

How a Structural Solution to a Real-World Social Dilemma Failed: A Field Experiment on the First Carpool Lane in Europe*

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In the current field experiment we evaluate a structural solution to a real-life social dilemma by examining the effects of a carpool priority lane on judgments and preferences concerning the decision to commute by carpool (i.e., the presumed cooperative option) or driving alone (i.e., the presumed noncooperative option). Our general hypothesis was that this intervention would evoke a process of self-justification in solo drivers, arising from feelings of relative deprivation and/or cognitive dissonance. Consistent with predictions, we found that in comparison with judgments made before the implementation of the carpool lane, solo drivers tended to decrease the importance of an attribute inherently linked to carpooling (i.e., low travel costs) and to increase the importance of an attribute inherently linked to driving alone (i.e., flexibility). Moreover, solo drivers exhibited a weaker preference for carpooling after the establishment of the carpool lane. This finding suggests that the negative side effects of this structural measure were more pronounced than the intended carpool-promoting effects.

“The puzzle facing commons [i.e., social dilemma] researchers in the behavioral sciences can be phrased as follows: If technological solutions are often unworkable because of their inherent insufficiencies, or because consumers don’t like to use them, if changes in morality are difficult to create, . . . and if egalitarian principles and free choice are to be preserved, how are scarce resources to be saved over extended periods to the satisfaction of consumers?”

J. Edney (1980:133)

One of the most challenging tasks facing societies and larger groups concerns the

management of social dilemmas, situations in which individual and collective interests are at odds (Dawes 1980; Messick and Brewer 1983; Yamagishi 1986). Many social dilemmas stem from the fact that a variety of behaviors are tempting to the individual, but at the same time are potentially detrimental to the general well-being of the collective. For example, the decision to commute by car alone (the presumed noncooperative option) instead of by carpool—sharing a car with other people—serves the individual’s interest in that it is generally quicker and more flexible, whereas carpooling (the presumed cooperative option) serves the collective interest because it helps to minimize or overcome problems related to environmental pollution and traffic congestion. To reduce the harmful effects of excessive car use, the Dutch government recently implemented a carpool priority lane—the first in Europe—as a structural solution to this critical and pervasive social dilemma.

What might be the psychological consequences of implementing a carpool priority lane? How might it affect people’s prefer-

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ences for carpooling? At present, answers to such questions are indirect at best. Granted, some studies have been conducted (for the most part in the United States) regarding the effectiveness of various strategies to promote carpooling, including monetary incentives, car-matching services, and separate lanes for carpoolers (for overviews, see Geller, Winett, and Everett 1982; Stevens 1990). These studies, however, generally have devoted little attention to the *psychological* processes underlying people's reactions to these interventions (see Stern 1992). The major purpose of the current research is to examine the impact of a carpool lane on attitudes and preferences relevant to commuting alone or by carpool. To this end, we conducted a field experiment administering a survey to a sample of solo drivers at *two* different times (approximately one month before and one month after the opening of the carpool lane) and on *two* different locations (along the highway where the carpool lane was established, and along a comparable highway without a carpool lane).

Approaches to Promoting Carpooling: A Social Dilemma Analysis

The decision to commute alone or by carpool can be framed as a social dilemma, formally defined as an interdependent situation in which (1) each individual receives greater outcomes by making a noncooperative choice (e.g., solo driving) than by making a cooperative choice (e.g., carpooling), regardless of the decisions of others; yet (2) each individual is better off if all or most make a cooperative rather than a noncooperative choice (see Dawes 1980; Yamagishi 1986). These social dilemma properties have been said to characterize many problems in modern society, including overpopulation, the functioning of labor unions, and the depletion of natural resources (see Komorita and Parks 1994).

Theorists of social dilemmas generally distinguish between two broad categories of strategies for solving social dilemmas (see Messick and Brewer 1983; Rusbult and Van Lange forthcoming; Yamagishi 1986). One category may be referred to as the *individual-psychological* approach, which includes interventions aimed at influencing relevant attitudes and beliefs that may guide people's cooperative and noncooperative behaviors.

This approach attempts to change the subjective interpretations of the situation at hand—for example, by increasing individuals' awareness of the harmful environmental effects of excessive car use, as in educational campaigns.

A second category may be referred to as the *structural* approach to solve social dilemmas; this approach focuses on interventions that alter the objective features of the decision situation by changing the incentive patterns associated with cooperation and noncooperation. In regard to transportation, for example, carpooling can be stimulated by developing formal rules (e.g., preferential treatment of carpoolers), by altering the physical environment (e.g., reduction of parking space), and/or by providing selective rewards for carpooling and punishments for driving alone (e.g., through subsidies and taxes). The provision of a lane exclusively for carpoolers is an example of this structural approach in that it aims to increase the incentives of carpooling through an intervention in the physical environment. That is, the construction of this lane is expected to increase the efficiency of carpooling because it allows commuters to avoid daily traffic jams in the regular driving lanes. Research has revealed that efficiency is an important travel outcome in commuting, particularly for commuters who are concerned primarily with congestion and accessibility. That is they tend to interpret commuting as a chicken dilemma game (see Van Vugt, Meertens, and Van Lange 1995).¹

In the current study we attempt to extend and complement the literature on social dilemmas in two ways. First, the great majority of prior social dilemma studies concentrated on decision making in experi-

¹ In a chicken dilemma game the cooperative option (e.g., carpooling) becomes more attractive to the extent to which a greater number of people do not cooperate (e.g., solo driving; see Kelley and Thibaut 1978). Although the implementation of the carpool lane may have highlighted this social dilemma structure, we do not assume that people may have viewed the situation as such. For example, there is no evidence that people avoided using the lane because of the fear of ending up in a traffic jam. Moreover, for some commuters the implementation of the carpool lane may have accentuated the fact that carpooling is more desirable from a collective viewpoint (e.g., environmental well-being); this interpretation is characterized by a different interdependence structure as in the prisoner's dilemma game (see Van Vugt et al. 1995).

mentally induced social dilemmas, using experimental games as decision tasks for groups consisting of two to nine individuals (for exceptions, see Erev, Bornstein, and Galili 1993; Kerr 1989; Van Vugt et al. 1995). Hence it would be fruitful to examine whether the logic and knowledge derived from this research can be applied to *large-scale* dilemmas existing in the real world (for similar reasoning, see Komorita and Parks 1994).

Second, in recent years a growing number of studies have been published on structural solutions to social dilemmas (e.g., Messick et al. 1983; Rutte and Wilke 1985; Samuelson 1991, 1993; Samuelson et al. 1984; Yamagishi 1986, 1988). The primary concern of these studies has been to examine the conditions under which individuals would opt for various kinds of structural or institutional change; for example, when do people wish to give up their own freedom of choice to a leader, contribute to a sanctioning system, or privatize the common resource? This line of research, however, has given relatively little attention to the possible *consequences* of implementing such solutions; for example, how might these interventions affect people's attitudes and intentions relevant to cooperation? Thus the current study complements prior social dilemma research by examining the impact of a structural solution—the implementation of the carpool priority lane—on individuals' attitudes and preferences regarding carpooling versus driving alone.

Psychological Reactions to Structural Solutions of Social Dilemmas: Self-Justification

How might individuals respond to a structural solution in their commuting situation? How might this solution affect their commuting behavior? Because structural solutions, unlike individual-psychological solutions, focus on altering directly the incentive patterns of the situation, such solutions generally are believed to be quite promising (e.g., Rusbult and Van Lange forthcoming). Indeed, experimental studies of social dilemmas have revealed that individuals tend to appreciate structural solutions, particularly when many people fail to exhibit cooperative behavior (e.g., Messick et al. 1983; Samuelson 1993; Samuelson et al. 1984; Yamagishi

1986). Moreover, structural interventions such as changes in monetary payoffs are fairly effective in that the probability of cooperation tends to vary directly with the amount of reward associated with cooperative behavior (for recent reviews, see Komorita and Parks 1994; Van Lange et al. 1992). Structural solutions, however, may not always be so instrumental in the real world: They may not be strong enough, may be rather difficult to implement, or may be experienced as unfair and infringing on individual freedom (see Samuelson 1993; Samuelson and Messick 1995).

We propose that the implementation of the carpool lane also may suffer from these and related undesirable side effects. First, in real-life social dilemmas the cooperative option may be less viable than the one in the laboratory. For example, there may be several constraints that make it hard for people to carpool, such as difficulties in finding carpool partners or coordinating time schedules with potential partners. Although these latter constraints may vary from person to person, it seems plausible that a significant number of people feel *unable* to carpool (see Stevens 1990).

Second, the benefits of carpooling due to the implementation of a carpool lane (i.e., shortening travel time) do not necessarily make carpooling more attractive than the personally more convenient and more flexible option of driving solo. Indeed, one may assume that individuals have developed the habit of driving alone because this option is associated with numerous personal benefits such as comfort and flexibility. Accordingly, a reduction in travel time provided by the carpool lane may not be a strong enough incentive to alter that habit (see Verplanken et al. 1994). Thus a fair number of people may be *unwilling* to some extent to carpool, especially if they believe that not many others are willing to do so (see Pruitt and Kimmel 1977; Yamagishi 1986).

How might people respond psychologically to the implementation of the carpool lane if it is assumed that a significant number of people are either unwilling or unable to carpool? First, the implementation of the carpool lane benefits a relatively small group of people; only approximately 10 percent of the commuters were carpoolers before the carpool lane was implemented. Such benefits may lead to feelings of *relative deprivation* (e.g.,

Cook, Crosby and Hennigan 1977; Martin 1981) among most commuters (i.e., solo drivers) who do not receive these benefits, but feel that these benefits should serve a majority instead of a small minority of people. Moreover, these feelings may be exacerbated by unfavorable social comparisons arising from the fact that solo drivers, while being stuck in traffic jams, see each day that these carpoolers are not facing traffic congestion and therefore are much better off. It is plausible that feelings of relative deprivation are especially pronounced among commuters who think they are not responsible for their unfavorable situation—that is, among commuters who are largely *unable* to carpool.

Second, the implementation of the carpool lane obviously conveys (and to some extent emphasizes) the notion that carpooling not only has become more efficient in terms of travel time, but also is more desirable from a collective point of view. Because there is a fair amount of consensus about the desirability of carpooling in light of current environmental problems (see Stevens 1990), solo drivers may experience some degree of *cognitive dissonance*, a tension between their actual behavior and their beliefs about that behavior; for example, in regard to carpooling, driving alone contributes more to environmental and traffic problems (see Festinger 1957). Such dissonance may be resolved in two ways: (1) through a behavioral change if such change is possible (that is, individuals may start to commute by carpool), and (2) through a reappraisal of the attributes linked to carpooling and driving alone (for example, individuals may derogate the alternative of carpooling). Given that dissonance should be experienced only when individuals feel personally responsible for their choices (see Cooper and Fazio 1984), it is plausible that such psychological tension is most pronounced among those who view carpooling as a viable option but are *unwilling* to carpool.

In the current work we postulate that the psychological tension arising from feelings of relative deprivation or cognitive dissonance may be resolved largely by a process of *self-justification*, a psychological reevaluation of the behavioral options or conditions so as to serve one's view of the chosen option or situation (see Aronson 1988). Indeed, a fair amount of evidence suggests that those who experience high levels of relative deprivation attempt to reconsider the situation in terms of

additional attributes that make their position seem less bad in relation to others who are better off ("Driving my car alone may be somewhat more costly, but unlike carpoolers I am flexible about when to leave home or work"; see Wood 1989; Wood and Taylor 1991). Similarly, dissonance research commonly finds that those who experience high levels of cognitive dissonance engage in self-justification processes to reduce the tension between their cognitions and their behavior (e.g., Cooper and Fazio 1984). Indeed, individuals who are unwilling to make a cooperative choice tend to justify their noncooperative behavior by claiming that they did not at all expect others to cooperate (Messé and Sivacek 1979).

Hypotheses

The general hypothesis underlying the current study is that commuters driving alone will engage in self-justification in order to reduce the psychological tension caused by the establishment of the carpool lane. This self-justification hypothesis leads to a set of specific hypotheses regarding changes in (1) *beliefs* about relevant outcomes associated with commuting alone versus carpooling, such as travel time, flexibility, environmental well-being and travel costs; (2) *importance* attached to these outcomes; and (3) *preferences* for commuting alone or for carpooling.

First, we predict that solo drivers on the experimental route, relative to those on the control route, will develop more positive beliefs about solo driving and more negative beliefs about carpooling from Time 1 to Time 2 (*Hypothesis 1*).

Second, we predict that experimental solo drivers, relative to solo drivers on the control route, will show an increase in importance assigned to travel attributes inherently linked to solo driving, such as flexibility, and a decrease in importance assigned to attributes inherently linked to carpooling, such as environmental well-being and low travel costs (*Hypothesis 2*).

Third, we propose that the expected self-justification of solo drivers on the experimental route will be accompanied by a similar shift in *preferences* for carpooling. Accordingly we predict that solo drivers on the experimental route, relative to solo drivers on the control route, will exhibit a decreasing

preference for carpooling between Time 1 and Time 2 (*Hypothesis 3*).

METHOD

Participants and Design

During the morning rush hour we distributed 600 questionnaires among car commuters at gas stations along two major highways in the Netherlands. Of the initial sample of 600 participants, 267 completed the first questionnaire, yielding a response rate of 44.5 percent. One hundred ninety-two of these respondents (32.0 percent of the initial sample) also returned the second questionnaire. This group consisted of 169 males and 22 females (one participant failed to indicate gender) with an average age of 37 years and one month; 172 were solo drivers and 20 were carpoolers.² Accordingly the study utilized a 2 (control route versus experimental route) x 2 (time 1 versus time 2) quasi-experimental design—the latter variable a within-participant factor—to test the hypotheses regarding the effects of the carpool lane on solo drivers' beliefs, evaluations, and preferences for carpooling versus solo driving.

The Carpool Lane

The carpool lane, which was opened on October 27, 1993, was built in the median strip of the A1, one of the most congested highways in The Netherlands, between the cities of Amersfoort and Amsterdam. The lane itself was six kilometers (about four miles) long, and was separated from the other driving lanes by a concrete wall about .5 meter high.

In the morning rush hour (between 7:00 and 10:00 am) the carpool lane was designated for traffic heading toward Amsterdam, especially cars containing at least *three* passengers (i.e., carpoolers), buses, and motorcycles. The lane was closed during the middle of the day and then was opened for all motorized traffic leaving Amsterdam in the

evening rush hour (between 5:00 and 7:00 pm). Just before the opening of the lane, several travel time tests showed that the carpool lane would provide an advantage of about 20 minutes over the regular lanes.³

Procedure

The first series of questionnaires was distributed to car drivers stopping at a gas station during the morning peak-hour traffic. We first asked individuals whether they were on their way to work. If they were, we asked them whether they were willing to participate in a study regarding transportation decisions in commuting situations. Participants then received an envelope containing the questionnaire, which they could complete either at home or at work. Those who returned the first questionnaire (including their return address) received an almost identical questionnaire by mail about two months after the first one was distributed. Upon completing both phases of the research these participants were debriefed about the purpose of the study and thanked for their participation.

Selection of Routes and Timing of Measurements.

Half of the questionnaires (300) were distributed at a gas station along the A-1 highway, where the carpool priority lane was being built (experimental route). The other half were distributed to commuters recruited at a gas station along a highway known as the A-2 (between Den Bosch and Utrecht)—a route comparable to the experimental route in terms of daily traffic congestion (Dutch Ministry of Traffic and Waterways 1992). We added a control group to the design in anticipation of the media publicity accompanying the opening of the carpool priority lane, which might influence the effect of the lane on solo drivers' attitudes and preferences. The distance between the two gas stations was approximately 150 kilometers (about 95 miles); thus it was virtually impossible that participants would regularly use both routes.

² Because of the small number of carpoolers in our sample and because our hypotheses were focused primarily on how solo drivers would respond to the carpool lane, we decided to remove the carpoolers from further analyses. This decision was justified further by the fact that preliminary analyses of our data, including a comparison between solo drivers and carpoolers, yielded essentially the same results.

³ This point was confirmed by the carpoolers on the experimental route ($n = 6$). After the lane was opened they reported a decline in average travel time from 63 minutes to 36 minutes, more than 40 percent reduction. In contrast, the lane did not affect solo drivers' travel time (Time 1: 49 minutes; Time 2: 48 minutes).

We administered the Time 1 questionnaire approximately one month *before* the opening date of the carpool lane. The almost identical Time 2 questionnaire was sent by mail approximately one month *after* the carpool lane was opened. After the first measurement, the response percentages for the control and the experimental route were 43.7 percent and 45.3 percent, respectively; after the second measurement, the response percentage for each group was 32.0 percent of the original sample of 600 commuters; these percentages include the carpoolers. We found no significant differences between the groups of commuters who did and did not participate at both measurement times, either in sample composition (e.g., age, gender) or in attitudes and preferences regarding carpooling.

Dependent Measures

The first part of the questionnaire included several biographical questions about age, gender, travel mode, and estimated travel time; some of these questions were excluded from the Time 2 questionnaire. The second part contained (among other things) a list of nine travel attributes. This list was constructed carefully on the basis of prior research on transportation decisions (e.g., Flannelly and McLeod 1989; Van Vugt et al. 1995), revealing that these concerns were primary in commuters' decisions about solo driving versus carpooling. Some were judged to be linked strongly to either solo driving (i.e., flexibility, comfort, low travel time, and reliable travel time) or carpooling (i.e., low travel costs, environmental well-being, and sociability). Participants were asked to indicate (1) how *descriptive* they thought each of these travel attributes was for driving solo or carpooling ($-3 =$ more descriptive of driving solo, $0 =$ equally descriptive, $+3 =$ more descriptive of carpooling), and (2) how *important* they considered each of these travel attributes in their commuting decision ($1 =$ very unimportant, $7 =$ very important for my commuting decision).

Third, the questionnaire contained one general item regarding the perceived *self-efficacy* to carpool: "Would it be possible for you to commute by carpool in your situation?" ($1 =$ not at all possible, $7 =$ very much possible).

Finally, commuters were asked to state their own *preference* for driving solo or

carpooling ($1 =$ very strong preference for solo driving, $4 =$ indifferent, $7 =$ very strong preference for carpooling) as well as their intentions to carpool in the near future ($1 =$ very weak intention, $7 =$ very strong intention, $8 =$ I carpool already [for carpoolers]). The correlation between preference and intention was quite strong ($r = .67$, $p < .01$).

RESULTS

Changes in Beliefs about Carpooling versus Solo Driving: Testing Hypothesis 1

We analyzed all nine beliefs of solo drivers about carpooling versus driving solo in a 2 (experimental route versus control route) \times 2 (time 1 versus time 2) MANOVA; the latter variable was a within-participant factor. Table 1 presents the mean ratings and variances for the nine beliefs across the different routes and measurement times. The attributes are ordered from most strongly linked to carpooling (environmental well-being, low travel costs, sociability) to most strongly linked to driving solo (flexibility, reliable and low travel time).

Although the analysis revealed a marginally significant interaction for route and time at the multivariate level ($F(9,163) = 1.90$, $p < .06$), none of the univariate tests associated with this interaction effect was found to be significant. Thus, contrary to Hypothesis 1, solo drivers on the experimental route (versus solo drivers on the control route) did not develop more positive beliefs about solo

Table 1. Average Beliefs of Solo Drivers about Carpooling versus Solo Driving

Travel Attribute	Mean	Pooled Variance
Environmental Well-Being	2.41	1.01
Low Travel Costs	2.03	1.82
Sociability	0.46	1.14
Relaxation	-0.55	1.65
Safety	-0.95	1.22
Comfort	-1.54	1.21
Low Travel Time	-1.65	2.37
Reliable Travel Time	-1.98	1.32
Flexibility	-2.57	0.70

Notes. The judgment scale varies from -3 (attribute is more descriptive of solo driving) through $+3$ (attribute is more descriptive of carpooling). Attributes are rank-ordered on the basis of the average score, so that the first (environmental well-being) is considered most typical of carpooling and the last (flexibility) of solo driving. All means differ significantly from 0, the midpoint of the judgment scale; $p < .05$.

driving or more negative beliefs about carpooling from Time 1 to Time 2.

Changes in Importance Ratings of Carpooling versus Solo Driving: Testing Hypothesis 2

Hypothesis 2 predicted that solo drivers on the experimental route would increase the importance of attributes linked to solo driving and would decrease the importance of attributes linked to carpooling. A 2 (route) \times 2 (time) MANOVA revealed a multivariate main effect for time, $F(9,163) = 1.93, p < .05$, which was significant at the univariate level for two attributes: flexibility, $F(1,171) = 3.54, p < .05$, and low travel costs, $F(1,171) = 9.50, p < .01$. Both these effects were qualified by a significant interaction between route and time: for flexibility, $F(1,171) = 3.30, p < .05$; for low travel costs, $F(1,171) = 3.67, p < .05$.

In agreement with Hypothesis 2, solo drivers on the experimental route increased the importance of flexibility (an attribute that solo drivers linked strongly to solo driving; see Table 1) after the implementation of the carpool lane (Time 1 versus Time 2: $M_s = 5.27$ versus 5.89 ; M difference = $+0.62$; $F(1,85) = 6.33, p < .05$). Moreover, solo drivers on the experimental route decreased the importance of low travel costs between the measurement times (Time 1 versus Time 2: $M_s = 3.25$ versus 2.49 ; M difference = -0.76 ; $F(1,85) = 6.94, p < .01$). These changes were less pronounced for solo drivers on the control route, for flexibility (Time 1 versus Time 2: $M_s = 5.68$ versus 5.69 ; M difference = $+0.01$; $F(1,85) < 1$), and for low travel costs (Time 1 versus Time 2: $M_s = 2.96$ versus 2.72 ; M difference = -0.24 ; $F(1,85) < 1$). These results are consistent with the idea that solo drivers tended to engage in self-justification when confronted with the carpool lane. Although we found the predicted effects for only two attributes, both of these attributes were strongly associated with either solo driving (i.e., flexibility) or carpooling (i.e., low travel costs).

Changes in Preferences for Carpooling versus Solo Driving: Testing Hypothesis 3

We analyzed preferences for carpooling versus solo driving in a 2 (route) \times 2 (time) ANOVA. In agreement with Hypothesis 3,

this analysis revealed a strong main effect for time, $F(1,171) = 19.83, p < .001$, an indication that solo drivers exhibited a decreasing preference for carpooling between Time 1 ($M = 2.75$) and Time 2 ($M = 2.22$). Contrary to Hypothesis 3, however, this effect was not moderated by route, $F(1,171) < 1$, which suggests that the decline in carpool preference was similar for the two routes. Indeed, solo drivers on both the experimental route (Time 1 versus Time 2: $M_s = 2.91$ versus 2.31 ; $sds = 1.82$ and 1.58 ; M difference = -0.60 ; $F(1,85) = 3.32, p < .001$), and the control route (Time 1 versus Time 2: $M_s = 2.59$ versus 2.13 ; $sds = 1.57$ and 1.17 ; M difference = -0.46 ; $F(1,85) = 2.97, p < .01$), developed a weaker carpool preference—or a stronger preference for solo driving—after the implementation of the carpool lane.⁴

Finally, we examined how many solo drivers actually shifted to carpooling during the course of the study. Given the relatively short interval between the measurement times (approximately two months), substantial behavioral change was rather unlikely. Indeed, none of the solo drivers in our sample changed to carpooling between Time 1 and Time 2.

DISCUSSION

In the current study we evaluated a structural solution to a real-life social dilemma by examining the effects of a carpool priority lane on solo drivers' judgments and preferences regarding their decision to commute alone (the presumed noncooperative option) or by carpool (the presumed cooperative option). In general, our findings demonstrate that this intervention—the first of its kind in Europe—was not successful. Although the carpool lane seemed to increase the efficiency of carpooling (that is, the average travel time reported by carpoolers decreased substantially), solo drivers tended to reconsider the travel attributes by upgrading the importance of an attribute strongly linked to driving alone and by downgrading the importance of an attribute strongly linked to carpooling. Moreover, solo drivers' prefer-

⁴ Conversely, carpoolers on the experimental route developed a much stronger preference for carpooling between Time 1 ($M = 4.25, sd = 2.47$) and Time 2 ($M = 5.83, sd = 1.75$), which may well be attributed to a shorter travel time.

ences for carpooling tended to decline rather than to increase after the establishment of the carpool lane. Below we discuss several psychological mechanisms that may underlie these changes.

The general hypothesis advanced was that solo-driving commuters, when confronted with the carpool lane, would engage in a process of *self-justification*. Contrary to Hypothesis 1, we found no evidence that solo drivers developed more positive beliefs about solo driving or negative beliefs about carpooling after the implementation of the carpool lane. In agreement with Hypothesis 2, however, the establishment of the lane affected the importance that solo drivers on the experimental route attached to travel attributes which were linked to either carpooling or driving solo. These individuals increased the importance of flexibility, which they judged to be the most prototypic attribute of solo driving; moreover, they decreased the importance of low travel costs, one of the most exemplary attributes of carpooling.

Thus the predicted self-justification effects were observed for importance ratings, but not for beliefs. How so? One might assume that individuals generally tend to maintain or improve a favorable view of themselves and their behaviors; such tendencies, however, may be tempered by the extent to which reality permits them to do so. Indeed, research has shown that self-serving biases are constrained by the specificity and objectivity of the dimensions on which these judgments are made (see Van Lange 1991). Given that beliefs are more verifiable and more strongly constrained by reality than are evaluations, it is understandable that self-justification effects occurred primarily through changes in the importance assigned to travel attributes rather than through changes in the beliefs about those attributes.

Also, relevant to Hypothesis 2, we observed self-justification effects for only a subset of travel attributes. For example, solo drivers did not upgrade the importance of a reliable travel time—which was viewed as an advantage of driving alone—or downgrade the importance of sociability—an advantage of carpooling. A possible interpretation of this result is that it is sufficient, in the service of self-justification, to display biases along only a few dimensions, provided that they are linked strongly to one or the other of the behavioral options (“self-relevant dimen-

sions”; see Tesser & Campbell 1982). This may explain why we found effects for judgments of flexibility and low travel costs; there is a fair amount of consensus that these attributes are linked respectively to solo driving and carpooling (see Flannelly and McLeod 1989). Why then did solo drivers not downgrade the importance of environmental well-being? Perhaps, in the face of a growing environmental concern throughout society (see Stern 1992), they did not consider it very opportune to devalue the significance of such a highly socially desirable attribute.

In the introduction we offered two complementary explanations for the origin of the self-justification effects in solo drivers. These were based on two distinct psychological processes that may have been set in motion by the implementation of the carpool lane: (1) *relative deprivation*, emanating from the perceived inequity between solo drivers' outcomes and those of carpoolers, and (2) *cognitive dissonance*, emanating from the tension between solo drivers' beliefs about carpooling and their actual behavior. We assumed that feelings of deprivation would be paramount among people who were not able to carpool and feelings of dissonance among those who were unwilling to carpool. Which of these processes may have been more prominent in the current study?

To begin with, the reports of solo drivers about their self-efficacy to carpool were found to be highly skewed toward the lower end of the response scale: Nearly 80 percent of the participants scored 1 or 2 on a seven-point scale from 1 (= very much impossible) to 7 (= very much possible), which suggests the validity of a relative deprivation interpretation. Indeed, carpooling may have important obstacles such as finding at least two carpool partners at once and making time and financial arrangements (see Stevens 1990). Furthermore, feelings of deprivation may have been intensified by the belief that instead of a carpool lane benefiting a small minority of commuters, there could have been an extra regular driving lane which would have diminished the congestion considerably (“counterfactual thinking”; see Kahneman and Miller 1986). More illustrative evidence for a relative deprivation explanation is provided by a number of incidents that occurred shortly after the lane had been opened, showing expressions of reactance (see Brehm and Brehm 1981) among solo

drivers. For example, people purposely drove alone in the carpool lane; some had placed mannequins in their cars.

Strengths, Limitations, and Implications

Two limitations of the current research are noteworthy. First, we did not directly examine the mechanisms underlying self-justification—whether justification processes are shaped by unpleasant states arising from relative deprivation or from cognitive dissonance. For example, solo drivers' reports of their inability to carpool might have been colored by their unwillingness to carpool (see Kerr forthcoming). Second, our research employed the logic of a quasi-experimental design, involving a pretest and posttest, an experimental and a control group. Such designs, however, do not exclude the possibility that the posttest measures of the experimental and control groups are influenced by "external variables" which covaried with time.

In the current study, it is likely that the responses at Time 2 were influenced by the media. Immediately after it was established, the media presented extensive reports and evaluations of the lane, most of which conveyed a skeptical attitude toward the experiment; for example, the initial use fell short of expectations, and there were operational problems. Indeed, we conducted a content analysis of a random sample of 22 newspaper articles. All were published shortly after the opening of the carpool lane and 16 contained negative reviews.⁵ Such coverage may help to explain why the preferences for carpooling were lower at Time 2 not only for the experimental but also for the control group. In addition, solo drivers who were not exposed directly to the carpool lane may have concluded from these reports that commuters were not willing to carpool even in more favorable circumstances (i.e., in the presence of a carpool lane); this may have further weakened their preference for carpooling.

The current research makes a novel contribution to our knowledge and understanding of structural solutions to real-life social dilemmas. In particular, it extends prior research

focusing on structural solutions in laboratory-based dilemmas, which asks why people opt for structural solutions (e.g., Messick et al. 1983; Samuelson 1991; Samuelson et al. 1984). This line of research has revealed that dissatisfaction with the current situation *per se* is not sufficient to cause acceptance of structural change; acceptance also depends on whether the public perceives such solutions to be efficient, fair, and in line with people's self-interest and self-determination (see Samuelson 1993; Samuelson and Messick 1995). Such evaluative processes also may be at work when people suddenly are confronted with a structural change in a real-life situation. Our findings add credence to this claim by showing that a structural solution may not succeed if it fails to provide substantial personal benefits or if large numbers of people are prevented from receiving such benefits.⁶

Although we ourselves do not wish to engage in self-justification, we believe that experimentation with the carpool priority lane has taught us the following important lessons about when structural solutions are likely to succeed. First, before implementing structural measures it seems important to know more about the proportion of people who believe they are not capable of performing the collectively desired action, so as to anticipate their feelings of frustration and relative deprivation. Second, thoroughly understanding why individuals are unwilling to cooperate (e.g., personal comfort, time pressures) seems important before undertaking any drastic structural measures, because people might use precisely those reasons to justify their decision not to cooperate.

Perhaps, in regard to transportation, structural solutions could be accompanied by initiatives of local institutions and organizations that presumably are better able to find solutions compatible with commuters' needs and wishes (see Ostrom 1990). That is, persons who are unwilling to carpool may be persuaded by receiving multiple benefits of

⁵ We drew the sample from a list of more than 80 published items about the lane, which appeared in six national and five local newspapers over a period of three months.

⁶ The validity of this conclusion was demonstrated in the case of the carpool priority lane. The Dutch government closed this lane less than a year after the opening. It has been widely acknowledged that this closure was due both to a lack of interest and to enduring resistance among solo drivers: They successfully fought in court the legitimacy of the lane from which, in their opinion, so many citizens were excluded.

carpooling (e.g., better parking places in combination with a carpool lane), so that this option becomes more consistent with their self-interest. Moreover, for commuters who are unable to carpool, these interventions should focus on removing important personal barriers (e.g., matching commuters in the same neighborhoods, coordinating work schedules) so as to increase their opportunity to cooperate when suddenly faced with a structural change in their commuting situation.

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