



# Proenvironmental attitudes predict proenvironmental consumer behaviors over time

Wiebke Bleidorn<sup>\*</sup>, Madeline R. Lenhausen, Christopher J. Hopwood

University of California Davis, United States

## ARTICLE INFO

### Keywords:

Proenvironmental attitudes  
Proenvironmental behavior  
Longitudinal  
Life stage  
Perceived control

## ABSTRACT

Proenvironmental attitudes and behaviors have been increasing over the past decade. In this study, we use longitudinal panel data from a nationally representative sample of the Swiss population ( $N = 9106$ ) to replicate the finding that proenvironmental attitudes are linked with proenvironmental consumer behaviors, and present novel evidence that change in proenvironmental attitudes is associated with change in proenvironmental consumer behaviors. The links between proenvironmental attitudes and proenvironmental consumer behaviors were moderated by people's life stage but not by their perceived control. Together, these results provide important insights about the ways in which proenvironmental attitudes translate into proenvironmental consumer behaviors over time and across individuals with different demographic and psychological backgrounds.

## 1. Introduction

Climate change is a growing threat to humanity. Mitigating this threat will require widespread behavioral change at the levels of societies, organizations, and individuals (Hornsey et al., 2016; Nielsen et al., 2020). Proenvironmental behavior involves actions intended to minimize negative effects or enhance positive effects on the environment (Kollmuss & Agyeman, 2002). Many types of proenvironmental behavior, such as purchasing goods with a smaller carbon footprint, are influenced by a variety of factors including personal beliefs, preferences, resources, information, and sacrifices (Stern, 2011). People differ in their willingness to engage in these behaviors in order to protect the environment. Thus, considerable potential lies in a greater understanding of the psychological factors that predict proenvironmental behaviors (Nielsen et al., 2020).

Theory and research have emphasized the role of proenvironmental attitudes as antecedents of proenvironmental behavior (Bamberg & Möser, 2007; De Leeuw et al., 2015; Hall et al., 2018; Klöckner, 2013; Thøgersen & Ölander, 2002). Individuals with proenvironmental attitudes tend to evaluate the natural environment with some degree of favor (Milfont & Duckitt, 2010), for example by expressing environmental awareness, identifying as environmentalists, or supporting proenvironmental policies. There is some evidence to suggest that proenvironmental attitudes are positively associated with proenvironmental behaviors including proenvironmental consumption (for

reviews, see Hornsey et al., 2016; Stern, 2011; Nielsen et al., 2020). However, the link between proenvironmental attitudes and behavior is far from fully understood.

The goal of the present pre-registered study (<https://osf.io/zg6bk>) was to advance our understanding of the association between proenvironmental attitudes and proenvironmental consumer choice behavior, referring to the purchase of ecologically friendly and sustainable goods and products. Using longitudinal panel data from a nationally representative sample of the Swiss population, we first examined stability and change in people's proenvironmental attitudes and proenvironmental consumer behaviors over 6 years. We then examined the links between proenvironmental attitudes and proenvironmental consumer choice behaviors over time and across individuals with different demographic and psychological backgrounds.

### 1.1. Stability and change in proenvironmental attitudes and behaviors

Although proenvironmental attitudes and behaviors are relatively stable across time, some research suggests that they can and do change (Hall et al., 2018). To better understand the course of proenvironmental attitudes and behaviors, we examined the rank-order stability, mean-level change, and individual differences in change in proenvironmental attitudes and proenvironmental consumer behaviors using three waves of longitudinal data collected over 6 years in a nationally representative sample of the Swiss population.

<sup>\*</sup> Corresponding author. Department of Psychology, University of California Davis, One Shields Avenue, Davis, CA, 95616, United States.  
E-mail address: [wiebkebleidorn@gmail.com](mailto:wiebkebleidorn@gmail.com) (W. Bleidorn).

*Rank-order stability* reflects the degree to which the relative ordering of individuals on a variable is stable over time and can be expressed as test-retest correlation across two assessment waves. Previous research indicated that the rank-order stability of political attitudes (e.g., Alwin & Krosnick, 1991; Rekker et al., 2015) and aggregate behaviors (Epstein, 1979) tends to be moderate to high depending on the reliability of the assessments and time interval between assessments. We thus expected the rank-order stability of proenvironmental attitudes and behaviors to be moderate across 3- to 6-year intervals (H0a).

*Mean-level change* reflects absolute increases or decreases (gains or losses) in a variable over a certain period of time, averaged across all people. This index can be used to examine whether people's proenvironmental attitude and behaviors have changed on average, for example in response to campaigns or interventions. The past two decades have seen an increase in interventions and campaigns designed to raise awareness for environmental concerns and promote proenvironmental behaviors including proenvironmental consumption (Galvão et al., 2016; Kanger et al., 2020; O'Flaherty & Liddy, 2018). The overarching goal of these campaigns is to strengthen people's proenvironmental attitudes and increase people's motivation to engage in proenvironmental behaviors. We thus expected a slight increase in proenvironmental attitudes and proenvironmental consumer behaviors in the general population (H0b).

*Individual differences in change* describe the degree to which individuals' trajectories conform to versus deviate from the overall population trends of mean-level change (Schwaba & Bleidorn, 2018). Not everyone changes in the same direction or to the same degree; some people change less while others change more than the norm. A reliable assessment of individual differences in change is a necessary condition for studying the correlates of developmental trajectories. The question of why proenvironmental attitudes and behaviors change can thus be expressed as a question of the existence and correlates of inter-individual differences in change. We expected to find significant individual differences in change in both proenvironmental attitude and behaviors (H0c).

### 1.2. Cross-sectional and longitudinal links between proenvironmental attitude and behavior

There is some evidence that proenvironmental attitudes are positively associated with different types of proenvironmental behaviors (for reviews, see Hornsey et al., 2016; Stern, 2011; Nielsen et al., 2020). The majority of existing studies used cross-sectional designs to examine the links between proenvironmental attitudes and behaviors at one particular point in time (for exceptions, see Hall et al., 2018; Thøgersen & Ölander, 2002). These studies have been useful in determining that people with stronger proenvironmental attitudes tend to be more likely to engage in proenvironmental behaviors. However, the cross-sectional approach does not enable an examination of the processes underlying attitudes and behavior. To test whether *changes* in proenvironmental attitudes predict *changes* in people's behavior, longitudinal or experimental data are needed.

In the present study, we used three waves of longitudinal data to examine the links between both stable levels of and changes in proenvironmental attitudes and proenvironmental consumer behaviors over time. Consistent with past evidence (Gupta & Ogden, 2009; Hauser et al., 2013), we expected that levels of proenvironmental attitudes are positively correlated with concurrent levels of proenvironmental consumer behaviors (H1a). Conditioned on the finding of significant individual differences in change (see H0c), we further predicted that *changes* in proenvironmental attitudes are positively correlated with *changes* in proenvironmental consumer behaviors (H1b), indicating that those individuals who increase more in their proenvironmental attitudes over time also increase more in proenvironmental consumer behaviors. Together, these findings would support the proposition that campaigns and interventions designed to increase proenvironmental attitudes may

also result in an increase in proenvironmental behaviors.

### 1.3. Moderators of the association between proenvironmental attitude and behavior

Previous research on the links between proenvironmental attitudes and behaviors yielded effect sizes that were smaller and less consistent than theoretically expected (Barber et al., 2014; Gupta & Ogden, 2009; Hall et al., 2018; Hornsey et al., 2016). One explanation for the mixed body of evidence is that the degree to which proenvironmental attitudes predict proenvironmental consumer behaviors may differ across people with different demographic and psychological backgrounds (Ajzen et al., 1991; Glasman & Albarracín, 2006; Milfont et al., 2006; Soutter et al., 2020; Stern, 2011). For example, it is well established that people with stronger proenvironmental attitudes are more likely to engage in proenvironmental consumer behaviors if they have the requisite financial resources (Hall et al., 2018; Hauser et al., 2013). Other demographic and psychological factors may also influence the strength of the connection between proenvironmental attitudes and behavior. In the present study, we focused on the effects of two potential moderators: life stage and perceived control.

#### 1.3.1. Life stage

Lifespan theories of aging stress that people go through different life stages that are characterized by specific themes and developmental tasks (Freund & Baltes, 2002; Erikson, 1959; Heckhausen, 1997; Hutteman et al., 2014). Such age-graded trends may strengthen or weaken the link between proenvironmental attitudes and behaviors. In Western societies, middle adulthood (~35–65 years) is characterized by a growing sense of generativity, agency, and a sense of mastery (Hutteman et al., 2014). These themes may generally strengthen the association between proenvironmental attitudes and behaviors (Milfont & Sibley, 2011). Middle-aged adults may thus be more likely to act according to their proenvironmental attitudes and engage more frequently in proenvironmental consumer behaviors by purchasing sustainable and environmentally goods and products. In contrast, younger adults (18–35 years) tend to be less concerned with themes of generativity (Milfont et al., 2020). While older adulthood (>65 years) is also characterized by themes of generativity, it is also a time of decreases in control and mastery (Heckhausen, 1997), which complicates predictions about the strength with which proenvironmental attitudes may be linked to proenvironmental behaviors.

In summary, the link between proenvironmental attitude and behaviors may vary across life stages. We predicted that the association between levels of proenvironmental attitudes and proenvironmental consumer behaviors would be stronger for middle-aged adults compared to younger adults (H2a) and explored differences with older adults. We further tested whether the correlation between changes in proenvironmental attitudes and changes in proenvironmental consumer behaviors would be stronger for middle-aged adults compared to younger and older adults (H2b).

#### 1.3.2. Perceived control

Theory and research suggest that perceived control plays a role in linking proenvironmental attitudes and behaviors (Ajzen, 1991; Bamberg & Möser, 2007; Hines et al., 1987; Klöckner, 2013). Perceived control has been studied in various forms under varying names including self-efficacy, sense of control, or control beliefs (Skinner & Zimmer-Gembeck, 2011; Lachman & Weaver, 1998). While there are subtle differences, these terms generally refer to an individual's beliefs about their ability to perform a certain behavior (Bamberg et al., 2003) and the degree to which their behavior can bring about desired outcomes (Robinson & Lachman, 2017).

There is a large body of evidence documenting the power of perceived control as a robust predictor of the effort people exert to solve problems and persist at tasks, especially when faced with challenges and

obstacles (Skinner & Zimmer-Gembeck, 2011). People who believe that their behavior can bring about change should thus be also more likely to express their proenvironmental attitudes by engaging in proenvironmental behaviors. In contrast, those who believe their environment is unpredictable and outside of their personal control should be less likely to engage in proenvironmental behaviors, even if they endorse proenvironmental attitudes. In other words, the degree to which people engage in proenvironmental behaviors is likely shaped by beliefs about the degree to which their behavior can bring about desired outcomes (Stern, 2011).

Existing research has documented links between different measures of perceived control and proenvironmental behavior (Hall et al., 2018; Masud et al., 2016). However, these studies have typically focused on main effects of control beliefs on behaviors in relatively small samples. Here, we examined the moderating effect of perceived control on the links between proenvironmental attitudes and proenvironmental consumer behaviors in a large and nationally representative Swiss sample. We predicted that the association between levels of proenvironmental attitudes and behaviors would be stronger for individuals with higher compared to lower levels of perceived control (H3a). We further tested whether the correlation between changes in proenvironmental attitudes and change in proenvironmental behaviors would be stronger for individuals who are high compared to low in perceived control (H3b).

#### 1.4. The present study

The purpose of the present study was to scrutinize the link between proenvironmental attitudes and proenvironmental behaviors over time and across individuals. Table 1 presents an overview of the pre-registered hypotheses tested in this study. We first examined the stability of and change in proenvironmental attitudes and proenvironmental consumer behaviors over 6 years in a nationally representative sample of the Swiss population. We then tested three sets of hypotheses about the association between proenvironmental attitudes and proenvironmental consumer behaviors. Specifically, we replicated past findings that people with stronger proenvironmental attitudes are generally more likely to engage in proenvironmental consumer behaviors; we examined whether changes in people's proenvironmental attitudes were related to changes in their proenvironmental consumer behaviors; and we tested whether the association between (change in) proenvironmental attitude and (change in) proenvironmental consumer behavior was moderated by people's life stage and perceived control.

## 2. Methods

All analyses in the present study were preregistered (<https://osf.io/zg6bk>). Any deviations from the pre-registration are noted in the manuscript. The first and last authors of this preregistration have had no

**Table 1**  
Pre-registered hypotheses.

|     |                                                                                                                                                               |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H0a | The rank-order stability of PEA and PEB is modest across 3–6 years.                                                                                           |
| H0b | The mean-levels of PEA and PEB increase across the study period.                                                                                              |
| H0c | There is significant individual-level change in PEA and PEB.                                                                                                  |
| H1a | Stable levels PEA and PEB are positively correlated.                                                                                                          |
| H1b | Changes in PEA and PEB are positively correlated.                                                                                                             |
| H2a | The correlation between levels of PEA and PEB is stronger for middle-aged adults compared to younger adults (we will explore differences with older adults).  |
| H2b | The correlation between changes in PEA and PEB is stronger for middle-aged adults compared to younger adults (we will explore differences with older adults). |
| H3a | The correlation between levels of PEA and PEB is stronger for individuals who are high versus low in perceived control.                                       |
| H3b | The correlation between changes in PEA and PEB is stronger for individuals who are high versus low in perceived control.                                      |

Notes. PEA = Proenvironmental attitude. PEB = Proenvironmental behavior.

previous access to the SHP dataset. The second author downloaded the data and computed descriptives and intercorrelations for the main study variables prior to the publication of our preregistration. None of the analyses outlined below were performed prior preregistration.

#### 2.1. Sample

Data came from the Swiss Household Panel (SHP), based at the Swiss Centre of Expertise in the Social Sciences, funded by the Swiss National Science Foundation, and approved by the Research Commission of the University of Neuchâtel (Zimmermann-Sloutskis et al., 2010, for more information, see <https://forscenter.ch/projects/swiss-household-panel/>). The SHP is an ongoing panel study which has followed a random sample of private households in Switzerland. Data collection started in 1999 with a sample of 5077 households containing over 7000 household members. In 2004 and 2013, two refreshment samples including over 6500 households were added. In the 2018 assessment, over 9000 individual household members participated in the panel (Voorpostel et al., 2020). Here, we used data from all participants who provided responses to three proenvironmental attitude and behavior questions administered in 2011, 2014, and 2017 at one or more assessment waves. Table 2 shows the sample sizes, average age, and gender distribution at each assessment wave.

#### 2.2. Measures

The selection of measures used in this study was constrained by the availability of variables assessed in the Swiss Household Panel (SHP). We used the item “How important is the protection of the environment for you?” to assess participants' *proenvironmental attitudes* (PEA). Participants responded to this item on an 11-point Likert scale ranging from 0 “not important at all” to 10 “very important”. We used two items to assess participants' *proenvironmental consumer behaviors*: PEB<sub>organic</sub> “How often do you buy organic or ecological products, even though it is a bit more expensive?” (0 “never” to 10 “always”) and PEB<sub>seasonal</sub> “When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?” (0 “never” to 10 “always”). We focused on these relatively low-level consumer choice behaviors because individuals differ in these behaviors and these differences likely reflect – at least in part – psychological differences. All three items were administered as part of an environmental attitudes and behaviors survey in 2011, 2014, and 2017. Similar items focusing on organic products and seasonal produce have been used in previous research on proenvironmental attitudes and behaviors (e.g., Gupta & Ogden, 2009; Hauser et al., 2013).

We used 4 items to assess dispositional *perceived control*. These items were derived from established instruments; two items stem from Pearlman and Schooler (1978), “Whether or not I am able to get what I want is in my own hands”; “What happens to me in the future mostly depends on me” and two were derived from Lachman and Weaver (1998): “I can do just about anything I really set my mind to”; “When I really want to do something, I usually find a way to succeed at it”. These items were administered in 2012, 2015, and 2018 and rated on an 11-point scale from 0 “completely disagree” to 10 “completely agree”. Internal consistencies ranged between  $\alpha = .76$  to  $\alpha = .77$  across assessment waves. For each participant, we computed an averaged perceived control score across the three assessment waves.

We used participants' year of birth recorded in 2011 to assign them to different *life stage* groups. Specifically, we split the sample into three life stage groups: young adults (18–35, born between 1976 and 1993), middle-aged adults (36–64, born between 1947 and 1975), and old adults (65+, born before 1947). We examined *gender* as time-invariant covariate, as some research indicated that women tend to be more likely to endorse proenvironmental attitudes and engage in proenvironmental behavior than men (Milfont & Sibley, 2016). We also included personal annual *income* per assessment wave as time-variant covariate in the final models to account for the fact that people's

**Table 2**  
Sample size, age, and gender per assessment wave.

|      | Total |                                       | Men        |                                       | Women      |                                       |
|------|-------|---------------------------------------|------------|---------------------------------------|------------|---------------------------------------|
|      | N     | M <sub>age</sub> (SD <sub>age</sub> ) | N (%)      | M <sub>age</sub> (SD <sub>age</sub> ) | N (%)      | M <sub>age</sub> (SD <sub>age</sub> ) |
| 2011 | 7177  | 48.63 (18.12)                         | 3167 (44%) | 47.91 (18.12)                         | 4010 (56%) | 49.20 (18.11)                         |
| 2014 | 6802  | 46.94 (18.52)                         | 3040 (45%) | 46.32 (18.55)                         | 3762 (55%) | 47.44 (18.48)                         |
| 2017 | 9106  | 46.68 (18.56)                         | 4134 (45%) | 46.36 (18.66)                         | 4972 (55%) | 46.94 (18.47)                         |

Note. Sample includes participants who responded to three questions about proenvironmental attitude and behaviors administered in 2011, 2014, and 2017.

proenvironmental consumer behavior (and attitudes) may depend on their financial resources (Stern, 2011).

### 3. Results

Analyses for this study were conducted in R (R Core Team, 2017), with structural equation models estimated using the lavaan package (Rosseel, 2012). We used Full Information Maximum Likelihood estimation to handle missing data. We used chi-square difference tests to compare fits of nested models and  $p < .05$  to determine statistical significance for hypothesized tests. Analysis scripts and a covariance matrix of study data are posted on OSF (<https://osf.io/2xywp/>).

#### 3.1. Descriptives

Table 3 shows the mean-levels and standard deviations for the proenvironmental attitude and the two proenvironmental behavior variables per assessment wave. Scores were above the midpoint on two of these variables across waves, indicating that the average person in the sample believes that the protection of the environment is important to them ( $M = 7.55 - M = 7.78$ ), that they often purchase ecological or organic goods even if they are more expensive ( $M = 7.39 - M = 7.53$ ). The average score for the third variable was near the midpoint, suggesting that people sometimes pay attention to the fact that it is a seasonal product when buying fruits and vegetables ( $M = 5.42 - M = 6.03$ ).

Consistent with previous studies, the cross-sectional correlations between proenvironmental attitudes and the two proenvironmental behaviors were moderate across assessment waves (see Table S1 in the Supplementary Online Materials [SOM]). Correlations ranged between  $r = .26$  between PEA and PEB<sub>seasonal</sub> in 2017 and  $r = .30$  between PEA and PEB<sub>organic</sub> in 2017, indicating that some but not all people who endorse the protection of the environment engage in proenvironmental consumer behaviors.

#### 3.2. Univariate longitudinal analyses

We first examined the rank-order stabilities of proenvironmental attitudes and the two proenvironmental behaviors across assessment waves (see Table 4). Consistent with hypothesis H0a, the rank-order correlations were in the range of those typically found for behavioral individual difference measures (e.g., Bleidorn, 2020; Bleidorn et al.,

**Table 3**  
Means and standard deviations of proenvironmental attitudes and behaviors across years.

|      | PEA         | PEB <sub>organic</sub> | PEB <sub>seasonal</sub> |
|------|-------------|------------------------|-------------------------|
|      | M (SD)      | M (SD)                 | M (SD)                  |
| 2011 | 7.65 (1.78) | 5.42 (2.65)            | 7.39 (2.41)             |
| 2014 | 7.55 (1.78) | 5.74 (2.55)            | 7.53 (2.21)             |
| 2017 | 7.78 (1.74) | 6.03 (2.46)            | 7.51 (2.15)             |

Notes. Standard deviations in parentheses. PEA: proenvironmental attitude, “How important is the protection of the environment for you?”. PEB<sub>organic</sub>: “How often do you buy organic or ecological products, even though it is a bit more expensive?”. PEB<sub>seasonal</sub>: “When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?”

2021) with slightly higher correlations across 3-year compared to 6-year intervals.

We parameterized mean-level change and individual differences in change by fitting three univariate linear latent growth curve (LGC) models for the proenvironmental attitude and behavior variables (see Fig. 1). LGC models estimate a latent intercept and latent slope to determine the trajectory of change in a variable over time separated from measurement error. The intercept captures the mean-level and variance of a variable at baseline. The slope captures the average rate of change and individual differences in change across the study period. Fit indices indicated excellent model fit for the two proenvironmental behaviors (CFIs > .99, RMSEAs < .05), and acceptable fit for proenvironmental attitudes (CFI = 0.99; RMSEA = 0.082). The model parameters are shown in Table 5.

Consistent with hypothesis H0b, the slope means indicated significant increases in people’s proenvironmental attitude (PEA:  $B = 0.02$  per 3 years,  $p < .001$ , 95% CI [0.01, 0.03]) and proenvironmental behaviors (PEB<sub>organic</sub>:  $B = 0.10$  per 3 years,  $p < .001$ , 95% CI [0.09, 0.11]; PEB<sub>seasonal</sub>:  $B = 0.02$  per 3 years,  $p < .001$ , 95% CI [0.01, 0.03]) across assessment waves (see Fig. 2). Of particular interest was significant variance in the slopes, which is a precondition for testing several of the study hypotheses described below. Consistent with H0c, we found substantial individual differences in change in both proenvironmental attitudes and behaviors over time (all  $ps < .01$ ), indicating that people differed significantly in their individual rates of change for these variables.

Results of conditional latent growth curve models including gender as time-invariant and income as time-variant covariates revealed some significant associations with the intercepts of both proenvironmental attitudes and behaviors (see lower part of Table 5). On average, women were generally more likely to endorse proenvironmental attitudes (PEA:  $B = 0.35$ ,  $p < .001$ , 95% CI [0.28, 0.43]) and more likely to engage in proenvironmental consumer behaviors (PEB<sub>organic</sub>:  $B = 0.35$ ,  $p < .001$ , 95% CI [0.24, 0.46]; PEB<sub>seasonal</sub>:  $B = 0.86$ ,  $p < .001$ , 95% CI [0.75, 0.96]). A significant slope correlation with PEB<sub>seasonal</sub> ( $B = -0.02$ ,  $p < .020$ , 95% CI [-0.04, 0.00]) indicated that they were less likely to increase in the frequency with which they purchase seasonal produce. Income was not associated with the intercept of PEA and only negligibly associated with the intercept of PEB<sub>seasonal</sub> ( $B = 0.05$ ,  $p = .003$ , 95% CI [0.02, 0.8]). However, income was associated with the intercept of PEB<sub>organic</sub> ( $B = 0.21$ ,  $p < .001$ , 95% CI [0.18, 0.25]), indicating that people with higher income were more likely to purchase organic or ecological products at each assessment wave. Notably, income was not

**Table 4**  
Rank-order stabilities of proenvironmental attitudes and behaviors.

| Interval    | PEA | PEB <sub>organic</sub> | PEB <sub>seasonal</sub> |
|-------------|-----|------------------------|-------------------------|
| 2011 → 2014 | .60 | .62                    | .55                     |
| 2014 → 2017 | .61 | .65                    | .55                     |
| 2011 → 2017 | .58 | .58                    | .50                     |

Notes. Rank-order correlations are all significant at  $p < .001$ . PEA: proenvironmental attitude, “How important is the protection of the environment for you?”. PEB<sub>organic</sub>: “How often do you buy organic or ecological products, even though it is a bit more expensive?”. PEB<sub>seasonal</sub>: “When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?”

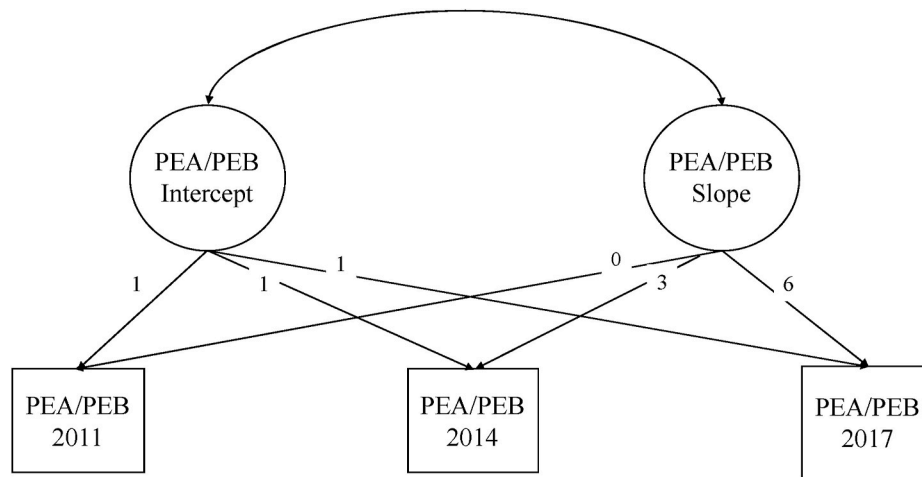


Fig. 1. Path diagram of univariate latent growth curve model.

Notes. PEA = Proenvironmental Attitude, PEB = Proenvironmental Behavior. The intercept estimates PEA/PEB scores at baseline; the slope estimates linear change in PEA/PEB across waves.

Table 5  
Univariate latent growth curve models.

|                         | Intercept |              |          |              | Slope    |              |       |          |              |       |
|-------------------------|-----------|--------------|----------|--------------|----------|--------------|-------|----------|--------------|-------|
|                         | Mean      |              | Variance |              | Mean     |              |       | Variance |              |       |
|                         | Estimate  | 95% CI       | Estimate | 95% CI       | Estimate | 95% CI       | p     | Estimate | 95% CI       | p     |
| No Covariates           |           |              |          |              |          |              |       |          |              |       |
| PEA                     | 7.61      | [7.57, 7.65] | 2.06     | [1.92, 2.20] | 0.02     | [0.01, 0.03] | <.001 | 0.01     | [0.00, 0.02] | .009  |
| PEB <sub>organic</sub>  | 5.41      | [5.35, 5.46] | 4.76     | [4.47, 5.05] | 0.10     | [0.09, 0.11] | <.001 | 0.05     | [0.03, 0.06] | <.001 |
| PEB <sub>seasonal</sub> | 7.36      | [7.31, 7.41] | 3.62     | [3.37, 3.88] | 0.02     | [0.01, 0.03] | <.001 | 0.02     | [0.01, 0.03] | .007  |
| Including gender        |           |              |          |              |          |              |       |          |              |       |
| PEA                     | 7.42      | [7.36, 7.47] | 2.03     | [1.89, 2.17] | 0.02     | [0.01, 0.03] | <.001 | 0.01     | [0.00, 0.02] | .010  |
| PEB <sub>organic</sub>  | 5.21      | [5.13, 5.30] | 4.73     | [4.44, 5.02] | 0.09     | [0.08, 0.11] | <.001 | 0.04     | [0.03, 0.06] | <.001 |
| PEB <sub>seasonal</sub> | 6.89      | [6.81, 6.96] | 3.44     | [3.19, 3.69] | 0.04     | [0.02, 0.05] | <.001 | 0.02     | [0.01, 0.03] | .005  |
| Including income        |           |              |          |              |          |              |       |          |              |       |
| PEA                     | 7.67      | [7.41, 7.93] | 2.06     | [1.92, 2.20] | 0.02     | [0.01, 0.03] | <.001 | 0.01     | [0.00, 0.02] | .009  |
| PEB <sub>organic</sub>  | 3.19      | [2.82, 3.55] | 4.65     | [4.36, 4.94] | 0.09     | [0.08, 0.10] | <.001 | 0.04     | [0.03, 0.06] | <.001 |
| PEB <sub>seasonal</sub> | 6.85      | [6.52, 7.19] | 3.61     | [3.35, 3.87] | 0.02     | [0.01, 0.03] | <.001 | 0.02     | [0.01, 0.03] | .008  |

Notes. Intercepts are all significant at  $p < .001$ . PEA: proenvironmental attitude, “How important is the protection of the environment for you?”. PEB<sub>organic</sub>: “How often do you buy organic or ecological products, even though it is a bit more expensive?”. PEB<sub>seasonal</sub>: “When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?” Gender included as a time-invariant covariate: 0 = men, 1 = women. Income was log-transformed and included as a time-varying covariate.

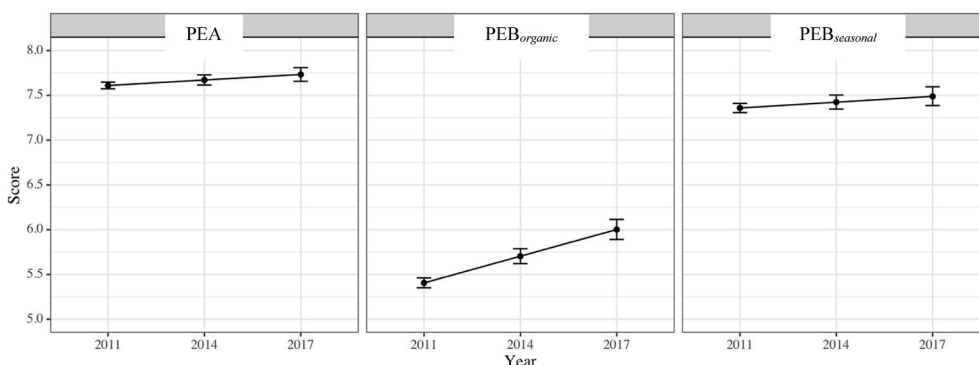


Fig. 2. Model implied change in proenvironmental attitudes and behaviors from 2011 to 2017.

Notes. PEA: proenvironmental attitude, “How important is the protection of the environment for you?”. PEB<sub>organic</sub>: “How often do you buy organic or ecological products, even though it is a bit more expensive?”. PEB<sub>seasonal</sub>: “When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?” Model-implied trajectories from best-fitting univariate latent growth curve models. Y-axis shows scale excerpt (full scale: 0 “never” to 10 “always”).

significantly associated with the slopes of either proenvironmental attitudes or behavior.

### 3.3. Bivariate longitudinal analyses

We examined the co-development of proenvironmental attitudes and

proenvironmental behaviors by combining the univariate latent growth curve models into two bivariate latent growth curve models, one for PEB<sub>organic</sub> and one for PEB<sub>seasonal</sub> (see Fig. 3). In each of these models, we estimated the correlations between the latent intercepts (H1a) and slopes (H1b) of proenvironmental attitudes and behaviors. The latent intercept correlations reflect the measurement-error corrected

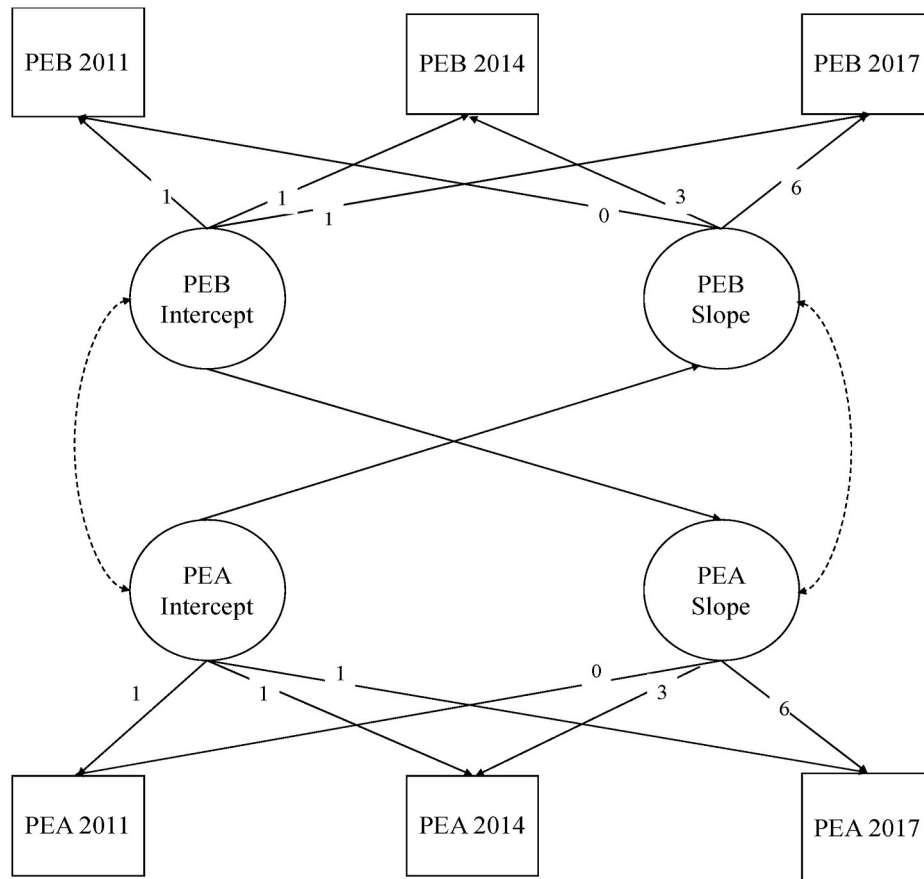


Fig. 3. Path diagram of bivariate latent growth curve model.

Notes. PEA = Proenvironmental Attitude, PEB = Proenvironmental Behavior. Dashed lines indicate intercept-intercept correlations and slope-slope correlations.

association between variables at baseline; the latent slope correlations reflect correlated change over time. Overall, these models fit the data well (both CFIs  $\geq .98$ , RMSEAs  $< .05$ ).

Supporting H1a, we found significant positive correlations between the latent PEA intercept and the two latent proenvironmental behaviors intercepts: Across assessment years, people with stronger proenvironmental attitudes were more likely to engage in proenvironmental consumer behavior by purchasing organic goods and products ( $PEB_{organic}: r = .46, p < .001, 95\% \text{ CI } [.43, .49]$ ) and seasonal fruits and vegetables ( $PEB_{seasonal}: r = .45, p < .001, 95\% \text{ CI } [.41, .48]$ ) more often. Notably, correlations between latent intercepts are corrected for attenuation due to measurement error and thus slightly higher than the average cross-sectional correlations between observed scores reported above.

Supporting H1b, we also found significant positive correlations between the latent slopes for PEA and the two proenvironmental behaviors. These correlations indicated that people who increased more in their proenvironmental attitudes over time were more likely to also increase in the frequency with which they purchased organic goods ( $PEB_{organic}: r = .59, p < .001, 95\% \text{ CI } [.33, .85]$ ) and seasonal fruits and vegetables ( $PEB_{seasonal}: r = .50, p = .004, 95\% \text{ CI } [.16, .84]$ ). All correlations remained significant at  $p > .004$  when including gender and income as covariates.

### 3.4. Moderator analyses

We used a multiple-group modeling approach to test the effects of the moderator variables – life stage and perceived control – on the correlations between both latent intercepts and latent slopes of proenvironmental attitudes and behaviors derived from the bivariate latent

growth curve models described above (see, [Lenhausen et al., 2020](#)).

#### 3.4.1. Life stage

We first split the sample into three life stage groups – young adults (18–35 years,  $N = 2668$ ), middle-aged adults (36–64 years,  $N = 6010$ ), and old adults (65+ years,  $N = 2238$ ) – and estimated two multiple-group bivariate latent growth curve models describing the co-development between proenvironmental attitudes and proenvironmental behaviors with all model parameters estimated freely across the three life stage groups. Using  $\chi^2$ -model comparison tests, we then tested whether the model fit decreased when a) the intercept-intercept correlations (H2a), b) the slope-slope correlations (H2b), or c) both intercept and slope correlations were constrained to be equal across life stage groups.

Constraining both the intercept-intercept and slope-slope correlations led to a significant decrease in model fit for both  $PEB_{organic}$  ( $\Delta CFI = .001, \Delta\chi^2/\Delta df = 16.58/4, p = .002$ ) and  $PEB_{seasonal}$  ( $\Delta CFI = .001, \Delta\chi^2/\Delta df = 13.84/4, p = .008$ ), indicating significant group differences in the links between proenvironmental attitudes and behaviors. Table 6 shows the intercept-intercept and slope-slope correlations for the three life stage groups derived from the best-fitting multiple-group bivariate latent growth models. A comparison of the intercept-intercept correlations indicated that, different from our hypothesis (H2a), the association between PEA and  $PEB_{organic}$  was more pronounced in young adults compared to middle-aged and older adults. The link between PEA and  $PEB_{seasonal}$  appeared to be slightly more pronounced in older adults compared to middle-aged and young adults. Consistent with H2b, results indicated that the slope-slope correlations between PEA and both  $PEB_{organic}$  and  $PEB_{seasonal}$  were indeed more pronounced in middle-aged adults compared to young and older adults.

**Table 6**

Intercept-intercept and slope-slope correlations derived from multiple-group bivariate latent growth curve models for proenvironmental attitude and behaviors.

|                             | Intercept-Intercept Correlation |            |          | Slope-Slope Correlation |             |          |
|-----------------------------|---------------------------------|------------|----------|-------------------------|-------------|----------|
|                             | <i>r</i>                        | 95% CI     | <i>p</i> | <i>r</i>                | 95% CI      | <i>p</i> |
| PEA/PEB <sub>organic</sub>  |                                 |            |          |                         |             |          |
| Young adulthood             | .57                             | [.49, .64] | <.001    | .54                     | [.22, .86]  | .001     |
| Middle adulthood            | .42                             | [.38, .47] | <.001    | .81                     | [.21, 1.00] | .008     |
| Old adulthood               | .42                             | [.34, .49] | <.001    | .17                     | [-.31, .65] | .650     |
| PEA/PEB <sub>seasonal</sub> |                                 |            |          |                         |             |          |
| Young adulthood             | .35                             | [.29, .41] | <.001    | .27                     | [-.09, .63] | .140     |
| Middle adulthood            | .34                             | [.30, .37] | <.001    | .43                     | [-.09, .95] | .100     |
| Old adulthood               | .41                             | [.34, .49] | <.001    | -.18                    | [-.64, .28] | .440     |

Notes. PEA: proenvironmental attitude, "How important is the protection of the environment for you?". PEB<sub>organic</sub>: "How often do you buy organic or ecological products, even though it is a bit more expensive?". PEB<sub>seasonal</sub>: "When you buy fruits and vegetables, do you pay attention to the fact that it is a seasonal product?"

### 3.4.2. Perceived control

We then split the sample into three perceived control groups – low (<7, *N* = 3975), middle (7–8, *N* = 3978), and high (9–10, *N* = 3352) – and estimated two multiple-group bivariate latent growth curve models describing the co-development between proenvironmental attitudes and proenvironmental behaviors with all model parameters estimated freely across the three perceived control groups. Using  $\chi^2$  model comparison tests, we again tested but found no support for a decrease in model fit when a) the intercept-intercept correlations (H3a), b) the slope-slope correlations (H3b), or c) both intercept and slope correlations were constrained to be equal across groups for both PEB<sub>organic</sub> ( $\Delta\text{CFI} = .00$ ,  $\Delta\chi^2/\Delta\text{df} = 2.08/4$ , *p* = .72) and PEB<sub>seasonal</sub> ( $\Delta\text{CFI} = .00$ ,  $\Delta\chi^2/\Delta\text{df} = 3.00/4$ , *p* = .56).

## 4. Discussion

A critical question for researchers and policymakers alike is when, how, and for whom proenvironmental attitudes predict proenvironmental behaviors. Previous studies have found positive but typically small associations between proenvironmental attitudes and behaviors (Hornsey et al., 2016; Kollmuss & Agyeman, 2002). However, past research has largely neglected the fact that both attitudes and behaviors are dynamic constructs that change over time. Moreover, little research has examined whether the association between proenvironmental attitudes and behaviors differs across people with different demographic and psychological backgrounds. To address these questions, we examined the ways in which proenvironmental attitudes translate into proenvironmental consumer behaviors across time and people in a nationally representative sample of the Swiss population. Taken together, four findings stand out.

First, we found evidence that proenvironmental attitudes and behaviors are dynamic constructs that are both moderately rank-order stable and subject to mean-level change over time. The considerable rank-order stabilities indicate that those people who rate the protection of the environment as important and frequently purchase organic goods and seasonal produce today are also more likely to endorse proenvironmental attitudes and engage in proenvironmental consumer behaviors in the future. The finding of significant mean-level change in these variables indicates that, on average, people have increased slightly in their proenvironmental attitudes and behaviors from 2011 to 2017 (see Fig. 2). This increase was most notable in the frequency with which people purchased organic goods and ecological products (Cohen's *d* = .25). This effect held across genders and income groups, and may reflect the effectiveness of interventions and campaigns designed to promote proenvironmental attitudes and behaviors (Galvao et al., 2016; Kanger

et al., 2020; O'Flaherty & Liddy, 2018) but could also reflect slowly changing consumer choice patterns in response to greater availability of sustainable products (Juhl et al., 2017), and other factors not accounted for in this research. However, not everyone increased in proenvironmental attitudes and consumer behaviors at the same time or to the same degree. Consistent with our hypotheses, we found significant individual differences in the trajectories of these variables. This variation allowed us to examine the correlates of change, as described in more detail below.

Second, consistent with previous research (Kollmuss & Agyeman, 2002; Thøgersen, & Ölander, 2002), we found that proenvironmental attitudes were generally positively associated with proenvironmental consumer behaviors, which means that individuals who rated the protection of the environment as more important were more likely to purchase organic goods and seasonal fruits and vegetables. Importantly, our study yielded new evidence that changes in proenvironmental attitudes track with changes in proenvironmental behaviors. This finding advances our understanding of the links between attitudes and behaviors and represents a particularly promising avenue for promoting proenvironmental behaviors. We found that increases in proenvironmental attitudes explained between a quarter to a third of the variance in increases in proenvironmental behaviors, even with demographic factors controlled. These longitudinal associations raise questions about causality. If changes in attitudes cause behavioral change, promoting proenvironmental attitudes may be a potent pathway for fostering increases in proenvironmental behaviors (Stern, 2011). Although theoretically less plausible, it is possible that change in proenvironmental behavior causes changes in proenvironmental attitudes; or that unmeasured third variables cause changes in both. Future studies, particularly those that include experimental designs, are needed to address questions about causality and close the gap between proenvironmental attitudes and behavior.

Third, the links between proenvironmental attitudes and behaviors were moderated by life stage. Specifically, we found partial support for our hypothesis that the association between proenvironmental attitudes and proenvironmental behaviors is most pronounced in middle adulthood. As expected, changes in proenvironmental attitudes were indeed most strongly associated with changes in proenvironmental behaviors in middle-aged adults, particularly with increases in the frequency with which people purchase organic or ecological goods and products (PEB<sub>organic</sub>, *r* = .81). In contrast with our hypotheses, however, we found that the correlation between stable levels of proenvironmental attitudes and this variable was most pronounced in young adults (PEB<sub>organic</sub>, *r* = .57). This suggests that, on average, proenvironmental attitudes are particularly strong predictors of ecological purchasing behavior in young adults. One possible explanation is that there is more variance in attitudes and behaviors among young adults, which would enable stronger covariance. The age-group specific descriptives, however, provide little support for this hypothesis, suggesting comparable distributions of PEA and PEB<sub>organic</sub> across the three age groups (see Table S2, SOM). It may also be that issues related to third variables (e.g., wealth, values, or concerns about the environment) contribute to a tighter link between attitudes and this proenvironmental behavior for younger adults, suggesting hypotheses for future research. Finally, this effect may be unique to Switzerland or similar cultures, which highlights the need for future research on samples from different societies and cultures. The moderator analyses produced generally less consistent results for the links between proenvironmental attitudes and PEB<sub>seasonal</sub>, the frequency with which people purchase seasonal produce. One explanation for this somewhat mixed pattern of results may be that the environmental benefits of purchasing seasonal produce are less obvious and potentially also less effective (Brooks et al., 2011; Gomiero et al., 2011). As such, even people with strong proenvironmental attitudes and the intention to engage in proenvironmental consumer behavior may not be aware of or convinced by the environmental benefits of consuming seasonal fruit and vegetables.

Fourth, we found no support for the hypothesis that individual differences in perceived control moderate the links between pro-environmental attitudes and behaviors. We expected the association between proenvironmental attitude and behaviors to be strongest in people who are high in perceived control. However, the present analyses indicated no significant differences in the correlations between neither stable levels nor changes in proenvironmental attitudes and pro-environmental behaviors across groups with low, medium, or high levels of perceived control. Notably, we assessed individual differences in perceived control at a more general level than has been done in previous studies in this area which have typically focused on narrower operationalizations of perceived behavioral control (Bamberg et al., 2003; van der Werff & Steg, 2015). Our focus on dispositional perceived control eschewed risks of conceptual overlap with the behavioral outcome measures. However, a narrower operationalization of behavioral control beliefs might have led to different results.

#### 4.1. Limitations

The current study used longitudinal data from a large and nationally representative sample of Switzerland. A potential limitation is that this sample came from a Western, educated, industrialized, rich, and democratic (WEIRD) country (Henrich et al., 2010). There may be differences in the association between proenvironmental attitudes and proenvironmental behaviors across countries, and we caution generalizing results from the current study to other countries. For example, in poorer or less developed countries, it is plausible that factors other than people's attitudes toward the environment predict their pro-environmental consumer behavior. The generalizability of the present findings thus requires future research to examine a broad range of societies.

We relied on single-item self-report measures to assess individual differences in proenvironmental attitudes and behaviors. The substantial rank-order stability provides some evidence for the reliability of these single-item measures. However, future studies using longer and ideally validated measures of proenvironmental attitudes and pro-environmental consumer choice behaviors may produce more reliable and thus more precise estimates of the cross-sectional and longitudinal links between proenvironmental attitudes and behaviors (Hawcroft & Milfont, 2010; Milfont & Duckitt, 2010). Related to this issue, we assessed a relatively narrow range of proenvironmental attitudes and behaviors. Future research should sample a wider range of variables (e. g., attitudes about environmental policy, behaviors involving reducing waste) in these domains to test the generalizability of these results.

#### 5. Conclusion

Proenvironmental attitudes and behaviors have been increasing in the Swiss population and throughout the world over the last decade. We replicated the finding that proenvironmental attitudes predict pro-environmental consumer behaviors, and presented novel evidence that increases in proenvironmental attitudes have strong associations with increases in proenvironmental consumer behaviors over time, particularly in middle aged adults. These findings provide important hints that interventions and campaigns designed to increase proenvironmental attitudes may offer viable pathways for promoting increases in pro-environmental behavior.

#### CRedit author statement

Wiebke Bleidorn: Conceptualization, Methodology, Writing – original draft, Project administration; Madeline Lenhausen: Data curation, Formal analysis; Christopher Hopwood: Conceptualization, Writing-Reviewing and Editing.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2021.101627>.

#### References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Alwin, D. F., & Krosnick, J. A. (1991). The reliability of survey attitude measurement: The influence of question and respondent attributes. *Sociological Methods & Research*, 20, 139–181.
- Bamberg, S., Ajzen, I., & Schmidt, P. (2003). Choice of travel mode in the theory of planned behavior: The roles of past behavior, habit, and reasoned action. *Basic and Applied Social Psychology*, 25, 175–187.
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, hungerford, and tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27, 14–25.
- Barber, N. A., Bishop, M., & Gruen, T. (2014). Who pays more (or less) for pro-environmental consumer goods? Using the auction method to assess actual willingness-to-pay. *Journal of Environmental Psychology*, 40, 218–227.
- Bleidorn, W., Hopwood, C. J., Back, M. D., Denissen, J. J. A., Hennecke, M., ... Zimmermann, J. (2021). Personality stability and change. *Personality Science*. In press.
- Bleidorn, W., et al. (2020). Longitudinal Experience-Wide Association Studies (LEWAS) - A framework for studying personality change. *European Journal of Personality*, 34, 263–485.
- Brooks, M., Foster, C., Holmes, M., & Wiltshire, J. (2011). Does consuming seasonal foods benefit the environment? Insights from recent research. *Nutrition Bulletin*, 36, 449–453.
- De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for educational interventions. *Journal of Environmental Psychology*, 42, 128–138.
- Epstein, S. (1979). The stability of behavior: I. On predicting most of the people much of the time. *Journal of Personality and Social Psychology*, 37, 1097.
- Erikson, E. H. (1959). *Identity and the life cycle: Selected papers* (New York).
- Freund, A., & Baltes, P. (2002). Life-Management strategies of selection, optimization, and compensation: Measurement by self-report and construct validity. *Journal of Personality and Social Psychology*, 82, 642–662.
- Galvão, L. A., Haby, M. M., Chapman, E., Clark, R., Câmara, V. M., Luiz, R. R., & Becerra-Posada, F. (2016). The new united nations approach to sustainable development post-2015: Findings from four overviews of systematic reviews on interventions for sustainable development and health. *Revista Panamericana de Salud Pública*, 39, 157–165.
- Glasman, L., & Albarracín, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin*, 132, 778–822.
- Gomiero, T., Pimentel, D., & Paoletti, M. G. (2011). Environmental impact of different agricultural management practices: Conventional vs. organic agriculture. *Critical Reviews in Plant Sciences*, 30(1–2), 95–124.
- Gupta, S., & Ogdien, D. T. (2009). To buy or not to buy? A social dilemma perspective on green buying. *Journal of Consumer Marketing*, 376, 391.
- Hall, M. P., Lewis, N. A., Jr., & Ellsworth, P. C. (2018). Believing in climate change, but not behaving sustainably: Evidence from a one-year longitudinal study. *Journal of Environmental Psychology*, 56, 55–62.
- Hauser, M., Nussbeck, F. W., & Jonas, K. (2013). The impact of food-related values on food purchase behavior and the mediating role of attitudes: A Swiss study. *Psychology and Marketing*, 30, 765–778.
- Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology*, 30, 143–158.
- Heckhausen, J. (1997). Developmental regulation across adulthood: Primary and secondary control of age-related challenges. *Developmental Psychology*, 33, 176–187.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, 466(7302), 29–29.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, 18, 1–8.
- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change*, 6, 622–626.
- Hutteman, R., Hennecke, M., Orth, U., Reitz, A. K., & Specht, J. (2014). Developmental tasks as a framework to study personality development in adulthood and old age. *European Journal of Personality*, 28, 267–278.
- Juhl, H. J., Fenger, M. H. J., & Thøgersen, J. (2017). Will the consistent organic food consumer step forward? An empirical analysis. *Journal of Consumer Research*, 44, 519–535.
- Kanger, L., Sovacool, B. K., & Noorköiv, M. (2020). Six policy intervention points for sustainability transitions: A conceptual framework and a systematic literature review. *Research Policy*, 49, Article 104072.
- Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behavior: A meta-analysis. *Global Environmental Change*, 23, 1028–1038.



- Kollmuss, A., & Agyeman, (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environmental Education Research*, 8, 239–260.
- Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, 74, 763–773.
- Lenhausen, M. R., van Scheppingen, M. A., & Bleidorn, W. (2020). Self-other agreement in personality development in romantic couples. In *European journal of personality*. Online advance publication.
- Masud, M. M., Al-Amin, A. Q., Junsheng, H., Ahmed, F., Yahaya, S. R., Akhtar, R., & Banna, H. (2016). Climate change issue and theory of planned behaviour: Relationship by empirical evidence. *Journal of Cleaner Production*, 113, 613–623.
- Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, 30, 80–94.
- Milfont, T. L., Duckitt, J., & Cameron, L. D. (2006). A cross-cultural study of environmental motive concerns and their implications for proenvironmental behavior. *Environment and Behavior*, 38(6), 745–767.
- Milfont, T. L., Poortinga, W., & Sibley, C. G. (2020). Does having children increase environmental concern? Testing parenthood effects with longitudinal data from the New Zealand attitudes and values study. *PLoS One*, 15(3), Article e0230361.
- Milfont, T. L., & Sibley, C. G. (2011). Exploring the concept of environmental generativity. *International Journal of Hispanic Psychology*, 4, 21–30.
- Milfont, T. L., & Sibley, C. G. (2016). Empathic and social dominance orientations help explain gender differences in environmentalism: A one-year bayesian mediation analysis. *Personality and Individual Differences*, 90, 85–88.
- Nielsen, K. S., Clayton, S., Stern, P. C., Dietz, T., Capstick, S., & Whitmarsh, L. (2020). *How psychology can help limit climate change*. American Psychologist.
- O’Flaherty, J., & Liddy, M. (2018). The impact of development education and education for sustainable development interventions: A synthesis of the research. *Environmental Education Research*, 24, 1031–1049.
- Pearlin, L. I., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior*, 19, 2–21.
- R Core Team. (2017). *R: A language and environment for statistical computing*. Vienna, Austria: R Found. Stat. Comput.
- Rekker, R., Keijsers, L., Branje, S., & Meeus, W. (2015). Political attitudes in adolescence and emerging adulthood: Developmental changes in mean level, polarization, rank-order stability, and correlates. *Journal of Adolescence*, 41, 136–147.
- Robinson, S. A., & Lachman, M. E. (2017). Perceived control and aging: A mini-review and directions for future research. *Gerontology*, 63, 435–442.
- Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling and more. Version 0.5–12 (BETA). *Journal of Statistical Software*, 48, 1–36.
- Schwaba, T., & Bleidorn, W. (2018). Individual differences in personality change across the adult lifespan. *Journal of Personality*, 86, 450–464.
- Skinner, E. A., & Zimmer-Gembeck, M. (2011). Perceived control and the development of coping. In S. Folkman (Ed.), *The Oxford handbook of stress, health, and coping* (pp. 35–59). The Oxford handbook of stress, health, and coping (p. 35–59). Oxford University Press.
- Soutter, A. R. B., Bates, T. C., & Möttus, R. (2020). Big five and hexaco personality traits, proenvironmental attitudes, and behaviors: A meta-analysis. *Perspectives on Psychological Science*, Article 1745691620903019.
- Stern, P. C. (2011). Contributions of psychology to limiting climate change. *American Psychologist*, 66, 303–314.
- Thøgersen, J., & Ölander, F. (2002). Human values and the emergence of a sustainable consumption pattern: A panelstudy. *Journal of Economic Psychology*, 23, 605–630.
- Voorpostel, M., Tillmann, R., Lebert, F., Kuhn, U., Lipps, O., Ryser, V.-A., Antal, E., Monsch, G.-A., Dasoki, N., Klaas, H. S., & Wernli, B. (2020). *Swiss household panel User guide (1999-2018), wave 20, february 2020*. Lausanne: FORS.
- van der Werff, E., & Steg, L. (2015). One model to predict them all: Predicting energy behaviours with the norm activation model. *Energy Research & Social Science*, 6, 8–14.
- Zimmermann-Sloutskis, D., Wanner, M., Zimmermann, E., & Martin, B. W. (2010). Physical activity levels and determinants of change in young adults: A longitudinal panel study. *International Journal of Behavioral Nutrition and Physical Activity*, 7, 2.