

Does Being an Environmental Citizen Lead to Greater Well-Being? The Self-Determination Theory Approach

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Abstract

In this study, we examine a potential model based on the Self-Determination Theory, which explains how environmental citizenship and connectedness to nature could be associated with subjective well-being through the satisfaction of basic psychological needs. A convenience sample of 172 adolescents from three Lithuanian schools with a mean age of 15.4 years was gathered (40.1% male, 51.7% female, and 8.1% who preferred not to answer). The tested model showed reasonable fit indices: CFI = 0.941, TLI = 0.928, NFI = 0.913, RMSEA = 0.104 [0.090–0.119], SRMR = 0.073 and $\chi^2(98) = 281.532, p < .01$, and could explain approximately 41% of the variance of subjective well-being. The results show that pro-environmental actions taken by environmental citizens in the private sphere can have a positive impact on mental health as pro-environmental behavior satisfies basic psychological needs.

Plain language summary

This study examines a potential model based on the Self-Determination Theory, which explains how environmental citizenship and connectedness to nature could lead to subjective well-being through the satisfaction of basic psychological needs. A convenience sample of 172 adolescents from three Lithuanian schools participated in the study. The tested model could explain approximately 41% of the variance of subjective well-being. The results show that behaving pro-environmentally helps people satisfy their basic psychological needs, which in turn helps them feel better and thus increases their psychological well-being. Caring for the environment not only helps with environmental issues, but it also makes us feel better.

Keywords

environmental citizenship, well-being, basic psychological needs, morality, connectedness to nature, knowledge, pro-environmental behavior

Introduction

Nowadays, there is plenty of information and models on how to promote behavior to live more environmentally friendly, for example: Theory of planned behavior (Ajzen, 1985), Norm activation model (Schwartz & Howard, 1981), and The value-belief-norm theory (Stern, 2000). There is, however, a gap in the literature on how an environmentally friendly lifestyle impacts our mental state, and it's worth noting that there are not many established models encompassing this relationship. We know that there is a positive relationship between our environmentally friendly actions and our well-being

(Kaida & Kaida, 2016). But still, it is not clear whether well-being promotes environmentally friendly behavior or whether environmentally friendly behavior enhances one's well-being (Kasser, 2017). In this study we propose a model based on the Self-Determination Theory (SDT) which explains how environmental citizenship (EC) and

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connectedness to nature could lead to well-being through the satisfaction of basic psychological needs. Masson and Otto (2021) proposed that basic psychological need satisfaction leads to higher motivation and can better predict environmental activism compared to values (biospheric, altruistic, and egoistic). We hope that our proposed model will bring more clarity to the topic of how pro-environmental behavior is associated with well-being.

Previously, Kasser (2017) introduced a model where pro-environmental behavior helps satisfy basic psychological needs. According to Ryan and Deci (2017), all people have innate psychological needs for autonomy, competence, and relatedness. Satisfying those needs supports and promotes personal growth and psychological well-being. There is evidence that the satisfaction of the needs for competence and autonomy mediates the relationship between pro-environmental preferences and consumer well-being (Gao et al., 2020). Similarly, sufficiency orientation is associated with need satisfaction and well-being (Tröger et al., 2021). We can assume that people can satisfy their needs through eco-friendly activities and, in exchange these activities support or enhance their wellbeing. In addition, it is possible that people act in accordance with their internalized moral guidelines, which might involve being environmentally friendly, and this moral satisfaction may also positively affect one's well-being (Prentice et al., 2019). Furthermore, children view pro-environmental behavior as moral behavior (Šorytė, 2021) and adolescents view environmental issues as moral issues (Krettenauer, 2017). We can therefore assume that pro-environmental behavior helps satisfy moral needs.

In addition, a meta-analysis has shown that personal moral norm uniquely predicts intention to engage in pro-environmental behavior (Bamberg & Möser, 2007). Moreover, Prentice et al. (2020) study showed that satisfaction of moral needs was associated with flourishing and uniquely predicted flourishing along with other psychological needs, and that moral needs are closely associated with moral behavior. Overall, people who act pro-environmentally could satisfy not only their three main basic psychological needs (autonomy, competence, and relatedness), but also moral needs and thus need satisfaction could enhance one's subjective well-being. There have, however, been only a few studies conducted on the relationship between moral needs and pro-environmental behavior and this topic requires more attention.

Environmental citizenship could play a big role in the model proposed in the current study. Environmental citizenship is defined as "*responsible pro-environmental behaviour of citizens who act and participate in society as agents of change in the private and public sphere on a local,*

national, and global scale, through individual and collective actions in the direction of solving contemporary environmental problems, preventing the creation of new environmental problems, achieving sustainability, and developing a healthy relationship with nature" (Hadjichambis & Reis, 2020). According to the definition of environmental citizenship, this construct is not singular, but rather plural, implying individual and public PEBs, developing healthy connections with nature, and civic engagement for a sustainable future. Environmental citizenship is not innate, it is formed through our experiences and the education system has the potential to be the main influence on the its development (Hadjichambis et al., 2019), particularly, the acquisition of objective knowledge regarding environmental issues (Hawthorne & Alabaster, 1999). As individuals get a greater understanding of climate change issues, they seek tougher climate change policies (Bedsted & Klüver, 2009). Furthermore, drawing from the definition of environmental citizenship, environmental citizens tend to have a healthy relationship with nature, which is supported by a study by Telešienė et al. (2021). Additionally, a study by Solano-Pinto et al. (2020) demonstrated that low scores of PEB, knowledge of waste management, and circular economy were related to a low degree of connectedness to nature. The authors proposed that the educational system has to grant not only essential knowledge about environmental issues but also help to create a healthy connection with nature. Overall, we can say the main factors for developing EC could be the education system and a strong connection with nature.

Connectedness to nature is important not only for promoting EC but also for one's subjective well-being (Pritchard et al., 2020) and, overall, for pro-environmental behavior (Whitburn et al., 2020). It seems that some people care more about the environment than others because they feel a stronger connection to nature. If we could foster this connection, it might encourage individuals to behave in ways that are beneficial to the environment (Whitburn et al., 2020). Furthermore, it is essential for children to develop a strong connection to nature as early in life as possible because this increases the likelihood that they will engage in environmentally conscious actions as adults (Křepelková et al., 2020). One of the ways to develop that connection in childhood is through educational programmes in nature, as was shown by Pirchio et al. (2021). The aforementioned educational programme in nature not only strengthened participants' connection to nature but also had a positive impact on their well-being and pro-environmental behavior (Pirchio et al., 2021). Research points toward connectedness to nature having a positive impact on EC, PEB, as well as one's well-being.

This study focuses on adolescents as they should have basic knowledge about the environment from biology, chemistry, geography, and citizenship lessons in school. Additionally, adolescents' connectedness to nature is the lowest across one's lifespan (Richardson et al., 2019), and lower connectedness to nature scores are associated with fewer PEBs (Krettenauer et al., 2020). Furthermore, the adolescence years are a critical period where physical, emotional, cognitive, and social development occur and that development is reflected in one's adulthood (Branje et al., 2021; Inchley et al., 2020).

The proposed model is shown in Figure 1. All components were chosen based on their interrelations based on current literature and by applying the self-determination theory to them.

As there is evidence that low scores of knowledge of waste management and circular economy are related to lower connectedness to nature (Solano-Pinto et al., 2020), we assume that an overall higher degree of environmental knowledge will be related to a higher degree of connectedness to nature, especially to cognitive connection. In addition, we believe that a person with extensive knowledge of nature will have a stronger connection with it because that person understands that they are a part of an ecosystem and understanding that one is a part of an ecosystem reflects the fact that one is a part of nature. Furthermore, people who have sufficient knowledge about environmental issues like climate change seek tougher policies toward sustainability (Bedsted & Klüver, 2009), and that reflects that these people are starting to act as agents of change. As objective knowledge helps to form environmental citizenship (Hawthorne & Alabaster, 1999), we assume that knowledge is directly proportional to the level of environmental citizenship. In addition, a higher degree of connection

to nature is positively associated with environmental citizenship (Telešienė et al., 2021) as environmental citizens tend to have a healthy relationship with it (Hadjichambis & Reis, 2020).

As for connection to nature and pro-environmental behavior, the meta-analysis conducted by Whitburn and colleagues has shown strong evidence supporting a positive association (Whitburn et al., 2020), and it may be that a strong connectedness with nature promotes pro-environmental behavior (Mackay & Schmitt, 2019). Furthermore, there is robust evidence for a positive relationship between pro-environmental behavior and subjective well-being (Zawadzki et al., 2020). It can be that children who are connected to nature tend to perform more pro-environmental behavior and, in turn, experience more happiness (Barrera-Hernández et al., 2020). In this case, pro-environmental behavior is a mediating variable. There is also evidence for a direct relationship between connectedness with nature and happiness (Capaldi et al., 2014) and, based on the biophilia hypothesis, we assume that connectedness with nature leads to higher well-being (Kellert & Wilson, 1993).

Regarding the satisfaction of basic needs, we believe that pro-environmental behavior can be an activity through which a person can meet their needs (Kasser, 2009) and by doing so—can improve their psychological well-being (Ryan & Deci, 2017)

Components of the Model

As was mentioned in the introduction, components were chosen based on their relationships found in recent literature and theory. Other components were considered but not included. For example, climate change anxiety was considered but not included. Climate change anxiety has

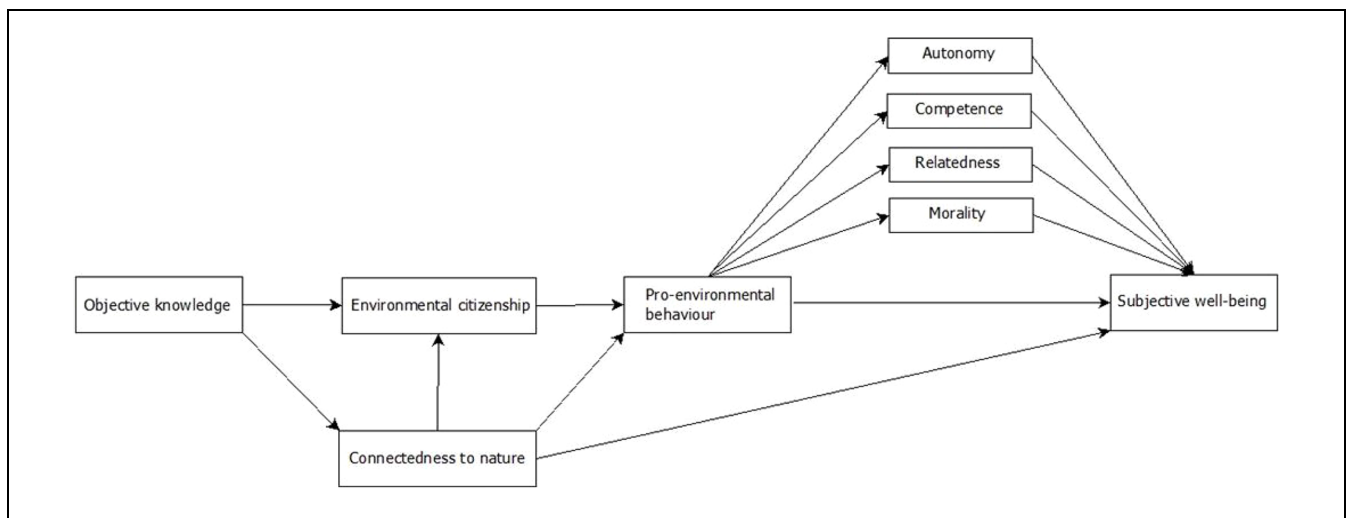


Figure 1. Proposed model explaining the relationship between environmental citizenship and subjective well-being.

a positive relationship with basic psychological need frustration, depressiveness, and a negative relationship with needs satisfaction (Wullenkord et al., 2021). Climate change anxiety was excluded from the current model, because here we focus only on positive outcomes. It may, however, be a possible addition to the model in future research.

Environmental Citizenship. An environmental citizen is someone who can act as an agent of change to promote sustainability and empower people to become more environmentally friendly. Environmental citizens try to educate society and friends to act in eco-friendly ways and actively participate in decision making toward a sustainable future (Hadjichambis & Paraskeva-Hadjichambi, 2020).

Objective Knowledge. Objective knowledge can be understood as knowledge based on scientific facts and information about environmental issues and strategies to prevent or mitigate them. Environmental knowledge is a component of the environmental citizen concept (Hawthorne & Alabaster, 1999) and an important component of this proposed model because action-related environmental knowledge can lead directly to private sphere and indirectly to public sphere behavior (Liobikienė & Poškus, 2019). Better knowledge regarding environmental issues has a significant positive relationship with connectedness with nature (Obery & Bangert, 2017).

Connectedness with Nature. Connectedness with nature can be defined as the unity between a human and nature, it is perceived as a feeling of belonging to nature (Mayer & Frantz, 2004). People can be connected with nature in a variety of ways, including affective, cognitive, and experiential connections (Mayer & Frantz, 2004; Richardson et al., 2019; Zelenski & Nisbet, 2014). Affective connection can be understood as one's feeling good while being in nature; cognitive connection is one's understanding that nature is important for our environment; and experiential connection—as one's feeling of being a part of nature and enjoying spending time in nature (Mayer & Frantz, 2004; Richardson et al., 2019; Zelenski & Nisbet, 2014).

Pro-Environmental Behavior. Pro-environmental behavior refers to behavior aimed at minimizing harm to the environment as much as one can or even benefiting the environment through one's behavior (Steg & Vlek, 2009). According to Stern (2000) PEBs have two major types (I) public sphere and (II) private sphere. Private sphere PEBs have a direct impact on the environment, that is,—energy conservation in a household, buying only necessary products, choosing eco-friendly products, recycling,

and similar actions, while public sphere PEBs have an indirect impact on the environment and can influence other people to be more environmentally friendly (Stern, 2000). In the public sphere individuals participate in various climate change organizations and support policies leading toward a sustainable future (Stern, 2000).

Basic Psychological Needs. According to Ryan and Deci (2017), basic psychological needs are innate and are essential for psychological growth, wellness, and autonomous motivation. Those needs are autonomy, competence, and relatedness. Autonomy represents an individual's free will of choice, freedom to act, and the feeling of being in control of one's life. The need for competence represents one's feeling of competence, feeling capable and confident in one's skills and knowledge. Lastly, the need for relatedness represents one's feeling of connection with other people, feeling that one is cared for and caring for others, and having good relations with other people. Additionally, according to Prentice et al. (2019), there is another psychological need called "morality." This need represents "the feeling or experience that one is a moral" (p. 449).

Subjective Well-Being. There are several terms used interchangeably in the literature to describe wellness or well-being, including "happiness," "flourishing," "thriving," and others (Butler & Kern, 2016). Due to the lack of a universal definition of subjective well-being or flourishing in life (Coleman, 2009), in this study, we refer to flourishing as subjective well-being, which can be defined as a "dynamic optimal state of psychosocial functioning that arises from functioning well across multiple psychosocial domains" (Butler & Kern, 2016). According to Seligman (2011), there are five measurable pillars that represent one's subjective well-being. Those pillars are positive emotions, engagement, relationship, meaning, and accomplishment (PERMA). Kern et al. (2016) adjusted Seligman's PERMA model to better suit youth. An adjusted model called EPOCH consists of five domains:

- a) *Engagement* refers to being absorbed and engaged in various activities or the world itself.
- b) *Perseverance* refers to having persistence of one's goals. Completing those set goals even though it faces obstacles.
- c) *Optimism* refers to having a positive outlook and hope for the future, optimists view negative events as lasting a short time and being not permanent.
- d) *Connectedness* refers to having close relationships with others, not simply having friends, but feeling loved, cared for, supported, and valued by others people.

- e) *Happiness* refers to feeling happy, not only momentarily good or being happy all the time, but feeling generally satisfied with life.

Relationships Between the Components of the Model. As we mentioned before, perceived science knowledge has a significant relationship with nature relatedness, and nature relatedness mediates the relationship between perceived science knowledge and pro-environmental behavior (Obery & Bangert, 2017). In addition, interest in scientific issues positively correlates with nature relatedness (Wang et al., 2020). We can assume that having objective knowledge based on facts about environmental issues can lead to connectedness to nature. Furthermore, objective knowledge of environmental issues is essential for understand action-related consequences, especially in situations where the consequences of one's actions are not directly visible and require a deeper understanding of environmental issues to identify (Robelia & Murphy, 2012). Moreover, a study conducted by Priadi et al. (2018) indicated that the more knowledge a person has about ecology, the better their EC behavior will be. Scientific knowledge about ecological issues is necessary for future action agents, but they also should have a healthy relationship with nature, and thus both are relevant in education about environmental issues (Hadjichambis & Reis, 2020).

An environmental citizen is an agent of change toward a more sustainable future (Hadjichambis & Paraskeva-Hadjichambi, 2020). Without actions, there will be no changes toward sustainability. If one wants to be a change agent for a better future, one's behavior should be environmentally friendly. Pro-environmental behavior not only helps to achieve a more sustainable environment but also has an influence on one's subjective well-being (Kaida & Kaida, 2016; Venhoeven et al., 2013). Additionally, connectedness to nature is related to both variables: pro-environmental behavior (Whitburn et al., 2020) and subjective well-being (Cervinka et al., 2012).

Furthermore, pro-environmental behavior has a significant relationship with subjective well-being and this relationship can be explained by the fact that people understand pro-environmental behavior as meaningful (Zawadzki et al., 2020). Kasser (2017) proposed that well-being (through various pro-environmental activities) can be achieved by satisfying one's basic psychological needs. Behaviors that satisfy needs are more likely to be repeated (Ryan & Deci, 2017), thus helping people satisfy their needs through pro-environmental behavior could lead to both a happier and a more sustainable society.

As this study primarily aims to explore the development of a model that integrates all the discussed

components, we have chosen not to propose specific hypotheses. The decision has been made not to include hypotheses in the present model since our primary emphasis is on its development. All the components of the model taken pair-by-pair were found to be significant in previous research and are well grounded in the literature.

Given the lack of any other model capable of covering all of these components entirely, our objective is to identify and analyse the pathways shown in Figure 1. The existing model is open to possible modifications and may be revised when further research is conducted.

The benefits of the proposed model are that it gives us a better understanding of how pro-environmental behavior and subjective well-being are related, thus furnishing educational institutions, such as schools, with valuable insights into the potential ways to improve students' subjective well-being by being environmental citizens. In addition, the model can serve as an intervention verification model if investigated longitudinally.

Methods

In this study, structural equation modeling is going to be used to examine the proposed model. As for the analysis of linear relationships, we are going to use Pearson's correlation coefficient. To assess the reliability of the measures, we are going to use Cronbach's alpha, McDonald's omega, and Kuder-Richardson formula. Additionally, we are going to use skewness and kurtosis estimates to assess the distribution of variables.

Participants

We planned a sample size of no less than 150 participants, based on the requirements for structural equation modeling (Ding et al., 1995). The sample size of the current study is 172 participants (40.1% male, 51.7% female, and 8.1% who prefer not to answer). The mean age of the participants was 15.4 years ($SD = 0.88$), one respondent did not provide information about their age.

Procedure

A study was conducted in three Lithuanian schools. Schools were selected through convenience sampling and based on existing cooperation agreements between the schools and the host university of the authors. Specific classes were selected by the school administration based on their availability and to avoid any scheduling conflicts or interference with their regular schoolwork. Due to COVID-19 restrictions at the time, the survey was supervised by a schoolteacher in each school. Teachers provided participants with all the study-related information

required for participation. Participants filled in online questionnaires. Data collection began on April 28, 2022, and ended on June 4, 2022. Prior to conducting the survey, all necessary approvals were obtained. All parties gave active written consent (schools, parents, and participants). Participants had the option to withdraw from the study at any time without repercussions.

Measures

To examine the proposed model, we used the measurements listed below. Participants filled in other measures that are not discussed here. Item order inside all scales was randomized for each participant.

Demographic Variables. Participants were asked about their biological sex and age. The question regarding biological sex had three options: male, female, and prefer not to answer.

Subjective Well-Being. The EPOCH measurement of adolescent well-being was used to evaluate subjective well-being (Kern et al., 2016). The EPOCH is a 20-item self-report instrument that measures five domains of subjective well-being: engagement, persistence, optimism, connectedness, and happiness. Each domain was evaluated with four items. Example item: *When I engage in an activity, I enjoy it so much that I lose track of time.* Each item is scored on a 5-point Likert scale, with 1 being “almost never/not at all like me” and 5 being “almost always/very much like me.”

Connectedness to Nature. Connectedness to nature was assessed with Nature connection index (NCI) (Richardson et al., 2019). Nature connection index is a six-item self-report instrument (e.g., *Spending time in nature is very important to me*). Each item is scored on 7-point Likert scale ranging from “completely disagree”—1 to “completely agree”—7. Points index weighting was conducted according to Richardson et al. (2019) guidelines. After using the weighting system, the lowest possible score is 0 and the highest possible score is 100.

Basic Psychological Needs. To assess basic psychological needs (autonomy, relatedness, and competence) we revised Gao et al. (2020) modified “Basic Psychological Need Satisfaction Scale—Relationship Domain” (La Guardia et al., 2000) instrument. The scale consists of nine items, three items for each need. There are no reverse items as there were in the original scale. Every item starts with “*When engaging in pro-environmental behaviour,*” in order to record the satisfaction of needs only through PEB. To assess morality as a psychological

need, we used Prentice et al. (2019) provided items and modified them by adding “*When engaging in pro-environmental behaviour*” in front of them. The morality need scale consist of four items. All items were rated on a 5-point Likert scale where “strongly disagree”—1 and “strongly agree”—5. See Appendix A for a full list of items.

Objective Knowledge. To assess objective knowledge about the environment, we used an objective knowledge test provided by Leeming et al. (1995). Original test consists of 30 items, we removed four items, because they were irrelevant for Lithuania and were inappropriate for the time. Each item has six answers, of which only one is correct. One of those six answers was “*I don’t know.*” To evaluate the participants’ knowledge level, correct answers were added together to obtain a score. Minimum score was 0 and a possible maximum score was 26. Higher scores indicated better objective knowledge about the environment. The test showed high internal consistency (KR-20 = 0.931).

Pro-Environmental Behavior. To assess self-reported pro-environmental behavior, we used items from Krettenauer (2017) and Gupta and Agrawal (2018). The PEB instrument consists of four scales, namely: energy conservation (four items), waste reduction (five items), recycling (five items), and sustainable purchasing (five items). See Appendix A for a full list of items. Participants were asked how frequently various behaviors occur. All items were rated on a 5-point Likert scale where “never”—1 and “always”—5.

Environmental Citizenship. Environmental citizenship was assessed with the “Agent of change” scale from the Environmental Citizenship Questionnaire (Hadjichambis & Paraskeva-Hadjichambis, 2020). The scale consists of three items (e.g., *I would try to change society and promote sustainability*). All items were rated on a 5-point Likert scale where “very unlikely”—1 and “very likely”—5.

Analysis Strategy and Data Availability

In this study we used JAMOVI 2 (<https://www.jamovi.org/>) for its extensive capabilities in covariance based structural equation modeling. We follow the guidelines that a well-functioning model needs to have its root mean square residual (SRMR) < 0.08; root mean square error of approximation (RMSEA) < 0.07; Tucker-Lewis index (TLI) > 0.95; normed fit index (NFI) > 0.95, and confirmatory fit index (CFI) > 0.95 (Hooper et al., 2008). Since the study is exploratory, we allow for reasonable deviations from these guidelines.

Table 1. Descriptive Statistics of All Used Variables.

Variable	M	SD	S	K	α	ω
Nature connectedness index	46.802	32.986	0.555	-1.238	.957	.970
Connectedness	3.297	1.100	-0.104	-0.757	.889	.889
Engagement	3.049	1.070	0.312	-0.714	.891	.897
Happiness	3.118	1.065	0.287	-0.848	.900	.903
Perseverance	3.013	0.984	0.393	-0.549	.831	.832
Optimism	3.154	1.078	0.043	-0.759	.892	.899
Energy conservation	3.458	0.952	-0.247	-0.126	.845	.849
Waste reduction	3.322	0.931	-0.141	-0.156	.848	.850
Recycle	3.324	0.967	-0.242	-0.143	.860	.862
Sustainable purchasing	3.155	0.969	-0.090	-0.325	.905	.907
Autonomy	3.407	0.873	0.122	0.052	.929	.929
Morality	3.449	0.874	0.132	-0.118	.944	.944
Competence	3.376	0.862	-0.001	0.149	.910	.897
Relatedness	3.328	0.873	-0.026	0.234	.920	.921
Environmental citizenship	3.256	0.875	-0.234	0.446	.899	.901
Objective knowledge	12.157	5.353	-0.288	-0.733	—	—

Note. S = skewness, K = kurtosis, α = Cronbach's alpha, ω = McDonald's omega.

In this study we do not investigate specific areas of well-being or specific types of pro-environmental behavior. Therefore, higher-order constructs will include subjective well-being domains, which will form an overall subjective well-being variable, along with pro-environmental behavior types, which will form an overall pro-environmental behavior variable. The same approach was used for basic psychological need satisfaction.

The study is based on an open-ended pre-registration: <https://osf.io/wcb27> and the data used in this manuscript are openly available: <https://osf.io/yk5ch>.

Results

Table 1 presents descriptive statistics, reliability, and a list of all variables used in this study. Based on their skewness and kurtosis values, the variables are suitable for use in linear models. Linear relationships among all used variables are presented in Table 2. All variables have linear relationships which are statistically significant and therefore these variables may be used in structural equation modeling.

The proposed model was tested using maximum likelihood estimation (Figure 2). Since the distributions of all the variables are close to normal and the internal consistencies are good. The model demonstrated reasonable fit: CFI = 0.941, TLI = 0.928, NFI = 0.913, RMSEA = 0.104 [0.090–0.119], SRMR = 0.073, and $\chi^2(98) = 281.532, p < .01$. Although the fit indices do not perfectly align with the guidelines we set for the model, we can consider that the model is functioning reasonably well and fits the data.

The structural equation modeling showed that objective knowledge does not predict environmental citizenship, but significantly predicts connectedness to nature. Further, connectedness to nature significantly predicts environmental citizenship, pro-environmental behavior, and subjective well-being. Environmental citizenship significantly predicts pro-environmental behavior while pro-environmental behavior significantly predicts both psychological need satisfaction and subjective well-being, whereas psychological need satisfaction significantly predicts subjective well-being.

Overall, the model can explain 40.8% of the variance in subjective well-being; 48% of the variance in psychological need satisfaction through pro-environmental behavior; 46.5% of the variance in pro-environmental behavior; 20.5% of the variance in environmental citizenship; and only 3% of the variance in connectedness to nature.

Discussion

The proposed model, according to the data, functions well, and indeed, pro-environmental behavior was found to be related to basic psychological needs satisfaction, which in turn, is related to subjective well-being. The findings revealed that environmental citizens, as change agents, tended to act more environmentally friendly in their private sphere. More frequent private-sphere pro-environmental behavior had a significant relationship with subjective well-being, while more frequent behavior pro-environmental behavior had a significant relationship with the satisfaction of basic psychological needs, which in turn had a significant relationship with the

Table 2. Linear Relationships Between All Used Variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Nature connectedness index	—														
2. Connectedness	0.515***	—													
3. Engagement	0.568***	0.735***	—												
4. Happiness	0.469***	0.770***	0.784***	—											
5. Perseverance	0.512***	0.760***	0.814***	0.780***	—										
6. Optimism	0.488***	0.813***	0.781***	0.875***	0.788***	—									
7. Energy conservation	0.564***	0.583***	0.520***	0.501***	0.544***	0.496***	—								
8. Waste reduction	0.562***	0.481***	0.491***	0.462***	0.474***	0.448***	0.887***	—							
9. Recycle	0.534***	0.460***	0.405***	0.412***	0.440***	0.423***	0.882***	0.870***	—						
10. Sustainable purchasing	0.535***	0.455***	0.517***	0.455***	0.503***	0.484***	0.826***	0.867***	0.845***	—					
11. Autonomy	0.619***	0.491***	0.527***	0.453***	0.539***	0.472***	0.595***	0.600***	0.604***	0.615***	—				
12. Morality	0.708***	0.536***	0.544***	0.457***	0.527***	0.515***	0.594***	0.606***	0.608***	0.621***	0.896***	—			
13. Competence	0.635***	0.493***	0.560***	0.462***	0.549***	0.509***	0.595***	0.590***	0.599***	0.609***	0.902***	0.908***	—		
14. Relatedness	0.607***	0.461***	0.479***	0.406***	0.515***	0.443***	0.581***	0.569***	0.593***	0.637***	0.911***	0.883***	0.892***	—	
15. Environmental citizenship	0.450***	0.382***	0.467***	0.357***	0.429***	0.351***	0.483***	0.507***	0.485***	0.557***	0.622***	0.600***	0.582***	0.612***	—
16. Objective knowledge	0.172*	0.175*	0.176*	0.110	0.143	0.170*	0.138	0.092	0.137	0.014	0.147	0.137	0.091	0.082	0.117

* $p < .05$, *** $p < .001$.

participants' subjective well-being. We can assume that citizens who care about the environment and try to preserve nature in their private sphere have opportunities to satisfy their basic psychological needs, including the need for morality. It seems that acting pro-environmentally could potentially lead to increased subjective well-being, although experimental designs would be needed to test this thoroughly. Our findings are consistent with Kasser's (2017) proposed model that subjective well-being can be improved through various pro-environmental behaviors that satisfy basic psychological needs.

For example, adolescents who recycle and know which plastic items are recyclable and which aren't, can satisfy their need for competence because they know about the different kinds of plastic and feel competent because they can engage in pro-environmental behavior in an informed manner. When adolescents are in a group and see others in the group behaving in an environmentally friendly manner, such as throwing trash in the appropriate receptacles, the need for relatedness can also be met as one feels that they are a part of a group that protects nature. Adolescents view environmental issues as moral issues (Krettenauer, 2017), therefore, when acting in a pro-environmental manner, they also satisfy their need for morality by acting in accordance with their internalized moral norms (Prentice et al., 2019). Furthermore, adolescents who act pro-environmentally without any pressure from parents or others can satisfy their need of autonomy because their actions are entirely under their control. We can assume that with a greater variety of actions there will be more opportunities to satisfy various basic psychological needs. All satisfied needs lead to better subjective well-being and are essential for self-determined motivation while also increasing the likelihood of the need-satisfying behaviors to be repeated (Ryan & Deci, 2017). This could be one of the possible ways to maintain pro-environmental behavior. Cooke et al. (2016) found that the more people satisfied their basic psychological needs through pro-environmental behavior, the more intrinsic motivation they developed, and in turn higher motivation was associated higher engagement in both difficult and easy pro-environmental actions. Wray-Lake et al. (2019) found that civic engagement (PEB, helping behavior, and charitable donations) was directly and indirectly associated with well-being through basic psychological need satisfaction. Furthermore, it may be that the greater one's connection with nature is, the greater one's need for morality regarding pro-environmental actions is.

Moreover, connectedness to nature may have a substantial impact on environmental citizenship, pro-environmental behavior, and subjective well-being, as results show that having a strong connection with nature

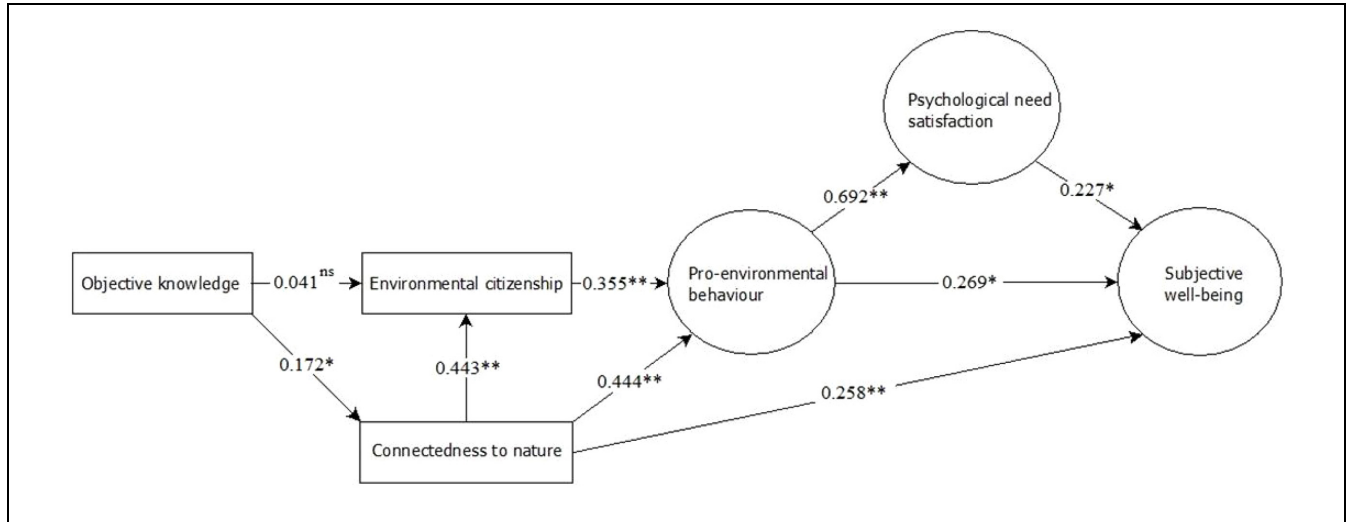


Figure 2. Path-analysis results of the proposed model.

Note. ns = not significant.

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

is strongly related to subjective well-being. From the perspective of the biophilia hypothesis (Kellert & Wilson, 1993), we as people are evolutionarily programmed to be connected to nature and that connection with nature is essential to achieve a holistic balance of our well-being and healthy nature. According to the definition of environmental citizenship, people have to have a healthy connection with nature (Hadjichambis & Reis, 2020). Our study results confirm that connectedness to nature is related to being an agent of change. People who understand the importance of nature in their daily lives and enjoy being in wild and clean nature are more likely to conserve it.

Consistently with previous studies, our results show that having a stronger connection with nature is related to subjective well-being (Richardson & McEwan, 2018) and pro-environmental behavior (Mackay & Schmitt, 2019), since people are an inseparable part of nature (Kellert & Wilson, 1993; McMahan, 2018). Furthermore, our results regarding objective environmental knowledge are similar to Obery and Bangert (2017), who show that nature relatedness mediates the relationship between knowledge and pro-environmental behavior. However, we get different results from Priadi et al. (2018), as we did not find a significant relationship between environmental citizenship and objective knowledge regarding environmental issues. It can be that specific objective knowledge about the environment, which has meaning in a person's environment, promotes being an agent of change. However, knowledge about environment and environmental issues is necessary for the development of environmental citizenship (Hadjichambis & Reis, 2020). Citizens should act consciously based on objective

knowledge. According to a recent study by Poškus (2022), the need for learning, environmental literacy, and the need for action are three key elements of environmental citizenship in young adults. We can assume that in order for adolescents to act and potentially satisfy psychological needs, they need specific knowledge regarding environmental issues as well as an understanding of how they can contribute to environmental protection. In this proposed model, pro-environmental behavior is a mediating variable between the environmental citizenship and subjective well-being. Citizens who desire change in the direction of sustainability and who act in that direction could attain both a sustainable environment and better subjective well-being. We can assume that for citizens to achieve harmony between a healthy environment and a healthy mental state, pro-environmental action is necessary. As for direct relations between pro-environmental behavior and subjective well-being, people view that behavior as meaningful (Zawadzki et al., 2020). We can assume that environmental citizens who act in a pro-environmental way and do not satisfy basic psychological need they still can improve their subjective well-being, because they still view their behavior as meaningful for the environment.

According to the data, the proposed model appears to function sufficiently well and demonstrates that pro-environmental behavior can be not only beneficial for the environment but for one's well-being as well. To our knowledge, this is the first model that explains how environmental citizenship can determine individual subjective well-being in the context of the Self-Determination Theory. Environmental citizens can satisfy their basic psychological needs through their pro-environmental

actions and thereby achieve better subjective well-being and help the environment as well.

Practical Implications

There are numerous methods of promoting a more sustainable lifestyle and improving one's well-being. For example, education programmes in nature aimed at increasing connectedness to nature, well-being, and pro-social behavior (Pirchio et al., 2021). Other interventions, such as nature excursions, aim to increase only connectedness to nature and well-being (Barton et al., 2016). Others, on the other hand, attempt to promote environmental citizenship through "Sustainable Development" courses (Telešienė et al., 2021). Some interventions involve both nature and education, while others only involve nature or education. The goal of all mentioned interventions is a more sustainable lifestyle that also promotes individual well-being.

Our proposed model can be utilized as a change model to assess the efficacy of various interventions for environmental citizenship, connectedness to nature, or well-being. Moreover, in pursuit of improving student well-being, educational institutions should provide objective information about the environment, nurture environmental citizenship, and enhance connection to nature, as those actions promote pro-environmental behavior, which has direct and indirect associations with subjective well-being.

Limitations

While the model fit the data sufficiently well, the study has several limitations. One of the limitations was the relatively small non-random convenience sample which did not allow us to identify specific pro-environmental behaviors for a specific level of psychological need satisfaction. Additionally, we did not assess whether the model functions similarly across genders and age groups, which could potentially moderate its pathways. Because the study is cross-sectional, we can only speculate on the direction of the relationships proposed in the model.

Future longitudinal and/or interventional studies could help address this issue. Additionally, the study was conducted in Lithuania and the cultural context might have some effect on the results, so international verifications of the model would help in further developing it. Furthermore, due to COVID-19 restrictions at the time, the survey was supervised by a schoolteacher in each school, which could have had an effect on how students answered the survey questions.

The exceptionally good internal consistency of the scales used in the present study, while not a problem in and of itself, may be due to question form effects and may indicate a pattern of preference of the participants. While the internal consistency obtained in this study is not unusual, one should still bear this caution in mind.

Future Directions

Future research using this model should apply a longitudinal design with an intervention targeted at participants' objective knowledge. A longitudinal interventional study would help uncover whether an increase in knowledge effectively leads both to higher engagement in pro-environmental actions and higher individual well-being.

Moreover, there are more unanswered questions. Is subjective well-being affected the same way by both private and public pro-environmental actions? Does the proposed model function the same way for all people, regardless of their personality traits? To answer these questions, future researchers should strive for larger and more representative sample. As for personality traits, researchers should not compare individual traits but regard personality trait profiles as moderators for the whole model, adopting a person-oriented research methodology. Furthermore, future research should try to modify the proposed model by adding basic psychological need frustration, which is associated negatively with well-being (Chen et al., 2015).

Appendix A

Basic Psychological Need Satisfaction Items

Morality

When engaging in pro-environmental behaviour, I feel a strong sense of moral fulfilment.
When engaging in pro-environmental behaviour, I feel that I am being a good person.
When engaging in pro-environmental behaviour, I embody my moral values.
When engaging in pro-environmental behaviour, I feel that I am doing the right thing.

Competence

When engaging in pro-environmental behaviour, I feel very capable and effective.
When engaging in pro-environmental behaviour, I feel like a competent person.
When engaging in pro-environmental, people I know tell me that I know what I'm doing.

Autonomy

When engaging in pro-environmental behaviour, I feel free to be who I am.
When engaging in pro-environmental behaviour, I have a say in what happens and I can voice my opinion.
When engaging in pro-environmental behaviour, I believe that my choice was based on my true desires and values.

Relatedness

When engaging in pro-environmental behaviour, I feel the support of others.
When engaging in pro-environmental behaviour, I feel a lot of closeness and connectedness to other people.
When engaging in pro-environmental behaviour, I feel connected to people who care about me and who I care about.

Pro-Environmental Behaviour

Energy Conservation

I turn off the TV and computer screens when they are not in use.
I turn off the lights when they are not needed.
If I need a new light bulb, I use energy efficient light bulbs.
I conserve energy and water by taking shorter showers.

Waste Reduction

I prefer bringing my lunch or snacks in reusable containers.
I reuse my shopping bags.
If I need batteries, I use rechargeable batteries.
I use refillable water bottles.
If I am offered a plastic bag in a store, I refused to take it.

Recycling

I collect and recycle used plastic containers.
I collect used paper and put it in a specialized container for paper.
I prefer buying products made from recyclables (e. g., paper).
I recycle used bottles.

Sustainable Purchasing

I buy products packaged in reusable or recyclable containers.
I will not buy a product if I know that the company that sells it is socially irresponsible.
I have paid more for environmentally friendly products when there is a cheaper alternative.
I buy products that are environment friendly.
I avoid purchasing things that I do not need.

Declaration of Conflicting Interests

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Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the ethics committee of the Institute of Psychology of Mykolas Romeris University, approval number: 2/-2022.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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Data Availability Statement

The data used in this manuscript are openly available: <https://osf.io/yk5ch>

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