

Car Versus Public Transportation? The Role of Social Value Orientations in a Real-Life Social Dilemma¹

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This research evaluates the role of social value orientations (i.e., preferences for distribution of outcomes for the self and others) in decisions as how to commute. It was proposed that the commuting situation could be viewed either as an environmental issue, reflecting the decision structure of an N-person Prisoner's Dilemma, or as an accessibility problem, reflecting the decision structure of an N-person Chicken Dilemma. On the basis of interdependence theory (Kelley & Thibaut, 1978) it was predicted that people who are primarily concerned with the collective welfare—prosocial individuals—would prefer commuting by public transportation when other commuters were expected to go by public transportation. On the other hand, it was hypothesized that people who are primarily concerned with their own well-being—proself individuals—would prefer commuting by public transportation when others were expected to go by car. The obtained findings were consistent with these expectations. Practical and theoretical implications regarding the link between social value orientations and environmentally relevant behavior will be discussed.

It is widely assumed that the car is one of the greatest inventions of human technology. People ascribe to cars highly rewarding qualities like convenience, efficiency, and individual freedom. Despite these positive qualities, society

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increasingly faces serious problems caused by the massive use of cars. Currently, many major cities in the world are trying to cope with air pollution, noise, and congestion because they have relied all too heavily on cars as a means of transportation, while ignoring alternatives such as public transportation, biking, or walking. In a study of 32 of the world's major cities, Newman and Kenworthy (1989) found wide variations in the percentages of people commuting by car. In Washington, DC, for example, 81% commuted by car; in Amsterdam, 58% commuted by car, whereas, in Tokyo, only 16% commuted by car. It is clear that decisions regarding commuting by car versus public transportation are affected by structural variables such as a scarcity of parking space, the likelihood of traffic jams, and differences in the quality or costs of cars versus the quality or costs of public transportation. In The Netherlands, where 55% commute by car (Central Bureau of Statistics, 1991), both cars and public transportation are often equally viable commuting options because these options do not tremendously differ in travel time or travel costs.

The current research uses interdependence theory (Kelley & Thibaut, 1978) to analyze the decision to commute by car versus public transportation. Our main assumption is that individuals may construe the decision situation as either an environmental issue or an accessibility problem. Moreover, it is assumed that such construals may vary as a function of the individual's social value orientation (i.e., individual's preferences for particular patterns of outcomes for the self and others; Messick & McClintock, 1968). On the basis of these assumptions some hypotheses will be tested regarding the influence of social value orientations on preferences for car versus public transportation in a commuting situation.

Car Versus Public Transportation: An Interdependence Analysis

The decision to commute by car or by public transportation has consequences not only for the commuter himself or herself but also for others. An individual's well-being may be strongly affected by the choices of others in at least two different ways. As more people commute by car rather than by public transportation, the individual may experience (a) the negative effects of environmental pollution and/or (b) the costs associated with traffic congestion, provided that he or she commutes by car as well. Similarly, the individual's own choice affects the well-being of others. This interdependent situation is, to some extent, problematic because the individual's own well-being may be better served by a choice for the car, given that it may yield greater individual outcomes in terms of convenience, flexibility, and privacy, whereas the well-being of others is better served by the individual choice for public

transportation, which contributes neither to pollution nor to congestion. This particular type of interdependence yielding a conflict between individual and collective interests is better known as a *social dilemma* (Dawes, 1980; Messick & Brewer, 1983).

Individuals may construe a situation in which they must decide to go by car or by public transportation in at least two distinct ways (cf. Van Vugt, Meertens, & Van Lange, 1994). First, the decision to commute by car or by public transportation can be interpreted as a choice between the pursuit of a person's own immediate outcomes (i.e., personal convenience) versus a concern with the collective well-being in the long run (i.e., our environment). According to this interpretation, the choice for the car is attractive from an individual short-term perspective. Relative to public transportation, the car generally provides more convenience, flexibility, and privacy. On the other hand, the choice for public transportation is attractive from a collective long-term perspective because public transportation produces fewer waste materials that threaten the quality of our environment relative to cars. The structure of interdependence underlying this interpretation resembles an N-person Prisoner's Dilemma Game (Dawes, 1980; Hamburger, 1979; Van Lange, Liebrand, & Kuhlman, 1990) or a *social trap* (Platt, 1973). According to this interpretation, the option of going by car (i.e., noncooperative choice) is always more attractive to an individual regardless of other individuals' choices. However, if all individuals opt for the car, then each individual is ultimately worse off than if all individuals had opted to go by public transportation (i.e., cooperative choice).

A second possible interpretation of the decision to commute by car or by public transportation is instigated by considerations of travel time, ride continuity, and accessibility. The decision situation is viewed not so much in terms of long-term societal consequences but in terms of the immediate costs and benefits for oneself: "Would it be more efficient or quicker to go by car or public transportation?" The interdependence structure reflecting this accessibility interpretation is fundamentally different from the interdependence structure reflecting a choice between personal convenience and our environment. According to an accessibility interpretation, the choice for commuting by car is more attractive as fewer individuals choose to go by car because of a lower probability of time delays caused by traffic jams, and/or parking problems. However, when the number of other people commuting by car exceeds a certain limit, the choice for public transportation may yield greater outcomes for oneself because congestion can be avoided. The structure of interdependence underlying an accessibility interpretation resembles the so-called N-person Chicken Dilemma Game (Liebrand, 1983; Liebrand, Wilke, Vogel, & Wolters, 1986). Individuals are better off choosing the car (i.e., noncooperative choice)

than public transportation (i.e., cooperative choice) when a sufficient number of other individuals do not opt for the car.³

Transformation of Motivation: The Role of Social Value Orientations

What factors determine whether individuals construe the decision to commute by car or by public transportation as an environmental versus accessibility problem, or as a Prisoner's versus Chicken Dilemma Game, respectively? The fundamental assumption underlying the current research is that judgments and decisions regarding commuting by car versus public transportation are shaped by what Kelley and Thibaut (1978 in their interdependence theory) referred to as transformation of motivation. They argued that it is unlikely that all or most individuals make their choices on the basis of the same objective decision situation or the given matrix that represents an individual's immediate outcomes. Indeed, one may assume that any given structure of interdependence undergoes a series of transformations so as to reach an effective matrix that is more directly predictive of behavior in interdependent settings. Such transformations may, on the one hand, be dictated by an individual's self-interested concerns, such as considerations of personal prosperity and well-being. On the other hand, such transformations may be dictated by broader concerns, such as consideration of collective welfare, willingness to contribute to a good future, or motivation to set a good example for other individuals.

One of the factors that may determine these divergent transformations are social value orientations (McClintock, 1972) or differences in the way individuals evaluate outcomes for themselves and others. There is empirical support for at least three distinct orientations (Kuhlman & Marshello, 1975; Messick & McClintock, 1968; McClintock & Liebrand, 1988): cooperation (i.e., the tendency to maximize joint welfare), individualism (i.e., the tendency to maximize one's own welfare, with no or very little regard for others' welfare), and competition (i.e., the tendency to maximize relative advantage over others' welfare). Accordingly, cooperators or prosocial individuals should primarily evaluate interdependent situations in terms of collective welfare, whereas proself individuals (individualists and competitors) should primarily evaluate such situations in terms of their own well-being.

³Formal descriptions of the Prisoner's and Chicken Dilemma Games are discussed in more detail by Kelley and Thibaut (1978) and Liebrand (1983). It should be noted that the Chicken Dilemma represents an interdependence structure that is very similar to the one obtained by an accessibility interpretation (cf. Liebrand, 1983); however, this is not to deny that other games that similarly—or even more extensively—represent possibilities for coordination (e.g., "Battle of Sexes," as suggested by Harold Kelley [personal communication, May 3, 1994]) may also serve as a model for an accessibility interpretation in this commuting context.

Over the past decades, this claim has received considerable support, revealing that, compared with individualists and competitors, prosocials are more likely to exercise personal restraint and to make cooperative choices in a variety of interdependent situations, including social dilemma tasks (Knight & Dubro, 1984; Kramer, McClintock, & Messick, 1986; McClintock & Liebrand, 1988; Sattler & Kerr, 1991; Van Lange & Kuhlman, 1994). Although much of this work has focused primarily on decision making in relatively abstract contexts (i.e., using experimental games as a means to induce and examine interdependent situations; for exceptions, see McClintock & Allison, 1989), the findings highlight the idea that prosocially oriented individuals assign greater weight and attention to the long-term collective consequences, whereas individualists and competitors primarily focus on their immediate self-interests.

Thus, in the context of commuting decisions, it is likely that prosocials, more than individualists and competitors, take into account the long-term collective consequences for the environment by evaluating how much cars and public transportation differ in terms of the amount of harm done to the environment. That is, they are assumed to primarily transform the situation into an N-person Prisoner's Dilemma Game. Conversely, individualists and competitors are more likely than prosocials to consider their short-term self-interest by evaluating how much these options differ in personal convenience, flexibility, and accessibility. Because the individual outcomes associated with travel time by car (vs. public transportation) depend largely on the decisions of others, we assume that proself individuals will view the situation primarily as an N-person Chicken Dilemma Game.

Research Design and Hypotheses

The above provides a conceptual framework with which it is possible to understand how individuals with differing social value orientations may construe—and behave in—a real-life social dilemma, concerning the decision to commute by car versus public transportation. Ideally, one would like to examine such issues in the real world; however, it seems exceedingly difficult to successfully manipulate subjects' beliefs regarding other people's commuting choices because of various situational and ethical constraints (Cooper, 1976; Weiner, 1980). Accordingly, the current research complements prior research on social dilemmas by examining a hypothetical commuting task designed to simulate decisions regarding car versus public transportation as closely as possible by using actual commuters and by presenting outcomes in terms of the magnitudes of travel time and environmental pollution. This task was used to test three hypotheses following from our prior discussion and further explicated in the next paragraphs.

Hypothesis 1: Given prosocials' concern with collective welfare and proselves' concern with their own well-being, we predicted, first, that prosocials would exhibit a stronger preference to commute by public transportation than proselves who would be more likely to prefer commuting by car. Support for this prediction would not only provide evidence in support of the ecological validity of social value orientations, but would also contribute to our understanding of the determinants of environmentally relevant behavior. This seems particularly important in light of Stern's (1992) extensive review of environmental change, in which he concluded that "personality variables rarely show systematic relationships to environmentally relevant behavior, with the exception of locus of control and related variables" (p. 284). Furthermore, he asserted that little is known regarding environmental's behavior link with motives or values such as egoism and altruism (pp. 279-281).

Hypothesis 2: Second, based on the assumption that prosocials primarily construe the situation as an environmental issue (resembling an N-person Prisoner's Dilemma), whereas proselves primarily construe it as an accessibility problem (resembling an N-person Chicken Dilemma), we predicted an interaction of social value orientation and expectations about others' commuting choices. In a considerable body of research regarding N-person Prisoner's Dilemmas, it has been demonstrated that cooperative choices can be elicited by the cooperation of the majority of others (Liebrand et al., 1986; Schroeder, Jensen, Reed, Sullivan, & Schwab, 1983; Yamagishi, 1986). One of the possible explanations for this finding is that the behavior of a majority may give rise to conformity pressures that provide individuals with a standard as to what is the most appropriate thing to do. On the other hand, decisions in Chicken Dilemmas should be extremely sensitive to expectations of others' cooperative behavior because the individual outcomes are directly affected by the behavior of others. That is to say, noncooperation yields greater outcomes for self if the majority cooperates, but yields lower outcomes for self if the majority does not cooperate. Taken together, it is predicted that prosocials should exhibit a stronger preference for public transportation when they believe that the majority of others commute by public transportation. Conversely, proselves should be more strongly motivated to

commute by public transportation when they believe the majority of others commute by car.

Hypothesis 3: Furthermore, the interaction of social value orientation and expectations about others' choices, predicted in Hypothesis 2, may be more pronounced when the possibility of traffic congestion associated with commuting by car is more salient. Accordingly, the current research manipulated the possibility of congestion (no possibility vs. a clear possibility of congestion) to test the following specific hypothesis. When subjects believe that the majority commutes by car, proself individuals in particular may be more motivated to commute by public transportation under conditions in which there is a clear possibility of time delay (caused by congestion) than under conditions in which this is less of a possibility. For prosocials we predict that their preferences will take a similar form in these two conditions.

Although travel time and environmental pollution are assumed to be important, it is not expected that these are the only attributes that individuals take into account in evaluating car or public transportation in real-life commuting decisions. Accordingly, we administered a judgment task, in which we asked subjects to rate the two options on a list of travel attributes that are assumed to affect commuting decisions as well. This allows us to examine whether individuals, indeed, construe commuting decisions as a social dilemma: a deliberation between individual (e.g., travel convenience, travel flexibility, and travel time) versus collective outcomes (e.g., environment and public health). It may also provide some evidence in support of the ecological validity of the predicted relationship between social value orientations and commuting decisions. That is to say, relative to individualists and competitors, prosocials presumably assign greater weight to the collective outcomes and smaller weight to the individual outcomes of their travel decisions. To further investigate this issue, we examined how prosocial and proself individuals would respond to a serious environmental threat in their personal commuting situation.

Method

Subjects and Design

Thirty-one female and 25 male Dutch subjects were recruited by an advertisement in three Maastricht local newspapers inviting those who commute by

car to participate in a study about decision making in commuting situations. The average age of the subjects was 32 years. All subjects commuted by car on a daily basis. They were paid 25 Dutch guilders (about \$14 in U.S. currency) for their participation. The design was a $2 \times 2 \times 2$ (Social Value Orientation: Prosocials vs. Proselfs \times Expectations of Others' Commuting Choices: Majority Car vs. Majority Public Transportation \times Congestion: Absence of Congestion Possibility vs. Presence of Congestion Possibility). All variables were between-subjects factors. The major dependent variable was the individual's preference for commuting by car or by public transportation.

Procedure

The experiment was scheduled in groups of 6 subjects. Upon arrival, each subject was individually seated in front of a computer in a separate cubicle. Two tasks followed the general instructions: (a) the measurement of individuals' social value orientations, and (b) the simulation of a commuting situation. The experiment concluded with a postexperimental questionnaire and a careful debriefing.

The measurement of social value orientation. Each subject's social value orientation was assessed by a series of decomposed games (Messick & McClintock, 1968), which involve making choices between specific combinations of outcomes for oneself and for a (hypothetical) other. In the current research, we employed a computerized version of the Ring Measure of Social Value (Liebrand, 1984; McClintock & Liebrand, 1988). The Ring Measure of Social Value and related measurements of social value orientations have been shown to have good internal consistency and test-retest reliability over a period of 4 to 6 weeks. They also appear to be free of tendencies toward social desirability (Kuhlman, Camac, & Cunha, 1986; Liebrand, 1984; Platow, 1992). The task consisted of 32 choices between pairs of self/other outcome combinations (defined in terms of imaginary amounts of money). The total outcomes allocated to self, in comparison with the total outcomes allocated to the other, yielded an index of the subject's social value orientation: cooperative, individualistic, or competitive. The Ring Measure of Social Value is described in more detail in Liebrand (1984) and McClintock and Liebrand (1988).

Consistent with previous research, subjects were only classified if at least 60% of the choices were consistent with either one of the above orientations (cf. McClintock & Liebrand, 1988). Of 56 subjects, only 6 failed to meet these criteria and, from the classifiable subjects, 22 were classified as prosocial, 23 as individualistic, and 5 as competitive. Given the low number of competitors and the fact that our hypotheses were identical for individualists and competitors, we combined individualists and competitors to form a group of essentially

proself interested individuals. Accordingly, our analyses focused on differences between prosocial and proself individuals (for similar procedures, see Kramer et al., 1986; Van Lange & Liebrand, 1991).

Simulation of commuting situation. In the second task, we described a commuting situation to provide a context in which to examine subjects' preferences for commuting by car versus public transportation. The situation was designed in an attempt to parallel very closely actual commuting situations in the Netherlands. The distance between work and home was set at 40 km, which could be covered by car or by train. There was a highway near home and a railway station within 3-min walking distance from home. Subjects commuted during one week (i.e., for 5 days, from Monday through Friday). They were led to believe that the experiment was conducted with a total number of 180 people sitting before computers at 10 different locations (i.e., universities) and making commuting choices at the same time—so as to mimic the fact that commuting situations always involve a considerable number of interdependent others. It was made explicit that subjects' preferences for commuting by car versus public transportation were stored on their personal computers, which were said to be linked to a mainframe computer recording all individual responses for each day. Once each individual's preference was recorded, the mainframe computer would then provide information regarding the preferred choices of all commuters. In reality, however, there were not 180 subjects involved, and the personal computer simply stored the subject's own preferences.

Once the commuting situation was explained, it was made explicit that there would be serious environmental damage as that more and more individuals demonstrated a preference for commuting by car. Specifically, we stated that "the more people will commute by car, the more rapidly the vegetation at the side of the road will decrease as a consequence of acid-rain produced by cars; moreover, the greater will be the contribution to the greenhouse effect, which may threaten humanity in the future." In contrast to car use, it was stated that "regardless of the number of commuters, public transportation will not cause any damage to the environment."

Congestion. We manipulated the possibility of traffic congestion to examine whether the presence or absence of this possibility would affect car versus public transportation preferences. In the absence of congestion-condition it was stated that there would be no time delay associated with going by car, irrespective of the number of people who preferred to go by car. Subjects were told that going by car would always take about 40 min, regardless of the number of commuters going by car. In the presence of congestion condition, a serious time delay would occur when many others chose to go by car. It was stated: "Normally it will take about 40 min to commute by car. However, to the extent

that more people go by car, the travel time by car could increase to as much as 70 min." The travel time by public transportation was always about 50 min, including a 3-min walk from home to the railway station and a 2-min walk from the end station to work.

Expectations of others' commuting choices. Expectations of others' commuting choices were manipulated by providing subjects with information regarding the number and percentage of others who commuted by car or public transportation. Specifically, from Monday through Friday, subjects received information regarding the choices of all 180 commuters. This information, which was said to be provided by the mainframe computer, was given after each subject had stated his or her daily preference for going by car versus public transportation. In the majority car condition, the subjects were led to believe that a majority (range from 65% to 75%; $M = 70\%$) consistently commuted by car. In the majority public transportation condition, they were led to believe that a majority consistently commuted by public transportation (range from 65% to 75%; $M = 70\%$). Thereafter, the consequences of one's own and others' preferred choices, in terms of environmental damage and possible time delays were presented to the subjects. The consequences for the environment and travel time, as a function of expectations and presence versus absence of congestion possibility, are summarized in Table 1. This table also shows that, when a majority commuted by car in the presence of congestion condition, the daily travel time by car was either 61 or 62 min, rather than the 40 min used to travel by car in the other conditions.

Dependent Measures

Every working day, before subjects received information regarding the choices of others, they stated their own preferences for going by car versus public transportation on a scale ranging from *strong preference for car* (1) to *strong preference for public transportation* (7), as well as their actual choices of *car* (1) and *public transportation* (2).⁴

Postexperimental questionnaire. One of the goals of this postexperimental questionnaire was to examine the ecological validity of the simulated commuting task and the role of social value orientations in commuting decisions. First, we asked subjects: "What would you do when you are ready to leave home on a morning and, suddenly, there is a radio announcement saying that serious smog will occur if too many commuters go by car on that day?" Possible responses include *commute by car* (1) and *commute by alternative means of*

⁴Subjects were led to believe that these choices served as input for calculating the percentages of people commuting by car or public transportation.

Table 1

Environmental and Travel Time Consequences of Majority by Car and Majority by Public Transportation (P.T.)

Expectations of others' commuting choices	Environmental consequences	Congestion	
		Absence of congestion possibility	Presence of congestion possibility
Majority car	Serious damage produced by cars	40 min by car	61-62 min by car
	No damage produced by P.T.	50 min by P.T.	50 min by P.T.
Majority P.T.	Some damage produced by cars	40 min by car	40 min by car
	No damage produced by P.T.	50 min by P.T.	50 min by P.T.

transportation (2). Second, subjects rated their concern on a scale ranging from *very unimportant* (1) to *very important* (7) with each of seven travel attributes (travel time, travel costs, travel convenience, environment, public health, weather, and travel flexibility).

Information checks. To provide a check for the information about environmental damage and the manipulation of congestion, subjects were asked to rate the following statements about the decision situation: "If too many people choose to go by car on a day, there will be serious environmental damage"; and "If too many people chose to go by car on a day, there will be serious time delay." All subjects (100%) confirmed the statement that there would be serious environmental damage if too many subjects choose to go by car. Moreover, all subjects in the presence of congestion condition (100%), compared with 25% in the absence of congestion condition, believed that there would be a serious time delay if too many people chose to go by car, $\chi^2(1, N = 50) = 30.47, p < .001$. Generally, these checks indicated that the information was understood, although the result that 25% of the subjects in the absence of congestion condition believed that there would be a time delay clearly was less than ideal (we will address this issue in the discussion section).

After the working week, subjects were asked whether most of the 180

people had displayed a preference to go by car or by public transportation during the week on a scale ranging from *strong preference for car* (1) to *strong preference for public transportation* (7). The manipulation check of Expectations was highly significant, $F(1, 42) = 365.88, p < .001$. Subjects in the majority public transportation condition thought that the commuters had a stronger preference for going by public transportation ($M = 5.73$) than subjects in the majority car condition ($M = 2.04$). Finally, the subjects were debriefed, thanked, and paid for their participation.

Results

*Preference for Car Versus Public Transportation*⁵

Preferences for commuting by car versus public transportation on a scale ranging from *strong preference for car* (1) to *strong preference for public transportation* (7) were first analyzed in a $2 \times 2 \times 2 \times 4$ (Social Value Orientation: Prosocials vs. Proselves \times Expectations of Others' Commuting Choices: Majority Car vs. Majority Public Transportation \times Congestion: Absence of Congestion-possibility vs. Presence of Congestion-possibility \times Day: Tuesday through Friday) ANOVA with repeated measures for the last factor.⁶ This analysis revealed a main effect for social value orientation, $F(1, 42) = 3.79, p < .05$. Consistent with Hypothesis 1, prosocials ($M = 5.22$) exhibited a stronger preference for commuting by public transportation than did Proselves ($M = 4.17$).

More importantly, and consistent with Hypothesis 2, we observed an interaction of social value orientation and expectations, $F(1,42) = 4.47, p < .05$. Further tests for simple effects revealed that prosocials exhibited a greater preference for commuting by public transportation in the majority public transportation condition ($M = 5.75$) than in the majority car condition ($M = 4.77$), $t(20) = 1.73, p < .05$. In contrast, proselves exhibited a greater preference for commuting by public transportation in the majority car condition ($M = 4.85$) than in the majority public transportation condition ($M = 3.66$), $t(26) = 1.75, p < .05$. These findings (Figure 1) provide evidence in support of Hypothesis 2, which stated that prosocial individuals, indeed, construed the

⁵Preliminary analyses of the data revealed highly significant correlations between daily commuting preferences and commuting choices (r s varied from .76 to .82). Because of the greater variance in commuting preferences relative to choices and the fact that the hypotheses for these measures were identical, only the analyses of the first measure are reported here.

⁶Preference on Monday was excluded from this analysis because, at that point in the experiment subjects had not received information about other commuters' choices.

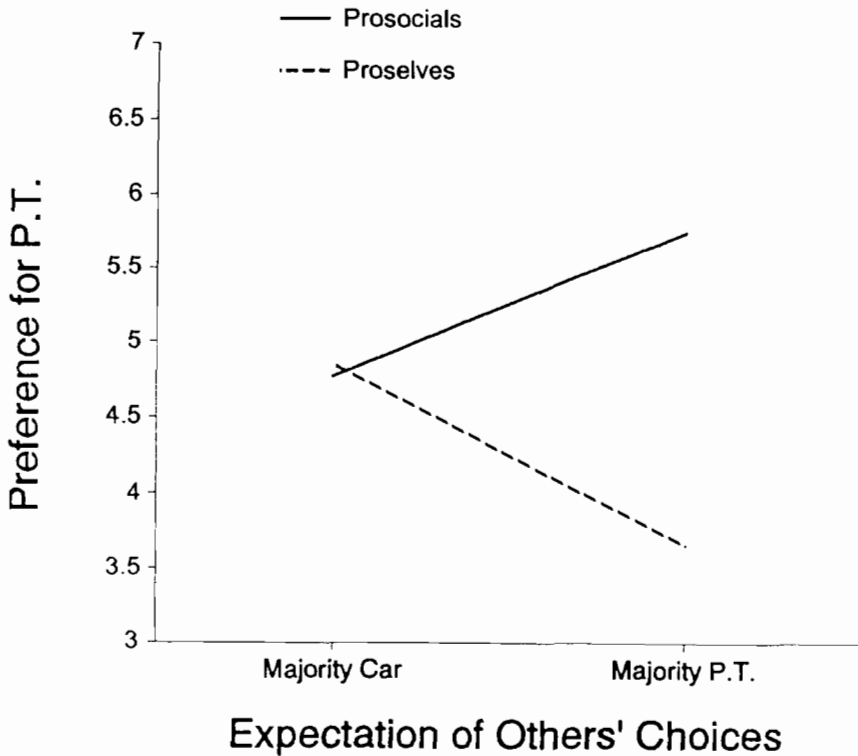


Figure 1. Interaction of social value orientation and expectations of others' commuting choices on preference for public transportation (P.T.).

decision situation as an N-person Prisoner's Dilemma, whereas prosel self individuals construed it as an N-person Chicken Dilemma.

In Hypothesis 3, we predicted that proselives would be more in favor of public transportation when (a) they expected a majority to prefer commuting by car and (b) they believed there was the possibility of a time delay. For prosocials, we expected that their preferences for public transportation would be enhanced when a majority preferred public transportation and that this would take a similar form in the absence of congestion and presence of congestion conditions. Ideally, evidence in support of Hypothesis 3 would be revealed by an interaction of social value orientation, expectations of others' commuting choices, and possibility of congestion. However, this interaction was not significant, $F(1, 42) < 1$. Additionally, we conducted a more precise analysis, testing whether there would be an interaction between expectations of others' choices and congestion for prosel self subjects. However, this two-way

interaction was not significant either, $F(1, 24) < 1$. Thus, we found no evidence supporting Hypothesis 3.

Next, we analyzed subject's preferences for Monday, examining whether preferences for public transportation versus car would be dependent on social value orientations when information regarding what the majority prefers could not influence such preferences. A 2×2 (Social Value Orientation: Prosocials vs. Proselfs \times Congestion: Absence of Congestion Possibility vs. Presence of Congestion Possibility) ANOVA revealed a marginally significant main effect for social value orientation, $F(1, 46) = 3.41, p < .08$. As predicted by Hypothesis 1, Prosocials ($M = 4.95$) tended to exhibit a stronger preference for commuting by public transportation than did Proselfs ($M = 4.07$).

Finally, after the commuting task, subjects were asked how they would respond to a radio announcement saying that serious smog would occur in their own commuting situation when too many people opted for the car. As one would expect on the basis of Hypothesis 1, more prosocial (100%) than proself subjects (70.6%) indicated that they would not continue commuting by car but, instead, would take an alternative means of transportation, $\chi^2(1, N = 50) = 5.23, p < .05$. Thus, this result complements the above findings by providing additional evidence in support of the ecological validity of social value orientations in commuting decisions.

Travel Concerns Related to Car Versus Public Transportation

In the introduction, we assumed that the decision to commute by car versus public transportation could be defined as a social dilemma, in which a concern with long-term collective welfare should lead to preferences for public transportation, whereas a concern with one's own immediate well-being should lead to preferences for traveling by car. Given these claims, it is important to examine whether individuals' preferences are related to these individual and collective concerns. Accordingly, we asked subjects to rate their concern on a scale ranging from *very unimportant* (1) to *very important* (7), with a list of travel attributes, some of which were more descriptive of cars, and some of which were more descriptive of public transportation. If the task, indeed, has ecological validity and subjects construe such decisions as a social dilemma, then individual concerns should correlate negatively and collective concerns should correlate positively with preferences for public transportation.

In Table 2, a summary is presented of the correlations between each of these concerns and the preference for commuting by public transportation. As can be seen in Table 2, collective concerns such as environment and public health correlated positively with the preference for public transportation. In contrast, individual concerns (e.g., travel convenience and flexibility) correlated

negatively with the preference for public transportation. Moreover, the two collective concerns intercorrelated positively (correlation of judgments of environment and public health), and most of the individual concerns were intercorrelated positively (e.g., several significant correlations between judgments of travel costs, travel flexibility, travel time, and travel convenience).

The distinction between individual and collective concerns received further support from the results of a principal component analysis on all of these concerns. After varimax rotation, this analysis revealed two factors with Eigenvalues greater than 1. The first factor explained 37 % of the variance and was described by the items travel convenience, travel flexibility (both with factor loadings of .86), and travel time (factor loading of .54). The second factor explained 27.2% of the variance, and was described by the items public health and environment (the respective factor loadings were .88 and .71). Accordingly, the first factor contained items representing individual concerns, whereas the second factor contained items representing collective concerns.

Thus, the correlational analyses in combination with the principal component analysis illustrate that the decision between car and public transportation entails at least one essential element of a social dilemma—a deliberation between individual concerns and collective concerns. Moreover, the fact that collective concerns were positively associated, and individual concerns were negatively associated with public transportation preferences, provides support for the ecological validity of the simulated commuting task.

Finally, to explore whether these concerns were related to social value orientations, we performed a MANOVA on individual and collective concerns including the full factorial design. First, the means on collective concerns (i.e., average of environment and public health items; $\alpha = .71$) for prosocials ($M = 5.73$) and proselves ($M = 5.13$) were in line with the prediction in Hypothesis 1, but the main effect of social value orientation on collective concerns did not reach acceptable levels of statistical significance, $F(1, 48) = 2.52, p < .11$. Furthermore, the effect of social value orientation on individual concerns (i.e., average of convenience, flexibility, and travel time items; $\alpha = .68$) was not significant, $F(1, 48) < 1$.⁷

⁷This analysis also revealed a significant interaction of social value orientation and expectations on individual concerns, $F(1,42) = 6.42, p < .02$. Means indicated that proselves assigned greater importance to individual concerns when the majority was expected to go by public transportation, whereas prosocials assigned greater importance to individual concerns when the majority was expected to go by car. This is in line with Hypothesis 2, which stated that prosocials transform the situation into an environmental problem (resembling a Prisoner's Dilemma Game), whereas proselves transform it into an accessibility problem (resembling a Chicken Dilemma Game).

Table 2
Correlations Between Travel Concerns and Preference for Public Transportation (P.T.)

	Preference for P.T.	Time	Costs	Convenience	Environmental	Flexibility	Public health
Preference for P.T.							
Travel time	-.18						
Travel costs	.14	.04					
Travel convenience	-.47**	.32*	.13				
Environment	.66**	-.20	.21	-.28*			
Travel flexibility	-.52**	.27*	.11	.71**	-.47**		
Public health	.34**	-.24	.35**	-.01	.55**	.02	
Weather	-.14	.31*	.25	.58**	-.02	.52**	.32*

* $p < .05$. ** $p < .01$.

Discussion

The present study was conducted in light of the belief that excessive car use may lead to a situation most of us would rather wish to avoid. We have used concepts derived from Kelley and Thibaut's (1978) interdependence theory to analyze how individuals may construe different interdependence structures of the same decision situation (i.e., commuting situation) according to their social value orientations. One of the major findings of the current research was that prosocials, relative to proselves, exhibited greater preferences for commuting by public transportation, and were more concerned with the collective outcomes (i.e., environment) of their decisions. In addition, a greater percentage of prosocials indicated that they were ready to stop driving their cars in case of a serious environmental threat in their working area. Generally, these results were in accordance with Hypothesis 1. These findings underline the role of social value orientations in how individuals approach and respond to a large scale social dilemma that exists in real life (cf. McClintock & Allison, 1989). Moreover, these findings complement prior research on environmentally relevant behavior, in that personality differences related to such concepts as egoism and altruism seem promising in advancing our understanding of environmental behavior (cf. Stern, 1992).

A further important finding was that prosocials exhibited a greater preference for commuting by public transportation when they were led to believe that the majority preferred to commute by public transportation than when they were led to believe that the majority preferred to commute by car. From an environmental point of view, one should, indeed, expect that it is morally less acceptable to take the car when a majority is going by public transportation (normative pressures; cf. Liebrand et al., 1986). For proselves we found the reverse effect: They were more strongly inclined to commute by public transportation if they were led to believe that the majority of others would commute by car. These findings are in line with Hypothesis 2, and they support the notion that prosocials transform the situation into an environmental issue (resembling an N-person Prisoner's Dilemma), whereas proselves transform it into an accessibility problem (resembling an N-person Chicken Dilemma).

However, contrary to Hypothesis 3, this interaction of social value orientation and expectations of others' commuting choices was not further influenced by the possibility of a time delay due to congestion. A post hoc interpretation for the absence of this finding may be that the manipulation of possibility of congestion was only partially successful (i.e., 25% of subjects in the absence of congestion condition believed that congestion was still a possibility). Presumably, because the subjects were daily commuters, they may have had a good deal of experience with traffic jams and, accordingly,

they may have paid little attention to information that was inconsistent with such experiences. Thus, it seems likely that, to a large extent, subjects have approached this simulated commuting task based on their own experience and, accordingly, may have been less responsive to information regarding congestion.

The finding regarding subjects' responses to an environmental threat in their own commuting situation deserves some further attention. All prosocials, versus about 70% of proselves indicated that, in case of a smog alarm, they would immediately leave the car at home and seek alternative means of transportation. This provides further support for the relevance of social value orientations regarding the way in which individuals approach serious environmental problems. Prior laboratory research has revealed that an enhanced level of group identity may be particularly useful in dealing with emergency situations (i.e., situations in which the collective resources were almost depleted; Kramer & Brewer, 1984). The current findings indicate that, in addition to group identity, personality differences reflected by social value orientations, to some extent, may influence the probability with which such situations become disastrous. It seems important, therefore, to conduct future research to explore how proselves, in particular, can be motivated to respond less selfishly to such alarming situations.

Before closing, we wish to outline some of the strengths and limitations of the scenario paradigm that was used in the current research. This methodology measures subjects' reports of how they would commute in a particular situation given the specific environmental and accessibility conditions. Consequently, a potential limitation of this paradigm is that it does not directly exclude tendencies toward favorable self-presentation or other self-enhancing processes, which, to some extent, may account for the fairly strong overall preference for public transportation. However, such tendencies are less likely to account for the effects involving social value orientation because the measurement of this variable has been demonstrated to be independent of tendencies toward favorable self-presentation (Platow, 1992). Moreover, it seems unlikely that the interaction between social value orientation and expectations of other commuter preferences is a result of a contemplative process in terms of favorable self-presentation. In this regard, it is also important to point out that several features of the current study (e.g., using actual commuters and creating a clear impression that many other commuters are involved) enhance the validity of the results obtained. Furthermore, several additional findings (e.g., judgments of several travel concerns in real life and how individuals respond to a smog alarm) are consistent with the notion that the hypothetical commuting situation, indeed, represented a social dilemma and that this dilemma is likely to be construed and solved differently by prosocial and proself individuals.

Nevertheless, it would be fruitful to replicate the current, preliminary work by using a paradigm that focuses more strongly on actual behavior, as well as on the real consequences of such choices.

Some implications of the current work are also worth discussing. Although interdependence theory (Kelley & Thibaut, 1978) has primarily focused on interpersonal, dyadic relationships and interactions, the current study shows that this theory may also serve as a useful conceptual framework in which to understand interdependent situations involving many other individuals. In contrast to more traditional social dilemma theories (e.g., rational choice theory and game theory) that view people as basically self-interested, interdependence theory denotes that human behavior is also shaped by considerations beyond an individual's immediate self-interest (e.g., prosocial motives).

One of the practical implications of the current findings is that remedies to the massive problem of environmental pollution should primarily focus on changing the behavior of individuals with proself orientations. The finding that these individuals are inclined to perceive the commuting situation as an accessibility problem with a structure very similar to an N-person Chicken Dilemma Game, contributes to an understanding of why campaigns stressing the significance of our environment may, in fact, be less effective than expected. That is to say, a moral appeal to the collective interest of a clean environment may further promote procollective behavior by prosocial individuals, but it may have very little impact on the behavior of proself individuals. Thus, in designing campaigns aimed at reduction of car use or other environmentally-damaging behaviors, one has to take into account the different interpretations people assign to such situations of interdependence (cf. Snyder, 1993). In light of the current results, it is plausible that proself individuals are particularly sensitive to arguments that emphasize the personal benefits of commuting by public transportation or the personal costs of commuting by car, such as travel time or travel convenience. It goes without saying that such messages are only effective to the extent that they are persuasive, which may require some structural changes in public transportation, such as an extension of networks, an increase in transport frequency, or an improvement in travel convenience and flexibility.

References

- Central Bureau of Statistics. (1991). *De mobiliteit van de Nederlandse bevolking 1991*. [The mobility of the Dutch population in 1991]. Heerlen, The Netherlands: Author.
- Cooper, J. (1976). Deception and role playing: On telling the good guys from the bad guys. *American Psychologist*, *31*, 605-610.

- Dawes, R. M. (1980). Social dilemmas. *Annual Review of Psychology*, *31*, 169-193.
- Hamburger, H. (1979). *Games as models of social phenomena*. San Francisco, CA: W. H. Freeman.
- Kelley, H. H., & Thibaut, J. W. (1978). *Interpersonal relations: A theory of interdependence*. New York, NY: John Wiley & Sons.
- Knight, G. P., & Dubro, A. F. (1984). Cooperative, competitive, and individualistic social values: An individualized regression and clustering approach. *Journal of Personality and Social Psychology*, *46*, 98-105.
- Kramer, R. M., & Brewer, M. B. (1984). Effects of group identity on resource use in a simulated commons dilemma. *Journal of Personality and Social Psychology*, *46*, 1044-1057.
- Kramer, R. M., McClintock, C. G., & Messick, D. M. (1986). Social values and cooperative response to a simulated resource conservation crisis. *Journal of Personality*, *54*, 101-117.
- Kuhlman, D. M., Camac, C., & Cunha, D. A. (1986). Individual differences in social value orientation. In H. Wilke, D. Messick, & C. Rutte (Eds.), *Experimental social dilemmas* (pp. 151-176). New York, NY: Verlag Peter Lang.
- Kuhlman, D. M., & Marshello, A. (1975). Individual differences in game motivation as moderators of preprogrammed strategy effects in prisoner's dilemma. *Journal of Personality and Social Psychology*, *32*, 922-931.
- Liebrand, W. B. G. (1983). A classification of social dilemma games. *Simulation and Games*, *14*, 123-138.
- Liebrand, W. B. G. (1984). The effect of social motives, communication and group size on behaviour in an N-person multi-stage, mixed-motive game. *European Journal of Social Psychology*, *14*, 239-264.
- Liebrand, W. B. G., Wilke, H. A. M., Vogel, R., & Wolters, F. J. M. (1986). Value orientation and conformity in three types of social dilemma games. *Journal of Conflict Resolution*, *30*, 77-97.
- McClintock, C. G. (1972). Social motivation—a set of propositions. *Behavioral Science*, *17*, 438-454.
- McClintock, C. G., & Allison, S. (1989). Social value orientation and helping behavior. *Journal of Applied Social Psychology*, *19*, 353-362.
- McClintock, C. G., & Liebrand, W. B. G. (1988). The role of interdependence structure, individual value orientation and other's strategy in social decision making: A transformational analysis. *Journal of Personality and Social Psychology*, *55*, 396-409.
- Messick, D. M., & Brewer, M. B. (1983). Solving social dilemmas: A review. In L. Wheeler & P. Shaver (Eds.), *Review of personality and social psychology* (Vol. 4, pp. 11-44). Beverly Hills, CA: Sage.

- Messick, D. M., & McClintock, C. G. (1968). Motivational basis of choice in experimental games. *Journal of Experimental Social Psychology*, *4*, 1-25.
- Newman, P., & Kenworthy, J. (1989). *Cities and automobile dependence: An international sourcebook*. Gower, England: Aldershot.
- Platow, M. J. (1992). *A note on the social desirability of pro-social choices in decomposed games*. Unpublished manuscript, University of Otago, Otago, New Zealand.
- Platt, J. (1973). Social traps. *American Psychologist*, *28*, 641-651.
- Sattler, D. N., & Kerr, N. L. (1991). Might versus morality explored: Motivational and cognitive bases for social motives. *Journal of Personality and Social Psychology*, *60*, 756-765.
- Schroeder, D. A., Jensen, T. D., Reed, A. J., Sullivan, D. D., & Schwab, M. (1983). The actions of others as determinants of behavior in social trap situations. *Journal of Personality and Social Psychology*, *19*, 522-539.
- Snyder, M. (1993). Basic research and practical problems: The promise of a "functional" personality and social psychology. *Personality and Social Psychology Bulletin*, *19*, 251-264.
- Stern, P. C. (1992). Psychological dimensions of global environmental change. *Annual Review of Psychology*, *43*, 269-302.
- Van Lange, P. A. M., & Kuhlman, D. M. (1994). Social value orientations and impressions of partner's honesty and intelligence: A test of the might versus morality hypothesis. *Journal of Personality and Social Psychology*, *67*, 126-141.
- Van Lange, P. A. M., & Liebrand, W. B. G. (1991). Social value orientation and intelligence: A test of the Goal-Prescribes-Rationality Principle. *European Journal of Social Psychology*, *21*, 273-292.
- Van Lange, P. A. M., Liebrand, W. B. G., & Kuhlman, D. M. (1990). Causal attribution of choice behavior in three N-person prisoner's dilemmas. *Journal of Experimental Social Psychology*, *26*, 34-48.
- Van Vugt, M., Meertens, R. M., & Van Lange, P. A. M. (1994). Commuting by car or by public transportation: An interdependence theoretical approach. In U. Schulz, W. Albers, & U. Müller (Eds.), *Social dilemmas and cooperation* (pp. 291-309). Berlin, Germany: Springer Verlag.
- Weiner, B. (1980). A cognitive (attribution)-emotion-action model of motivated behavior: An analysis of judgments of help-giving. *Journal of Personality and Social Psychology*, *39*, 186-200.
- Yamagishi, T. (1986). The structural goal/expectation theory of cooperation in social dilemmas. In E. Lawler (Ed.), *Advances in group processes* (Vol. 3, pp. 51-87). Greenwich, CT: JAI.