Shifting horizons: Significant life events and pro-environmental behaviour change in early adulthood

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Abstract

Young people's daily routines are especially malleable during significant life events, offering opportunities for pro-environmental behaviour (PEB) change. We investigated how PEBs shifted during two Moments of Change (MoCs), an exogenous disruption (COVID-19) and a biographical transition (starting university). We also looked at whether values and attitudes explained these shifts. We conducted two longitudinal studies with 16–24-year-olds. Study 1 (exogenous MoC) tracked behaviour across three waves during 2020 (n=146) using multilevel latent growth models. Study 2 (biographical MoC) (n=256) used paired-samples t-tests examining change across two time points, i.e, pre and post the start of university. Both studies used path-analytic structural equation models to test a values – attitudes – behaviour pathway and regressions to examine the self-activation hypothesis. In Study 1, we found positive changes to food waste and the consumption of animal products, and a negative change in environmental activism and active travel. In Study 2, we found positive changes in domestic PEBs, active travel, and the consumption of animal products, and negative changes in environmental activism and ethical consumption. Self-transcendence values positively predicted activism (Study 1) and domestic PEBs (Study 2) and related to lower animal-product consumption in both studies, while environmental attitudes mediated the link between self-transcendence and consumption only in Study 2. These findings suggest that targeted interventions timed to MoCs can leverage values and attitudes to support lower-impact diets and home practices. Structurally constrained domains (e.g., activism opportunities, infrastructure-dependent travel) may require contextual changes in tandem with MoCs to yield benefits to PEBs. Our study is one of the first to look at COVID-19 as a MoC and one of the first to examine the transition from school to university and its effects on

multiple PEBs. Some limitations include reliance on self-report measures with retrospective baselines and short follow-up periods.

Introduction

Climate change, caused by greenhouse gas emissions (GHGs) from human activities, is one of the most urgent and immediate problems challenging modern day societies (1). Tackling climate change requires urgent, substantive change in societal patterns of consumption and the adoption of pro-environmental behaviours (PEBs), defined as everyday actions minimising their environmental impact or even benefiting the environment (2). Many PEBs (e.g., purchasing, travel, etc.) include habitual actions, as well as more deliberate ones, e.g., buying appliances (3).

Once formed, habits can be difficult to break; however, they can be weakened during life events or *moments of change* (MoCs) which represent significant changes to one's environment and provide opportunities to foster pro-environmental consumption patterns. MoCs can also affect people differently; for example, they may activate pre-existing values, such that people who value the environment are more likely to adopt PEBs during a MoC (i.e. 'self-activation'). The present study investigates the effects of two MoCs, i.e. the COVID-19 pandemic and the start of university, on young people's PEBs, values and attitudes.

Habits and Moments of Change

Much human behaviour is habitual and has its origins in pursuing a goal, for example to satisfy a need or attain a reward (4). Habits are triggered directly by a stimulus in the environment, i.e., contextual cues (5). These can include time of day, physical location, and preceding actions in a sequence (6).

When the context is stable, behaviours do not rely on conscious deliberation (7) as their performance is guided by context-driven habit processes, however a change in the contextual cues should result in attenuating habitual responses (8). This is the basis of the Habit Discontinuity Hypothesis (9). A recent systematic review on MoCs found that most of

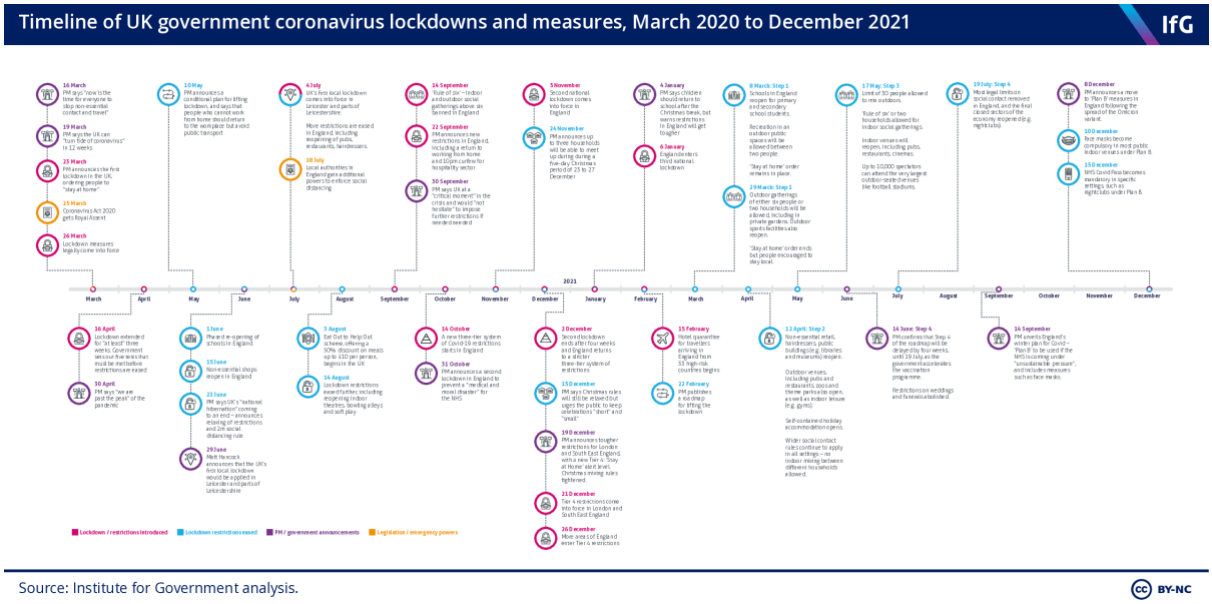
67 the studies in the domain tend to focus on biographical events (e.g., moving house; becoming
68 a parent) and to a lesser extent on exogenous events (e.g., financial crashes, natural disasters),
69 both of which result in significant changes to one's environment (10).
70 Biographical MoCs usually affect the individual aspects of one's life and are
71 predominantly planned for, voluntary and preceded by some degree of preparation (although
72 there are some exceptions, such as serious illness). Research has focused on relocation (11);
73 pregnancy (12); retirement (13); and changes in employment circumstances (14); holiday
74 breaks (15); New Year's resolutions (16); or biographical live events in general (17) as
75 drivers for pro-environmental behaviour change. For example, reduction in driving after
76 relocation (18) and lower meat consumption after becoming a parent (19).
77 Exogenous MoCs are driven by societal change and are usually unplanned. Studies
78 have found changes in energy conservation due to extreme climate events (20); in travel
79 behaviours due to the financial crisis (21,22); and in food consumption due to experiencing a
80 tsunami (23). The effects of exogenous MoCs have received less attention, perhaps due to
81 practical issues such as planning and data collection. This calls for further research to
82 investigate these important gaps in the domain.

83 ## *COVID-19 as a MoC*

84 One exogenous MoC is the Coronavirus (COVID-19) pandemic which started in 2020
85 in the UK and led to huge behavioural and lifestyle shifts because of lockdowns and other
86 restrictions. The pandemic led to various restrictions which were introduced in March 2020
87 and went through several changes. For a detailed summary of these restrictions please see Fig
88 1. Mitigating climate change is one area of human life that COVID-19 seemed to influence in
89 a rather positive way. In 2020, the UK registered a 9.5% decrease in carbon emissions (24)
90 with the biggest changes coming from the transport sector. For example, cycling trips
91 increased up to 200% in the period April – June 2020 compared to 2019, probably due to big

decreases in train use (95%) and bus use (85%) (25). People also reported walking more (38%), and the proportion of people switching from public transport use to walking increased by 31% (26).

Fig 1. Timeline of COVID-19 restrictions in the UK between March 2020 and December 2021



There were also changes in consumption. Data from the Vegan Society in the UK reported that 21.5% of people reduced their meat consumption during COVID-19, while 15.4% reduced the amount of dairy/eggs in their diet (27). CAST (28) reported that people threw away less food, with food waste levels remaining lower than pre-COVID levels as restrictions relaxed (29) (see also (30)). Organic food sales also increased by 12.5%, while sales of clothes made from natural materials increased by 9% (31). Finally, it is important to note that young people were one of the most affected groups by the COVID-19 restrictions. Research has identified that for those aged between 15 and 25 the pandemic had an adverse impact on well-being and mental health (32). This furthers the notion that COVID-19 served as an important MoC and should be explored in relation to the habit discontinuity hypothesis and its influence on young people's PEBs. While research has focused on the effects of

COVID-19 on certain PEBs, in the present article we explore this through the prism of MoC which is one of the major contributions of the current work.

Starting University as a MoC

In addition to going through the COVID-19 pandemic, in 2020 more than half a million people started their undergraduate degree as full-time students at universities across the UK (33). This makes the start of university a pivotal MoC for young people. However, most of the literature in the environmental domain has focused on investigating biographical events happening later in life (e.g., relocation, becoming a parent). There have been fewer studies on MoCs occurring earlier in life. This makes the transfer from school to university an understudied but interesting MoC. Studies in this domain usually explore students' overall experiences at university and the general trend in their green actions (e.g., (34)), for example, how information about environmentalism and membership of campus-based green groups impact PEBs but without a specific focus on new students (35). Conversely, when past research has looked at the start of university as a MoC, studies have usually concentrated on health behaviours such as dieting and exercising. For instance, a decrease in physical activity after starting university (36), a change in diet and subsequently weight gain (37), and a decrease in meat and milk consumption (38) (39). This makes the effect of starting university as a MoC on PEBs in an understudied phenomenon with important implications for tackling climate change.

Starting university is also accompanied by moving out of one's family home and expanding one's social circle (40). The ages between 16 and 24, known as late adolescence, are an essential stage of a person's life characterised by identity formation (41), exploration, and self-focus (42) as well as legal adulthood. Identity formation is important as young people's values could have a crucial role in their pro-environmental norms and behaviours (43). In addition, some of the behaviours young people adopt soon after they move out of the

parental home and become independent might stick with them in the long term. Therefore, they could influence their active participation in society (44). A key reason for this is that puberty is marked by extensive remodelling of the brain, particularly in areas involved in decision-making, risk assessment, and social interactions. Brain regions, such as the prefrontal cortex (responsible for executive functions) and the limbic system (associated with emotions and rewards), undergo significant maturation. The interplay between these regions during puberty can lead to heightened sensitivity to social cues and rewards, influencing behaviour choices (45). Thus, the experiences and habits formed during this period can have lasting effects. For example, positive behaviours such as regular exercise, healthy eating, and constructive social interactions can lead to a healthier, more engaged adult life. Conversely, negative behaviours adopted during this time, such as substance abuse or social withdrawal, can also persist, potentially leading to detrimental effects on one's health and social participation. Adolescents exposed to civic education and encouraged to participate in community activities are more likely to become engaged citizens. This involvement can include voting, volunteering, advocacy, e.g., through engaging in more pro-environmental behaviours later in life (46). Finally, educational programs during late adolescence that integrate environmental themes have been found to help young people develop a strong environmental identity, which once formed, tends to influence behaviour in a consistent manner into adulthood (47). Therefore, starting university might be one of the most impactful MoCs. The current article is one of the few with a specific focus on exploring the start of university as a MoC and its effects on young people's PEBs. This makes the present research pivotal in enriching the theoretical framework surrounding MoCs.

In the present article we chose two theoretically distinct MoCs that young people commonly experienced in 2020: (i) the COVID-19 pandemic as an exogenous, society-wide disruption that reconfigured daily routines, and (ii) the transition to university as a

biographical one that typically entails relocation, new schedules, and rebuilding everyday practices. Both events can reshape everyday life, therefore, creating brief periods when routines are disrupted, and new habits can be formed. Juxtaposing these MoCs permits a comparison between (a) change driven primarily by externally imposed constraints and affordances and (b) change driven by role transition and practice reassembly, both of which are central mechanisms in habit-discontinuity hypothesis. In addition, the selection is also methodologically advantageous: both events were highly prevalent in the target cohort in the year 2020, and were also salient and temporally well-defined, i.e., supporting clear measurement windows. Finally, they were also ecologically valid by capturing behaviours under real-world disruption rather than laboratory settings. While MoCs are shown to contribute to pro-environmental behaviour changes (e.g., (18)), there are also other important psychological constructs which might mediate the connection between MoCs and the change in PEBs (e.g., values, attitudes). For example, values, which are relatively stable guiding principles, are expected to be especially consequential as they provide higher-order priorities when routines are being reconsidered, while attitudes work at a more immediate level, translating those priorities into judgments about specific behaviours. We therefore explore the values – attitudes – behaviour pathway in more detail in relation to MoCs to paint a clearer picture of life events and their effects on habitual sustainable actions.

Values and Attitudes

One important psychological construct that might mediate the relationship between a MoC and PEBs is human values which have been identified as lying along two dimensions: self-enhancement to self-transcendence, and openness to change to conservatism (48). Self-transcendence values are characterised by a concern for the interests and welfare of others but are also considered important for promoting human growth and wellbeing (49). People with higher levels of self-transcendence values are typically more environmentally-concerned and

184 engage in more environmentally-friendly behaviours (50,51). In addition, a meta-analysis
185 concluded that people for whom self-transcendent values were more important than self-
186 enhancement experienced greater obligation to act in an environmentally-friendly way (52).
187 Studies have also reported positive associations between self-transcendence and various
188 categories of pro-environmental behaviours (53), environmental activism (54), energy
189 conservation (55), recycling (56), and consumption (57); (58).
190 In addition, there may be a link between values and MoCs. While values are thought
191 to be quite stable over time (59), there is some evidence that a life-changing events (e.g.,
192 moving to a new culture or having a child) could make them malleable (60,61). Indeed, going
193 to university can *change* values (62), and different values might change according to the
194 programme of study (60). Similarly, self-transcendence values were especially important
195 during COVID-19 as they were reported to be related to complying with restrictions and
196 helping vulnerable people struggling with the pandemic (63). This furthers the notion that
197 human values could be vital for behaviour change during MoCs.
198 Interestingly, values could also play another role as MoCs may facilitate the
199 expression of pre-existing values; this is known as the *self-activation hypothesis* (18). It states
200 that a MoC could prime pre-existing values leading to a change in behaviour. Hence, self-
201 transcendence could be activated by the MoC and in turn influence behaviour change. For
202 example, value activation would mean travel restrictions (context change) leading one to
203 consider travelling more sustainably (e.g., cycling; (64)). Previous work has already explored
204 values in relation to the self-activation hypothesis during MoCs (14) but predominantly
205 during relocation. To the best of our knowledge, no research to date has explored the self-
206 activation hypothesis during the start of university as a MoC or during an exogenous MoC
207 such as COVID-19. Consequently, the results from the present article could enrich the MoCs

208 literature and offer new perspectives on the role of values in changing PEBs while going
209 through a MoC.
210 Another important psychological construct which might play a role in the relationship
211 between MoCs and PEBs is attitudes, which could also have a role in shaping PEBs.
212 Evidence shows that environmental attitudes are positively predicted by universalism which
213 is one of the key characteristics of self-transcendence (65). Attitudes are evaluative responses
214 toward an object of thought embodying cognitive, behavioural, and affective responses (66).
215 Thus, holding attitudes towards a particular event or object can be connected to the
216 emergence of behaviours (67). Previous studies have shown an association between
217 environmental attitudes and behaviours (68) and attitudes and behaviour change (69). Those
218 with stronger pro-environmental attitudes show higher engagement in PEBs (70,71).
219 Furthermore, research has shown that there is a relationship between values and PEBs,
220 stipulated that mediating variables (e.g., attitudes) are needed for the reasonable prediction of
221 environmental actions by self-transcendence (72). Thus, it could be that the effect of values
222 on behaviours is mediated by environmental attitudes (73). This makes attitudes another vital
223 element in the behavioural domain which should be explored in more detail when
224 investigating MoCs.
225 Hence, given the well-established perspective in the field that environmental attitudes
226 might serve as mediators guiding the relationship between self-transcendence values and
227 PEBs (72, 73), in the present article we test this through the prism of moments of change. We
228 apply a mediation analysis which directly tests this proximal pathway, allowing us to examine
229 whether attitudes statistically carry (part of) the association between values and PEBs during
230 periods of routine disruption. Modelling attitudes as a mediator between self-transcendence
231 values and PEBs therefore provides process evidence about how value orientations become
232 enacted in concrete choices precisely when new behavioural patterns are formed.

Present Research

The present article explores how habit discontinuity affects PEBs – more specifically sustainable consumer behaviours, and environmental activism – when going through an exogenous MoC (COVID-19) and a biographical MoC (starting university). The article also looks at the role of values and attitudes in the relationship between MoCs and a change in PEBs and tests the self-activation hypothesis.

Hypothesis 1. In line with previous studies in the domain of MoCs (18), we hypothesised that:

Hypothesis 1a: The COVID-19 pandemic will result in changes to young people's PEBs.

Hypothesis 1b: The transition from school to university will lead to changes in young people's PEBs.

These hypotheses are exploratory in their nature due to the lack of studies in the domain; therefore, it is difficult to predict the direction of changes.

Hypothesis 2. Consistent with past research on the positive influence of self-transcendence values on PEBs (53), we hypothesised that:

Hypothesis 2a: Self-transcendence would serve as a positive predictor of PEBs during COVID-19 as a MoC.

Hypothesis 2b: Self-transcendence would serve as a positive predictor of PEBs during the transition from school to university as a MoC.

Hypothesis 3. Based on the previously established mediating role of attitudes (73), we hypothesised that:

Hypothesis 3a: Environmental attitudes would serve as a mediator in the relationship between values and PEBs during the COVID-19 pandemic.

Hypothesis 3b: Environmental attitudes would serve as a mediator in the relationship between values and PEBs during the transition from school to university.

Hypothesis 4. Studies 1 and 2 further tested the self-activation hypothesis. Previous research has evaluated the effects of MoCs on activating values (e.g., (14)) however only during relocation; in the present research we test the self-activation hypothesis and hypothesise that:

Hypothesis 4a: Going through COVID-19 as a MoC (Study 1) could activate self-transcendence values which could then lead to positive pro-environmental behaviour change.

Hypothesis 4b: Going through the start of university as a MoCs (Study 2) could lead to the activation of self-transcendence values which could then lead to a positive change in pro-environmental behaviour.

Study 1

Materials and Methods

Ethics

The Ethics Committee at the Department of Psychology, University of Bath reviewed and approved the study (Reference number: 20-197).

Sample

We recruited participants by advertising an online study on Facebook with boost posts targeting young people (aged 16 to 24) living in all areas of the United Kingdom. We collected data at two time points. During the first time point of data collection there were 829 people who took part in the UK survey. However, 468 were excluded as they completed less than 70% of the survey. Another three participants were excluded from the analysis as they

only spent between two and six minutes completing the survey which was deemed an insufficient as the median time of completion was 10 minutes. Thus, 358 participants completed part one of the study. From the 358 people, 268 left details to be re-contacted. When contacted about the second part of the survey, 181 agreed to participate. However, 25 people were excluded as they completed less than 70% of the survey, and a further 10 people were excluded as the identifiers they had provided could not be matched with identifiers from the first round of data collection. Therefore, the final sample of the study consisted of 146 participants.

Design

Our study had a longitudinal within-subjects correlational design investigating the relationship between COVID-19 and young people's pro-environmental behaviours. The participants reported their pro-environmental behaviours at three time points. They reported on the first two time points in August 2020. First, they were asked to think about their PEBs before the coronavirus outbreak (i.e., March 2020) (time point one), thus providing retrospective answers. Second, they had to report on their PEBs 'at the moment' of completing the survey, data was collected between 20 and 27 August 2020 (time point two), therefore after experiencing the COVID-19 pandemic and its restrictive measures. The third time point of data collection was between 30 November and 4 December 2020, during which the participants once again reported their PEBs while experiencing further lockdown measures.

Procedure

Participants were able to access the online survey on Qualtrics directly by clicking on the Facebook post they saw. After opening the survey, they were presented with an information sheet giving details about the study followed by a consent form. While completing the first survey, respondents were asked to provide contact details (e-mail

address) and indicate if they were willing to take part in further studies. Participants were then recontacted three months later via e-mail containing a link to the second part of the study also hosted on Qualtrics. The survey once again included an information sheet and a consent form. Each part of the study was completed voluntary, and participants were entered into a prize draw for a shopping voucher worth £50 for each time point of data collection in which they participated. The participants were debriefed about the purposes of the study at the end of the second survey.

Materials

Demographics

The participants completed demographic questions about their gender, age, type of place of residence, and employment status.

Pro-environmental Behaviours

We used 20 items (3) to measure pro-environmental behaviours. The participants had to rate how often they engaged in different pro-environmental actions, e.g., "encourage other people to save energy"; "use a bike instead of using a car", etc. The scale was from "Not at all" (1) to "At least once a day" (7). These were combined into four sub-scales using a principal component analysis (see S1 Text): environmental activism (seven items) (α =.81 in Study 1; α=.88 in Study 2); ethical consumption (three items) (α=.57 in Study 1; α=.74 in Study 2); travel behaviours (three items) (α=.41 in Study 1; α=.52 in Study 2); domestic behaviours (five items) (α=.52 in Study 1; α=.70 in Study 2). Due to the low reliability score of the domestic behaviours scale in Study 1, we excluded it from the analysis. Instead, we included a single question asking participants how much of the food they buy was thrown away for the three time-points on a scale from None (1) to More than 30% (5). This applied only to Study 1. Due to the low reliability scores of the scale for travel PEBs in both Study 1 and Study 2, we decided to focus only on active travel which was measured with two items

on the use of a bike instead of a car and walking somewhere instead of using a car. This was applied to both Study 1 and Study 2.

Further to this list, the young people also had to estimate their weekly consumption of each of the following: red meat, white meat, fish, and dairy. The scale ranged from Never (1) to Every day (6). These were combined into one sub-scale (four items) (α=.54 in Study 1; α=.64 in Study 2).

Values

We measured personal values using the Portrait Value Questionnaire PVQ (Short-Form) (74) consisting of 21 statements at time point two and time point three. Each gave a description of a person, e.g., "It's important to her to show her abilities. She wants people to admire what she does." At the beginning of the questionnaire, participants filled in their gender; thus, they saw either a female, male or non-conforming version of the questionnaire. For each statement, they rated how much each person was like them on a scale from "Not at all like me" (1) to "Very much like me" (6). The sub-scale of this questionnaire has been widely used in previous research and is divided into four sub-scales: Openness to change; Self-enhancement; Conservation; and Self-transcendence. Therefore, in our research we used the established and tested sub-scales as indicated by the authors of the scale, but focused only on self-transcendence values (α=.57 in Study 1; α=.74 in Study 2) due to their connection to environmental behaviour (75). We collected data on values during timepoint two and again during timepoint three.

Environmental Attitudes

We used six items from the New Ecological Paradigm (NEP; (76)) to measure environmental attitudes (α =.44 in Study 1; α=62. in Study 2) e.g., "Humans have a right to modify the natural environment to suit their needs". The scale ranged from Strongly disagree (1) to Strongly agree (5). Despite a low reliability, we proceeded with analysis using the NEP

as it is one of the most widely-used measures of environmental attitudes (77). We collected data on environmental attitudes only during timepoint two.

Data Analysis Plan

We applied multilevel latent growth modelling to test changes in behaviours over time. We built five models, one for each set of pro-environmental behaviours. Next, to investigate the direct effect of self-transcendence values on each set of behaviours and the mediating effect of attitudes we applied path-analytic structural equation models with observed composites. We used R for all estimations. Given that our study is exploratory in nature, we decided not to control for the number of comparisons (Type 1 error) as this could limit our ability to uncover novel relationships or patterns. This allowed us to interpret the findings as exploratory and use them to generate hypotheses for future research.

Results

Descriptive Statistics

Table 1 reports demographic data for the sample. Table 2 reports means and standard deviation for all study variables. Sample sizes of at least 100 people are preferred for growth curve models (78).

Table 1. Demographic data

Total Participants	146
Gender	
Female	125 (85.6%)
Male	17 (11.6%)
Non-conforming	4 (2.7%)
Age	
Mean	17.97 years (SD=1.85)

Range	16 – 22 years
Living Area	
Countryside or small village	30 (20.5%)
Large village or small town	67 45.9%)
Centre of a large town or city	12 (8.2%)
Suburbs of a large city of town	37 (25.3%)
Car ownership	
Yes	32 (21.9%)
No	114 (78.1%)

372

373 **Table 2. Mean scores and standard deviations for all study variables**

Variables	Time point 1		Time point 2		Time point 3	
	Mean	SD	Mean	SD	Mean	SD
Environmental activism	2.56[1]	1.25	2.49	1.37	2.31[1]	1.01
Active travel	3.80[1]	1.45	3.43[1]	1.56	3.63	1.39
Ethical consumption	3.16	1.16	3.04	1.27	3.09	1.12
Food waste	2.49[1]	.74	2.31[1]	.65	2.36[1]	.62
Consumption of animal products	3.14[1]	.67	3.08[1]	.70	2.90[1]	.74
Self-transcendence			5.22	.58	5.13	.56
Environmental attitudes			4.04	.51		

374 [1] – indicates significant differences between the time points at $p < .05$

Latent Growth Models

To track changes over time for each of the five categories of PEBs we applied latent growth models (LGMs). LGMs are better equipped to deal with measurement error and missing data and allow for the modelling of change within individuals over time by treating growth parameters (e.g., intercepts and slopes) as latent variables. This approach is beneficial for understanding the underlying developmental processes that drive changes in observed variables (79). We specified the LGMs to capture the growth trajectories of individuals over time, and the latent variables included the initial status (intercept) and the rate of change (slope). We considered several indices of the goodness-of-fit. These were: Chi-square, which should not yield a significant result (80); the root mean square of approximation (RMSEA) where values below .05 show close fit but values up to .08 are also acceptable (81). The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) – values above .95 show very good fit (82), values over .90 provide evidence of acceptable fit (81); and the Standardised Root Mean Squared Residual (SRMR) which should be up to .05 for a close-fitting model and up to .10 for an acceptable fit (81).

Our first LGM examined changes in the levels of *environmental activism*. The model had a good fit: x2 (1) = 0.63, p=.426; RMSEA = .001; CFI = 1.00; TLI = 1.05; SRMR = .016, indicating that linear growth was appropriate for the data. The slope of the model was significant (μ_s = -0.11, p<.05, 95% CI [-.195, -.033]). Thus, our participants' levels of environmental activism declined after the start of the pandemic (See Table 2).

The LGM exploring change in *active travel behaviours* had an acceptable fit: x2 (1) = 7.402, p<.05; RMSEA = .209; CFI = .960; TLI = .880; SRMR = .053. The slope of the model was significant (μ_s=-0.12, p<.05, 95% CI [-.220, -.028]). Thus, our participants engaged in less active travel after the onset of COVID-19 (See Table 2).

Our LGM looking at change over time of *ethical consumption* behaviours had a good fit: x2 (1) = 1.44, p=.230; RMSEA = .055; CFI = .997; TLI = .992; SRMR = .022, indicating that linear growth was appropriate for the data. The slope was not significant (μ_s=-0.06, *p*=.232, 95% CI [-.147, .036]). This revealed there was no change between the three time-points in participants' ethical consumption behaviours (See Table 2).

We also estimated a LGM tracking changes in *food waste levels* which had an acceptable fit: x2 (1) =4.49, *p*<.05; RMSEA = .166; CFI = .938; TLI = .814; SRMR = .059. The slope (μ_s = -.100, *p*<.001, 95% CI [-.178, -.022]) was significant. The participants decreased their food waste levels, i.e. threw away less food after the start of the pandemic (See Table 2).

Our final LGM examined change over the first nine months of the pandemic in *consumption of animal products*. The model had a good fit: x2 (1) = 1.14, p=.285; RMSEA = .033; CFI = .999; TLI = .998; SRMR = .036, indicating linear growth was appropriate for the data. The model revealed the slope was significant (μ_s =-0.08, *p*<.05, 95% CI [-.128, -.022]). Our participants consumed less animal products after the start of the pandemic (See Table 2).

Path-Analytic Structural Equation Modelling: Mediation

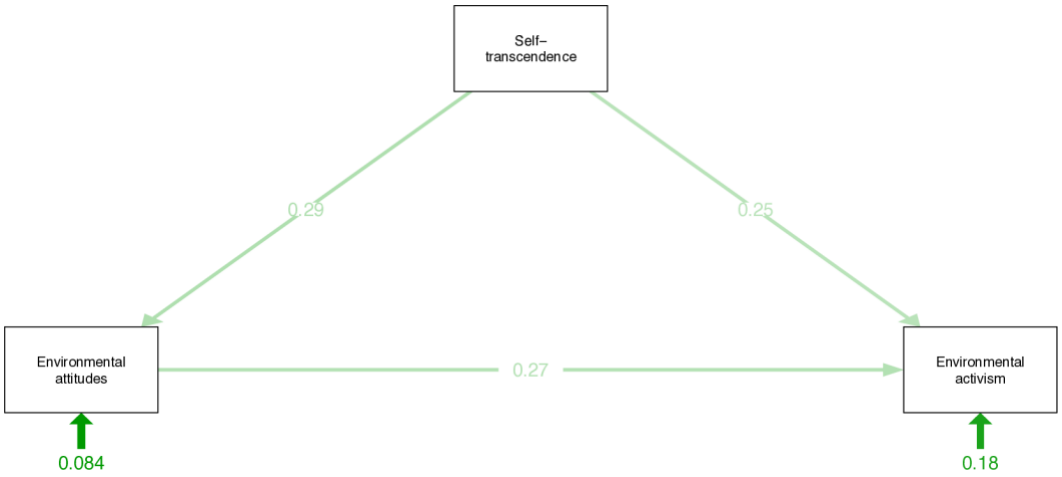
The next step in our analysis was to investigate the effect of self-transcendence and environmental attitudes on PEBs for which we observed a change over time. Thus, we applied path-analytic structural equation modelling (SEM) with observed composites including self-transcendence as predictor and environmental attitudes as mediator to environmental activism, consumption of animal products, active travel, and food waste in time point three. Models were fit in lavaan with a maximum-likelihood (ML) estimator and bias-corrected bootstrap CIs (10,000 resamples) for indirect effects. Our three-variable mediation models are saturated (just-identified), i.e., they reproduce the sample covariance

matrix exactly. Therefore, global fit indices are trivial ($\chi^2(0)=0$; CFI/TLI=1.00; RMSEA=0; SRMR=0), thus we focus on interpreting path estimates and R^2 rather than omnibus fit (83).

We collected data for people's values twice – at time two (August 2020) and time three (December 2020). While values tend to be stable over time (59), to test this, we conducted a one-way ANOVA comparing participants' scores for self-transcendence at time point two and time point three to test this. The results revealed there were no significant differences between the two time-points, $F(1, 144) = 0.327$, p=.568. Thus, we used the data for self-transcendence from time two as a predictor in our SEMs. The data on environmental attitudes was collected only once during time two.

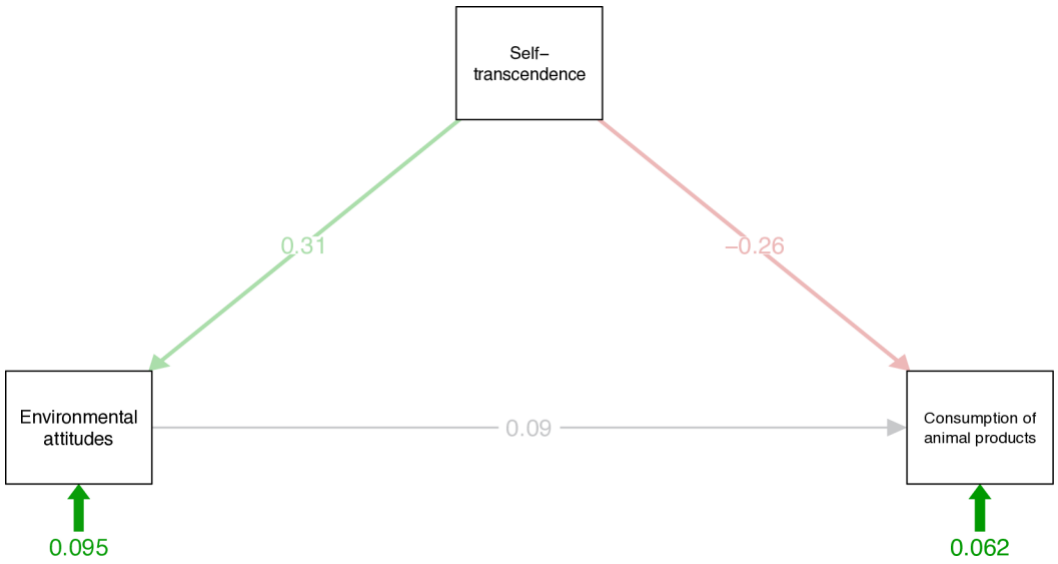
Our first model included self-transcendence as a predictor, environmental attitudes as a mediator, and levels of environmental activism from time point three as a dependent variable. The results revealed self-transcendence predicted attitudes (b = 0.29, BootSE = 0.078, 95% BCa CI [0.115, 0.423], p = .001), and attitudes predicted activism (b = 0.25, BootSE = 0.142, 95% BCa CI [0.264, 0.822], p < .001). The direct effect of self-transcendence on activism remained significant (b = 0.27, BootSE = 0.117, 95% BCa CI [0.210, 0.678], p < .001). The indirect effect via attitudes was significant (b = 0.139, BootSE = 0.056, 95% BCa CI [0.055, 0.284], p = .013), yielding a total effect of b = 0.582 (BootSE = 0.115, 95% BCa CI [0.365, 0.816]). Variance explained was R^2(attitudes) = .084 and R^2 (activism) = .178. (Standardised coefficients: a = .289, b = .273, c′ = .252; indirect = .079; total = .331). Therefore, values were connected with environmental attitudes which in turn were connected with engaging in environmental activism (Fig 2).

Fig. 2 Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and environmental activism as dependent variable



Our second model included self-transcendence as a predictor, environmental attitudes as a mediator, and levels of consumption of animal products from time point three as a dependent variable. We found self-transcendence predicted higher environmental attitudes (b = 0.31, BootSE = 0.086, 95% BCa CI [0.134, 0.469], p = .001), but attitudes did not predict animal-product consumption (b = 0.09, BootSE = 0.158, 95% BCa CI [−0.164, 0.447], p = .361). The direct effect of self-transcendence on consumption was negative and significant (b = −0.26, BootSE = 0.107, 95% BCa CI [−0.594, −0.171], p < .001). The indirect effect via attitudes was not significant (b = 0.03, BootSE = 0.048, 95% BCa CI [−0.042, 0.151], p = .404), yielding a total effect of b = −0.23 (BootSE = 0.103, 95% BCa CI [−0.543, −0.136], p = .001). Variance explained was R^2_attitudes = .095 and R^2_consumption = .062. (Fig 3).

Fig 3. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and consumption of animal products as dependent variable



Our models for active travel and food waste did not find direct effects of self-transcendence or environmental attitudes; there were also no significant mediations in the two models. See S2 Text for full details of these SEMs.

Given the modest reliability of the environmental attitudes measure in Study 1 (α =.44), the indirect effects should be viewed as conservative, because measurement error in the mediator preferentially attenuates both constituent paths of the mediation. Consequently, the significant mediation for environmental activism is likely a lower-bound estimate of the underlying mechanism, and the null mediations for animal-product consumption, active travel, and food waste should be interpreted cautiously as potentially underpowered rather than definitive evidence of no indirect effect. We therefore refrain from fine-grained comparisons of indirect path magnitudes across domains and note that stronger inferences would require a higher-reliability attitude measure or repeated attitude assessment.

Linear Regressions

The final step in our analysis was to establish whether the MoC activated participants' self-transcendence values which in turn led to a change in engagement with PEBs, i.e. environmental activism, consumption of animal products, active travel, and food waste. To test this, we subtracted the score of time one from time two, and of time two from time three,

for each of the three PEB variables. Next, we checked whether self-transcendence was a significant predictor of these new variables. All our linear regressions showed non-significant results, indicating that self-transcendence values did not influence engagement in PEBs (See Table 3).

Table 3. Results of linear regressions.

Dependent Variable	b	SE	*t*	df	*p*
Environmental Activism (Time 2 – Time 1)	0.01	0.059	0.241	144	.81
Environmental Activism (Time 3 – Time 2)	-0.05	0.043	-1.22	144	.264
Consumption of animal products (Time 2 – Time 1)	0.05	0.129	0.422	143	.674
Consumption of animal products (Time 3 – Time 2)	-0.07	0.044	-1.65	125	.101
Active travel (Time 2 – Time 1)	0.02	0.039	0.45	144	.656
Active travel (Time 3 – Time 2)	-0.02	0.031	-0.52	144	.604
Food waste (Time 2-Time 1)	-0.04	0.081	-0.46	143	.649

Food waste (Time 3 – Time 2)	0.063	0.062	1.03	143	.304

Discussion

The findings from Study 1 offered some insight into the relationship between the COVID-19 pandemic and changes in young people's PEBs. We found mixed results; in the nine months after the start of COVID-19 our participants reported consuming fewer animal products, and throwing away less food; thus, these behaviours increased, indicating a positive influence linked to the pandemic. However, we also observed reductions in PEBs; our participants engaged in less environmental activism and less active travel. These findings support H1a. The results for the changes in PEBs are in line with previous work exploring changes in meat consumption and food waste during the pandemic (e.g., (27,28)), but contrast findings on the relationship between COVID-19 and active travel (e.g., (25)). The latter could be due to the characteristics of the sample, i.e. living in smaller villages or towns, and the availability of infrastructure (e.g., bike hire schemes).

Next, self-transcendence values had a direct effect only on the consumption of animal products and environmental activism in partial support of H2a. The latter relationship was also mediated by attitudes in partial support of H3a. These findings offer important insights on the different factors which might guide young people's engagement with everyday green actions. For example, the effect of values and attitudes could be more pronounced with actions which do not require additional effort (e.g., signing an online petition) compared to actions which might rely on external factors such as infrastructure (e.g., active travelling). In addition, we did not find support for the self-activation hypothesis in Study 1 in contrast to H4a. Previous research has only explored this during biographical MoCs; the present findings

suggest the pandemic restrictions could have been the guiding factor in people's decision-making rather than their values.

In Study 1, we focused on an exogenous MoC characterised by its sudden occurrence – the COVID-19 pandemic – whereas in Study 2, we examined a biographical MoC, the transition from school to university, and investigated their effects on young people's PEBs.

Study 2

Method and Materials

Ethics

The Ethics Committees at the Department of Psychology, University of Bath (Reference number: 20-197) and the School of Psychology, Cardiff University (Reference number: EC.20.04.14.6001) reviewed and approved the study.

Sample

Recruitment avenues included participation panels at the University of Bath and Cardiff University as well as social media (the personal Twitter account of the first author and Facebook groups for first year (freshers) students at one of the universities). University communications teams also distributed information about the survey on various screens on the premises of the campus and on the faculty web pages. Two hundred and fifty-six first-year university students completed the study between November and December 2020. The data of an additional 39 students was excluded: 10 did not complete the full survey, three spent insufficient time responding (less than four minutes for the full survey, compared to a median completion time of 10 mins), and 26 were outliers (details below).

Design

A within-subjects retrospective pre-post correlational design was used to investigate the relation between going through the start of university as a biographical MoCs and students' pro-environmental behaviours. During completion of the questionnaire, participants filled in the measures for PEBs twice. First, they were asked to think about their time before starting to university, i.e. September 2020, thus providing retrospective answers. Second, they had to report on their PEBs 'at the moment' of completing the survey, thus for the period 1-2 months after they had started university. Data was collected between 12 November and 5 December 2020. All other measures (e.g., values) were completed only once and the participants were told to answer according to the present time, i.e. at the time of taking part in the study.

Procedure

The participants from the Psychology departments at the two universities signed up via the relevant experimental management system. They were then able to access a link to the survey via Qualtrics. After opening the survey, they were presented with an information sheet giving details about the study. Before they could begin filling in the survey, the participants had to provide informed consent after reading a consent form explaining their rights and clicking on 'I CONSENT to participate'. They could not begin the study without clicking this button. The psychology students at both universities received course credit for their participation in the study, while those who belonged to other departments were entered into a prize draw for a £50 gift voucher. At the end of the survey, all participants were debriefed.

Measures

We used the same measures as in Study 1.

549 ### *Data Analysis Plan*

550 To test our first hypothesis investigating changes in pro-environmental behaviours due
551 to the transfer from school to university we conducted a number of paired samples t-tests
552 comparing the levels of the PEBs before and after starting university. The rest of the data
553 analysis plan mirrors the one in Study 1.

554 # Results

555 ### *Descriptive Statistics*

556 Before conducting analyses, the data was checked for any potential outliers. Twenty-
557 six participants were identified as outliers and removed from further analyses. Thus, the final
558 sample of the study consisted of 256 first year students. Demographic data are summarised in
559 Table 4. Power analysis using G*Power (84) revealed that the total sample size for the
560 present study should be 156 participants when conducting paired-samples t-tests.

561 **Table 4. Demographic data**

Total Participants	256
Gender	
Female	233 (91%)
Male	20 (7.8%)
Non-conforming	3 (1.2%)
Age	
Mean	18.7 years (SD=1.56)
Range	17 – 35 years
Nationality	
British	183 (71.5%)

Continental Europe	29 (11.3%)
Other	42 (16.4%)
Did not disclose	2 (0.8%)
Moved to a new city to start university	
Yes	211 (82.4%)
No	43 (16.8%)
Did not disclose	2 (0.8%)
Place of residence	
Student Accommodation	204 (79.7%)
Parental/Guardian home	36 (14.1%)
Shared house	12 (4.7%)
Did not disclose	4 (1.6%)

1.1.1 Paired samples t-tests comparing pro-environmental behaviours before and after starting university

To test H1, we conducted paired samples t-tests to evaluate differences between the scores of the participants for PEBs before and after going through the two MoCs. An increase in the scores for domestic behaviours, environmental activism, ethical consumption behaviours, and active travel behaviours would indicate there was a positive change in behaviours. A decrease in the scores for the consumption of animal products would also indicate a positive change in behaviours.

The results revealed significant differences for the frequencies of engaging in all categories of PEBs and the consumption of animal products (See Table 5).

Table 5. Paired-samples t-tests for pro-environmental behaviours before and after starting university

	Mean	SD	Paired *t* test		
			t value	*df*	Sig (two-tailed)
Environmental activism pre	2.27	.92	5.15	251	**.001**
Environmental activism post	2.06	.89			
Domestic PEBs pre	5.23	.89	5.54	253	**.001**
Domestic PEBs post	5.51	.85			
Ethical consumption pre	3.06	1.13	4.55	252	**.001**
Ethical consumption post	2.79	1.17			
Active travel pre	3.43	1.33	5.45	253	**.001**
Active travel post	3.90	1.32			
Consumption of animal products pre	3.18	.84	9.27	252	**.001**
Consumption of animal products post	2.86	.85			

Based on the results from the t-tests, starting university was related to positive changes in young people's domestic and travel behaviours as engagement in these increased, and in the consumption of animal products as this showed a decrease. However, there were declines in environmental activism, and ethical consumption as these decreased after the start of university paired with COVID-19 restrictions.

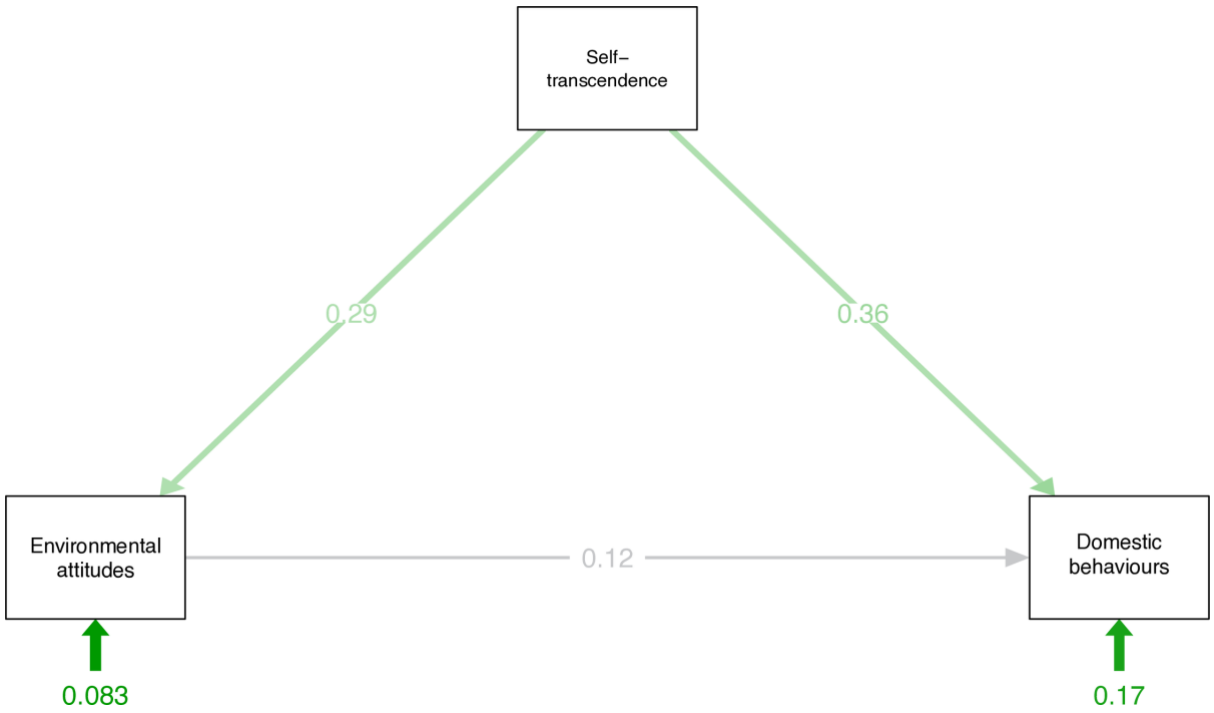
Path-analytic Structural Equation Modelling: Mediation

As with Study 1, we used path-analytic SEM with composite scores to test for the direct effect of self-transcendence on PEBs and for the mediating effect of environmental attitudes on the relationship between values and behaviours.

Our model for domestic behaviours found that self-transcendence predicted higher attitudes (b = 0.29, BootSE = 0.050, 95% BCa CI [0.147, 0.346], $p < .001$). Attitudes did not predict engagement in domestic behaviours (b = 0.12, BootSE = 0.089, 95% BCa CI [−0.004,

0.347], p = .052), but there was a direct effect of self-transcendence on domestic behaviours path (b = 0.36, BootSE = 0.080, 95% BCa CI [0.283, 0.598], p < .001). The indirect effect via attitudes was marginally significant (b = 0.03, BootSE = 0.023, 95% BCa CI [0.003, 0.096], p = .067), yielding a total effect of b = 0.35 (BootSE = 0.082, 95% BCa CI [0.325, 0.644], p < .001). Variance explained was R^2(attitudes) = .083 and R^2(domestic behaviours) = .168. Therefore, higher self-transcendence values were connected with higher environmental attitudes which in turn could have lead to engaging in more domestic PEBs (Fig 4).

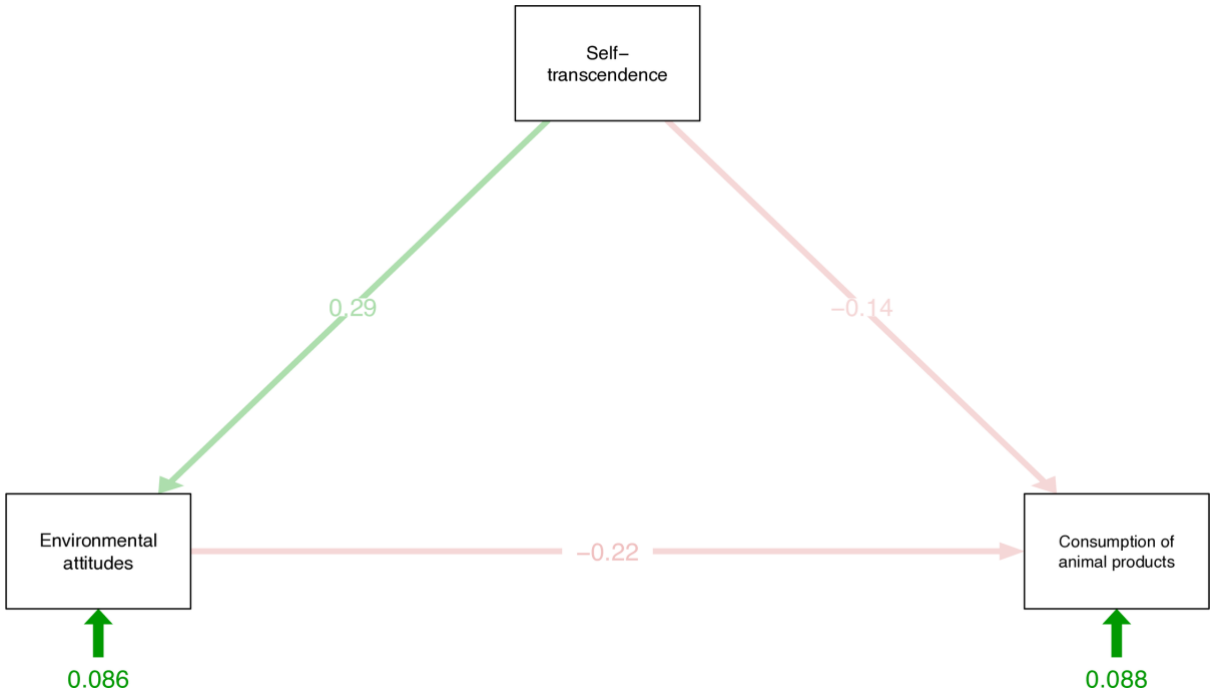
Fig 4. Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and domestic behaviours as dependent variable



Our model for consumption of animal products, found that self-transcendence predicted higher attitudes (b = 0.29, BootSE = 0.050, 95% BCa CI [0.150, 0.348], p < .001). Attitudes, in turn, predicted lower animal-product consumption (b = −0.22, BootSE = 0.092, 95% BCa CI [−0.493, −0.131], p = .001), and there was also a direct negative effect of self-transcendence on consumption (b = −0.22, BootSE = 0.072, 95% BCa CI [−0.303, −0.023], p = .017). The indirect effect via attitudes was significant (b = −0.065, BootSE = 0.028, 95%

BCa CI [−0.146, −0.033], p = .007), yielding a total effect of b = −0.208 (BootSE = 0.069, 95% BCa CI [−0.375, −0.104], p < .001). Variance explained was R^2(attitudes) = .086 and R^2(consumption of animal products) = .088.Therefore, higher self-transcendence values are connected with higher environmental attitudes which in turn lead to consuming less animal products (Fig 5).

Fig 5. Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and consumption of animal products as dependent variable



Our models for environmental activism, ethical consumption, and active travel did not find a main effect of self-transcendence or environmental attitudes on these variables. The SEMs also did not find significant mediations between the self-transcendence and environmental attitudes for any of the three types of behaviours. Please see S3 Text for a detailed breakdown.

Linear Regression: Self-activation Hypothesis

The final step in our analysis for Study 2 mirrored the one in Study 1 by testing the self-activation hypothesis using linear regressions for domestic behaviours and the

consumption of animal products. We subtracted participants' scores during time one from their scores during time two for each of three variables. Next, we checked whether self-transcendence was a significant predictor of these new variables. The linear regression analyses are presented in Table 6.

Table 6. Results of linear regressions: self-activation hypothesis

Dependent Variable	b	SE	*t*	df	*p*
Domestic Behaviours (Time 2 – Time 1)	0.09	0.056	1.69	229	.09
Consumption of animal products (Time 2 – Time 1)	-0.28	0.082	-3.37	228	**0.01**

As evident from the results there were no significant differences for changes in environmental activism and domestic behaviours. However, there were significant differences for the consumption of fish, meat and dairy. The students with higher levels of self-transcendence exhibited even more reductions in their consumption of animal products compared to those with low levels of self-transcendence.

Discussion

The results from Study 2 indicated that after starting university, young people engaged in more domestic PEBs and more active travel and reduced their consumption of animal products. However, there were some reductions, as our findings showed there were lower levels of environmental activism and lower engagement in ethical consumption. These findings are in line with H1b. The results offer key insights on the relationship between the

start of university as a biographical MoC and changes in various PEBs which has received little attention to date.

In addition, Study 2 showed that self-transcendence values had a direct positive effect on domestic behaviours and the consumption of animal products in partial support of H2b. We also reported significant mediations through environmental attitudes for these two sets of behaviours in partial support for H3b. These findings provide further evidence about the strong relationship between self-transcendence values, attitudes, and behaviours which are more likely to be internally motivated (e.g., meat consumption) compared to behaviours which are more likely to be guided by external factors such as infrastructure (e.g., active travel). Finally, we found support for the self-activation hypothesis only for the consumption of animal products after the MoC; the reductions in consumption of animal products were stronger for students with higher levels of self-transcendence compared to those with lower levels. This finding is in partial support of H4b. This provides direct evidence for the effect of self-transcendence values on changes in meat consumption and is in line with past studies in the biographical MoCs domain (e.g., (18)).

General Discussion

The main aim of the present research was to explore changes in young people's PEBs going through an exogenous MoC, i.e., the COVID-19 pandemic, and a biographical MoC, i.e., the transition from school to university. It also examined the potential impact of self-transcendence values and environmental attitudes on PEBs. Finally, it tested the self-activation hypothesis, looking at whether a MoC could activate values which subsequently affect one's behaviours.

Changes to young people's PEBs after MoCs

In both Study 1 and Study 2, we found a set of positive (i.e., pro-environmental) relationships between significant life events and domestic behaviours, and the consumption of animal products. In both studies we also found a negative relationship between significant life events and environmental activism, and specifically in Study 2 we reported a negative relationship with ethical consumption. For active travel, the results were mixed: in Study 1 we found a decline after the exogenous MoC, whereas in Study 2 we found an increase after the biographical MoC. These results are in line with both H1a and H1b which predicted there will be changes to young people's PEBs after experiencing MoCs.

The results from the present research are consistent with previous studies and data on the effects of MoCs on everyday sustainable behaviours. For example, the Vegan Society (27) reported a rise in vegetarian and vegan diet after the start of COVID-19. The fall in meat and dairy consumption could be attributed to fewer opportunities to dine out which is when people usually consume more non-vegetarian meals (85). However, this was not possible due to pandemic restrictions. In addition, the global pandemic has also led to worsening of the financial situation of students around the UK, as 80% of them reported experiencing financial struggles due to COVID-19 (86), with 38% saying they had cut back on food spending. This could also be observed in the results from Study 2 where new undergraduates also faced COVID-19 restrictions. The first-year undergraduates stated they lowered their intake of fish, meat and dairy products consistent with previous research which found that starting university is associated with a reduction in meat consumption (87). Seafood and red meat are higher-priced items; thus, living on their own and having less disposable income could have led to a drop in consumption. Reviews of university settings consistently show that taste, availability and price are the dominant determinants of students' selections, with constrained budgets steering choices toward cheaper options (88).

684 The decrease in active travel in Study 1 was not consistent with reports showing that
685 people engaged in more cycling and walking in the first nine months of the pandemic (25).
686 Most of our sample reported living in in a village or a large town (66.4%), therefore, they
687 might have relied on a car to reach facilities such as bigger supermarkets. In addition, the
688 findings observed by Corker et al. (25) were mainly related to bigger cities where people
689 could more easily hire bikes or e-scooters, making infrastructure availability a key factor in
690 travel mode choice. However, we observed positive changes in travel PEBs in Study 2, and
691 these are in line with an increase in active travelling after the start of university reported by
692 Rau and Manton (89) as well as by research exploring other biographical MoCs during late
693 adolescence, e.g., relocation (64). Almost 80% of the sample in Study 2 lived in student
694 accommodation, therefore we could argue that engaging in active travel could have been
695 easier for new students due to the usually close proximity of student housing to university
696 facilities, as well as to amenities such as supermarkets. This is also consistent with disrupted
697 commute routines after relocation when mode choice among university students varies with
698 new distances and spatial contexts, and these types of transitions are precisely when travel
699 habits are most malleable (90). This once again suggests the important role infrastructure
700 might have as a deciding factor in travel behaviours.
701 The results of Study 1 also showed there was no change in participants' levels of
702 ethical consumption during the first nine months of the pandemic consistent with data
703 reported by Vladimirova et al. (91) from various countries including the UK which stated that
704 for 54% of consumers their engagement with buying eco-friendly clothes during COVID-19
705 remained the same. However, Study 2 found a decrease in ethical consumption for new
706 students. Late adolescence is accompanied by an increasing need for social and psychological
707 independence (92) achieved through a newfound sense of autonomy. A large part of this
708 freedom is a certain level of financial independence from one's parents. Thus, during this

period students gain the ability to operate their own finances. The consumer behaviours we explored included purchasing organic food, and items of clothing made from natural materials. These products usually have a higher price point. Reviews focused on students highlight budget and availability as primary constraints on ethical food purchasing in university settings (93). In addition, we collected data for both studies in 2020 during the first wave of COVID-19 when around 80% of students reported experiencing financial struggles because of the pandemic (86). Our results indicated that indeed for students, who reported a larger effect of COVID-19 and its restrictions on green actions, there were declines in ethical consumption and increases in domestic behaviours. This makes COVID-19 and its restriction an additional reason for the change in first-year students' ethical consumption, but also for them becoming more resourceful by increasing their domestic PEBs, i.e. saving energy and cutting down on food waste reported in Study 2. Furthermore, as students assume budget and cooking autonomy, qualitative and survey evidence has identified links between meal planning or leftover management with lower waste in student households (94,95).Throwing away less food was also observed after the start of the pandemic in Study 1. This is a promising result and has been widely observed during COVID-19 with reports from CAST (28) and Wrap (30) indicating a decline of food waste in the UK, and could also be partially attributed to people trying to save more resources.

Finally, both studies reported lower engagement with environmental activism. A possible explanation is the COVID-19 pandemic itself which severely restricted the opportunities for gatherings of large crowds of people. Thus, young people, who also had to abide by lockdown measures, had fewer opportunities to express their positions as active citizens. In the context of the transition to university, activism can dip as participation is highly network and opportunity dependent while first-semester integration tasks compete for time. Studies related to on-campus activism and first-year adjustment emphasise the

centrality of social ties and time demands for sustained engagement (96). Given that young people are heavily influenced by their peers' actions when it comes to civic participation and activism (97), the lack of the organised in-person #FridayForFuture protests could have also driven down other environmental activism behaviours online. Furthermore, the lack of in-person campus activities organised by student societies could have also contributed to lower levels of environmental activism as students had less access to information which is central to raising awareness levels (98).

On the one hand, we could assume that some of the changes during the biographical (planned) MoC are behaviours for which people are actively looking for an alternative due to the new physical and/or social environment. Therefore, they are based on careful consideration with the idea of replacing old and potentially harmful habits. However, there could be behavioural changes due to the lack of an ability to perform old behaviours. For example, students who used to drive a car before coming to university might switch to walking or taking public transport because they are unable to bring a car on campus (e.g., lack of parking). On the other hand, people seemed forced into their new lifestyles and behaviours during the unplanned moment of change (COVID-19) with a hope to go back to normality. Nonetheless, there are some caveats to consider. The adoption of new diets during lockdown could stem from a desire to lead a healthier life rather than COVID-19 restrictions. Similarly, reduction in food waste could be due to economic decisions related to saving money. Therefore, while the two MoCs appear hugely different in their characteristics, they might offer similar opportunities for change. Further, the success of these changes could be very dependent on the types of behaviours and on external factors.

Overall, the present studies showed support for the habit discontinuity hypothesis. This is consistent with studies exploring other MoCs, such as relocation (99), (100). However, the current definition of MoCs is tightly linked to this hypothesis and offers a

rather generalisable notion of the concept. The present findings are promising but they also show that more work is needed to identify and distinguish different MoCs in order to consider the specific characteristics of each life transition. It is important to be able to unpack these differences as this would help expand the theory and dynamics behind MoCs. This is crucial for applying behavioural change interventions during MoCs, specifically interventions which are aimed at tackling climate change and reaching net-zero.

The effects of values and attitudes on PEBs

The second hypothesis in our research stated that participants with higher levels of self-transcendence would engage in more PEBs after the MoC; this relationship would be mediated by environmental attitudes according to our third hypothesis. Our SEMs showed that self-transcendence was a significant predictor for environmental activism (Study 1), domestic behaviours (Study 2), and the consumption of animal products for both studies, and these relationships were mediated by environmental attitudes. These results are partially in line with H2a, H2b, H3a, and H3b.

These results offer an interesting insight into the factors influencing the various categories of PEBs. For example, meat consumption is strongly associated with self-transcendence (101), similar to recycling and waste reduction (59). Engaging in actions which correspond to core values is an important way for people to express and project their beliefs and attitudes to the outer world (102). In addition, values could also be seen as an integral part to one's self-identity (103) and their stability over time could affect and guide more time-flexible constructs such as attitudes which in turn affect behaviours (104). Having a vegan or vegetarian diet, signing petitions, or wasting less food might be easier and more fitting ways for people to express their concern for the environment and their attitudes and perception towards climate change than switching their commute routines. In recent years,

783 such behaviours have been greatly associated with having an eco-friendly lifestyle, and
784 veganism specifically has been described as a lifestyle movement (105).
785 This contrasts with behaviours which might be guided by other factors. For example,
786 walking and cycling are often associated with living a healthy life rather than a sustainable
787 one (106). Also, compared to going vegan or vegetarian, active travelling is related to extra
788 time for planning, available infrastructure, and convenience (107). Therefore, people might
789 be considering the additional effort and greater effect on their daily lives, rather than their
790 personal values, when changing their active travel behaviours. Nevertheless, our two samples
791 consisted of young people, most of whom did not rely on a car anyway.

792 Testing the self-activation hypothesis

793 Our final set of hypotheses (H4a and H4b) set out to test whether MoCs could activate
794 values which then lead to changes in behaviours, also known as the self-activation
795 hypothesis. We did not find support for the self-activation hypothesis during the exogenous
796 MoC (COVID-19), i.e., our results do not support H4a in Study 1. The changes in behaviours
797 we reported in Study 1 could be purely because people were trying to adjust to what was
798 allowed during lockdown rather than being guided by self-transcendence values. Thus, we
799 could speculate that values are not the primary motivations guiding adaptive behaviours
800 during exogenous MoCs. However, more research testing self-activation during exogenous
801 MoCs is needed to provide more concrete conclusions.
802 In Study 2, we found that students with stronger pro-environmental values seemed to
803 exhibit greater change (consumed less) in their consumption of fish, meat and dairy in partial
804 support of H4b. Thus, the start of university might activate one's values which could then
805 promote a change towards more pro-environmental food choices. This gives us reason to
806 speculate that the change in this behaviour could be attributed to people's values rather than
807 external factors. This indicates partial support for the self-activation hypothesis which has

already been established in past studies looking biographical MoCs (18,108). It also aligns with evidence that food choices are frequent, proximal, and morally salient, so biospheric values most readily translate into concrete dietary shifts (109). By contrast, we observed null results for activism, active travel, and ethical consumption. As discussed above, these domains are more structurally constrained, activism depends on networks, time, and campus opportunity structures, active travel hinges on distance and infrastructure; and ethical consumption among students is limited by price and availability. Therefore, sustaining a well-documented attitude – behaviour gap. People's values remain an important determinant in their pro-environmental lifestyle. However, our results suggest that value activation at the start of university might be most prominent where contextual friction is low and supportive choice architectures are present, while other domains likely require structural supports in addition to personal values similar to a recent findings from a systematic review on MoCs (10).

Limitations and future directions

Some of the limitations of the current research should be addressed. The research relied on self-reported measures for tracking behaviour change. Previous studies have shown that self-reported measures are not fully consistent with actual behaviours; this is especially true in the environmental domain (110). Furthermore, data for time point one in both Study 1 and Study 2 were collected retrospectively. This could be a potential issue as participants might not have a good recollection of their actions. Nevertheless, the behaviours reported in the subsequent time points corresponded to the time of data collection. The use of retrospective data collection has been supported in the literature, particularly in longitudinal and biographical research where prospective data collection is not feasible. For instance, studies in travel research (111);(112) rely on retrospective reports and have found these to be reliable especially when probing specific behaviours during recent events. In the present

research, both studies focused on distinguished types of behaviours (i.e., pro-environmental ones) during events which occurred less than six months before data collection. The theoretical underpinnings of recall accuracy suggest that while there may be some memory decay, significant life events and behaviours are often remembered with sufficient accuracy (113). Future studies could focus on collecting data before the beginning of a biographical MoCs which could offer more accurate representation of behaviours. In addition, we also tracked behaviour change via self-report measures which might result in inaccurate measurement. Nonetheless, they are easy to administer, require less time for filling in, and could reach a wider audience. Future studies could use technology to collect behaviour data, for example, smartphone applications where participants record their daily pro-environmental behaviours.

Another limitation is the low reliability scores of some of the measures used for tracking pro-environmental behaviours. This was specifically evident in Study 1. One potential reason for this is the fact that participants for Study 1 were recruited online, resulting in a more diverse sample in terms of demographics, education levels, and potentially varying levels of familiarity with the measures used. This is compared to the participants in Study 2 who were mainly psychology students at university. The diversity in the former sample likely contributed to greater variability in responses.

The research also finds some support for the habit discontinuity hypothesis as there is evidence of behaviour change for actions which are usually considered habitual after the start of the MoC. However, conclusions should be taken with caution as there were no measures in the research aimed at testing habit change. Therefore, future studies could include questionnaires specifically testing habitual behaviour and habit strength, for example, the Self-Report Habit Index (SRHI) (114). This would allow for a more nuanced understanding

of behaviour change and more concrete conclusions about the habit discontinuity hypothesis, specifically disrupting old habits and forming new ones, during moments of change.

Next, our studies did not include control groups not going through MoCs which weakens any causal claims pertaining to the relationship between the two MoCs and changes in PEBs. Future studies should recruit two sets of participants, i.e., those going through a MoC and those not going through one. There could still be difficulties as graduating from secondary education is a MoC in itself independent of whether young people continue into higher education or not.

Study 1 and Study 2 also suffered from samples with predominantly female participants, 85.6% and 91% respectively. This limits the generalisability of our results; it also does not give us any opportunity to investigate gender differences which have previously been reported in the literature (115). In addition, Study 1 experienced substantial attrition from the initial 829 participants to the longitudinal analytical sample (N = 146; ≈82% attrition), and the retained sample was predominantly female (85.6%). However, given that we recruited through social media this rate of attrition is not that unusual especially when we consider that we had included only a few vouchers as incentives (116). In addition, our latent growth models used FIML, which yields unbiased estimates if data are missing at random (MAR), the magnitude of dropout makes MAR uncertain. If those who remained were systematically more conscientious, engaged, or pro-environmentally inclined than those who exited, both baseline levels and the slopes of change could be biased. For example, higher baseline PEB among completers could (a) compress observed declines (if ceiling effects apply) or (b) magnify change (if highly engaged participants were more responsive to pandemic-related disruption). Accordingly, the Study 1 change estimates should be interpreted with caution and viewed as most applicable to samples similar in composition to our retained cohort. Future studies should ensure a more diverse and representative sample.

Moreover, given the popularity of the UK as a study destination to people from all over the world, it might be interesting to compare the effect of starting university on the PEBs of domestic and international first-year students. There could be important differences due to the bigger transition experienced by non-UK nationals and their acculturation when settling in the UK. In addition, the effect of other psychological constructs on behaviour change could also be explored.

Finally, we collected data up to three months after the MoC, which limits the potential of substantial long-term effects on PEBs. Future studies should focus on collecting longer-term data, these could also investigate possible interventions which could result in behavioural change, for example beyond university and into people's professional lives. Thus, interventions should explore ways in which newly-formed behaviours could be sustained in the long-term and perhaps lead to changes in other PEBs, so-called spillover effects (117). Such interventions should build on the factors observed here to shape PEBs, including values and attitudes. This could include carbon literacy training for new students to provide relevant knowledge and skills for low-carbon behaviour change, capitalising on youth concern about climate change and the habit disruption of starting higher education.

Conclusion

This article contributes to a growing body of literature at the intersection of developmental and environmental psychology, focusing on MoCs. The aim was to explore the effects of MoCs on young people's PEBs. It is one of the few studies to explore how the transfer from school to university might affect PEBs and adds to the growing evidence base on the effects of COVID-19 on PEBs. In addition, it treats COVID-19 as a MoC, thus shedding more light on it as an unexpected and unplanned disruption. The present findings have demonstrated that MoCs might represent an important opportunity for breaking habits

when accompanying factors are carefully considered. In particular, some MoCs may allow for values or attitudes to activate PEBs, but this is not inevitable. There seems to be a complex relationship between a MoC, one's values and attitudes, and the surrounding infrastructure, as these all serve as catalysts for effective pro-environmental behaviour change. Our findings highlight the importance of targeted interventions during life transitions. Policymakers, educators, and scientists can leverage these insights to learn more about the readiness of people to change their behaviours during both biographical and exogenous MoCs. This could then be applied in designing interventions and policies aimed at achieving more sustainable habits to help mitigate climate change, such as targeted programmes, enhanced education curriculum, resources and support for individuals going through MoCs, infrastructure development, community-based initiatives, awareness campaigns, and engagement with other stakeholders, e.g., local government, schools or universities, and businesses. Overall, these findings reinforce the value of designing timely, targeted interventions during key life transitions to encourage sustainable lifestyle change.

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Supporting Information

Fig 1. Timeline of COVID-19 restrictions in the UK between March 2020 and December 2021

Fig 2. Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and environmental activism as dependent variable

Fig 3. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and consumption of animal products as dependent variable

Fig 4. Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and domestic behaviours as dependent variable

Fig 5. Significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and consumption of animal products as dependent variable

S1 File. Appendix A – Exploratory Factor Analysis (EFA)

S2 File. Appendix B – Additional SEM analyses for Study 1

S3 File. Appendix C – Additional SEM analyses for Study 2

Appendix A – Exploratory Factor Analysis (EFA)

We conducted an exploratory factor analysis (EFA), using principal component analysis with Varimax (orthogonal) rotation, to determine the factors of the questionnaire measuring the pro-environmental behaviours of the participants. The EFA yielded four factors which explained 57.15% of the variance. The Rotated Matrix is displayed in S1 Table 1. The Bartlett test of sphericity, which tests the overall significance of all correlations within the matrix, was significant (χ^2 (190) = 2083.138, $p < .001$). This determined that it was appropriate to use the factors as described in the analytic model with the present data set. Moreover, The Kaiser-Meyer-Olkin measure of sampling adequacy established a high strength of relationships among variables in our sample (KMO = .88).

Factor 1 was labelled Environmental Activism as it covered respondents' active role in society on environmental issues. This factor was comprised of seven items, for example: "Share content via my personal social media account about climate change"; "Take part in a protest about an environmental issue"; "Like/follow pages on social media advocating for climate change". It explained 21.58% of the variance.

Factor 2 included domestic pro-environmental behaviours, i.e. behaviours which the participants could do at home. It consisted of five items such as: "Turn off the tap when brushing teeth"; "Recycle household waste (e.g., glass)"; The items "Hand-dry clothes instead of using a tumble dryer" and "Take short showers (less than 3 min long)" loaded both in Factor 1 and Factor 2. However, based on theory, similar use of this questionnaire in previous research (Whitmarsh, 2009), and their factor loadings, they were included in Factor 2. Factor 2 explained 15.09% of the variance.

Factor 3 included consumption pro-environmental behaviours related to shopping practices of respondents. It had three items: "Buy clothes made only from natural materials

(cotton, wool, linen, etc.)"; "Buy environmentally friendly products"; "Eat organic, locally grown or in-season food". It explained 10.80% of the variance.

Factor 4 focused on travel pro-environmental behaviours and also consisted of three items: "Use a bike instead of a car"; "Use public transport instead of a car"; "Walk somewhere instead of using a car". It explained 9.69% of the variance.

The reliability analyses revealed that Cronbach's Alpha for Factor 1 (Environmental Activism) was .88; for Factor 2 (Domestic PEBs) was .70; for Factor 3 (Consumption PEBs) was .74; for Factor 4 (Travel PEBs) was .52.

S1 Table 1. Rotated Matrix from the Reliability Analysis on the Pro-environmental behaviours scale.

Items	Factors			
	Environmental Activism	Domestic PEBs	Consumption PEBs	Travel PEBs
Share content via my personal social media account about climate change	**.82**			
Sign a petition about an environmental issue	**.80**			
Comment under articles on social media from my personal account about climate change	**.71**			
Take part in a protest about an environmental issue	**.71**	-.31		
Find out more about environmental issues (e.g., learning more about climate change)	**.68**		.42	
Like/follow pages on social media advocating for climate change	**.68**		.36	
Encourage other people to save energy	**.49**	.35	.48	

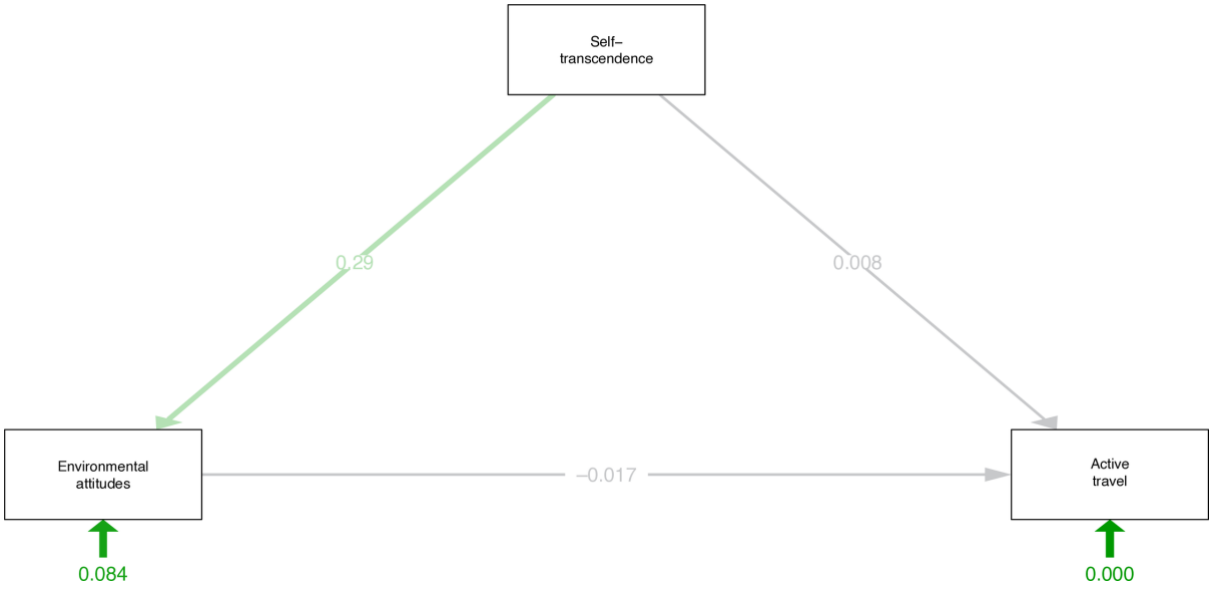
Take short showers (less than 3 min long)	.45	**.26**		
Hand-dry clothes instead of using a tumble dryer	.42	**.32**		
Turn off the tap when brushing teeth		**.71**		
Turn off lights when not in use		**.70**		
Avoid wasting food (e.g., by using leftovers)		**.70**		
Recycle household waste (e.g., glass)		**.65**		
Use my own bag when shopping for groceries		**.57**		.55
Eat organic, locally grown or in-season food			**.72**	
Buy clothes made only from natural materials (cotton, wool, linen, etc.)	.33		**.61**	.36
Buy environmentally friendly products	.44		**.55**	
Use a bike instead of a car				**.66**
Use public transport instead of a car				**.66**
Walk somewhere instead of using a car		.44		**.59**

Percentage of Variance	21.58	15.09	10.80	9.68
Eigen Value	4.32	3.02	2.16	1.94
Cronbach's Alpha	.876	.700	.738	.520

Appendix B – Additional SEM analyses for Study 1

We conducted a SEM which included self-transcendence as a predictor, environmental attitudes as a mediator, and active travel from time point three as a dependent variable. Self-transcendence predicted higher environmental attitudes (b = 0.29, BootSE = 0.078, 95% BCa CI [0.115, 0.423], p = .001), but attitudes did not predict active travel (b = 0.012, BootSE = 0.228, 95% BCa CI [−0.415, 0.482], p = .928), and the direct effect of self-transcendence on active travel was not significant (b = −0.01, BootSE = 0.180, 95% BCa CI [−0.379, 0.327], p = .824). The indirect effect via attitudes was also not significant (b = 0.002, BootSE = 0.062, 95% BCa CI [−0.126, 0.130], p = .932), yielding a total effect of b = -0.01 (BootSE = 0.117, 95% BCa CI [−0.380, 0.320], p = .844) R^2(attitudes) = .084, R^2(active travel) < .001 (S2 Fig 1).

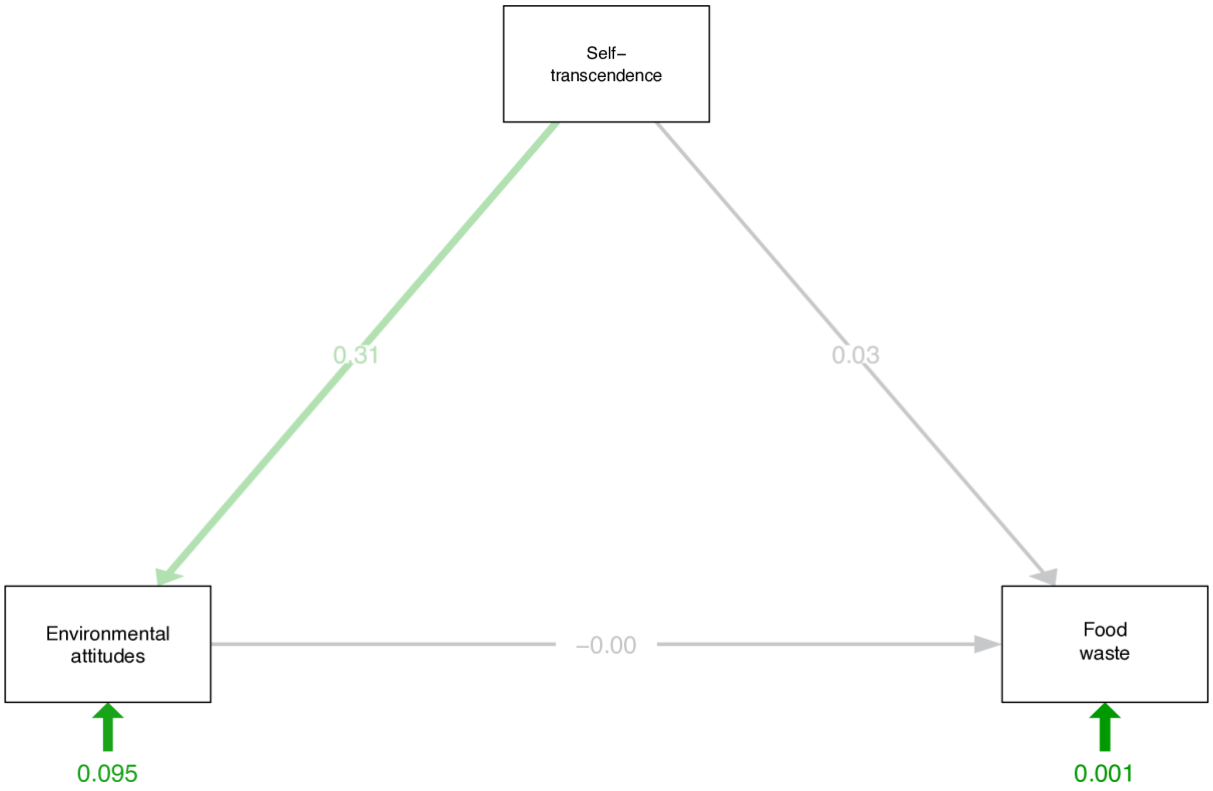
S2 Fig 1. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and engagement in active travel as dependent variable



We conducted a SEM which looked at self-transcendence as a predictor, environmental attitudes as a mediator, and food waste levels from time point three as a

dependent variable. Self-transcendence predicted higher environmental attitudes (b = 0.31, BootSE = 0.086, 95% BCa CI [0.134, 0.469], p = .001), but attitudes did not predict active travel (b = −0.001, BootSE = 0.111, 95% BCa CI [−0.223, 0.211], p = .986, and the direct effect of self-transcendence on active travel was not significant b = 0.03, BootSE = 0.101, 95% BCa CI [−0.178, 0.220], p = .733, respectively). The indirect effect via attitudes was also non-significant (b = −0.001, BootSE = 0.033, 95% BCa CI [−0.064, 0.070], p = .987), yielding a total effect of b = 0.03 (BootSE = 0.090, 95% BCa CI [−0.156, 0.198], p = .705). Variance explained was R^2(attitudes) = .095 and R^2(food waste) = .001 (S2 Fig 2).

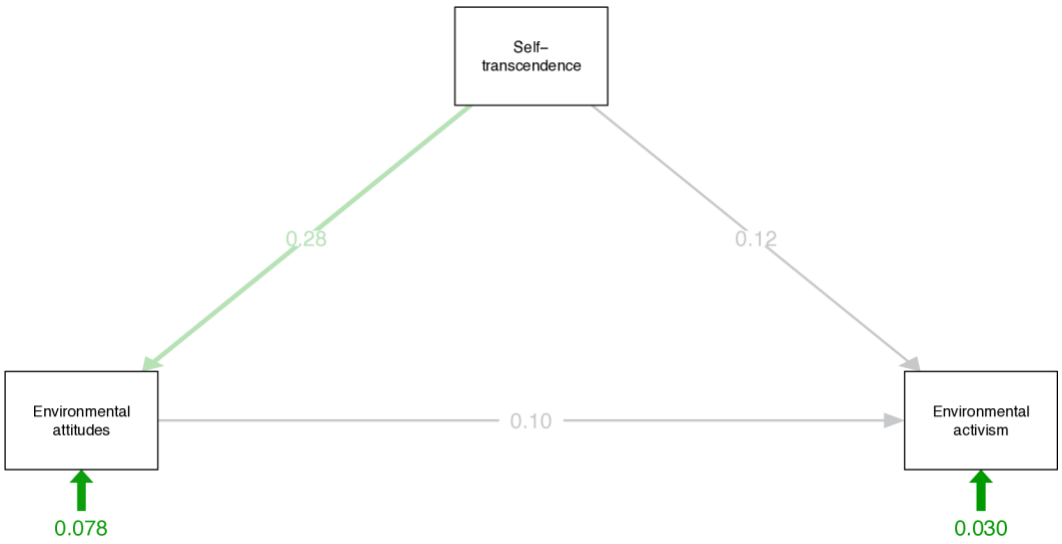
S2 Fig 2. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and food waste as dependent variable



Appendix C – Additional SEM analyses for Study 2

We conducted a SEM which included self-transcendence as a predictor, environmental attitudes as a mediator, and environmental activism from time point two as a dependent variable. Self-transcendence predicted higher attitudes (b = 0.28, BootSE = 0.051, 95% BCa CI [0.139, 0.341], $p < .001$). Environmental attitudes did not predict environmental activism (b = 0.10, BootSE = 0.115, 95% BCa CI [−0.075, 0.372], $p = .183$, and self-transcendence values did not predict environmental activism (b = 0.12, BootSE = 0.104, 95% BCa CI [−0.056, 0.357], $p = .152$). The indirect effect via attitudes was not significant (b = 0.29, BootSE = 0.030, 95% BCa CI [−0.015, 0.104], $p = .217$); the total effect was also not significant (b = 0.14, BootSE = 0.099, 95% BCa CI [−0.004, 0.388], $p = .060$) (S3 Fig 1).

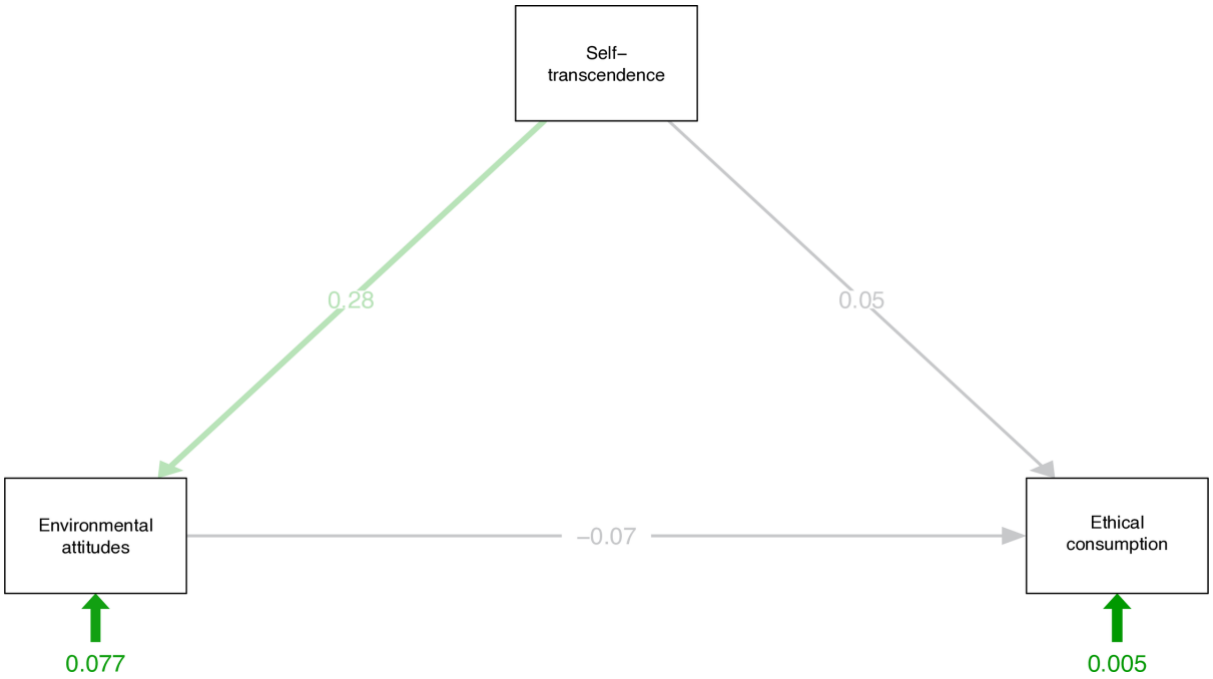
S3 Fig 1. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and environmental activism as dependent variable



We also conducted a SEM which looked at self-transcendence as a predictor, environmental attitudes as a mediator, and ethical consumption at time point two as a dependent variable. Self-transcendence predicted higher attitudes (b = 0.28, BootSE = 0.053, 95% BCa CI [0.139, 0.348], p < .001). Both environmental attitudes (b = −0.07, BootSE = 0.145, 95% BCa CI [−0.417, 0.150], $p = .357$) and self-transcendence did not predict ethical

consumption (b = 0.05, BootSE = 0.122, 95% BCa CI [−0.154, 0.322], *p* = .493). The indirect of effect of self-transcendence via attitudes was also not significant (b = −0.02, BootSE = 0.036, 95% BCa CI [−0.110, 0.033], p = .365), yielding a total effect of b = 0.03 (BootSE = 0.116, 95% BCa CI [−0.172, 0.279], p = .658). Variance explained was R^2(attitudes) = .077 and R^2(consumption) = .005 (S3 Fig 2).

S3 Fig 2. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and ethical consumption as dependent variable



Finally, we conducted a SEM which explored self-transcendence as a predictor, environmental attitudes as a mediator, and active travel at time point two as a dependent variable. We found that self-transcendence predicted higher attitudes (b = 0.29, BootSE = 0.052, 95% BCa CI [0.149, 0.350], *p* < .001), but neither attitudes (b = 0.04, BootSE = 0.150, 95% BCa CI [−0.199, 0.391], *p* = .532) nor self-transcendence (b = −0.01, BootSE = 0.142, 95% BCa CI [−0.308, 0.255], *p* = .955) predicted active travel. There was not significant indirect effect via attitudes (b = 0.01, BootSE = 0.039, 95% BCa CI [−0.048, 0.108], *p* = .547); while the total effect was near zero (b = 0.01, BootSE = 0.135, 95% BCa CI [−0.265,

0.266], p = .909). Variance explained was R^2(attitudes) = .086 and R^2(active travel) = .002. (S3 Fig 3).

S3 Fig 3. Non-significant mediation model with self-transcendence as predictor, environmental attitudes as mediator and active travel as dependent variable