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Pro-Environmental Behavior and Its Antecedents as a Case of Social and Temporal Dilemmas

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Aims: Greater global and local responsible environmental behavior requires the consideration of future consequences of today's choices and decisions. As such, much pro-environmental behavior might be defined as cases of environmental social and temporal dilemma. The goal of this research was to assess the direct contributions of future orientation, subjective knowledge, and trust in people to environmental behavior, and their indirect contribution through their effects on willingness to sacrifice.

Study Design: Survey study. This survey was a part of an International environment quantitative survey project of ISSP (International Social Survey Programme).

Place and Duration of Study: The research is based on survey data collected in Israel during 2010.

Methodology: Survey data was collected by means of face-to-face interviews among 1216 respondents, which were a representative sample of the Israeli adult population. Pro-environmental behavior served as the dependent variable; future orientation, trust and subjective knowledge as three predictors and willingness to sacrifice were treated as a mediator. The data analysis included simple descriptive and zero-order correlations and the research model was tested by the structural equation model (SEM).

Results: SEM model found a very good fit between data and the research model and assumptions ($\chi^2/df = 3.503$), GFI = .988; CFI = .97). The three predictors - future orientation, subjective knowledge and trust in people - had a positive significant direct

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contribution to pro-environmental behavior and that future orientation and subjective knowledge also had a positive significant indirect contribution through their effect on willingness to sacrifice. Future orientation was found to be the central and most influential element in the model (direct impact .43, indirect impact .35).

Conclusion: We argue that the concepts and theories of environmental social dilemma and temporal dilemma are central for explaining the effects of future orientation, trust in people and subjective knowledge on environmental behavior.

Keywords: Environmental subjective knowledge; future orientation; Pro-environmental behavior; temporal and social dilemma; trust in people; willingness to sacrifice.

1. INTRODUCTION

Environment researchers and practitioners cite environmental human behavior as a major cause and also a major solution to the environmental crisis [1]. The argument for sustainable environmental behavior focuses on the close and more distant future of earth and mankind. The path to greater global and local responsibility for environmental change depends, in large part, upon change in the daily lives of humans [2], which requires the consideration of future consequences of today's choices and decisions. As such, much pro-environmental behavior might be defined as cases of environmental social and temporal dilemma.

In the present research, we examined a model designed to explain and predict pro-environmental behavior in Israeli society and willingness to sacrifice for the sake of the environment as an antecedent to such behavior. We placed the variable of general future orientation at the heart of the explanatory factors, and also included the variables of general trust in people and subjectively perceived knowledge, which are closely related to future orientation and environmental behavior. All these elements are connected by the perception of environmental behavior problems as social and temporal dilemmas.

1.1 Pro-Environmental Behaviors as a Social and Temporal Dilemma

"Social dilemmas are everywhere" [3] (p.281); they can be found in every sphere of social life, and are central in environmental problems [4]. Environmental problems often present people with at least two types of conflict of interest: temporal conflict and social conflict [5-8].

A temporal conflict is expressed in the time gap between immediate versus long term consequences of an actual action and between the actual action (environmentally beneficial or destructive) and its tangible or visible results. Research has shown that the greater the time gap between an action and its consequences, the more people tend to discount the subjective value of the future events and scenarios; thus these behavioral choices are affected more by present needs than by future ones [9,10]. Accordingly, it seems that environmental issues arouse temporal conflicts that lead to an inevitable and irreversible decline in the state of the environment or as [5] (p.289) noted: "Many of our most pressing environmental problems can be viewed as the result of an insidious arrangement of conflicting short-term individual and long-term collective consequences that gradually led us down a path that we might soon regret". The temporal dilemma is closely connected and is actually a part of the social dilemma.

The social conflict, or the social dilemma inherent in choices about environmental behavior, arises from the fact that while it is obviously desirable for individuals in society to cooperate on environmental issues such as overpopulation, resource depletion, or pollution, nevertheless – and this is the dilemma – it is also clear that no matter what others do, each individual is usually better off choosing to defect [6,11,12]. By taking this choice, the individual favors his/her own profits over the common environmental ones. Generally selfish thinking is about immediate profits, while common thinking deals with more distant profits, and this makes the connection between temporal and social dilemmas. The environmental social dilemma incorporates both (a) a social trap dilemma – the common resource dilemma (or the "tragedy of the commons", as [13] first termed it), in which the individual is tempted with an individualistic selfish immediate benefit that produces a cost shared by all (such as overconsumption of water); and (b) a social fence dilemma (or "the public goods dilemma") in which the individual avoids the cost or effort of contributing to a specific public good that is shared by all (such as sorting garbage) [3,14].

Many studies indicate three personal and environmental elements involved in creating environmental attitudes and behaviors, which are connected to the temporal and social dilemmas. Some of the central elements are: (a) future orientation – the tendency of people to perceive and ascribe value to future consequences of their present actions [5]; (b) subjective knowledge – information, knowledge and understanding of the implications of the behavior for the environment [3,15,16]; and (c) trust in people – some degree of social affinity to "people in general," or trust in the good intentions of those around you that lead to environmentally cooperative behavior [14]. Research has shown that in situations of social dilemma, there is less inclination to choose cooperative behavior rather than a non-cooperative individualistic behavior, and therefore, when it comes to the environment, the behavioral choices will often be unfavorable to the environment [5,17,18].

1.2 Future Orientation

An accepted indicator of the tendency to consider the future implications of one's present actions, in various areas of behaviors is the degree of future orientation. It is defined as the degree to which individuals or societies engage in future-oriented behavior such as planning, investing in the future, and delaying gratification [19]. Thus, future-oriented people may choose an action that promises a significant but future reward, even if it involves paying a price at the moment and will be more willing to sacrifice comfort, time and/or financial resources in favor of long-term goals. Accordingly, future-oriented people tend to choose pro-environmental solutions in temporal and social environmental dilemmas, as this general stable individual differences in future orientation are expressed by the extent to which people consider distant versus immediate consequences of potential behaviors [20].

Future-orientation scales measure the inclination of people to seriously consider future consequences. This quality together with cognitive understanding of the causes and consequences should cause people to act in a pro-environmental way. Absence of an inclination towards future orientation is positively associated with behavior that might jeopardize future goals [21].

This general subject has been researched and defined in many ways, including its role in the context of the environment (for a review, see [5,22]) and was found to be important to developing pro-environmental attitudes and behavior. Research has shown that future-oriented individuals manifested more pro-environmental attitudes and behaviors than present-oriented people did regarding various environmental issues, such as: water

conservation, reducing waste, recycling, support of bio-diversity, commuting to work by car or public transportation, willingness to limit resource consumption and so on [6,17,20,23-26].

We hypothesized that a high score on the future-orientation scale would predict pro-environmental behavior directly, as well as indirectly, through a positive effect on willingness to sacrifice.

1.3 Subjective Knowledge about Causes and Consequences of Environmental Behavior

Some researchers argue that one of the necessary conditions for promoting change in environmental behavior and for successful resource management is an increase in environmental knowledge of how on-going environmental deterioration will affect future generations [3,15,16,27]. The relevance of knowledge to shaping pro-environmental attitudes and behavior has been widely researched, yielding a comparative assessment of the predictive ability of different types of knowledge regarding such attitudes and behavior. The most reliable predictor of environmental behavior was found to be concrete knowledge about how to implement actions (action-related knowledge) and about their effectiveness in protecting the environment (effectiveness knowledge)[15,16,27-29].

Another distinction is between objective knowledge, that is, people's accurate stored information, and subjective (or perceived) knowledge, which represents people's self-beliefs about their own knowledge [30]. [31] Did not find a significant correlation between the two types of knowledge and noted that subjective knowledge predicted environmental behavior better than objective knowledge did. Here we will discuss subjective knowledge, which reflects the feeling of ordinary people that they are capable of understanding the reasons for environmental problems and ways to resolve them.

An examination of environmental behavior from the perspective of a social dilemma further supports the expectation that knowledge will promote environmental behavior. Environmental temporal dilemmas are characterized by uncertainty about causes and future outcomes of various choices of environmental behaviors. [3] Claimed that uncertainty results in lower levels of cooperation and [4] (p.170): "Environmental uncertainty tends to promote overuse because most users are optimistic about the future and underestimate the damage they are doing to the environment."

[32] Found that in social dilemmas and understanding or knowledge about the "game" yielded greater cooperation. They suggested that cooperation was elicited because of better abilities to understand the problem and to assess possible ways of controlling the outcomes. Although real life situations are different from laboratory games situations, it is reasonable that knowledge of environmental issues and knowledge of action strategies contributes to motivate a person to choosing the desirable cooperative pro-environmental behavior over the "rational" selfish one that people often adopt in situations of environmental dilemmas [4].

Following this line of reasoning, we hypothesized that people who feel they better understand the causes of environmental problems and the potential consequences of strategies to combat these problems will be relatively more willing and more likely to take such action.

1.4 Trust in People

One of the three principal elements needed to enhance cooperation in social dilemma situations is trust (the other two are knowledge and morality), specifically, the trust that others facing the same dilemma will not defect [12]. [33] Also discussed the important role that trust plays in cooperation and claimed that cooperation among individuals requires reciprocity. Reciprocity can be manifested in the amount of mutual trust among people and may be one of the resolutions of social dilemmas.

Even if people have good understanding of the causes of environmental problems and ways to resolve them, and even if they have a high level of (self-reported) willingness to make sacrifices for the sake of the environment, this is not a full guarantee that they will exercise pro-environmental behavior. [14] (pp.184-185) Explained how social dilemmas inevitably lead to deficient results, or what he terms “a tragedy”: “A group of people facing a social dilemma may completely understand the situation, may appreciate how each of their actions can contribute to disastrous outcome, and still be unable to do anything about it.” Nevertheless, he suggested solutions to social dilemmas. One of these was strategic solution by reciprocity. He claimed that the expectation of reciprocity has a critical impact on the actions of individuals, causing them to behave favorably towards society. The expectation of reciprocity is reflected in people’s evaluation of those around them as partners or as exploiters, or in other words, in the degree of trust they place in others.

[34] Also suggested that interpersonal trust may promote pro-environmental behavior. He postulated that environmentally responsible behavior can spread and that members of a society can influence each other to behave pro-environmentally, as long as they have established mutual trust. Interpersonal trust (or lack of trust) was mentioned as a barrier to creating pro-environmental behavioral change [35]. Similarly, others noted that trust in people or the belief that others will not exploit one's goodwill, is a crucial factor for cooperation [36,37].

In the present research we examined the general trust of people in others and hypothesized that this trust would be a significant predictor of pro-environmental behavior.

1.5 Willingness to Sacrifice for the Sake of the Environment

Willingness to sacrifice for the environment represents the extent to which individuals confronted with day-to-day environmental dilemmas consider the well-being of the environment, even at the expense of immediate self-interest, effort or costs [38]. Willingness to sacrifice for the environment is one of the predictors of environmental behavior in various models and theories and serves as a mediator between environmental attitudes and pro-environmental behaviors [39,40].

According to [38] willingness to sacrifice for the environment may be especially important when deciding on environmental action, which involves the psychological tension between one’s immediate best interests and one’s future orientation towards the greater good of the environment, which is the central element of a social dilemma. They emphasized the impact of the relative weight attributed to short-term compared with long-term considerations in determining the degree of willingness to make sacrifices for the sake of the environment. Therefore, in the present research, we hypothesized that future orientation would be a

predictor of willingness to make such sacrifices, because it measures the relative weight given to long-term considerations.

Thus we examined the role of willingness to make sacrifices in the form of pro-environmental behavior as a mediator between subjective knowledge, future orientation and trust in people, on the one hand and environmental behavior, on the other hand.

1.6 Pro-environmental Behavior

Environmental behavior includes a wide range of human behaviors that affect the environment. Actually, it is not the conduct per se but its environmental impact that matters [41]. Accordingly, in this research we adopted the impact-oriented (as distinguished from intent-oriented) definition of environmental behavior: "the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself" [38] (p.407). Pro-environmental behaviors are those behaviors that may have a positive impact on the environment and at least they will not have a negative impact.

The range of environmental behaviors is as vast and varied as the range of environmental issues. They consist of, for instance: (a) environmental activism or environmental citizenship, which refers to different forms of active involvement in environmental organizations and demonstrations; and (b) private-sphere behaviors, which deal with concrete environmental practices: the purchase, use, and disposal of personal and household products that have environmental impact [35]. These behaviors differ in their specific consequences for the environment and in many other measurable characteristics, such as difficulty of performance, intensity, frequency and duration [16]. In many cases pro-environmental behavior is a kind of social and temporal choice that requires the actor to give up present self-enhancing habits and adopt behaviors for the sake of a better future for her/himself, for other people and for environmental sustainability [3,4,11].

1.7 The Context of Israel's Environmental Situation

This research investigated an Israeli sample. Understanding the Israeli environmental context is important as a background for its results. Like other nations, Israel faces severe environmental problems today. Among the more important reasons: rapid population growth; rapid industrialization and increased affluence including use of automobiles. In addition, environmental concerns were largely ignored because of the need to consider security as a top priority. The greatest threats to the environment are those facing common resources, such as public lands, water supplies and air quality. Israel's limited water sources are endangered by industrial, agricultural and municipal sewage (Israel 2013 is the heaviest pesticide user in the OECD); disposal of solid waste has become a thorny issue (over 80 percent of Israel's trash is still buried in dumps); less than one percent of Israel's electricity comes from renewable energy and air pollution is a serious problem as a result of heavy industry and a steep rise in automobile use (according to the Ministry of Environmental Protection, in Israel 2013, 800 people die each year due to air pollution); loss of open space and recreational areas is another serious environmental problem in Israel [42,43].

Israel is not devoting sufficient resources to environmental issues. Ministry of Environmental Protection was established in 1988, but its mandate is limited, its budget small and number of personnel modest. However an improvement can be seen in recent years. Legislation was

developed to reduce pollution, waste sorting and other environmental problems. The ability of citizens and groups to enforce environmental regulations in the domain of civil law was bolstered in 1992 with the passage of the Law for the Prevention of Environmental Nuisances. Some Israeli environmental groups are increasing their efforts to enlarge the public's environmental awareness through hikes and other educational activities and through promoting legislation and its enforcement, and the environmental education curriculum is spreading through the educational system and the general population's awareness to environmental issues is slowly growing up [42,43]. But all these changes and activities are not enough yet to overcome the severe environmental problems. As a result of this situation we expected to find in Israel only an average level of the research variables in relation to environment.

1.8 The Research Hypotheses

In the present research we employed a survey that was broad in terms of size (1216 respondents), scope (a representative sample of the Israeli population) and quality (personal interviews), in order to examine the following hypotheses that are derived from the literature review.

1. People with a stronger future orientation will behave more pro-environmentally.
2. People who feel they have more knowledge about the causes and solutions of environmental problems will exercise more pro-environmental behavior.
3. People with greater basic trust in others will have a greater tendency towards pro-environmental behavior.
4. People with greater willingness to sacrifice for the sake of the environment will act more pro-environmentally.
5. Stronger future orientation, subjective feeling of environmental knowledge and basic trust in people will indirectly enhance pro-environmental behavior through their effect on willingness to sacrifice for the sake of the environment.

2. METHODS

2.1 Sample and Data

The ISSP is an international social studies work group that conducts population surveys as a basis for comparative research on various topics of social significance. Quantitative self-reported data are collected by means of face-to-face interviews with a representative sample of the adult population in each country (in Israel, the data are collected in both the Jewish and the Arab sector and interviews are held in Hebrew, Russian and Arabic). The variables and data in the present research are based on survey data collected in an environment module of ISSP in 2010. We added to the Israeli questionnaire a special module that included future orientation items.

The sample included 1216 respondents, a representative sample of the adult population (age > 18 years) in Israel, comprised of 654 (53.8%) females and 562 (46.2%) males. Their ages ranged from 18 to 93 years, with an average of 46.1 years and a standard deviation of 18.38 years. Of the total sample, 1023 (84.1%) were Jews and 193 (15.9%) were Arabs.

2.2 Variables

Future orientation was measured by the Consideration of Future Consequences (CFC) Scale, which is the instrument most commonly used to measure future orientation and has been shown to be a reliable predictor in the environmental context [6,17,20,23,24,25,26].

The CFC scale assesses the degree to which people take into consideration distant (as opposed to immediate) consequences of their behavior [20,44]. The scale consists of 12 items; respondents rate the degree to which they feel each item describes them. The instrument was translated into Hebrew following the instructions for intercultural research [45]. First, two independent professional translators translated the CFC and then the two translated versions were compared. The Hebrew version was then tested on a small sample of 43 undergraduate students, who commented on it, and final corrections were made based on their feedback. Research [44,46] indicated that the CFC scale was comprised of two underlying factors, which they labeled as the CFC-Immediate and CFC-Future subscales. Higher scores in CFC Immediate were found to predict lower levels of the trait self-control, and therefore CFC Future had to be reversed in the coding for future orientation index. We adopted their suggestion of these two subscales; in our model we treated CFC as a latent variable that contained the two observed variables. The Cronbach's α of these two subscales was higher than 0.7 (Table 1).

Table 1. Research measures

Variable and items	Mean \pm SD	Median	n
Future orientation			
Ranking: 1=disagree strongly, 5=agree strongly (CFC Immediate items were reversed so that lower CFC denotes lower future orientation)			
1. CFC Immediate, $\alpha=.786$	3.19 \pm 0.762	3.17	1167
2. CFC Future, $\alpha=.719$	3.44 \pm 0.711	3.40	1162
Subjective knowledge			
Ranking: 1=nothing at all, 5=a great deal $\alpha=.723$ "How much do you feel you know about..."			
1. The causes of these ^a sorts of environmental problems?	3.34 \pm 1.221	3	1194
2. Solutions to these sorts of environmental problems?	2.73 \pm 1.211	3	1187
Trust in people $\alpha=.654$			
1. Would you say that most people can be trusted, or that you can't be too careful in dealing with people? (1=you can't be too careful, 5=most people can be trusted)	2.82 \pm 1.196	3	1204
2. Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair? (1=most people would try to take advantage, 5=most people would try to be fair)	2.95 \pm 1.094	3	1183
Willingness to sacrifice, $\alpha=.80$			
Ranking: 1=very unwilling, 5=very willing "How willing would you be to..."			

Continue Table 1.

1. Pay much higher prices in order to protect the environment?	2.86±1.097	3	1196
2. Pay much higher taxes in order to protect the environment?	2.51±1.109	2	1208
3. Accept cuts in your standard of living in order to protect the environment?	2.83±1.070	3	1196
Environmental behavior: 'private-sphere' behaviours, α=.714			
Ranking: 1=never, 4=always			
"How often do you"...			
1. Make a special effort to sort glass or tins or plastic or newspapers and so on for recycling? ^b	2.52±1.091	2	1108
2. Make a special effort to buy fruit and vegetables grown without pesticides or chemicals? ^c	1.51±0.797	1	1055
3. Cut back on driving a car for environmental reasons? ^d	1.44±0.755	1	872
4. Reduce the energy or fuel you use at home for environmental reasons?	1.61±0.887	1	1181
5. Choose to save or re-use water for environmental reasons?	1.98±1.092	2	1197
6. Avoid buying certain products for environmental reasons?	1.71±0.902	1	1200

^aThis question was preceded by a list of environmental problems.

^b93 respondents (7.6%) reported that 'recycling is not available where I live'.

^c 141 respondents (11.6%) reported that 'organic food is not available where I live'.

^d 322 respondents (26.5%) reported 'I do not have or cannot drive a car'.

Subjective knowledge was measured with two items (Table 1). These two observed variables were used in the SEM model to build the latent variable "subjective knowledge."

Trust in people was measured by two items (Table 2) that were used as two indicators of the latent variable "trust."

Table 2. Distribution of rankings of trust in people

Item 1	Ranking: 1= You can't be too careful, 5 = Most people can be trusted					Total
	1	2	3	4	5	
Would you say that most people can be trusted, or that you can't be too careful in dealing with people?	224 (18.6%)	208 (17.1%)	436 (36.2%)	230 (19.1%)	106 (8.7%)	1204
Item 2	Ranking: 1=most people would try to take advantage ... 5=most people would try to be fair					Total
Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?	136 (11.5%)	233 (19.7%)	467 (39.5%)	249 (21.0%)	98 (8.3%)	

Willingness to sacrifice for the sake of the environment was treated in the research model as a latent variable that was measured by three items presented in Table 1 (Cronbach's α =

.80). The overall level of these items was slightly below medium (Table 1), with averages ranging from 2.51 to 2.86.

Environmental behavior was treated as a latent variable with two indicators. The first indicator was “private sphere” (mean of 6 items), measuring the frequency of the respondents’ engagement in various daily practical behaviors. The overall level of these behaviors was quite low (5 of the items had an average of less than 2 on a scale of 4 degrees). The second indicator was “environmental activism” (sum of 4 binary items; Table 3).

Table 3. Distribution of engagement in environmental activism behavior

Variable	no	yes	n
1. Are you a member of any group whose main aim is to preserve or protect the environment?	1121 (93.0%)	85 (7.0%)	1206
2. In the last five years, have you signed a petition about an environmental issue?	1034 (86.5%)	162 (13.3%)	1196
3. In the last five years, have you given money to an environmental group?	1097 (91.0%)	108 (9.0%)	1205
4. In the last five years, have you taken part in a protest or demonstration about an environmental issue?	1145 (94.7%)	64 (5.3%)	1209

2.3 The Model

Pro-environmental behavior served as the dependent variable. We treated CFC, trust, and subjective knowledge as three predictors, and included the possible correlations between them (Fig. 1). Willingness to sacrifice was treated as a mediator between the three predictors and environmental behavior. We also tested the direct, non-mediated effects of the three predictors on environmental behavior.

2.4 Statistical Analyses

The data analysis was performed with SPSS 19. First, simple descriptive and zero-order correlations were computed. Missing data was replaced by means.

To test the structure of the model, we employed the structural equation model (SEM), using the AMOS software package [47]. SEM enables the testing of all sets of relationships simultaneously. It is recommended for multivariate models rather than bivariate correlations or stepwise regression analyses [16]. In addition, the parameters of the model were also estimated using the bootstrapping approach.

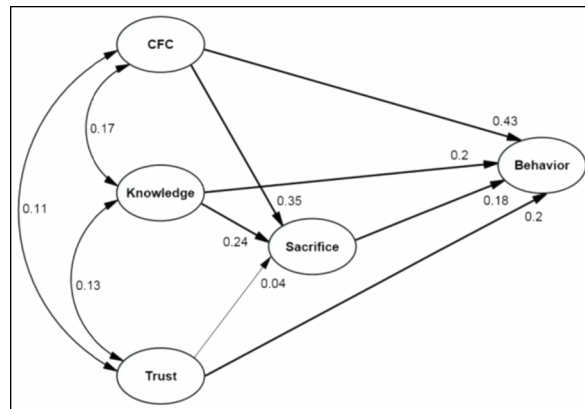


Fig. 1. SEM path model results

Numbers denote standardized coefficients. Bold lines denote significant effects ($P < .05$), and thin line denotes non-significant effects. Double-headed arrows represent standardized correlation, and single-headed arrows represent standardized regression weights.

3. RESULTS

3.1 Descriptive Statistics

The descriptive measures of the research model variables and items – means, standard deviations, medians, sample sizes and Cronbach's alpha coefficients – are presented in Table 1.

3.1.1 Future orientation

The overall distribution of CFC in the sample was symmetrical, with a mean for all the scale items of $3.307 \pm .606$, a median of 3.27, and an inter-quartile range of 2.91–3.73. The means of the two CFC subscales are presented in Table 1. The means indicate that the total level of future orientation was slightly higher than a medium level. It means that generally the Israeli people moderately tend to consider the future implications of their present actions and delay immediate rewards in various areas of behaviors, including pro-environmental behaviors.

3.1.2 Subjective knowledge

The means of the items are presented in Table 1. These findings suggest that the level of knowledge that people felt they had about causes or solutions of environmental problems was medium. Paired sample t-tests showed that the respondents felt they had more knowledge about the causes of environmental problems than about the solutions to these problems (3.34 ± 1.221 compared with 2.73 ± 1.211 , respectively; $p < .001$).

3.1.3 Trust in people

The data distribution indicates that the respondents had a medium (leaning towards low) level of trust in people. The distribution of the levels of interpersonal trust in the sample is presented in Table 2. Interestingly, and sadly, less than 9% felt that most people could be trusted or tried to be fair.

3.1.4 Willingness to sacrifice

The mean and median willingness to sacrifice for the environment did not exceed the medium level. Paired sample t-tests showed that the willingness to pay much higher prices or to accept a lower standard of living in order to protect the environment was significantly higher (3.34 ± 1.221) than the willingness to pay much higher taxes (2.73 ± 1.211) in order to protect the environment.

3.1.5 Environmental behavior

The items that were used to describe the frequency of engagement in environmental behavior practices are presented in Table 1 and those related to environmental activism or citizenship are presented in Table 3.

The mean and median frequencies at which the respondents engaged in environmental behavior were “sometimes,” at best, and “never” in most cases. Comparison of the types of behavior shows that the most frequent behavior was recycling of bottles, cans, or paper. At least half of the people reported that they never bought organic food, saved energy, drove less, or avoided buying certain products for pro-environmental reasons.

The vast majority (> 90%) had not taken part in any activism practices for the sake of environment in the last five years, as shown in Table 3.

3.2 The Model

Fig. 1 is a graphic illustration of the model tested. According to guiding recommendations [48,49] our model provided a good fit with the data : $\chi^2 = 63.06$ (df = 18), ($\chi^2/df = 3.503$), GFI = .988; CFI = .97; NFI = .959; IFI = .97; TLI = .94; RMSEA = .045.

The findings confirmed our hypotheses regarding the significant positive direct effects of the three independent variables – future orientation, subjective knowledge, and trust in people – on environmental behavior (Hypotheses 1-3). In addition, the effect of willingness to sacrifice on pro-environmental behavior was also significant and positive (Hypothesis 4). Hypothesis 5 was only partially confirmed: only the future orientation tendency and the subjective feeling of knowledge had an indirect impact on pro-environmental behavior through their significant and positive effect on the willingness to sacrifice for the sake of environment, while trust in people did have such a significant indirect impact. Of the three independent explanatory variables, future orientation had the primary and strongest leading direct (.43) and indirect (.35) impact on pro-environmental behavior, while subjective knowledge had a secondary and weaker impact (.20 and .24) and trust in people had the weakest impact (.20 and .0).

Using a bootstrap approximation, which was obtained by constructing two-sided bias-corrected confidence intervals, we calculated the standardized direct (unmediated), indirect (mediated) and total effects of the three predictors on behavior and their statistical significance (Table 4). Most of the effect of each independent variable was direct. All the effects (direct, indirect, and total) of the independent variables on behavior (with the exception of the indirect effect of trust on behavior) were statistically significant. All the variables in the examined model explained 44.1 per cent of the variance in pro-environmental behavior.

The low correlations between the independent variables - future orientation, subjective knowledge, and trust in people – indicate that each of them had its own independent effect on environmental behavior.

Table 4. Standardized effects of CFC, trust and knowledge on behavior

Variable	Total effect	P-value	Indirect effect	p-value	Direct effect	p-value
CFC	.491	.001	.061	.002	.429	.001
Knowledge	.241	.002	.042	.003	.199	.002
Trust	.203	.011	.008	.183	.195	.012

4. DISCUSSION

The goal of this research was to assess the direct contributions of future orientation, subjective knowledge, and trust in people to environmental behavior, and their indirect contribution through their effects on willingness to sacrifice. We found that the three factors had a positive significant direct contribution to environmental behavior and that future orientation and subjective knowledge also had a positive significant indirect contribution through their effect on willingness to sacrifice, confirming our hypotheses. We argue that the concepts and theories of environmental social dilemma and temporal dilemma are central for explaining the effects of each of these elements on environmental behavior and the connection between them.

4.1 Future Orientation and Pro-Environmental Behavior

Future orientation, as measured by consideration of future consequence (CFC), was found to be the central and most influential element in the model. It had a significant positive effect on environmental behavior, both directly and through willingness to sacrifice. This finding concurs with the extensive reports in the literature of a significant positive correlation between CFC and environmental attitudes and behavior [17,20,23,24,25,26]. [50] Argued that individual differences in CFC actually represent a cognitive mind-set that determines the extent to which the individual is influenced by potential immediate and distant outcomes in deciding how to act. In other words, high CFC guides the processing of information with regard to current behavior. The significant positive direct contribution of CFC to environmental behavior may be explained by the logic that when people with a general tendency to attribute greater importance to future developments make behavioral decisions, they also give more consideration to environmental processes that are liable to harm or to improve the future environment. Since the conflict in environmental dilemma situations is choosing between immediate selfish behaviors that pay off in the short term and cooperative behaviors that pay off in the longer space of future time (temporal dilemma), environmental research should put future orientation at the center.

However, an environmental dilemma is not only a temporal dilemma but also a social one. An inclination towards future orientation is not a sufficient condition for pro-environmental behavior [51]. In order for it to motivate pro-environmental behavior, the future outcomes need to be perceived as personally beneficial. To resolve the central environmental dilemma between immediate and long-term pay-offs, pro-environmental behavior has to offer synchronized personal and social benefits that enhance the conditions of the actor, her/his dear ones, society and earth all together.

If people with high CFC also feel they have basic knowledge about environmental problems and solutions, it is all the more reasonable that they will be motivated towards pro-environmental behavior. The finding that CFC also had some indirect effect on behavior (through willingness to sacrifice) indicates that environmental behavior does not depend only on the consideration of future developments but also on cognitive acknowledgement of the price to be paid in order to achieve these goals as well as willingness to pay it.

4.2 Subjective Knowledge and Pro-Environmental Behavior

Subjective knowledge regarding the environment may help to explain the effects of CFC on behavior. Research has shown that effects of future orientation and the knowledge of issues and action strategies cause a reduction in the temporal discounting of environmental problems and risks and therefore lead to an increased tendency to change relevant behaviors [9,10].

In social dilemmas, understanding the nature of the dilemma increases the tendency towards cooperation [12]. Here too, the subjective sense of understanding environmental problems and strategies for their solution may contribute to the individual's perceived behavioral control, which facilitates pro-environmental behavior (according to several theories, such as the theories of planned behavior [52] and the reasoned action approach [53] or the appropriateness theory [3]. Positive correlations were found between concrete environmental knowledge and attitudes and self-reported behavior [54]. Others also found a correlation between active engagement in environmental issues and knowledge about specific problems and about how to act in order to most effectively deal with them [55]. The field of risk evaluation also confirms the effect of understanding reasons and solutions on environmental behavior. [56] Theorized that risk perception starts out from a mental representation of the risk's causal structure, that is, the causes and consequences that the person ascribes to the risk. In our study, the respondents were shown a list of environmental problems and then asked about their subjective knowledge of the causes and solutions of these problems. We suggest that greater (subjective) knowledge of environmental issues and action strategies may facilitate their mental representation and consequently, the perception and evaluation of environmental risks. This, in turn, may drive people to express higher willingness to sacrifice for the environment and to become engaged in remedial actions.

4.3 Trust in People and Pro-Environmental Behavior

We also found that trust in people contributed to environmental behavior as much as subjective knowledge did. The finding that interpersonal trust is a fundamental prerequisite to environmental behavior is not new. Interpersonal trust is considered to be an important precursor to the development of cooperation in resource dilemmas [57]. It was also theorized that in "dilemma games," people cooperate when they realize the importance of cooperation, and trust that their partners will respond favorably to their own cooperation [58].

The importance of trust and cooperation among people sharply contrasts the rise of individualism in the modern era [59]. Israel was found to be in the middle of a scale that measured individualism [60]. [61] Claimed that level of trust and norms of reciprocity among individuals are basic factors that build social capital. Social capital not only strengthens the individuals and the community by granting social support, solidarity and cohesion but also facilitates coordination and cooperation within it, improving education, economics, life

satisfaction and even health and after this research we can also claim – concern for the environment.

Realizing that trust is an important element in attaining cooperation, some ways were suggested to enhance in-group trust, which focus on communicating cooperative intentions before or after choices have been made and on installing institutions that facilitate cooperation. This may be relevant to cooperative behavior in the environmental dilemma context, as well [62].

Another explanation of the findings regarding the effects of CFC, subjective knowledge, and trust in people is related to the perception of pro-environmental behavior as an expression of cooperative behavior. [6] Found that the tendency towards cooperation and pro-environmentalism correlated positively with future orientation and negatively with the degree of uncertainty regarding scenarios of environmental implications of behavior. The findings of the present research are consistent with these findings. We also claim that the higher people's future orientation (the more concrete and close the future seems) and the greater their knowledge of environmental issues and action strategies - the lower their level of uncertainty and the greater their contribution to more pro-environmental behavior.

5. CONCLUSION

The present study contributes to the current body of research on pro-environmental behavior in several respects:

First, it points to the central understanding that environmental problems are a case of temporal and social dilemmas. Furthermore, it demonstrates the great importance of future orientation, as measured by CFC, as well as the contribution of subjective knowledge and trust in people, in choosing pro-environmental behavior and the willingness to sacrifice for it as a solution to these dilemmas. The perception of environmental problems as social dilemmas of common resource exploitation (the social trap dilemma) and of public goods fostering (the social fence dilemma) have been basic in environmental studies and thinking since the publication of Hardin's article about the tragedy of the commons [4]. Our research emphasizes the leading role of future orientation in choosing cooperative choices in favor of sustainable environment rather than the competing selfish choices of immediate personal payoffs.

Second, in today's increasingly crowded world, millions of people from a broad spectrum of backgrounds are encountering social and temporal dilemmas [11,12]. Most of the research on CFC has been conducted with specific-purpose or student populations. Therefore the discussion of future orientation as a central explanatory factor of pro-environmental behavior in a broad social or cultural group as studied in the present research is important [3]. The accumulation and documentation of information from similar studies representing whole societies would enable intercultural comparisons and identification of additional cultural or other factors that influence environmental behavior.

Finally, if engagement in pro-environmental behavior indeed depends upon future orientation, subjective knowledge and trust in people, in order to achieve changes it is advisable to strengthen and encourage such characteristics. This could be done by means of media coverage, environmental campaigns and environmental education, in an effort to strengthen skills in considering future consequences of actions, demonstrate the implications of environmental actions and disseminate knowledge about causes and solutions of

environmental problems and action strategies. Furthermore, the development of interpersonal trust could encourage cooperation by highlighting the potential benefit to individuals and to the general society of working together in order to protect the environment.

A further development of this study would require a more elaborated model that considers additional central factors discussed in environmental research that can be linked to environmental future orientation (such as general and environmental values, environmental attitudes and concerns, perception of norms held by social groups and significant others, perceived behavioral control and so on); the impact of interactions between such factors and future orientation on pro-environmental behavioral intentions and actual behaviors and the implementation of such models in more specific areas of environmental problems and dilemmas.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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