Journal of Environmental Psychology 73 (2021) 101555

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep

Explaining the difference between the predictive power of value orientations and self-determined motivation for proenvironmental behavior

Torsten Masson [a], Siegmar Otto [b,*]

[a] University of Leipzig, Germany
[b] University of Hohenheim, Germany

ARTICLE INFO

Keywords:
Autonomous motivation
Self-determination theory
Values
General ecological behavior

ABSTRACT

Previous research has shown that biospheric, altruistic, and egoistic values explain more variance in proenvironmental behavior than explained by the self-determined motivation that is linked to such behavior (i.e. motivation fueled by the fulfilment of basic psychological needs). However, these findings might stem from the relatively narrow measures of proenvironmental behavior employed in these studies. In two studies, we investigated the predictive power of self-determined motivation and value orientations in explaining broader measures of self-reported proenvironmental behavior. Our results support our expectation that self-determined motivation would remain a significant predictor of proenvironmental behavior after controlling for value orientations. In line with our expectations, self-determined motivation (vs. values) was more predictive of behavior that was predominantly guided by environmental motives. We discuss the implications of these results for the prediction of proenvironmental behavior.

Proenvironmental behavior[1] is driven by distinct motives or goals (Steg & Vlek, 2009) such as hedonic, financial, social, or normative goals (Lindenberg & Steg, 2007; Neaman, Otto, & Vinokur, 2018), values (De Groot & Steg, 2010; Steg & de Groot, 2012), identity motives (Masson & Fritsche, 2014; Masson, Jugert, & Fritsche, 2016; Fritsche, Barth, Jugert, Masson, & Reese, 2018; Whitmarsh & O'Neill, 2011), or attachment to physical places (Hernández, Matin, Ruiz, & Hidalgo, 2010). Such motives or goals are formed early in life and related behavior already stabilizes in childhood (Otto, Evans, Moon, & Kaiser, 2019).

Recently, studies have also investigated self-determined motivation as a potential predictor of proenvironmental behavior (Kaiser, Kibbe, & Arnold, 2017; Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998; Webb, Soutar, Mazzarol, & Saldaris, 2013). Self-determination theory is an approach to human motivation, describing how basic psychological needs relate to behavior and well-being. Specifically, Self-determination theory suggests that autonomy, competence, and relatedness (or affiliation) are basic psychological needs that motivate need-congruent behavior. Behavior endorsing feelings of personal autonomy, competence and relatedness (i.e. behavior guided by self-determined motivation) is more likely to be performed and, when performed, to contribute to human well-being (Deci & Ryan, 2000; Kasser, 2009). Although previous studies have provided evidence that self-determined motivation impacts proenvironmental intentions, its relative predictive power and relations to other predictors remain less clear. For example, Webb et al. (2013) applied an extended model of goal-directed behavior (including items measuring self-determined motivation) to demonstrate that self-determined motivation predicts proenvironmental intentions and self-reported energy conservation behavior over and above other predictors (e.g., perceived behavior control). In contrast, De Groot and Steg (2010) found that altruistic, biospheric, and egoistic values explained more variance in proenvironmental intentions than could be explained by self-determined motivation regarding proenvironmental behavior, as measured by the Motivation Toward the Environment Scale (MTES; Pelletier et al., 1998). On the basis of their results, they encouraged further studies to focus on different value orientations (as opposed to self-determined motivation) when trying to understand individuals' proenvironmental intentions.

The present research aimed to extend previous evidence, especially de Groot and Steg's (2010) finding, by assuming that their results stemmed, at least in part, from the specific behaviors applied in their

* Corresponding author.
E-mail address: siegmar.otto@uni-hohenheim.de (S. Otto).

[1] We refer to proenvironmental behavior as behavior that directly (e.g., saving energy at home) or indirectly (e.g., supporting campaigns aimed at fostering the use of renewable energies) affects the impact of mankind on the natural environment. This also includes behaviors that are aimed at raising awareness for environmental issues (e.g., pointing out environmental damage to others).

https://doi.org/10.1016/j.jenvp.2021.101555
Received 15 January 2020; Received in revised form 15 January 2021; Accepted 16 January 2021
Available online 22 January 2021

studies (i.e., car choice, donation to either a humanitarian or an environmental organization). Their results may be attributed to differences in the *match* between the goals associated with the behavior and the goals reflected by egoistic, altruistic, and biospheric values and self-determined motivation, respectively. For example, even for highly engaged environmentalists, environmental protection will be one of a long list of reasons to buy a particular car or to choose among different charity organizations (e.g., Otto, Kaiser, & Arnold, 2014).

Whereas egoistic, altruistic, and biospheric values cover a multitude of reasons to perform a certain behavior, the MTES reflects mainly proenvironmental reasons and the extent of self-determination linked to the behavior (De Groot & Steg, 2010). The effects of values and of self-determined motivation on a certain ecologically relevant behavior should depend on the different proenvironmental goals and other personal goals that are linked to the behavior. For example, buying a car may involve a multitude of goals (e.g., facilitating spatial mobility, expressing status, and ensuring safety, among others). In contrast, people's decision to join an environmental initiative might be best explained by the strength of their desire to protect the environment. Whereas values might be more predictive for behavior motivated by a number of different reasons, self-determined motivation might be a better predictor of behaviors guided by proenvironmental goals. Values are guiding goals in people's lives, tied to their self-concept. Self--determined proenvironmental motivation relates more to the level of engaging in behaviors. Thus, we can expect values to be better explain variance in proenvironmental behaviors that are not solely motivated by environmental reasons and self-determined proenvironmental motivation to better explain variance in proenvironmental behaviors that are predominantly motivated by environmental reasons. In order to further support this view, we used not just single behaviors but sub-classes of behaviors and scales thereof, that either expressed more faceted goals not only related to the environment, or that solely expressed dedication towards the environment. Additionally, self-determined motivation is related to the fulfilment of autonomy, competence and relatedness needs. If proenvironmental behavior is perceived to contribute to the fulfilment of these needs, self-determined motivation should explain proenvironmental behavior even in the absence of strong biospheric values.

To address this question, we investigated the power of self-determined motivation and values to predict proenvironmental behavior by applying different criteria: (a) a broad index of self-reported proenvironmental behavior (Kaiser & Wilson, 2004), (b) a subclass of self-reported proenvironmental behavior that—in contrast to other proenvironmental behavior—can be expected to be more strongly guided by proenvironmental goals (i.e., environmental activism; e.g., boycotting companies that harm the environment), and (c) a subclass of self-reported proenvironmental behavior that can be expected to be guided by a number of different goals and factors (i.e., mobility behavior).

1. Predicting proenvironmental behavior with self-determined motivation and values

Research in environmental psychology focuses on sets of constructs (e.g., attitudes, beliefs, or values, among others) that can explain proenvironmental behavior (e.g., Fujii, 2006; Karp, 1996; Schultz et al., 2005). Values—most notably altruistic, biospheric, and egoistic values—are established predictors of proenvironmental behavior (for a review, see Steg & de Groot, 2012). Findings are quite consistent and indicate that biospheric values (and to a lesser extent, altruistic values as well) are positively correlated with proenvironmental behavior, whereas the endorsement of egoistic values is negatively associated with intentions to behave in a proenvironmental manner (see e.g., Stern, Dietz, Kalof, & Guagnano, 1995).

Recently, self-determination theory has also been suggested to explain proenvironmental behaviors. Self-determination theory distinguishes between three types of motivation characterized by their level of self-determination (i.e., the degree to which people experience personal autonomy and competence when engaging in a behavior): amotivation, extrinsic motivation, and intrinsic motivation (Deci & Ryan, 2000). Amotivation involves a lack of intention to act, whereas intrinsically motivated behaviors are activities that people find interesting and that are propelled by the satisfaction or pleasure derived from their practice. Extrinsic motivation is grounded in contingencies between a behavior and a desired consequence and may be further differentiated by its level of self-determination, including external regulation (the least self-determined), introjected regulation, identified regulation, and integrated regulation (the most self-determined; Deci & Ryan, 2000). Jointly, they form a continuum of self-determined motivational types, ranging from the least self-determined motivation (i.e., amotivation; low levels of personal autonomy and competence) to fully self-determined motivation (i.e., intrinsic motivation; high levels of personal autonomy and competence).

Previous research has shown that self-determined motivation increases intentions to act in eco-friendly ways (e.g., Green-Demers, Pelletier, & Ménard, 1997; Lavergne, Sharp, Pelletier, & Holtby, 2010; Osbaldiston & Sheldon, 2003; Pelletier et al., 1998; Seguin, Pelletier, & Hunsley, 1998; Tabernero & Hernández, 2010). For example, Green--Demers et al. (1997) reported that intrinsic motivation and integrated, identified, and introjected regulation were all positively correlated with several self-reported proenvironmental behaviors, whereas amotivation was negatively associated with proenvironmental conduct. Their results also indicated that the relation between self-determined motivation and self-reported proenvironmental behavior was stronger for relatively difficult behavior (e.g., reading books or magazines about environmental issues) than for relatively easy behavior (e.g., recycling). While behavior difficulty moderated the association between self-determined motivation and self-reported behavior, these results - at least partly - might also be attributable to the nature of the different behaviors as being more or less driven by environmental goals, i.e. reading books about environmental goals may be driven more strongly by environmental goals. Previous findings thus provide tentative evidence for the assumption that self-determined motivation explains variance in proenvironmental behavior over and above other well-established predictors and that its predictive power may be greater for behavior that is predominantly guided by proenvironmental goals.

2. Proenvironmental self-determined Motivation—motives beyond value orientations

In environmental psychology, different constructs are employed to explain proenvironmental behaviors. However, many findings have been inconsistent across behaviors, indicating that the predictive power of constructs varies across different types of behaviors (e.g., Fujii, 2006; Gatersleben, White, Abrahamse, Jackson, & Uzzell, 2010). How can these differences in the predictive power of certain constructs be explained? An obvious answer is that people typically pursue a behavior in order to fulfill several goals, some being more important (or typical) than others across different behaviors (Kruglanski et al., 2013). That is, different behaviors that are all labeled "proenvironmental" may be fueled by different (environmental and nonenvironmental) reasons, and thus, different values are more or less strongly related to these behaviors. Not surprisingly, when different sets of constructs (e.g., values and self-determined motivation) are applied to explain the same behavior, their predictive validity depends, among other things, on the *match* between the goals associated with the behavior and the goals reflected by the respective construct.

Biospheric, altruistic, and egoistic values cover a wider range of goals than those covered by (proenvironmental) self-determined motivation, the latter implying a focus on environmental protection (Kaiser et al., 2017). The results reported by De Groot and Steg (2010) most likely reflect the nature of their criterion behavior as being motivated by

multiple (also nonenvironmental) reasons. Self-determined motivation linked to proenvironmental behavior (as measured by the MTES), for instance, does not address most goals that are well reflected by the egoistic value orientation (e.g., social status). However, the concept of self-determined motivation provides reasons to act proenvironmentally beyond the reasons covered by values.

Self-determined motivation captures motives that are not necessarily addressed by biospheric, egoistic, or altruistic values (i.e., the value orientations that are usually employed in environmental psychology), such as feelings of being able to independently set and pursue personal goals (autonomy) and to act effectively (competence). That is not to say that values and self-determined motivation are unrelated. For example, respondents who strongly endorse biospheric values will probably tend to derive more pleasure from proenvironmental behavior, and this pleasure in turn contributes to proenvironmental behavior being more intrinsically motivated. For example, previous results suggest that people who strongly endorse biospheric values are more likely to have a strong environmental self-identity, which, in turn, is positively correlated with proenvironmental action intentions (van der Werff, Steg, & Keizer, 2013a; 2013b). However, perceptions of personal autonomy or competence tied to proenvironmental behavior, due to their nature as psychological needs, may motivate such behavior even in the absence of a strong biospheric value orientation (Deci and Ryan, 2000). Investigating behavior that is predominantly guided by environmental goals, thus, should result in the higher predictive power of self-determined motivation.

Furthermore, it seems that motivation towards the environment (e.g., Pelletier et al., 1998) might very much overlap with the attitude toward environmental protection. Although self-determination and attitude are commonly treated as two separate constructs within environmental psychology (e.g., Vining & Ebreo, 2002), their disparity has been questioned. Kaiser et al. (2017) argue that the extent of a person's self-determined motivation and the related attitude are formally the same. Thus, practically, in terms of promoting proenvironmental behavior, this leads to a substantially different classification of self-determined motivation and values. Promoting self-determined motivation to protect the environment would result in an intrinsic motivation to protect the environment in contrast to a motivation that can result from egoistic values (e.g., saving energy to save money). Such differentiation is essential, because the promotion of (external) motives by addressing certain values comes with side effects like rebound, while the promotion of self-determined motivation does not (Otto et al., 2014). Even more importantly and promising, promoting self-determined motivation might lead to a broad spillover of proenvironmental behavior (Henn, Otto, & Kaiser, 2020).

3. Research goals

With two studies, the present research aimed to complement de Groot and Steg's (2010) findings by applying broader measures of self-reported proenvironmental behavior (Kaiser & Wilson, 2004). We expected that self-determined motivation would remain a significant predictor of a broad index measure of self-reported proenvironmental behavior after controlling for a person's biospheric, altruistic, and egoistic value orientations (Hypothesis 1). Furthermore, we expected self-determined motivation (as compared with values) to be more predictive of behavior that is predominantly motivated by environmental goals, such as environmental activism but might be less predictive for behavior presumably shaped by more diverse goals, such as mobility behavior (Hypothesis 2).

4. Study 1

In Study 1, we tested the effects of egoistic, altruistic, and biospheric value orientations and self-determined motivation on an index composed of 19 environmental behaviors. Power analysis (power 80%, two-tailed, $\alpha = .05$) suggested that a sample size of 200 respondents was sufficient to detect a small effect, similar to the effect sizes reported in De Groot and Steg (2010).

4.1. Method

Sample. A total of 200 persons (mostly students) were recruited on a German university campus to participate in a paper-and-pencil questionnaire about proenvironmental attitudes. We excluded one person due to missing data, resulting in a final sample of 103 women and 95 men (one person did not disclose gender) between the ages of 18 and 43 ($M = 24.72$, $SD = 4.12$).

Procedure and measures. When not otherwise declared, total scale scores were calculated as the mean of the scale's items. Respondents were first asked to rate the importance of 13 *egoistic, altruistic, and biospheric values* as guiding principles in their lives (on a 7-point Likert scale ranging from 1 = *not important at all* to 7 = *very important*; Stern et al., 1995). The following values were included: social justice, a world of peace, equality, being loyal, being helpful (i.e., altruistic orientation; Cronbach's alpha = .71, $M = 5.90$, $SD = 0.81$), protecting the environment, unity with nature, a world of beauty, inner harmony (i.e., biospheric value orientation, $\alpha = .63$, $M = 5.19$, $SD = 0.93$), authority, wealth, social power, being influential (i.e., egoistic value orientation, $\alpha = .77$, $M = 3.51$, $SD = 1.08$).

Second, we assessed respondents' *self-reported proenvironmental behavior* with the General Ecological Behavior Scale (GEB; see e.g., Kaiser & Wilson, 2004). In order to reduce the burden for the respondents, we selected 19 items from the original version (Kaiser & Wilson, 2004). Example items are "How often do you purchase organic food?" and "How often do you shower instead of taking a bath?" (rated on a 7-point Likert scale ranging from 1 = *never* to 7 = *always*; $\alpha = .67$, $M = 4.54$, $SD = 0.62$). We also calculated a separate measure of *environmental activism* (i.e., behavior expected to be predominantly motivated by environmental considerations) using the following five GEB items: (a) boycotting companies that harm the environment, (b) supporting collective action (e.g., rallies), (c) searching for information about environmental issues, (d) pointing out environmentally damaging behavior to others, and (e) donating to an environmental organization (rated on a 7-point Likert scale ranging from 1 = *never* to 7 = *always*; $\alpha = .73$, $M = 3.13$, $SD = 1.19$). This selection corresponds with the behaviors from the *Vicarious Behavior* factor, which was identified by Kaiser, Oerke, and Bogner (2007).

In the third section of the questionnaire, we employed a modified version of the MTES (Pelletier et al., 1998) to measure respondents' *self-determined motivation* with respect to their proenvironmental behavior. The MTES consists of six subscales reflecting different levels of proenvironmental self-determined motivation (i.e., the different motivational types; see above) that answer the question "Why are you doing things for the environment?" The scale was translated into German using a back-translation procedure. Due to space limitations, we reduced the number of items per subscale from four to three. Furthermore, after conducting a pretest ($N = 30$), we dropped the subscale on identified regulation due to relatively strong violations of univariate normality (the skewness of two items substantially exceeded $|1|$). Our MTES measure contained five subscales with a total of 15 items. Respondents rated the items on a 7-point Likert scale ranging from 1 = *totally disagree* to 7 = *totally agree*. The five subscales are intrinsic motivation ($\alpha = .75$, $M = 4.27$, $SD = 1.33$), integrated regulation ($\alpha = .84$, $M = 4.43$, $SD = 1.41$), introjected regulation ($\alpha = .87$, $M = 4.69$, $SD = 1.43$), extrinsic regulation ($\alpha = .70$, $M = 2.48$, $SD = 1.18$), and amotivation ($\alpha = .79$, $M = 2.60$, $SD = 1.25$). Example items are "I like how it feels when I do things for the environment," "An integral part of my life," "Would feel guilty if I didn't," "To avoid being criticized," and "Don't know, can't see how my efforts are helping," respectively. In line with previous studies (e.g. Koestner, Otis, Powers, Pelletier, & Gagnon, 2008), we collapsed intrinsic motivation and integrated regulation into a single scale

(sometimes called autonomous motivation) such that higher scores reflected higher levels of *self-determined motivation* (r = .66, $M = 4.35$, $SD = 1.25$).[2] Table 1 presents the interscale correlations for each of the variables.

4.2. Results & discussion

We submitted self-reported general proenvironmental behavior (Regression 1) and self-reported environmental activism (Regression 2) to multiple regression analyses that included egoistic, altruistic, and biospheric value orientations and the four motivational types as predictors (i.e., self-determined motivation, introjected regulation, external regulation, amotivation).[3] Table 2 presents the results of the regression analyses.[4] For Regression 1, we found that self-determined motivation (β = .47, 95% CI [0.31, 0.63]) positively contributed to self-reported general proenvironmental behavior, whereas amotivation (β = -.13, 95% CI [-0.26, −0.01]) and endorsement of egoistic values (β = -.21, 95% CI [-0.33, −0.10]) were negative predictors of self-reported proenvironmental behavior. No other effects were significant. Results of Regression 1 thus supported Hypothesis 1. Regression 2 showed a similar pattern of results, although amotivation did not predict self-reported environmental activism and external regulation was positively correlated with activism. Supporting Hypothesis 2, the coefficient for self-determined motivation increased on the level of marginal significance (β = .54, 95% CI [0.38, 0.69]), $z(198) = 1.50$, $p = .066$, indicating that its predictive power (descriptively) was greater for self-reported environmental activism than for a broad measure of self-reported proenvironmental behavior.

Next, we submitted self-reported general proenvironmental behavior (Regression 1) and self-reported environmental activism (Regression 2) to hierarchical multiple regression analyses including two blocks of predictor variables, (a) values and (b) the four motivational types (see Table 3). When the values were entered first, the addition of the four motivational types (self-determined motivation, introjected regulation, external regulation, amotivation) increased the amount of variance explained in self-reported general proenvironmental behavior and self-reported environmental activism by about 16% and 27%, respectively. By contrast, when the motivational types were entered first, including value orientations increased the amount of variance explained in self-reported general proenvironmental behavior and environmental activism by only 5% and 2%, respectively. The results of the hierarchical regression analyses thus supported Hypothesis 2.

In sum, the results of the regression analyses provided initial support for our two hypotheses, indicating that self-determined motivation remained a significant predictor of self-reported proenvironmental behavior after controlling for participants' value orientations (Hypothesis 1), and that the predictive power of self-determined motivation (descriptively) increased for behavior that is predominantly motivated by proenvironmental reasons (Hypothesis 2).

4.3. Study 2

In Study 2, we aimed to replicate and extend the findings of Study 1 with respect to the criteria. We employed, first, an even broader measure of self-reported proenvironmental behavior; second, a slightly different index of self-reported environmental activism (i.e., behavior predominantly motivated by environmental goals); and third—as an extension—a measure of self-reported mobility behavior (i.e., behavior supposedly less motivated by environmental considerations; Abrahamse, Steg, Gifford, & Vlek, 2009).

4.4. Method

Sample. A total of 435 students were approached at eight German universities and agreed to participate in a survey on environmental attitudes. After excluding nine participants due to missing data, the final sample contained 249 women and 161 men (15 respondents did not disclose their gender), between the ages of 19 and 37 ($M = 24.32$, $SD = 2.97$). Power analysis (power 80%, two-tailed, α = .05) indicated that the sample size was sufficient to detect small effects.

Procedure and measures. First, we assessed respondents' *self-reported general proenvironmental behavior* with a 40-item GEB. The items were dichotomized to address scaling differences across the items (0 = *behavior not performed*, 1 = *behavior performed*; α = .76, $M = .45$, $SD = .12$). In contrast to what one would expect, a polytomous response format leads to more arbitrary and less reliable results (Kaiser & Wilson, 2000). Thus, we dichotomized those items that originally had a five-point response format.

We used a slightly different measure of *self-reported environmental activism*: boycotting companies that harm the environment, searching for information about environmental issues, pointing out environmentally damaging behavior to others, talking to others about environmental issues, donating to an environmental organization (rated on a 5-point Likert scale ranging from 1 = *never* to 5 = *always*; α = .75, $M = 2.12$, $SD = 0.68$).

We also calculated a four-item measure of *self-reported mobility behavior* (i.e., behavior expected to be motivated less by environmental considerations similar to the factor *Mobility and Transportation* as in Kaiser et al., 2007; see also Abrahamse, Steg, Gifford, & Vlek, 2009). An example is "I use public transportation or walk to go to work/university" (5-point Likert scale ranging from 1 = *never* to 5 = *always*; α = .74, $M = 3.61$, $SD = 0.95$).

We used the same measures for the *value orientations* and the *four motivational types* as in Study 1. Cronbach's alpha was .77 for altruistic values ($M = 5.92$, $SD = 0.84$), .67 for biospheric values ($M = 5.12$, $SD = 0.93$), .82 for egoistic values ($M = 4.02$, $SD = 1.18$), .90 for self-determined motivation ($M = 4.09$, $SD = 1.18$), .89 for introjected regulation ($M = 4.25$, $SD = 1.46$), .69 for extrinsic regulation ($M = 2.67$, $SD = 1.13$), and .87 for amotivation ($M = 2.43$, $SD = 1.32$). Table 1 presents the interscale correlations for each of the variables.

4.5. Results & discussion

We submitted self-reported general proenvironmental behavior (Regression 1), self-reported environmental activism (Regression 2), self-reported mobility behavior (Regression 3) to multiple regression analyses that included egoistic, altruistic, and biospheric value orientations and the four motivational types (self-determined motivation, introjected regulation, external regulation, amotivation) as predictors. Table 2 presents the results of the regression analyses. For Regression 1,

[2] We analyzed the dimensionality of our MTES measure with a principal component analysis (Studies 1 & 2). Results showed three components with eigenvalues greater than 1 (69% explained variance): intrinsic motivation, integrated regulation and introjected regulation (Factor 1), external regulation (Factor 2), amotivation (Factor 3). Conceptually, introjected regulation is considered as a less self-determined regulatory type (i.e. controlled motivation; see Blais, Sabourin, Boucher, & Vallerand, 1990; Ryan & Connell, 1989). We thus did not include introjected regulation into our measure of self-determined motivation. However, studies investigating environmental behavior have repeatedly found that introjected regulation was substantially positively correlated with more self-determined motivational types (e.g., intrinsic motivation, integrated regulation), coefficients ranging from .5 to .7 (De Groot & Steg, 2010; Pelletier et al., 1998).

[3] In Regression 1, older (as compared with younger) respondents reported more proenvironmental behavior, whereas participants' gender did not influence their ecological behavior. However, including age in the regression analyses did not change the overall results and was therefore dropped from the analyses reported below.

[4] We reran regression analysis with a trimmed measure of biospheric values, including two items from the scale used by De Groot and Steg (2010; protecting the environment, unity with nature). Results can be found in the supplement.

Table 1
Inter-scale correlations between variables in Study 1 (N = 199) and Study 2 (N = 426).

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Biospheric value		.52**	.01	.54**	.49**	-.01	-.33**	.30**	.39**	.16**
2. Altruistic value	.58**		-.10*	.34**	.34**	-.02	-.24**	.16**	.20**	.10*
3. Egoistic value	.06	.01		-.16**	-.19**	.06	.26**	-.29**	-.17**	-.22**
4. Self-determined motivation	.54**	.43**	-.14		.81**	.22**	-.45**	.56**	.61**	.19**
5. Introjected regulation	.44**	.27**	-.10	.67**		.23**	-.48**	.52**	.53**	.19**
6. External regulation	.01	-.09	.14	.02	.09		.11*	.11*	.11*	.02
7. Amotivation	-.27**	-.22**	.29**	-.27**	-.27**	.34**		-.41**	-.41**	-.16**
8. General Ecological behavior	.40**	.37**	-.34**	.61**	.41**	-.08	-.40**		.67**	.46**
9. Environmental activism	.38**	.22**	-.19**	.64**	.50**	.15*	-.17*	.67**		.16**
10. Mobility behavior (Study 2)										

Note. * $p < .05$; ** $p < .01$; Correlations from Study 1 (2) are listed in the lower (upper) diagonal part of the table.

Table 2
Multiple regressions of general ecological behavior, environmental activism, mobility behavior and cognitive integration on motivational types and value orientations in Studies 1 and 2.

Model		*β*	*95% CI*	*β*	*95% CI*
Study 1	**Study 2**				
1	*DV: General ecological behavior*				
	Self-determined motivation	.47**	.31/.63	.39**	.26/.53
	Introjected regulation	-.03	-.18/.12	.09	-.04/.23
	External regulation	.03	-.09/.15	.03	-.05/.11
	Amotivation	-.13*	-.26/-.01	-.15**	-.24/-.06
	Biospheric value orientation	.10	-.04/.25	.03	-.07/.13
	Altruistic value orientation	.06	-.07/.20	-.07	-.16/.02
	Egoistic value orientation	-.21**	-.33/-.10	-.18**	-.26/-.10
2	*DV: Environmental activism*				
	Self-determined motivation	.54**	.38/.69	.46**	.33/.61
	Introjected regulation	.09	-.05/.24	.03	-.09/.18
	External regulation	.14*	.02/.25	.02	-.07/.09
	Amotivation	.01	-.12/.12	-.16**	-.25/-.07
	Biospheric value orientation	.10	-.05/.24	.09	-.01/.19
	Altruistic value orientation	-.07	-.20/.06	-.06	-.15/.02
	Egoistic value orientation	-.13*	-.24/-.01	-.05	-.13/.03
3	*DV: Mobility behavior*				
	Self-determined motivation			.06	-.11/.23
	Introjected regulation			.03	-.13/.20
	External regulation			.02	-.09/.12
	Amotivation			-.03	-.14/.08
	Biospheric value orientation			.11	-.01/.24
	Altruistic value orientation			-.02	-.13/.09
	Egoistic value orientation			-.20**	-.30/-.10

Note. * $p < .05$; ** $p < .01$.

we found that self-determined motivation positively contributed to self-reported general proenvironmental behavior (β = .39, 95% CI [0.26, 0.53]), whereas amotivation (β = -.15, 95% CI [-0.24, −0.06]) and endorsement of egoistic values (β = -.18, 95% CI [-0.26, −0.10]) were negatively associated with such behavior. No other effects were significant. Regression 2 showed a similar pattern of results (exception: egoistic values no longer predicted self-reported environmental activism). Replicating the results of Study 1, the coefficient for self-determined motivation significantly increased (β = .46, 95% CI [0.33, 0.60]), $z(425) = 1.99$, $p = .023$, indicating that its predictive power was greater for self-reported environmental activism than for general self-reported proenvironmental behavior. By contrast, the results of Regression 3 indicated that egoistic values predicted self-reported mobility behavior (β = -.20, 95% CI [-0.30, −0.11]), whereas the four motivational types remained nonsignificant. Results of the Regressions 1–3 thus provided additional support for Hypotheses 1 & 2.

Finally, we submitted self-reported environmental activism and self-reported mobility behavior to hierarchical multiple regression analyses including two blocks of predictor variables: values and motivational types (see Table 3). When values were entered first, including the four motivational types increased the amount of variance explained in self-reported in self-reported general proenvironmental behavior and self-reported environmental activism by about 20% and 22%, respectively, but did not increase the amount of variance explained in self-reported mobility behavior. By contrast, when the four motivational types were entered first, including values did not significantly increase the amount of variance explained in self-reported environmental activism but contributed to the amount of variance explained in self-reported mobility behavior (by about 4%). The results of the hierarchical regression analyses thus supported the prediction that self-determined motivation (as compared with values) would better predict behavior predominantly driven by environmental motives (Hypothesis 2).

Table 3
Explained variance in general ecological behavior, environmental activism and mobility behavior by motivational types and value orientations in Studies 1 and 2.

Predictors entered by step	R^2	R^2-Change	R^2	R^2-Change
		Study 1		**Study 2**
DV: General ecological behavior				
Motivational types first:				
Motivational types	.39		.35	
Values	.44	.05**	.38	.03**
Values first:				
Values	.28		.18	
Motivational types	.44	.16**	.38	.20**
DV: Environmental activism				
Motivational types first:				
Motivational types	.44		.38	
Values	.46	.02 (n.s.)	.39	.01 (n.s.)
Values first:				
Values	.19		.17	
Motivational types	.46	.27**	.39	.22**
DV: Mobility behavior				
Motivational types first:				
Motivational types			.04	
Values			.08	.04*
Values first:				
Values			.08	
Motivational types			.08	.00 (n.s.)

Note. * $p < .05$; ** $p < .01$; "motivational types" includes self-determined motivation, introjected regulation, external regulation, and amotivation as separate variables; "values" consist of biospheric, altruistic, and egoistic values.

5. General discussion

In two studies, we showed that self-determined motivation with respect to proenvironmental behavior uniquely predicts people's self-reported proenvironmental behavior across different (types of) dependent variables. As expected, self-determined motivation contributed to

the explanation of self-reported general proenvironmental behavior after controlling for altruistic, biospheric, and egoistic values (Hypothesis 1). More specifically, stronger self-determined motivation was positively associated with self-reported proenvironmental behavior, whereas amotivation was negatively associated with such behavior. The latter result replicates previous findings, demonstrating that self-determined motivation is a robust concept that can explain pro-environmental behavior (Pelletier et al., 1998; Villacorta, Koestner, & Lekes, 2003). Our results also indicate that the predictive power of self-determined motivation increases for behavior that is predominantly driven by proenvironmental motives (i.e., environmental activism), supporting Hypothesis 2. These findings were consistent for different measures of self-reported proenvironmental behavior across the two studies. Whereas behavior motivated by different environmental and nonenvironmental reasons (e.g., mobility behavior) was explained better by values, behavior that is almost solely dedicated to a pro-environmental cause may be explained better by self-determined motivation.

Furthermore, we found that egoistic value orientation (but not biospheric value orientation) predict general ecological behavior as well es proenvironmental activism and mobility behavior. This very much relates to the fact, that values are broader and can also contradict and finally counteract the motives that drive proenvironmental behavior. We don't think that the contrast between our results and previous findings (e.g., De Groot & Steg, 2010) is surprising, because our criteria measures represent a class of behaviors and do not depend on one specific behavior. This shows the importance of choosing different criteria in order to enhance and advance knowledge in the sense of robust and open science.

Despite consistent support for the hypothesized effects across the two studies, the present research has a number of limitations. First, a potential limitation of the studies is their reliance on student samples, which raises questions about the generalizability of the results. Second, the behaviors included in our measures of general proenvironmental behavior and environmental activism behavior vary in the degree of their environmental impact, ranging from high impact behaviors (e.g., flying) to behaviors only indirectly related to reducing negative environmental impact (e.g., pointing out environmental damage to others). Third, we applied a slightly different measure of biospheric values than previous research (De Groot & Steg, 2010). Ultimately, we cannot rule out that the differences between previous findings and our results are partly attributable to methodological reasons. However, the bivariate correlations between biospheric values and our criterion variables are in line with previous studies. Fourth, our studies relied on correlational data and therefore are limited in the degree to which they can explain the hypothesized models. However, we found significant correlations between value orientations and the self-determined motivational types, replicating previous findings (De Groot & Steg, 2010). Whereas amotivation was positively correlated with egoistic values, self-determined motivation was positively associated with biospheric (and to a lower extent, altruistic) values. Biospheric values' substantial correlations with self-determined motivation indicate that a stronger self-determined motivation – at least to some degree – reflects the internalization of a more broad value orientation.

On a more general level, our data show that comparisons of explanatory power are susceptible to (more or less arbitrary) choices of behavioral criteria due to the different composition of the reasons that drive each behavior (i.e., multifinality of behavior). Thus, when comparing the predictive power of psychological constructs for pro-environmental behavior or intention, the multifinality of the respective proenvironmental behaviors should be acknowledged. The explanation of behaviors that are driven by a multitude of reasons will profit from psychological constructs that cover a broad range of reasons such as value orientations, whereas behaviors that focus only on pro-environmentalism will be explained better by constructs that focus only on proenvironmental reasons. However, when one wishes to compare the overall performance of a construct in explaining proenvironmental behaviors, this comparison should be based on broad behavioral measures. In employing such a measure (e.g., the GEB), our results indicate that self-determined motivation emerged as a unique predictor of self-reported proenvironmental behavior and explained more variance than could be explained by biospheric, altruistic, and egoistic value orientations.

Author note

The authors thank Jane Zagorski for her language support and Daniel Hanss for his comments on earlier versions of this text.

Author statement

Torsten Masson: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Validation; Writing - original draft; Writing - review & editing. **Siegmar Otto:** Conceptualization; Data curation; Methodology; Resources; Validation; Writing - original draft; Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2021.101555.

References

Abrahamse, W., Steg, L., Gifford, R., & Vlek, C. (2009). Factors influencing car use for commuting and the intention to reduce it: A question of self-interest or morality? *Transportation Research Part F: Traffic Psychology and Behaviour, 12*, 317–324.

Blais, M. R., Sabourin, S., Boucher, C., & Vallerand, R. J. (1990). Toward a motivational model of couple happiness. *Journal of Personality and Social Psychology, 59*, 1021–1031.

De Groot, J. I. M., & Steg, L. (2010). Relationships between value orientations, self-determined motivational types and pro-environmental behavioural intentions. *Journal of Environmental Psychology, 30*, 368–378.

Deci, E. L., & Ryan, R. M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227–268.

Fritsche, I., Barth, M., Jugert, P., Masson, T., & Reese, G. (2018). A social identity model of pro-environmental action (SIMPEA). *Psychological Review, 125*, 245–269.

Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of self-reported pro-environmental behavior intentions. *Journal of Environmental Psychology, 26*, 262–268.

Gatersleben, B., White, E., Abrahamse, W., Jackson, T., & Uzzell, D. (2010). Values and sustainable lifestyles. *Architectural Science Review, 53*, 37–50.

Green-Demers, I., Pelletier, L. G., & Ménard, S. (1997). The impact of behavioural difficulty on the saliency of the association between self-determined motivation and environmental behaviours. *Canadian Journal of Behavioral Science, 29*, 157–166.

Henn, L., Otto, S., & Kaiser, F. G. (2020). Positive spillover: The result of attitude change. *Journal of Environmental Psychology, 69*, 101429.

Hernández, B., Martín, A. M., Ruiz, C., & Hidalgo, M. C. (2010). The role of place identity and place attachment in breaking environmental protection laws. *Journal of Environmental Psychology, 30*, 281–288.

Kaiser, F. G., Kibbe, A., & Arnold, O. (2017). Self-determined, enduring, ecologically sustainable ways of life: Attitude as a measure of individuals' intrinsic motivation. In G. Fleury-Bahi, E. Pol, & O. Navarro (Eds.), *Handbook of environmental psychology and quality of life research* (pp. 185–195). Cham: Springer International Publishing.

Kaiser, F. G., Oerke, B., & Bogner, F. X. (2007). Behavior-based environmental attitude: Development of an instrument for adolescents. *Journal of Environmental Psychology, 27*, 242–251.

Kaiser, F. G., & Wilson, M. (2000). Assessing people's general ecological behavior: A cross cultural measure. *Journal of Applied Social Psychology, 30*, 952–978.

Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences, 36*, 1531–1544.

Karp, D. G. (1996). Values and their effect on self-reported pro-environmental behavior. *Environment and Behavior, 28*, 111–133.

Kasser, T. (2009). Psychological need satisfaction, personal well-being, and ecological sustainability. *Ecopsychology, 1*, 175–180.

Koestner, R., Otis, N., Powers, T. A., Pelletier, L., & Gagnon, H. (2008). Autonomous motivation, controlled motivation, and goal progress. *Journal of Personality, 76*, 1201–1230.

Kruglanski, A. W., Köpetz, C., Bélanger, J. J., Chun, W. Y., Orehek, E., & Fishbach, A. (2013). Features of multifinality. *Personality and Social Psychology Review, 17*, 22–39.

Lavergne, K. J., Sharp, E. C., Pelletier, L. G., & Holtby, A. (2010). The role of perceived government style in the facilitation of self-determined and non self-determined

motivation for self-reported pro-environmental behavior. *Journal of Environmental Psychology, 29*, 169–177.
Lindenberg, S., & Steg, L. (2007). Normative, gain and hedonic goal frames guiding environmental behavior. *Journal of Social Issues, 63*, 117–137.
Masson, T., & Fritsche, I. (2014). Adherence to climate change-related ingroup norms: Do dimensions of group identification matter? *European Journal of Social Psychology, 44*, 455–465.
Masson, T., Jugert, P., & Fritsche, I. (2016). Collective Self-Fulfilling Prophecies: Group identification biases perceptions of environmental group norms among high identifiers. *Social Influence, 11*, 185–198.
Neaman, A., Otto, S., & Vinokur, E. (2018). Toward an integrated approach to environmental and prosocial education. *Sustainability, 10*, 1–11.
Osbaldiston, R., & Sheldon, K. M. (2003). Promoting internalizedmotivation for environmentally responsible behavior: A prospective study of environmental goals. *Journal of Environmental Psychology, 23*, 349–357.
Otto, S., Evans, G. W., Moon, M. J., & Kaiser, F. G. (2019). The development of children's environmental attitude and behavior. *Global Environmental Change, 58*, 101947.
Otto, S., Kaiser, F. G., & Arnold, O. (2014). The critical challenge of climate change for psychology: Preventing rebound and promoting more individual irrationality. *European Psychologist, 19*, 96–106.
Pelletier, L. G., Tuson, K. M., Green-Demers, I., Noels, K., & Beaton, A. M. (1998). Why are you doing things for the environment?: The Motivation toward the Environment Scale. *Journal of Applied Social Psychology, 28*, 437–468.
Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749–761.
Schultz, P. W., Gouveia, V. V., Cameron, L. D., Tankha, G., Schmuck, P., & Franek, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology, 36*, 457–475.
Seguin, C., Pelletier, L. G., & Hunsley, J. (1998). Toward a model of. *Environmental Activism. Environment and Behavior, 30*, 628–652.
Steg, L., & de Groot, J. I. M. (2012). Environmental values. In S. Clayton (Ed.), *The Oxford handbook of environmental conservation* (pp. 81–92). New York: Oxford University Press.
Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*, 309–317.
Stern, P. C., Dietz, T., Kalof, L., & Guagnano, G. A. (1995). Values, beliefs and proenvironmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology, 25*, 1611–1636.
Tabernero, C., & Hernández, B. (2010). Self-efficacy and intrinsic motivation guiding environmental behavior. *Environment and Behavior, 43*, 658–675.
Vining, J., & Ebreo, A. (2002). Emerging theoretical and methodological perspectives on conservation behavior. In R. B. Bechtel, & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 541–558). New York: Wiley.
Villacorta, M., Koestner, R., & Lekes, N. (2003). Further validation of the motivation toward the environment scale. *Environment and Behavior, 35*, 486–505.
Webb, D., Soutar, G. N., Mazzarol, T. W., & Saldaris, P. (2013). Self-determination theory and consumer behavioural change: Evidence from a household energy-saving behaviour study. *Journal of Environmental Psychology, 35*, 59–66.
van der Werff, E., Steg, L., & Keizer, K. (2013a). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology, 34*, 55–63.
van der Werff, E., Steg, L., & Keizer, K. (2013b). It is a moral issue: The relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour. *Global Environmental Change, 23*, 1258–1265.
Whitmarsh, L., & O'Neill, S. (2011). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*, 305–314.