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The moderating role of an ecological mindset in the relationship between well-being and sustainable environmental behaviours.

Henri A. von Harling

Department of Psychology, Health, and Technology

Faculty of Behavioural, Management and Social Sciences

Positive Clinical Psychology & Technology

First Supervisor: Dr. M. Schotanus-Dijkstra

Second Supervisor: Dr. M. E. Pieterse

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Abstract

Background and aim: Research has been investigating the association between pro-environmental behaviour and well-being for over two decades (Brown, & Kasser, 2005; O'Brien, 2008; Kaplan, 2000). However, the findings on this relationship are somewhat contradicting (Kasser, 2017). A possible moderating factor in this proposed relationship might be the influence of an ecological mindset, which can be understood as individuals' implicit beliefs about the possibility of climate change mitigation. This study aims to examine the relationship between pro-environmental behaviours and well-being as well as the potential moderating role of an ecological mindset. **Method:** A final sample of 289 participants (*M*age = 27.55) proficient in German or Dutch were asked to complete questionnaires measuring pro-environmental behaviours, well-being, and the ecological mindset. Multiple moderation analyses using the PROCESS macro for SPSS were conducted. **Results:** While no significant interaction effect could be found in any of the conducted analyses, significant correlations between two subscales of pro-environmental behaviour and overall well-being as well as psychological well-being were found. **Discussion and conclusion:** Due to issues with the scoring of the pro-environmental behaviour measure, potential shortcomings of the mindset measure, as well as the design of the study, the results should not be seen as absolute truths, but rather as trends in the investigated sample. To draw conclusions about causality and direction of the relationship between well-being and pro-environmental behaviours as well as the role of an ecological mindset, more research is needed.

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Whenever one reads the newspaper or watches the news, it is quite likely that one will hear something about climate change. Quite recently, the Intergovernmental Panel for Climate Change (IPCC) published a report stating that with current measures the 1.5-degree goal, declared in the Paris Agreement in 2015 (United Nations Framework Convention on Climate Change, 2015), will likely not be met (IPCC, 2023). To keep the consequences of global warming to a minimum, people need to act in a more pro-environmental way. In recent years, many terms have been used to describe behaviours that help reduce the negative impact of people on the environment. This paper will use the terms, *pro-environmental behaviours,* and *sustainable environmental behaviours* interchangeably. Sustainable environmental behaviour is defined as behaviour which minimizes the negative impact of one's behaviour on the environment and possibly even benefits it (Kollmuss, & Agyeman, 2002; Steg, & Vlek, 2009). Furthermore, Stern (2000) proposed three different types of environmentally significant behaviours, which are direct and public engagement (e.g., protest), indirect and public involvement (e.g., the willingness to pay higher taxes on certain things) and private participation (e.g., recycling).

According to a survey by the European Commission (2021), nearly two-thirds of Europeans have personally taken action to mitigate climate change. While these are encouraging numbers, public engagement as well as private participation can have a great impact on the mitigation of the climate crisis, hence, the question poses itself why these two-thirds only took some action and why the remaining one-third did not act yet (Lacroix et. al., 2022). On a similar note, Stern et. al., (1999) proposed that sustainable environmental behaviour is likely to occur when people believe that the environmental conditions are threatening to other individuals, species, and the whole biosphere and that their actions could help to avert or hinder this threat. Another factor potentially influencing the performance of sustainable environmental behaviours which has been proposed is the sense of control individuals have over their environment (Gifford & Nilsson, 2014). Furthermore, it has been suggested that behaving in sustainable ways is often seen as difficult and possibly even harmful to one’s well-being (Brown, & Kasser, 2005; O'Brien, 2008; Kaplan, 2000). In fact, research has investigated the association between pro-environmental behaviour and well-being. However, research on this relationship is somewhat contradictory (Kasser, 2017).

Well-being

Well-being is often divided into hedonic and eudaimonic well-being (Diener, 1984; Keyes, 1998; Ryff, 1989). Hedonic well-being is often called subjective well-being or emotional well-being and could be described as the presence of positive feelings about life, as well as happiness and overall life satisfaction (Diener, 1984). Similarly, eudaimonic well-being is comprised of psychological well-being and social well-being and could be described as the degree to which a person is fully functioning (Keyes, 1998; Ryan & Deci, 2001; Ryff, 1984). In particular, psychological well-being includes self-acceptance, positive relations with others, personal growth, environmental mastery, and autonomy (Ryff, 1984). Finally, social well-being includes social coherence, social actualisation, social integration, social acceptance, and social contribution (Keyes, 2002). When an individual portrays high levels of both hedonic and eudaimonic well-being, they are flourishing (Keyes, 2002, 2007). There are various factors which can influence an individual's well-being (Livingston et. al., 2022; Lorreto et. al., 2005; Ryff & Keyes, 1995).

Venhoeven, Bolderdijk, and Steg (2016) investigated the role of self-image in mediating the effect of environmentally friendly behaviour and positive emotions. Their findings suggest that the more environmentally friendly and generally positive the participants saw themselves, the better they felt about the performance of sustainable environmental behaviours. Additionally, the authors suggested that the positive feeling associated with the performance of sustainable environmental behaviours might arise through the positive self-image resulting from pro-environmental behaviours. Likewise, a study investigating the relationship between daily positive affect and pro-environmental behaviour at work found that the more relaxed, content and calm the employees felt, the more they performed their tasks in an environmentally friendly way (Bissing-Olson et. al., 2013). Similarly, Wray-Lake, et. al., (2019) found that both daily and average pro-environmental behaviour predicted well-being. Likewise, a study by Kaida & Kaida (2016) found that pro-environmental behaviour could enhance present as well as future subjective well-being.

Although an association between well-being and sustainable environmental behaviour appears to be quite likely, not all researchers seem to agree on the direction of this relationship (Kasser, 2017). Still, two main pathways between well-being and pro-environmental behaviours have been suggested. First, it may be that performing sustainable environmental behaviours increases one's well-being, for example by satisfying the need for autonomy, competence, or relatedness (Kasser, 2017; Corral-Verdugo et. al., 2011). In contrast, the relationship between pro-environmental behaviours and specifically hedonic

well-being could also be influenced by the perception of goal attainment, i.e., if individuals perceive the goal they are working towards as possible, performing sustainable environmental behaviours could increase hedonic well-being, whereas perceiving the goal as unattainable might reduce emotional well-being (Venhoeven et. al., 2013). Generally, sustainable environmental behaviours have been linked to increased hedonic well-being (Jacob et. al., 2009). Second, well-being could potentially facilitate pro-environmental behaviours (Koenig-Lewis et. al., 2014; Kasser, 2017; Van der Linden, 2018). This could result from the fact that happy people tend to view others more positively and thus believe that they should act in ways that benefit others (Lyubomirsky et al., 2005).

Furthermore, while previous research has examined many possible moderators for the relationship between sustainable environmental behaviours and well-being, it has not yet managed to establish a universally accepted understanding of moderating variables in this association (Jacob et. al., 2009; Venhoeven et. al., 2013; Kasser, 2017). Since understanding this relationship as well as its moderators can be beneficial in creating effective interventions, more research is needed to get a better grap of this association. A possible moderating factor in this proposed relationship might be the influence of an ecological mindset.

Ecological mindset

An influential theory of Dweck states that a growth mindset can be understood as believing that things are changeable in their very nature, while a fixed mindset describes the opposite (Dweck & Leggett, 1988). These two mindsets have been suggested to have the potential to affect an individual's motivations and behaviours and could thus be of interest in the study of environmental behaviours (Duchi et. al., 2020). These underlying attitudes have been proposed to influence the performance of sustainable environmental behaviours. Moreover, people with a rather fixed mindset regarding the environment and climate change seem to be less likely to have the intention to engage in sustainable environmental behaviours (Soliman & Wilson, 2017). Similarly, Duchi et. al., (2020) found that holding a growth mindset appears to be indirectly associated with increased pro-environmental behaviour inclinations and a higher frequency of self-reported sustainable environmental behaviours 10 days after the study.

Research regarding individuals' implicit beliefs about the possibility of climate change mitigation, i.e., their ecological mindset, is scarce. However, some concepts aim to measure similar things, e.g., ecological worldview (Xiao, Dunlap, & Hong, 2019), as well as a variety of theories on environmental beliefs, values, and norms. Although investigating concepts such as an individual's ecological worldview can provide some insight into possible determinants

of sustainable environmental behaviour, it might be more beneficial to examine the underlying beliefs about the changeability of the world. For instance, many studies have investigated different environmental belief systems to explain why some people act towards mitigating climate change and others do not (Steg, & Vlek, 2009). Moreover, a study by Soliman & Wilson (2017) examining the impact of implicit beliefs about the flexibility of the world on an individual's environmental views indicated that individuals who view the world as rather stable and unchangeable tended to be more reluctant to believe that the environment could not change for the worse and that changes through human behaviour could avert climate change, and hence were less likely to have the intention to engage in sustainable environmental behaviour. Based on this study, Duchi et. al., (2020) proposed that these implicit beliefs, specifically in the form of a growth mindset or a fixed mindset, might underlie their environmental views. Building on these findings, this study will use the terms ecological fixed mindset and ecological growth mindset. An ecological growth mindset can therefore be understood as a belief that the world, i.e., people, behaviours, and the climate itself, are changeable in their very nature, while an ecological fixed mindset means that these things are unable to be changed.

Purpose of this study

To deepen our understanding of the role of implicit beliefs about the changeability of the world as a moderator of the relationship between sustainable environmental behaviours and well-being, this study aims to examine the possible relationship between sustainable environmental behaviours and well-being and whether this relationship is moderated by an ecological mindset. Most of the research mentioned above hints at a positive association, and hence it is hypothesised that a positive relationship is found between sustainable environmental behaviours and well-being. In addition, it is expected that the ecological mindset moderates the relationship. In other words, when the ecological mindset is high, the positive relation between sustainable environmental behaviours and well-being is stronger.

Method

Design

The data for this study was collected in a cross-sectional online survey study. It was granted ethical approval by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences (BMS) of the University of Twente (Nr. 221165). The data was collected through a survey with a sample of psychology students at the University of Twente.

Participants

A sample of 332 participants was recruited using the University of Twente's research subject pool SONA systems, as well as through convenience sampling. Participants had to be at least 18 years old and be proficient in German or Dutch. Since some participants did not give informed consent, did not meet the requirement of being over 18 years old or did not sufficiently complete the questionnaires, the final sample included 289 participants. The age of the participants (208 female, 76 male, 5 other) ranged from 18 to 77 (M= 27.55; SD=12.72). Of the 289 participants included in the analysis, 201 were students, 56 were full-time employed, 26 were part-time employed, 4 were retired and 2 were unemployed.

Procedure

Of the 332 participants 93 were recruited between October and November 2022 through the University of Twente's subject pool SONA systems as well as through convenience snowball sampling via social media and in-person by Beyer (2022). Additionally, a sample of 239 participants was recruited between April and May 2023 using convenience sampling from educational institutions, workplaces, and online platforms. Participants had to click on a link to get to the online survey and informed consent was obtained before the participants started the survey. Qualitrics was used to build the survey and obtain data after completion. When finishing the survey, participants were redirected to the Sona-Systems website where they obtained 0.25 SONA credits if they used it to start the survey, while participants who did not start the survey using said website could just close the browser window. Since all questionnaires were administered in German or Dutch, participants were excluded when they were under the age of 18 and did not understand German or Dutch.

Measures

Mental Well-being. The Mental Health Continuum-Short Form (MHC-SF) was used to measure all three sub facets of well-being with 14 items. Emotional well-being is measured using three items (e.g., "*How often in the past month did you feel happy?*"), psychological well-being with six items (e.g., "*During the past month, how often do you feel that you had experiences that challenged you to grow and become a better person?*") and social well-being with five (e.g., "*During the past month, how often do you feel that you had something important to contribute to society?*") (Lamers et. al., 2011). The responses are obtained through a 6-point Likert scale ranging from *never* (0) to *every day* (5). The mean score of these items is then calculated with a higher score indicating higher levels of well-being. In

previous studies, the MHC-SF has shown high internal reliability (Lamer et. al., 2011). The Cronbach's alpha for this scale in this study was $\alpha = .89$.

Sustainable Environmental Behaviour. The General Ecological Behaviour Scale (GEB-50) was used to measure sustainable environmental behaviour (Kaiser, 2020). The scale consists of 50 items and ranges from *never* (0) to *very often* (4) and also has the option to select NA "Not applicable". The scale was divided into 5 subscales: garbage reduction and recycling (11 items, e.g., "*I buy beverages in cans.*"), water and power conservation (11 items, e.g., "*I wait until I have a full load to do my laundry.*"), ecologically conscious consumer behaviour (11 items, e.g., "*I buy meat and produce with eco-labels.*"), volunteering in nature protective activities (5 items, e.g., "*I boycott companies with an unecological background.*") as well as ecological automobile use (12 items, e.g., "*I drive my car in or into the city.*"). According to the creators of the scale, Rasch modelling should be used to score the questionnaire but due to technical difficulties, polytomous items were recoded to dichotomous variables, negatively worded items were reverse coded, and subscales were computed using mean scores. A test-retest reliability of up to .99 has been measured for this scale (Kaiser et. al., 2014). The Cronbach's alpha for the scale in this study was $\alpha = .703$.

Ecological Mindset. As suggested by Duchi et al., (2020) and Soliman and Wilson (2017) the Implicit Theories on the World Measure, a three-item scale developed by Chiu et. al., (1997), was used to measure ecological growth and fixed mindset. The following three items were used (1) *Our world has its basic or ingrained dispositions, and you really can't do much to change them* (2) *Though we can change some phenomena, it is unlikely that we can alter the core dispositions of our world* (3) *Some societal trends may dominate for a while, but the fundamental nature of our world is something that cannot be changed much*. These items were measured on a 6-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (6). For the purposes of this study, the scale was reverse coded, i.e., the higher the score, the stronger the growth mindset, and the lower the score, the stronger the fixed mindset. The Cronbach's alpha for the scale in this study was $\alpha = .812$.

Analysis plan

To analyse the data, the Statistical Package for the Social Sciences (SPSS) was used. At first, the German and Dutch scales were combined, and the data was cleaned to make further analyses easier. The descriptive statistics were then calculated to provide a preliminary understanding of the relationship between the three variables and to identify potential outliers and problems with the data. Then, a correlation matrix of the associations between the

different variables was created. To conduct the moderation analysis, the PROCESS macro was used (Hayes, 2022). In this analysis, sustainable environmental behaviour was used as the independent variable, ecological mindset as the moderator variable and well-being as the dependent variable. Furthermore, the demographic variables age and gender were selected as covariates to control for potentially confounding variables. Both sustainable environmental behaviour and ecological mindset were centred using the PROCESS macro.

Afterwards, the same analysis was conducted with each well-being subscale separately to explore potential differences between the subscales. The same was done with the subscales of sustainable environmental behaviour to check for differences between different types of pro-environmental behaviours.

Results

Descriptive statistics

The descriptive statistics of all variables included in the analysis are summarized in Table 1. Looking at the levels of well-being, participants scored on average higher on emotional (M = 3.30, SD = .95) and psychological well-being (M = 3.20, SD = .83) than on social well-being (M = 2.35, SD = .77). Furthermore, scores on ecological mindset (M = 3.78, SD = 1.01) suggest that the majority of participants tend to hold an ecological growth mindset. Moreover, on sustainable environmental behaviours participants scored on average higher on the subscales “garbage reduction and recycling” (M = .71, SD = .15) and “water and power conservation” (M = .70, SD = .18) than on “ecologically conscious consumer behaviour” (M = .45, SD = .18), “ecological automobile use” (M = .51, SD = .23) and “volunteering in nature protective activities” (M = .20, SD = .23).

Table 1

Descriptive statistics of the main variables (N=289).

	N	Min	Max	M	SD
Age	284	18.00	77.00	27.55	12.72
Gender	289	1.00	3.00	1.76	.47
Ecological Mindset	288	1.00	6.00	3.76	1.01
Well-being	289	.21	4.64	2.92	.74
Emotional well-being	288	.33	5.00	3.30	.95

Psychological well-being	289	.33	5.00	3.20	.83
Social well-being	289	0.00	4.20	2.35	.77
GEB-50	289	.12	.84	.54	.12
Garbage reduction and recycling	289	.14	1.00	.71	.15
Water and Power conservation	289	.00	.90	.70	.18
Ecologically conscious consumer behaviour	289	.00	.90	.45	.18
Volunteering in nature protective activities	289	.00	1.00	.20	.23
Ecological automobile use	289	.00	1.00	.51	.23

Association between well-being, pro-environmental behaviours, and ecological mindset

Overall, 25 of the 55 bivariate correlations (Table 2) were significant ($p < .05$) and of positive magnitude ($r > 0$). However, overall, and psychological well-being were only found to have a significant weak positive correlation with "garbage reduction and recycling" ($r = .12$, $p < .041$; $r = .15$, $p < .013$) and "Volunteering in Nature protective activities" ($r = .13$, $p < .029$; $r = .12$, $p < .036$). However, no significant associations were found between ecological mindset and the dependent variable well-being, the independent variable sustainable environmental behaviour or any of their subscales.

Table 2

Correlation Matrix of well-being, sustainable environmental behaviours, their subscales and ecological mindset (N=289)

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**
1. Mental well-being	-									
2. Emotional well-being	.84**	-								
3. Social well-being	.86**	.59**	-							
4. Psychological well-being	.93**	.70**	.67**	-						
5. Sustainable environmental behaviours	.09	.09	.07	.09	-					
6. Garbage reduction & recycling	.12*	.11	.06	.15*	.65**	-				
7. Water and power conservation	-.03	.03	-.04	-.04	.71**	.42**	-			
8. Ecologically conscious consumer behaviour	.02	.07	-.02	.04	.62**	.32**	.27**	-		
9. Volunteering in nature protective activities	.13*	.08	.11	.12*	.48**	.13**	.15*	.32**	-	
10. Ecological automobile use	.06	.04	.10	.02	.72**	.26**	.47**	.20**	.18**	-
11. Ecological Mindset	.06	.08	.08	.00	.06	.04	-.01	.09	.02	.04

**Pearsons *r*, two-sided significance of a < .01

*Pearsons *r*, two-sided significance of a < .05

Moderating effects of ecological mindset

The first moderation analysis showed that an ecological mindset did not significantly moderate the relationship between pro-environmental behaviours and well-being. While the overall model shows statistical significance, the interaction effect does not (B = .51, SE = .40, t = 1.29, p = .19, 95% CI [-.27, 1.30]). Although no statistically significant interaction effect could be found, Figure 1 illustrates a positive relation between well-being and sustainable environmental behaviours for low, average, and high ecological mindset.

Table 3

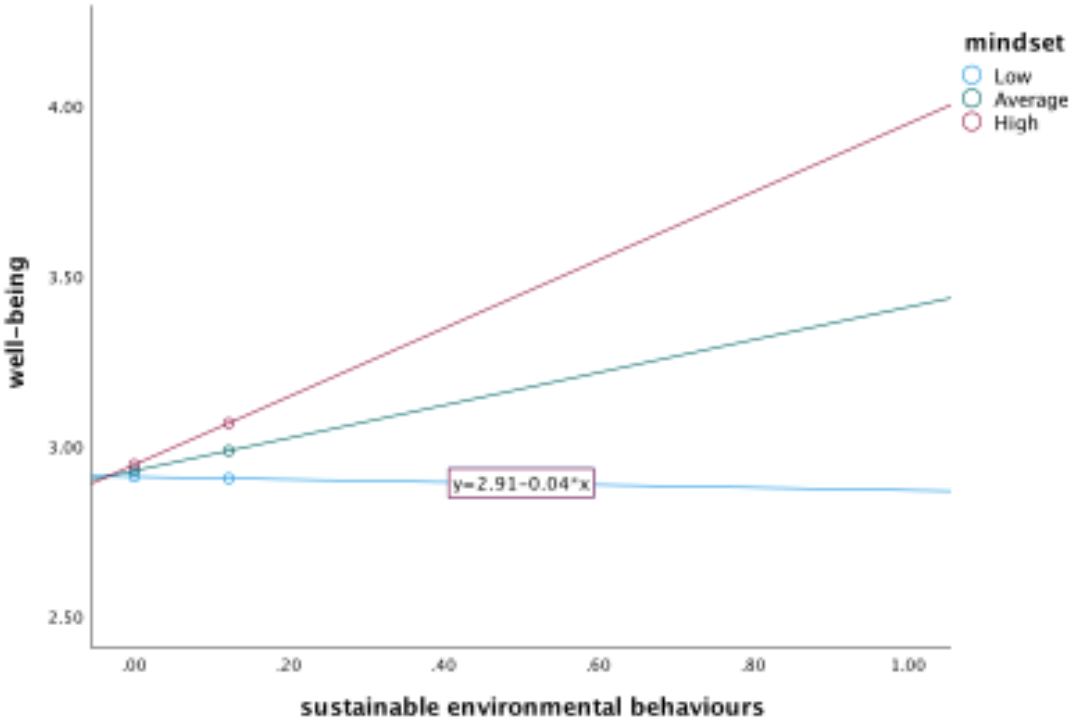
Moderating Effect of Ecological Mindset on the relation between pro-environmental behaviours and well-being (N=289)

	B	T	p
Intercept	2.55	13.59	.000
GEB-50	.48	1.32	.186
Ecological mindset	.02	.39	.690
Interaction effect	.51	1.29	.198
Age	.01	2.43	.015

Notes: R = .21, $R2$ = .043, $F(5,277) = 2.49$, $p < .05$

Figure 1

Visualisation of moderation in the association between well-being and sustainable environmental behaviours.



Based on the correlation matrix (Table 2) another moderation analysis on the association between the overall well-being score and the "volunteering in nature protective activities" subscale has been conducted. Again, while the overall model shows statistical significance, the interaction effect fails to do so (B = .21, SE = .19, t = 1.10, p = .271, 95% CI [-.17, .59], see Figure 2). Further moderation analyses were conducted for all subscales of well-being as well as all subscales of sustainable environmental behaviours. These analyses yielded similar non-significant results and failed to show a statistically significant interaction effect. Hence, no significant moderation effect could be found between any of the investigated variables.

Table 4

Moderating Effect of Ecological Mindset on the relation between volunteering subscale and well-being (N=289)

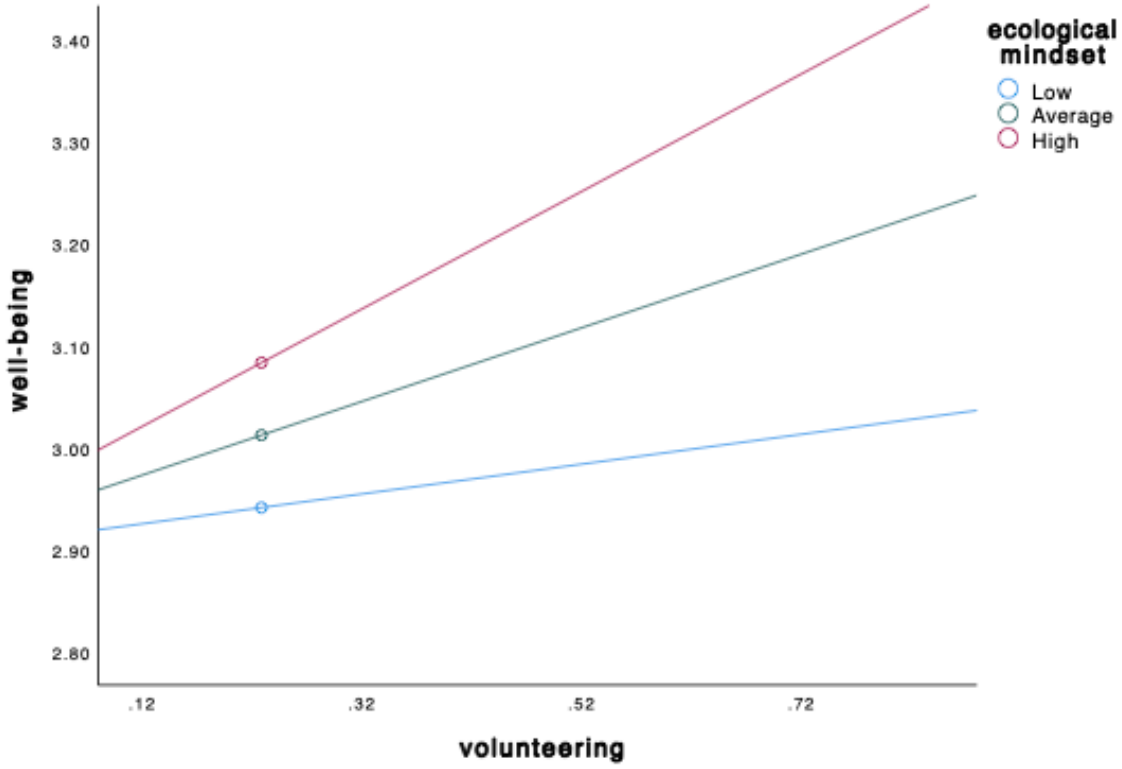
	B	T	p
Intercept	2.66	25.49	< .001
Volunteering	.36	1.89	.060

Ecological mindset	.02	.49	.620
Interaction effect	.21	1.10	.271
Age	.01	2.58	.010

Notes: $R = .21$, $R2 = .0452$, $F(4,278) = 3.29$, $p < .05$

Figure 2

Visualisation of moderation in the association between well-being and volunteering in nature protective activities.



Discussion

The purpose of this study was to gain a better understanding of the role of an ecological mindset as a potential moderator for the relationship between well-being and pro-environmental behaviours. To investigate this proposed relationship, multiple moderation analyses were conducted. Moreover, through the conducted analyses no statistically significant interaction effect and hence no significant moderation effect could be found. Thus, the hypothesis that the stronger the ecological mindset, the stronger the effect of pro-environmental behaviours on well-being can be rejected. Furthermore, the correlation between overall mental well-being and pro-environmental behaviours which have been

portrayed in other studies could not be found in this sample. Still, some correlations between subscales have been found and while these show statistical significance, all associations were of small magnitude.

The results of this study strongly imply that an ecological mindset does not moderate the relationship between well-being and pro-environmental behaviours in the investigated sample. This finding may be present because the ecological mindset, at least in its current conceptualization, does not act as a moderator of the investigated relationship. Furthermore, while the scale used to measure the ecological mindset has shown good reliability, it might not measure an ecological growth or fixed mindset. This is because the scale was adapted from a study by Chiu et. al., (1997) which aimed to investigate quite general implicit beliefs about the world rather than a specific ecological growth or fixed mindset. Hence, The original scale was not designed to measure an ecological fixed or growth mindset, which might be the reason that no correlations between ecological mindset and any other of the main variables could be found. On another note, other moderating variables might be present, which have not been investigated leading to the absence of a moderating effect of ecological mindset. Furthermore, in another, more representative, sample a moderating effect of ecological mindset might be found.

Another crucial finding is that in the investigated sample no significant association between the ecological mindset and pro-environmental behaviours is present. In contrast, Duchi et. al., (2020) suggested an effect of an ecological mindset on the performance of pro-environmental behaviours as well as on the inclination towards these behaviours. While the current study used the same measure to assess the ecological mindset, the findings of Duchi et. al., (2020) could not be replicated. Similarly, findings from Kaida and Kaida (2016) suggesting that pro-environmental behaviours may enhance emotional well-being have not been replicated in this study. This could result from the fact that Kaida and Kaida (2016) used only three items to measure pro-environmental behaviours. Specifically, these items only concern water and energy-saving behaviours and are not asking for specific behaviours of participants, which leaves more room for different interpretations of individuals. In a similar fashion, Duchi et. al., (2020) used a scale by Soliman and Wilson (2017) which aims to measure one's intentions to engage in pro-environmental behaviours rather than the already performed behaviours measured in the current study. Indeed, previous research has shown a notable discrepancy between intentions to engage in pro-environmental behaviours and actually performed behaviours (Zhang et. al., 2019). Overall, the novelty of the concept of an

ecological mindset as well as these drastic differences in the measurement of pro-environmental behaviours could explain the difference in results.

Two other significant findings in the current study are the associations of the subscales "volunteering in nature protective activities" and "garbage reduction & recycling" with overall well-being as well as psychological well-being. Similarly, Wray-Lake et. al., (2019) suggest that daily and average pro-environmental behaviours significantly predicted well-being. Interestingly, the pro-environmental behaviours mentioned were often related to recycling as well as conserving resources, which seems to be comparable to the subscale of garbage reduction and recycling. Nevertheless, the correlations found in the current study are not fully in line with the associations found in Wray-Lake et. al., (2019) since they only measured subjective well-being. Additionally, their study found no association between volunteering and well-being. One reason for these discrepancies, other than a different well-being measure, might be that Wray-Lake et. al., (2019) investigated volunteering in general rather than volunteering in nature protective activities. Again, due to the incoherence of measures across studies as well as investigating only one facet of well-being, differing results were found.

Strengths and Limitations

A considerable strength of the current study is the employment of a large sample size. Furthermore, the use of the GEB-50 to measure sustainable environmental behaviours could be considered a strength due to the large number of items measuring a variety of different behaviours. This becomes especially evident when looking at previous research (e.g., Kaida & Kaida, 2016; Wray-Lake et. al., 2019) which used scales with considerably fewer items measuring just a fraction of the behaviours.

There are at least four potential limitations concerning the results of this study. The first limitation concerns the design of this study. Specifically, the employment of a cross-sectional design might be limiting since findings might be more representative when using a longitudinal design like experience sampling. Especially since a cross-sectional design does not provide much information about the temporal sequence of the measured variables. This information might be helpful to better understand the direction of the association between pro-environmental behaviours and well-being. A second potential limitation concerns some of the measures used in this study. For example, while the GEB-50 is one of the most established measures for pro-environmental behaviours, it also has some weaknesses (Lange & Dewitte, 2019). For instance, given that it is a one-time self-report measure, it leaves a lot of room for the interpretation by participants. This means, that different participants have

different understandings of what it means to, e.g., recycle paper and what frequency qualifies as *often*. Another issue of the GEB-50 in this study was the way it is scored. The GEB-50 includes both polytomous as well as dichotomous items which have to be scored using Rasch modelling. While the creators of the scale provided an R-script to do so, during the analysis it was not possible to get the script to run. Hence, the scale had to be scored manually by dichotomizing all polytomous items. This might mean that the results of this study are to some degree flawed and thus not comparable to other studies using this measure. Another scale potentially biasing the results could be the ecological mindset measure. While the scale shows good reliability, the measure has been slightly adapted for a different use than originally designed. A third limitation of this study might be that while age and gender have been included in all analyses as covariates there might be other confounding variables altering the results of the analysis. At last, while the sample size was sufficient, the sample is not representative of the general population since the majority of participants were students and female. Hence, one should refrain from interpreting the findings of the current study beyond the investigated population.

Directions for future research

Due to these limitations, there are some things that future researchers investigating the role of an ecological mindset as a moderator in the relationship between pro-environmental behaviours and well-being could do to ensure that they do not conclude with missing correlations and insignificant interaction effects. For example, it might be advisable to repeat the analyses using different measures, especially to measure the ecological mindset. In particular, future researchers interested in investigating ecological mindset should create a new scale to measure this concept instead of using one not designed to do so. Moreover, another improvement might be to use the experience sampling method in future studies as well as to include additional covariates like education, political affiliation, and socio-economic status. Furthermore, future researchers could have participants log frequent pro-environmental behaviours like recycling multiple times a day to get a realistic picture of the actual frequency at which behaviours are performed. Also, it has been suggested to use the GEB-50 scale as a self-report measure in addition to a validated informant version of the scale, which still has to be created (Lange & Dewitte, 2019). Nonetheless, since an ecological mindset might not moderate the investigated relationship, investigating different moderators in this association could help understand its underlying working mechanisms. For instance, another moderator which might be valuable to investigate could be the perception of goal attainment. A study by Eigner (2001) showed that environmental volunteers showed reduced

emotional well-being when perceiving that they cannot reach their goal. Since this study could show a correlation between volunteering in nature protective activities and well-being it might be interesting to investigate this relationship further as well as test the moderation effect using different pro-environmental behaviours as well as all facets of well-being. Furthermore, it might also be beneficial to further investigate pro-environmental attitudes in the context of a moderator of the association between pro-environmental behaviours and well-being. While an ecological mindset is indeed an interesting concept to further explore in this relationship, the measure used in this study might not be the right choice.

Implications

The current results suggest several theoretical and practical implications. For instance, every finding of this study plays its part in obtaining a better understanding of the relationship between well-being and pro-environmental behaviours, which could prove to be valuable to policymakers or in the design of an intervention. If one aims to improve the impact of pro-environmental behaviours on well-being, for example, by focussing on changing people's implicit beliefs about the changeability of the world, this may not result in increased well-being achieved by performing sustainable environmental behaviours. Furthermore, the current study highlights potential limitations and challenges in measuring pro-environmental behaviours as well as ecological mindset. These investigated issues and the above-mentioned recommendations for future research can contribute to the refinement as well as the development of more precise and suitable measurement tools. This future research could then act as a stepping stone for the creation of improved scales or even the exploration of alternative methods to capture the complexities of these constructs, which then could have far-reaching implications in the creation of policies and interventions aimed at mitigating climate change as well as improving well-being.

Conclusion

Despite its limitations, the present study has contributed to enhancing our understanding of the relationship between well-being and pro-environmental behaviours. Moreover, it has acted as an additional piece of the puzzle in understanding the working mechanisms and potential moderators of this association. Also, this study has shown the need to employ alternative study designs and measurements instead of using cross-sectional designs and one-time self-report measures. Specifically, the use of the experience sampling method as well as informant versions of scales might prove a more comprehensive understanding of the complex dynamics between these variables. In addition, by examining

different moderators, researchers could further unravel the mechanisms underlying these concepts and potentially shed light on the conditions that influence the association between pro-environmental behaviours and well-being. To summarize, due to issues with the scoring of the GEB-50, potential shortcomings of the mindset measure, as well as the design of the study, the results should not be seen as absolute truths, but rather as trends in the investigated sample. To draw conclusions about causality and direction of the relationship between well-being and pro-environmental behaviours as well as the role of an ecological mindset, more research is needed.

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