Life Social Dilemma,” 796.

GÄRLING, TOMMY, see Fujii, S.

GELLER, E. SCOTT, see Boyce, T. E.

GENTRY, G. MARIE, see Dickinson, J. I.

GOLDHABER, RAVIT, see Schnell, I.

GRENSTAD, GUNNAR, see Olli, E.

GUSTAFSON, PER, “Roots and Routes: Exploring the Relationship Between Place Attachment and Mobility,” 667.

HARRIS, REBECCA, see Evans, G. W.


HARTIG, TERRY, “Guest Editor’s Introduction,” 475.

HARTIG, TERRY, see Korpela, K. M.


HÖGER, RAINER, see Hunecke, M.

HULL, R. BRUCE, see Michael, S. E.

HUNECKE, MARCEL, ANKE BLOßBAUM, ELLEN MATTHIES, and RAINER HÖGER, “Responsibility and Environment: Ecological Norm Orientation and External Factors in the Domain of Travel Mode Choice Behavior,” 830.

HUTTON, J. THOMAS, see Dickinson, J. I.

KAISER, FLORIAN G., see Hartig, T.

KAISER, FLORIAN G., see Korpela, K. M.


KAPLAN, STEPHEN, “Meditation, Restoration, and the Management of Mental Fatigue,” 480.

KAYA, NAZ, and FEYZAN ERKIP, “Satisfaction in a Dormitory Building: The Effects of Floor Height on the Perception of Room Size and Crowding,” 35.

KITAMURA, RYUICHI, see Fujii, S.

KOCHER, SARA, see Levi, D.

KORPELA, KALEVI M., TERRY HARTIG, FLORIAN G. KAISER, and URS FUHRER, “Restorative Experience and Self-Regulation in Favorite Places,” 572.


KUO, FRANCES E., see Brunson, L.

KUO, FRANCES E., see Taylor, A. F.


LEVI, DANIEL, SARA KOCHER, and ROGER ABOUD, “Technological Disasters in Natural and Built Environments,” 78.

LEWIS, ALAN, see Kilbourne, W. E.

LIMA, MARIA LUÍSA, see Castro, P.

MATTHIES, ELLEN, see Hunecke, M.


PERON, ERMINELDA, see Purcell, T.

PURCELL, TERRY, ERMINELDA PERON, and RITA BERTO, “Why Do Preferences Differ Between Scene Types?” 93.

RIESE, HANNE, see Vorkinn, M.


SAEGERT, SUSAN, see Evans, G. W.

SALTZMAN, HEIDI, see Evans, G. W.

SANDAL, GRO M., “Crew Tension During a Space Station Simulation,” 134.


SHROYER, JOANN L., see Dickinson, J. I.

STAATS, HENK, see Daamen, D.D.L.

STATOPOULUS, TED, see Zacharias, J.


SULLIVAN, WILLIAM C., see Brunson, L.

SULLIVAN, WILLIAM C., see Kuo, F. E.

SULLIVAN, WILLIAM C., see Kuo, F. E.

SULLIVAN, WILLIAM C., see Taylor, A. F.

VAN DAM, YNTE, see Kilbourne, W. E.
VINING, JOANNE, see Ebreo, A.
VORKINN, MARIT, and HANNE RIESE, “Environmental Concern in a Local Context: The Significance of Place Attachment,” 249.
WILKE, HENK A. M., see Daamen, D.D.L.
WISTER, ANDREW, see Cvtikovich, Y.
WOLLEBAEK, DAG, see Olli, E.
WU, HANQING, see Zacharias, J.
ZACHARIAS, JOHN, TED STATHOPOULOS, and HANQING WU, “Microclimate and Downtown Open Space Activity,” 296.
ZAHM, DIANE L., see Michael, S. E.

Articles:
“Aggression and Violence in the Inner City: Effects of Environment via Mental Fatigue,” Kuo and Sullivan, 543.
“Altruistic, Egoistic, and Normative Effects on Curbside Recycling,” Ewing, 733.
“Changes in Drivers’ Perceptions and Use of Public Transport During a Freeway Closure: Effects of Temporary Structural Change on Cooperation in a Real-Life Social Dilemma,” Fuji et al., 796.
“Contextual Effects on Environmental Attitudes and Behavior,” Blake, 708.
“Coping With ADD: The Surprising Connection to Green Play Settings,” Taylor et al., 54.
“Crew Tension During a Space Station Simulation,” Sandal, 134.
“The Effect of Selected Residential Carpet and Pad on the Balance of Healthy Older Adults,” Dickinson et al., 279.
“Environmental Concern in a Local Context: The Significance of Place Attachment,” Vorkinn and Riese, 249.
“Environmental Factors Influencing Auto Burglary: A Case Study,” Michael et al., 368.
“Guest Editor’s Introduction,” Hartig, 475.
“Housing Quality and Children’s Socioeconomic Health,” Evans et al., 389.
“The Importance of Transportation and Prioritization of Environmental Needs to Sustain Well-Being Among Older Adults,” Cvtikovich and Wister, 809.
“Improving Environmental Behavior in Companies: The Effectiveness of Tailored Versus Nontailored Interventions,” Daamen et al., 229.

“Meditation, Restoration, and the Management of Mental Fatigue,” Kaplan, 480.

“Microclimate and Downtown Open Space Activity,” Zacharias et al., 296.

“A Multinational Examination of the Role of the Dominant Social Paradigm in Environmental Attitudes of University Students,” Kilbourne et al., 209.


“Old and New Ideas About the Environment and Science: An Exploratory Study,” Castro and Lima, 400.


“Politeness in the Urban Environment: Is City Life Still Synonymous With Civility?” Moser and Corroyer, 611.


“Psychological Restoration in Nature as a Positive Motivation for Ecological Behavior,” Hartig et al., 590.


“Resident Appropriation of Defensible Space in Public Housing: Implications for Safety and Community,” Brunson et al., 626.

“Residential Density and Psychological Health Among Children in Low-Income Families,” Evans et al., 165.


“Restorative Experience and Self-Regulation in Favorite Places,” Korpela et al., 572.

“Roots and Routes: Exploring the Relationship Between Place Attachment and Mobility,” Gustafson, 667.

“Satisfaction in a Dormitory Building: The Effects of Floor Height on the Perception of Room Size and Crowding,” Kaya and Erkip, 35.


“Standing for Where You Sit: An Exploratory Analysis of the Relationship Between Academic Major and Environmental Beliefs,” Ewert and Baker, 687.

“Technological Disasters in Natural and Built Environments,” Levi et al., 78.

“Why Do Preferences Differ Between Scene Types?” Purcell et al., 93.

Book Reviews:

