UNIVERSITY OF TWENTE.

Transition to a sustainable society

A study on the complex interplay of possible antecedents for Pro-environmental Behaviour

Fynn Anton Preußer

Bachelor Thesis: Psychology of Conflict, Risk and Safety

First Supervisor: Dr. Ir. P.W. De Vries

Second Supervisor: N. M. A. Huijts

Due date: 01.07.2022

Abstract

With an increasing need to challenge the harmful environmental trends, understanding the antecedents of Pro-Environmental Behaviour (PEB) becomes progressively relevant. Environmental Self-identity (ESI) has been shown to be a predictor for PEB. Additionally, studies show that Self-identity can be affected by the ease with which one can remind oneself of certain behaviours (EOR). Moreover, Social Comparison has been shown to be an important antecedent of self-identity as it helps to reduce uncertainty about oneself. The present study investigates the possibility of a mediation effect of EOR on ESI via Social Comparison. Further, it investigates if a subsequent change in ESI affects following PEB.

For this purpose, an experimental survey was administered to a sample (N=97) of predominantly young, German, academics. Participants were randomly assigned to two EOR conditions and asked to recall either six ('High' EOR) or twelve ('Low' EOR) environmentally friendly behaviours from the past. The subsequent questionnaire entailed measures for Perceived Difficulty of the Task, Social Comparison, ESI and PEB.

Neither a proposed total effect of the EOR condition on ESI nor a mediation effect via Social Comparison was found. Additionally, ESI did not predict PEB. However, EOR had a significant effect on the Perceived Difficulty of the Task. Furthermore, participants who engaged in more downward social comparison had higher ESI. Exploratory analysis revealed that there is a mediating effect of Perceived Difficulty of the Task on ESI via Social Comparison.

In general, most of the results are not consistent with previous literature, except the finding that EOR tasks can be used to alter the Perceived Difficulty of a Task. Due to multiple methodological limitations the study calls for cautious interpretation of the results. Specifically, exploratory analysis revealed that the found results might be a product of the EOR task not manipulating the Perceived Difficulty severely enough. Future replicatory research is advised to reconsider the demands of the EOR task. Additionally, alternative, or improved measures should be considered.

Keywords: Ease of Retrieval; Perceived Difficulty of Task; Social Comparison; Environmental self-identity; Pro-Environmental Behaviour; Behavioural Change

Introduction

Fridays for future, the 1.5°C objective of the Paris climate agreement, UNESCO's sustainable development goals and many more examples all draw attention to the importance of living a more environmentally friendly life. However, the world is on track to fail at limiting the temperature increase to 1.5°C compared to pre-industrial levels (Boehm et al., 2021). This is alarming, as failing to meet this goal will have several detrimental consequences. One example is an increased risk to human and natural systems as of temperature extremes or water scarcity (IPCC, 2019, pp. 37-38). Furthermore, extinction of species attributable to changing environmental conditions poses a risk that is increased if the goal is failed to be met (IPCC, 2019, p. 8). These impacts of the negative trends, stress the importance for the world to work towards the objectives and agreements.

To effectively work towards these goals, one must consider the antecedents of maladaptive behaviours and the resulting environmental trends. Here, one of the main drivers are consumption patterns by households (Ivanova et al., 2016). Though consumers are becoming increasingly ecologically conscious (Leonidou et al., 2010), consumer behaviour is still responsible for 60-80% of the national carbon emission (Ivanova et al., 2016; Wilson et al., 2013). This vast environmental impact of consumer behaviours stresses the need to act on behaviour and promote pro-environmental behavioural alternatives. Additionally, it accentuates the necessity for research insights into how consumer behaviour might be changed.

One crucial factor in behaviour change that might be utilised is the self-identity of individuals, as it largely determines behaviour (Van der Werff et al., 2013c). However, research surrounding the manipulation of self-identity for purposes of pro-environmental behavioural change is sparse. Generally, research has come to the understanding that self-identity is affected by past behaviour (Lee et al., 1999; Van der Werff et al., 2013c). However, since retrospectively changing past behaviour is not possible, other ways to influence self-identity involving past behaviour might be more feasible.

With regards to the available research, subjective ease of retrieval of past behaviours has proven to be an effective way, which can be manipulated to affect self-identity (Schwarz et al., 1991). When experiencing the retrieval of behaviours to be easy, the content of the behaviours becomes more relevant for the construction of self-identity, compared to a difficult retrieval experience. The fact that ease of retrieval has self-identity altering effects, that depend on the to be recalled content, has been demonstrated in many different study contexts (Dijksterhuis et al., 1999; Schwarz et al., 1991; Tormala et al., 2002). Altering the ease of

retrieval may therefore present a feasible way to manipulate environmental self-identity of individuals.

Another factor widely acknowledged in social psychology for the creation of self-identity is how the individual compares oneself to others (Butzer & Kuiper, 2006; Carter & Vartanian, 2022; Festinger, 1954). By using other people as a comparative standard and assessing how they fare compared to them, individuals can reduce uncertainty about the self and how to define the self (Festinger, 1954). Thus, considering the effects of social comparison in the creation of pro-environmental self-identity is relevant.

Further clarity on factors and ways to promote pro-environmental behaviours (PEB) is a necessity to help shed light onto possible ways to work closer towards the 1.5°C goal and other environmental objectives. Therefore, the present research sets out to answer the question: *Can ease of retrieval facilitate a pro-environmental self-identity and hence Pro-environmental behaviour and what is the role of social comparison?*

Theoretical framework

Pro-environmental behaviour

Pro-environmental behaviour (PEB), as defined by Balundė et al. (2019), refers to 'actions aimed at avoiding harm to and/or safeguarding the environment, either performed in public (e.g., participation in environmental movements) or private domains (e.g., recycling)'.

There are many factors influencing pro-environmental behaviour of individuals such as various demographic, internal (e.g., motivation, locus of control, etc.) and external factors (e.g., economic, cultural, etc.), making it a complex concept to analyse (for an exhaustive analysis of factors see; Kollmuss & Agyeman, 2002). Regardless of its complexity, research in PEB has shown that two of its most important related antecedents are biospheric values and self-identity (Balundė et al., 2019; Van der Werff et al., 2013c). Pro-environmental behaviour is proximally affected by self-identity whereas biospheric values affect PEB more distally via self-identity (Balundė et al., 2019; Van der Werff et al., 2013c). Therefore, self-identity constitutes a factor of high predictive importance for PEB.

Self-identity

Due to the vast number of definitions of self-identity and its similarities to relating concepts, researchers have not come to an agreement on the exact definition of self-identity. In the scope of this thesis, the definition of Van der Werff et al. (2013c) is used as for its behavioural considerations, simplicity, high practicality and congruence to day-to-day

understanding. They define self-identity as 'the label used to describe oneself, which relates to particular behaviour'. In that, the label to describe one-self is related to a multitude of factors, such as 'goals, values, beliefs, (…) self-representations and self-evaluations' (Zacarés & Iborra, 2015).

Research into the relation between behaviour and environmental self-identity has concluded that self-identity influences behaviour (Whitmarsh & O'Neill, 2010). Thus, to use self-identity as a way to actively promote PEB, it is crucial to identify ways to influence the self-identity of actors.

As afore-mentioned, values have an impact on the self-identity. Specifically, biospheric values inform environmental self-identity (Van der Werff et al., 2013c). Therefore, one might initially think, that changing the biospheric values a person holds presents a way that can be readily used to influence self-identity. However, research indicates that values are rather abstract and resistant to change (Feather, 1995; Stern, 2000). This indicates that they might not constitute an effective way to change self-identity.

A study by Van der Werff et al. (2013a) has shown that PEB can be facilitated by reminding individuals of their past environmentally friendly behaviours. They conclude that reminding them has positive impacts on their environmental self-identity, which in turn informs their future behaviour (Van der Werff et al., 2013a). This suggests behaviour, self-identity, and their relationship to be in a rather fluid state. Additionally, Van der Werff et al. (2013a) found that the strength to which people believed to have acted environmentally friendly, plays a relevant role. Environmental self-identity was found to be dependent on the strength to which they perceived to have acted pro-environmentally previously (Van der Werff et al., 2013a). Therefore, finding ways to influence the perceptions people hold about their past behaviour might constitute a more feasible way to intervene in self-identity formation.

Ease of retrieval

Researchers interested in recall have investigated the effects of recalled material on judgment making. Their findings demonstrate that not only the content of recalled material affects judgment, but also the perceived difficulty of recalling such material (Schwarz et al., 1991). The latter is known as the 'Ease of retrieval' (Schwarz et al., 1991). The theoretical reasoning, underlying the effects of ease of retrieval, relates to the availability heuristic - researched by Tversky and Kahneman (1973) - which holds that people rely on what comes to mind easiest and that this affects subsequent judgments most.

A study conducted by Schwarz et al. (1991) on assertiveness ratings found evidence for the effects of ease of retrieval on assertiveness ratings. The researchers asked the subjects to name either six or twelve situations in which they acted assertively. Subjects were asked for self-ratings of assertiveness. Results show that participants rated themselves significantly higher on assertiveness when previously asked for six rather than twelve situations. They attribute this to the subjective experience of the task - perceived ease of retrieval. According to the researchers, subjects used their subjective experience of the tasks – the ease - as a cue to rate their own assertiveness, leading subjects to conclude that if recalling twelve situations presents a great challenge, they are most likely not assertive. These ease of retrieval tasks have been used in many study contexts, calling attention to its potential for manipulating subjective task experience and its great useability in experiments (Danziger et al., 2006; Raghubir & Menon, 2005; Schwarz et al., 1991; Tormala et al., 2007).

The importance of subjective experience in retrieval tasks is further confirmed by study findings on ease of retrieval and stereotyping (Dijksterhuis et al., 1999). Again, the impact of the subjective experience was a driving force in stereotyping ratings, thus confirming, and replicating Schwarz et al. (1991) findings in a different study context.

The aforementioned findings give reason to believe, that subjective experience of ease of retrieval has far reaching consequences on self-evaluations and beliefs about the self. Following the logic of Schwarz et al. (1991) study of assertiveness self-evaluations, people who perceive the task of recalling pro-environmental behaviours easy may thus come to the conclusion that environmental matters are likely a considerable part of their self-identity. Thus, ease of retrieval might also influence the self-identity in the context of identifying as pro-environmentally friendly.

Social comparison

Another factor that might affect self-identity is the belief of how one fares in the ease of retrieval task compared to others. Social Comparison Theory (Festinger, 1954) holds that humans have an internal drive to evaluate their beliefs and abilities to others and, in case of absence of objective measurement, use others as a standard to evaluate themselves. As a reference, individuals then use people who are not vastly different in their beliefs and abilities, to reduce uncertainty about themselves (Festinger, 1954). Additionally, for social comparison to happen, it does not necessitate the presence of others. This is because comparison to an imagined reference suffices for social comparison to take place (Baldwin & Mussweiler, 2018; Pomery et al., 2012).

In all social comparisons, imagined or real, the evaluator may either engage in upward, downward, or lateral social comparison (Pomery et al., 2012). Generally downward social comparison is thought to be self-enhancing, whereas upward social comparison has negative implications for the individual's self-evaluation (Pomery et al., 2012). However, it is important to notice that the extent of the value judgment depends on several external and internal factors, such as self-esteem or the perceived similarity to the referent (for an exhaustive explanation see; Pomery et al., 2012). As, social comparison thus affects self-evaluation, it may further impact and inform the self-identity.

Ease of retrieval's effect on social comparison

As outlined in Festinger's Social Comparison Theory (Festinger, 1954), when deprived of an objective measurement of how one did on a task people use others as a benchmark. However, in a task that is conducted alone, the individual is deprived of the latter information, possibly leaving the individual uncertain about their own performance in relation to others, making assumptions of how others would fare the only source of social comparison. As in Schwarz et al. (1991) study on assertiveness ratings, they might thus turn to their subjective experience of the task – ease of retrieval - to evaluate their own performance. Subsequently, since individuals have an internal drive to compare themselves to reduce uncertainty (Festinger, 1954), individuals may compare their subjective experience of the task to established mental constructs of how others would find the task. For example, they might have experienced the task as difficult – low ease of retrieval – and use this information as input for evaluating how they belief they fared compared to others, putting them in an unfavourable position for the comparison. Therefore, a perceived low ease of retrieval might affect social comparison to others adversly, and vice versa for high ease of retrieval. This is because the ease of retrieval may feed into the social comparison process as information about an individual's own performance.

Social comparison's effect on self-identity

Aside from the process of social comparison, the consequences of it are also important to consider. Social comparison, as such, not only serves as an evaluative measure; social comparison informs the self-identity and the verification of who one believes to be (Stets & Burke, 2014). Thus, by means of social comparison on specific topics, the individual gains clarity if a topic is central to who they are. It serves the development of creating a self-identity (Stets & Burke, 2014). Therefore, if someone holds the belief that others found it easier than

oneself to complete the ease of retrieval task – upward comparison - this might affect the individual to rate the topic of the task to be less central to their self-identity. In turn, if individuals engage in downward social comparison, meaning believing to fare better than others, the to be retrieved material might be rated more central to the self-identity.

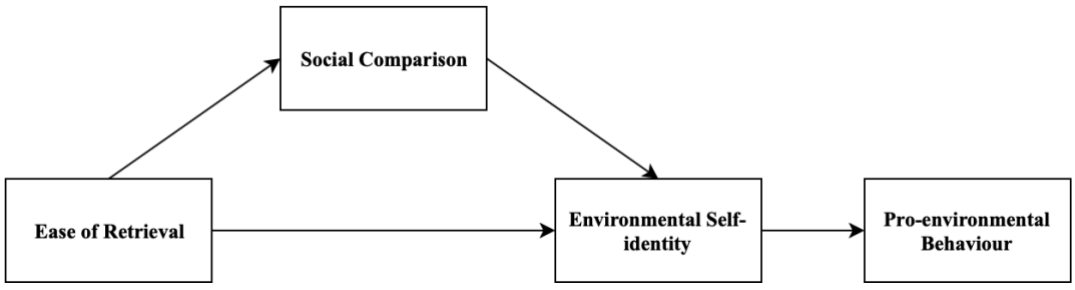
As of the foregoing theoretical arguing, it is expected that ease of retrieval might affect social comparison, which sequentially affects the environmental self-identity of the individual. Thus, social comparison might take on a mediatory role in the relationship between ease of retrieval and self-identity.

The Present study

The present study investigates the relationship between ease of retrieval and self-identity, in the context of pro-environmental behaviour. Similar to the study of Schwarz et al. (1991) on the relation between ease of retrieval and assertiveness ratings, the current study aims to manipulate the degree of ease of retrieval by differential task requirements in the experimental groups. Here one experimental group must recall more past pro-environmental behaviours than the other experimental group. Furthermore, the study integrates a measure of how individuals compare their performance to others, as social comparison is presumed to mediate the relationship between ease of retrieval and self-identity. To be able to make a statement about the experimental condition's functionality in differential ease of retrieval, a manipulation check in form of measuring the perceived difficulty of the task is drawn into consideration. Additionally, a behavioural measure is introduced to investigate if self-identity indeed corresponds with respective behaviour also in the present study context.

Figure 1

Conceptual Framework



Based on the foregoing theoretical framework the present study aims to investigate following predictions:

H1: Environmental self-identity will be higher in the high ease of retrieval group, compared to the low ease of retrieval group.

H2: Individuals in the high ease of retrieval group more often assess the task to be easier for themselves than for others, compared to the low ease of retrieval group.

H3: Environmental self-identity will be higher for individuals who rate the tasks to be easier for themselves, compared to individuals who rate the task to be easier for others.

H4: The relation between ease of retrieval and environmental self-identity is mediated by social comparison; people exposed to low ease of retrieval compare themselves more negatively to others, which in turn results in lesser environmental self-identity than people in the high ease of retrieval group.

H5: The higher the environmental self-identity, the more likely people engage in the PEB.

Method

Design and Participants

The present study employs a between-subjects mediation design with one independent variable, *Ease of Retrieval*; one mediating variable, *Social Comparison*; and one dependent variable, *Environmental Self-identity*.

The experimental variable, *Ease of Retrieval*, is composed of two levels (high and low). The mediating variable, *Social Comparison*, in this design is of continuous nature. Higher values rather constitute downward social comparison – indicating the belief that they found the task easier than others. Lower values on the other hand, represent upward social comparison – participants belief that others found the task easier than themselves.

The dependent variable examined is *Environmental Self-identity* – Higher values indicating higher environmental self-identity. To also consider if there are behavioural implications that, as outlined in the theoretical framework, depend on self-identity a measure to assess *Pro-environmental Behaviour* was put in place. Again, higher values indicate acting more pro-environmental.

To recruit a significant number of people, this study employed opportunity sampling and snowball sampling. For this, different social media channels were used, such as Instagram, Facebook, WhatsApp. Additionally, the university wide Sona-system was used for recruiting.

Subjects using the Sona-system, to take part in the study, were compensated with 0.25 credit points for their effort.

In total, 187 subjects took part in the study, however due to exclusion criteria and attrition this does not constitute the final sample. Following exclusion criteria led to a reduction of the final sample. First, all participants that had item non-response or did not complete the questionnaire until the last page, including the debrief, had to be excluded (N=72). Second, participants that did not answer seriously, as measured by an attention check question, needed to be omitted (N=18). With regards to other pre-set exclusion criteria no further participants had to be excluded. The latter entailed a completion time that is 2 standard deviations below the respective condition mean and being below 16 years old.

The final sample of 97 participants (N_{male} = 41; N_{female} = 54; $N_{diverse}$ = *2*) ranges in ages from 17 to 71 (M =25.79; SD = 9.9) and was predominantly german (N_{german} = 82; N_{dutch} = 6; N_{other} = 9). Most of the participants obtained secondary educational levels or higher ($N_{secondary}$= 42; $N_{bachelor}$ = 32; N_{master} = *9;* $N_{doctoral}$ = 2; $N_{vocational}$ =8; $N_{other\_education}$ =4). Regarding their occupation most were students or working ($N_{student}$= 70; $N_{working}$ = 21; $N_{trainee}$= *3;* $N_{unemployed}$ = 1; $N_{retired}$ =1; $N_{other\_occupation}$ =1). The sample was randomly distributed across experimental conditions. Ultimately the 'Low' ease of retrieval condition included 38 participants (N_{male} = 16; N_{female} = 22; $N_{diverse}$ = *0*) and the 'High' ease of retrieval condition consisted of 59 participants (N_{male} = 25; N_{female} = 32; $N_{diverse}$ = *2*).

Procedure and material

To host the experiment, the online survey software Qualtrics was used. First, participants were given information about their rights as participants of the study and general information about the purpose of the study. After, subjects were asked for their consent by means of an online consent form. By consenting, participants confirmed that they have read the information, participation is voluntary and that their data will be used for statistical analysis (Appendix A). Subsequently, the participants were asked for demographic information. Specifically, subjects gave information on their gender, nationality, education, occupation, and age (Appendix B).

Subsequently, they were randomly assigned to one of two experimental conditions. In both experimental conditions the participants were presented with the definition that pro-environmental behaviours are 'actions aimed at avoiding harm to and/or safeguarding the environment, either performed in public (e.g., participation in environmental movements) or private domains (e.g., recycling)' (Balundė et al., 2019). To make Balundė et al's (2019)

definition more operational, they were provided with the prompt ‘Think of any behaviour, large or small, that you do to protect the environment‘.

The ‘Low’ ease of retrieval group was then asked the following question ‘Please give 12 examples in which you have acted out pro-environmental behaviour’. Respectively, the ‘High’ ease of retrieval group was asked ‘Please give 6 examples in which you have acted out pro-environmental behaviour’. Ensuing, participants typed their answers in a provided text box.

Subsequently, individuals were asked to respond to a statement and a question, namely ‘I found the task…’ and ‘How difficult was it for you to recall these behaviours?’. Participants could indicate their answer on a seven-point Likert scale from ‘Very easy’ (1) to ‘Very difficult’ (7). These questions serve as a measure to validate if the manipulation of perceived ease of retrieval has worked by capturing the perceived difficulty of the task.

Next, participants were asked to fill out questions that measure four different constructs. However, only two constructs, namely ‘Social Comparison’ and ‘Environmental Self-identity’, are relevant for the present study. The additional constructs were measured as data collection was conducted collaboratively with two other researchers to maximise the participant pool.

The measure relevant for the mediator variable – Social Comparison - in the present study is the mean of the answers on five items. After recoding the items and computing the mean, higher values indicate that the individual compares themselves as having performed better on the task than others. Following items constitute the measure:

Item 1: ‘I found the task easier than other people that completed the task.’

Item 2: ‘I found the task more challenging than other people that completed the task.’

Item 3: ‘The task presented a greater challenge for me than for other people.’

Item 4: ‘Others had more trouble coming up with the amount of pro environmental behaviours than I did.’

Item 5: ‘It was more challenging for me to come up with the number of behaviours than for others.’

After each statement, the participants were asked to answer on a seven-point Likert scale ranging from ‘Strongly disagree’ (1) to ‘Strongly agree’ (7). Overall the scale shows acceptable internal consistency for this data set, $\alpha = .74$; $\lambda_2 = .76$ (George & Mallery, 2003).

Next, the dependent variable, Environmental Self-identity is measured by a means of the Environmental Self-identity scale (Van der Werff et al., 2013b). The scale is a three-item questionnaire (Appendix C), to be answered on a seven-point Likert scale ranging from ‘Strongly disagree’ (1) to ‘Strongly agree’ (7). For the present sample the environmental self-identity scale shows good internal consistency, $\alpha = .88$; $\lambda_2 = .88$ (George & Mallery, 2003).

Subsequently, participants were told that the researchers have arranged a deal with the WWF. Part of the deal was that the WWF donates a small amount of money for each click on a link to pro-environmental causes. Subjects are told that they can click the button showing the link up to 100 times. They were explicitly given the information that clicking on the link is fully voluntary and that they won't be penalised for skipping. The link serves as a behavioural measure to see if participants make an effort to click the link for donations – and thus engage in pro-environmental behaviour - or not.

As information about the true purpose of the link was withheld from the participants, and as they were fed false information about the effects of clicking on the link, participants were debriefed about this misdirection. Additionally, the participants are asked if they would like to withdraw their consent after knowing about the link's true purpose. Furthermore, they are thanked for their understanding and their participation in the study. Finally, contact details of the researchers are given in case the subjects have any remaining questions. The debrief, thanksgiving and the contact details can be found in Appendix D.

Data Analysis

For the present analysis IBM SPSS 26 is used. After preparation of the data predictive analysis is run.

For the predictive analyses, the data is first investigated. Since the ensuing mediation analysis involves linear regression analysis, the assumptions for regression analysis must be investigated. The assumption checks are repeated with Environmental Self-identity as the independent variable and the Pro-environmental Behaviour as the dependent variable, since an additional linear regression analysis is conducted after the mediation analysis, to investigate the relationship between Environmental Self-identity and Pro-environmental Behaviour. Generally, since ANOVAs are robust against assumption violation, even in case of violation, inferential analysis may be continued depending on the degree of violation. Ensuing, the data is investigated for significant correlations.

Next, the manipulation checks are conducted using ANOVA. This serves the purpose of determining if the different ease of retrieval conditions were indeed perceived as being of different difficulties.

Subsequently, the mediation analysis and the regression analysis are conducted. In all inferential statistics a confidence interval of 95% is used which corresponds to an alpha of .05. The first inferential analysis conducted is the mediation analysis. For this, 5000 bootstrapping using PROCESS macro for SPSS by Hayes is employed (Hayes, 2018). The theoretical

foundation of the PROCESS macro is in accordance with Baron and Kenny (1986) criteria for mediation. The second analysis performed is the linear regression analysis, in which Environmental Self-identity is regressed on Pro-environmental Behaviour.

Following the predictive analyses exploratory analysis is performed. Here, data is investigated using factor analysis to evaluate if the items load on their respective factor and are thus a valid measure of the latent construct. In case they do not load on their proper factors, items may be excluded. Ensuing, relevant inferential statistics are re-examined to determine if exclusion of factors caused the statistical power to provoke a change in significance. Additionally, other exploratory analyses might be conducted depending on notable results from the investigation of data.

Results

Investigation of data

For both conducted analyses – mediation analysis and the regression of Environmental Self-identity on Pro-environmental Behaviour -, checking the assumptions and screening the data for serious violations is necessary. Generally, the Assumption of Linearity, Independence of Residuals and Equal Variance have been met. However, the Assumption of Normality is violated (Appendix E, Appendix F, Appendix G, Appendix I) for Environmental Self-identity ($W = 0.93$; $p < .001$), Social Comparison ($W = 0.95$; $p = .001$) and Pro-environmental Behaviour ($W = 0.66$; $p < .001$). Yet since ANOVAs and specifically bootstrapping are robust statistical techniques (Hayes, 2018), the data is considered to be eligible for further analysis.

As can be seen in Table 1 there are several significant correlations between variables in the sample. One prominent finding is that the measure of Perceived Difficulty of the Task not only correlates with the condition the participants were put in, but also with the score for Social Comparison and the Environmental Self-identity score.

With regards to the distribution of the mean score on the Social Comparison measure, the skewness of the data accumulated to 0.24. Additionally, on average across all Social Comparison items, the neutral answering option was selected in 50.74 % of the cases. However, regardless of the slight positive skewness and the predominance of selecting the neutral answering option, the distribution is still considered to be relatively symmetrical. The mean scores of the Environmental Self-identity measure exhibit moderate negative skewness, -0.85. This indicates that participants generally tended to rate themselves on the upper end of the Likert scale, indicating stronger Environmental Self-identity.

Investigation of the Pro-environmental Behaviour measure (Appendix J) yields ceiling effects since a substantial number of people (n = 58) reached the maximum score. Additionally, a floor effect can be observed as a considerable high number of people score minimally on the Pro-environmental Behaviour measure (n = 27).

Table 1

Pearson Correlations and significance level for Ease of Retrieval (1), Perceived Difficulty of Task (2), Social Comparison (3), Environmental Self-identity (4), Pro-environmental Behaviour (5), Age (6), Gender (7).

Variables	1	2	3	4	5	6	7
1	1						
2	.322**	1					
3	-.096	-.528**	1				
4	-.046	-.337**	.522**	1			
5	.053	-.125	.145	.157	1		
6	.060	-.026	-.053	.123	-.093	1	
7	-.029	-.052	.035	.148	.280**	-0.61	1

**. Correlation is significant at the 0.01 level (2-tailed)

Manipulation check

To check if both groups, as intended, perceived the task to be of different difficulties and thus experience different ease of retrieval, a manipulation check was conducted. Univariate analysis indicates that there are significant difference between the groups in Perceived Difficulty of the Task ($F(1, 95) = 10.99$; $p = .001$). As intended, the 'Low' Ease of Retrieval group ($M = 3.92$; $SD = 1.25$) perceived the task to be more difficult than the 'High' Ease of Retrieval group ($M = 3.03$; $SD = 1.31$). Thus, Ease of Retrieval tasks present an effective way to alter the Perceived Difficulty of a Task.

Mediation analysis

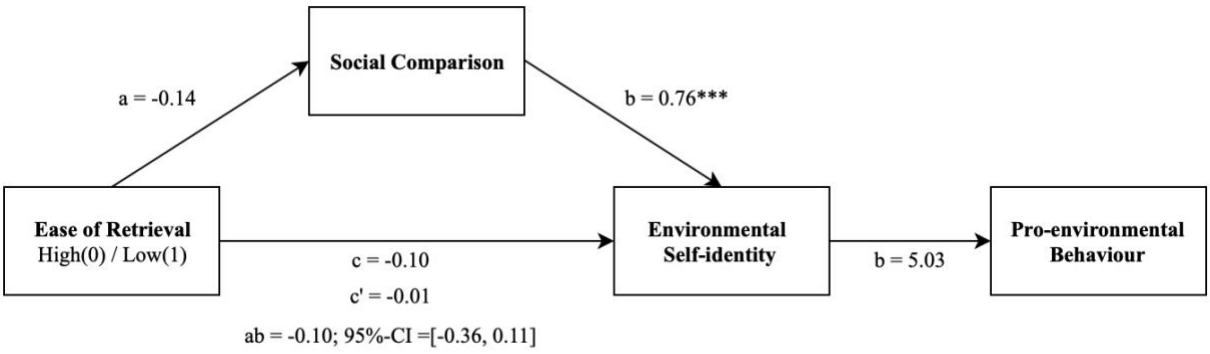
The analysis yields that there was no total effect of Ease of Retrieval (independent variable) on Environmental Self-identity (dependent variable) present (B = -0.10; p = .673; t(95) = 0.42; 95%-CI [-0.54, 0.35]). In other words, Environmental Self-identity was not significantly different for people who were exposed to the 'Low' Ease of Retrieval condition compared to the 'High' Ease of Retrieval condition. Thus, Hypothesis 1 had to be rejected. Results of the mediation analysis indicated that Ease of Retrieval (independent variable) does not statistically significantly predict the proposed mediator Social Comparison (B = -0.14; p = .368, t(95) = -0.91; 95%-CI [-0.44, 0.16]), which led to the rejection of Hypothesis 2. Yet, Social Comparison (mediator variable) had a statistically significant effect on the dependent variable Environmental self-identity (B = 0.76; p < .001; t(94) = 5.96; 95%-CI [0.51, 1.02]), confirming Hypothesis 3. This indicates that when participants evaluated themselves better compared to others, they reported increased Environmental Self-identity. With regards to the direct effect, meaning the effect of Ease of Retrieval (independent variable) on Environmental Self-identity (dependent variable) including the mediator in the model, there was no statistically significant effect (B = 0.01; p = .962; t(94) = 0.05; 95%-CI [-0.37, 0.38]). Additionally, the analysis yielded a not statistically significant indirect effect of Ease of Retrieval (independent variable) on Environmental Self-identity (dependent variable) via the mediator Social Comparison (ab = -0.10; 95%-CI [-0.36, 0.11]). Since there was neither a statistically significant indirect effect nor any other sign that gave reason to believe that there was partial or complete mediation in the sample (Figure 2), Hypothesis 4 had to be rejected.

Regression analysis

After the mediation analysis, the proposed regression analysis was conducted (Figure 2). The regression of Environmental Self-identity on Pro-environmental Behaviour, revealed that Environmental Self-identity does not statistically significant predict Pro-environmental Behaviour (r(95)= .16; p = .124). Under inclusion of all variables from the model, the effect size of Environmental Self-identity was statistically not significant (B = 5.03; t(93) = 0.94; p = .352) which led to the rejection of Hypothesis 5.

Figure 2

Complete model including mediation and regression with effect sizes and significance level



*Note. *p<.05; **p<.01; ***p<.001*

Exploratory analysis

Investigation of data

After conducting the analysis as planned, the data underwent exploratory analysis. To investigate the validity of the Perceived Difficulty of the Task measure (manipulation check measure), the Social Comparison measure and the Environmental Self-identity measure, the respective items were investigated using factor analysis.

First, the Principal Component Analysis (PCA) was run to determine the latent factors that the items collectively describe. Here, the Kaiser-Meyer-Olkin test yielded middling sampling adequacy, suggesting the data to be fit for factor analysis (KMO = .75). Additionally, Barlett's test of sphericity was significant ($p < .001$), signalling sufficient correlation between items to conduct a PCA.

With regards to the extracted factors, only factors exceeding an Eigenvalue of one were given due consideration (Guttman, 1954; Kaiser, 1960). Examination of the scree plot does not yield a clear number of factors. However, investigation of the Kaiser's criteria yields three factors. This finds support when considering the explained variance, as it is recommended to only extract factors with explained variance that exceeds 10 % (Urdan, 2010). These three factors together can explain 70.41% of the total variance. Since the latent factors are expected to correlate, a direct-oblimin-rotation was used.

Using the oblimin-rotated three-factor solution, the factors can be interpreted by looking at the items that load most heavily on the factor. Items that load most heavily on the first factor correspond to the items proposed in the Environmental Self-identity scale. Thus, the first factor

has face validity for being interpreted as Environmental Self-identity. Likewise, the second component may be interpreted as Social Comparison. Lastly the third factor may be interpreted as the manipulation check measure – Perceived Difficulty of the Task. As can be seen in the pattern matrix (Appendix H), item 1 and item 4 of the Social Comparison measure do not load on their intended factor but other factors. After considering the low factor loadings and their low face validity in terms of the factors that they load on, items 1 and 4 were excluded.

Mediation analysis with 3-item-solution for the Social Comparison measure

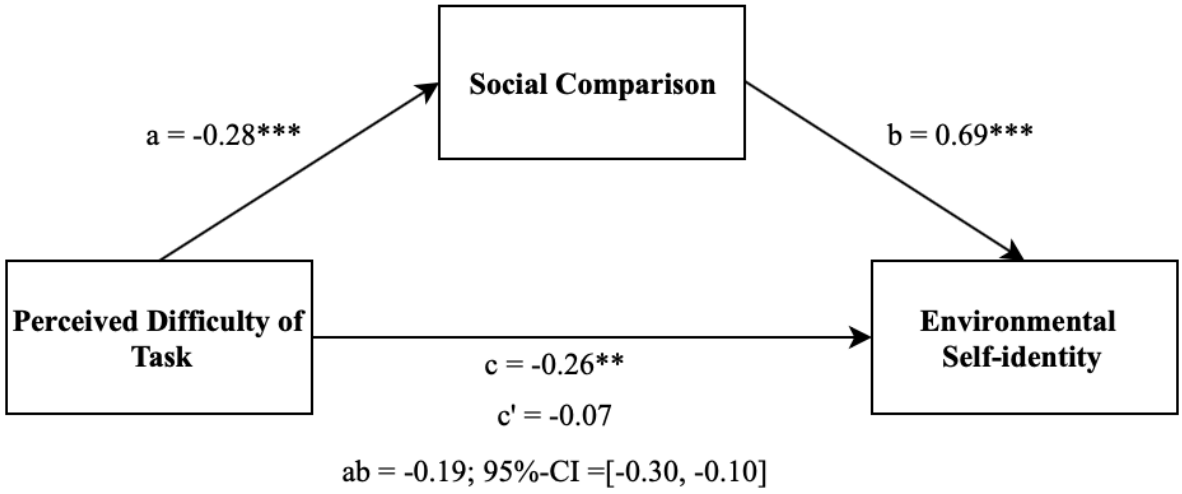
After exclusion of item 1 and item 4 of the Social Comparison measure, the mediation analysis was conducted once again with the three-item-solution for the Social Comparison measure. Again, the total effect (B = -0.10; p = .673, t(95) = -0.42; 95%-CI [-0.54, 0.35]), direct effect (B = -0.05; p = .802, t(94) = -0.25; 95%-CI [-0.48, 0.37]), the effect of Ease of Retrieval on Social Comparison (B = -0.09; p = .626, t(95) = -0.49; 95%-CI [-0.48, 0.29]), as well as the indirect effect (ab = -0.04; 95%-CI [-0.23, 0.12]) were statistically not significant. Thus, results support the afore-established rejection of Hypothesis 1, Hypothesis 2, and Hypothesis 4. As in the predictive analysis, the relationship between Social Comparison and Environmental Self-identity was found to be significant (B = 0.44; p < .001, t(94) = 3.70; 95%-CI [0.20, 0.68]), lending support to the previously accepted Hypothesis 3 .

Mediation analysis with Perceived Difficulty of Task as the independent variable

As concluded earlier in the initial investigation of data section of the report and as shown in the correlation table (see table 1), the Perceived Difficulty of Task variable correlates significantly with the Social Comparison variable and the Environmental Self-identity variable. This gives rise to the idea of using the Perceived Difficulty of Task variable as a predictor in the mediation model (Figure 3). Mediation analysis shows that there is a statistically significant total effect (B = -0.26; p = .001, t(95) = -3.25; 95%-CI [-0.41, -0.10]), an statistically not significant direct effect (B = -0.07; p = .446, t(94) = -0.77; 95%-CI [-0.23, 0.10]). The effect of Perceived Difficulty of Task on Social Comparison (B = -0.28; p < .001, t(95) = -5.79; 95%-CI [-0.37, -0.18]), Social Comparison on Environmental Self-identity (B = 0.69; p < .001, t(94) = 4.67; 95%-CI [0.4, 0.99]), as well as the indirect effect (ab = -0.19; 95%-CI [-0.30, -0.10]) were statistically significant. These results indicate that Social Comparison fully mediates the relationship between Perceived Difficulty of Task and Environmental Self-identity.

Figure 3

Mediation model with Perceived Difficulty of Task as the independent variable



*Note. *p<.05; **p<.01; ***p<.001*

Mediation analysis with Perceived Difficulty of Task as an independent variable (Ease of Retrieval conditions isolated)

Since the prior analysis did not consider that the Perceived Difficulty of the Task was affected by the experimental conditions the participants were exposed to, the mediation analysis is conducted anew for the Ease of Retrieval conditions isolated.

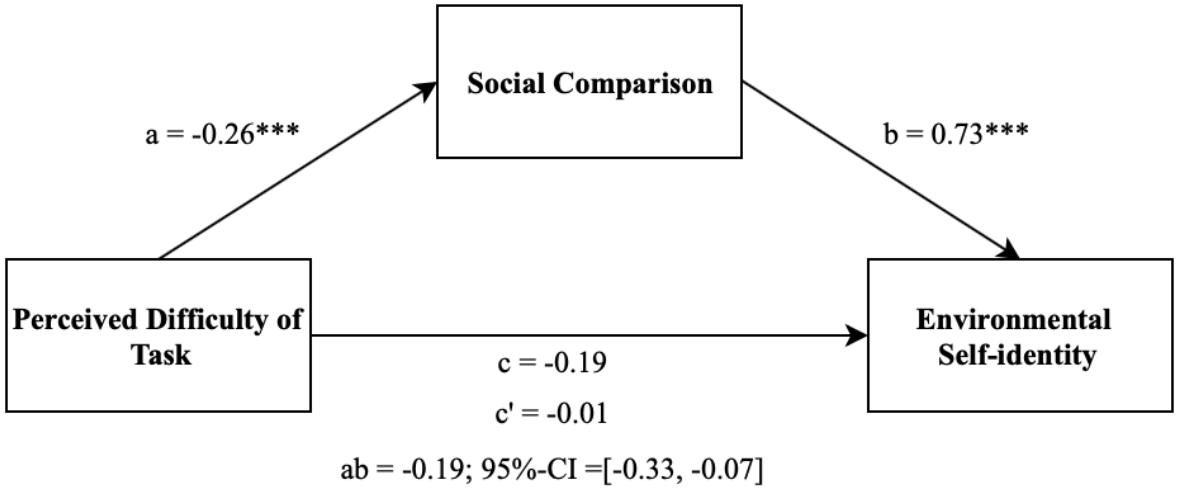
In the 'High' Ease of Retrieval subset (N=59) (Figure 4), the mediation analysis shows no statistically significant total effect (*B* = -0.19; *p* = .062, *t*(57) = -1.91; 95%-CI [-0.40, 0.01]), and direct effect (*B* = -0.01; *p* = .955, *t*(56) = -0.06; 95%-CI [-0.219, 0.207]). However, the effect of Perceived Difficulty of Task on Social Comparison (*B* = -0.26; *p* < .001, *t*(57) = -3.79; 95%-CI [-0.40, -0.12]), Social Comparison on Environmental Self-identity (*B* = 0.73; *p* < .001, *t*(56) = 3.62; 95%-CI [0.33, 1.13]), as well as the indirect effect (*ab* = -0.19; 95%-CI [-0.33, -0.07]) were statistically significant. According to Hayes (2018), these results argue for (indirect only) mediation.

In the 'Low' Ease of Retrieval subset (N=38) (Figure 5) more statistically significant effects were found. The total effect (*B* = -0.41; *p* = .003, *t*(36) = -3.17; 95%-CI [-0.67, -0.15]), the effect of Perceived Difficulty of task on Social Comparison (*B* = -0.34; *p* < .001, *t*(36) = -4.16; 95%-CI [-0.51, -0.18]), Social Comparison on Environmental Self-identity (*B* = 0.60; *p* = .019, *t*(35) = 2.44; 95%-CI [0.10, 1.12]), as well as the indirect effect (*ab* = -0.21; 95%-CI [-

0.43, -0.05]). The direct effect on the contrary turned out to be statistically not significant (*B* = -0.20; *p* = .173, *t*(35) = -1.39; 95%-CI [-0.50, 0.09]). The results indicate full mediation.

Figure 4

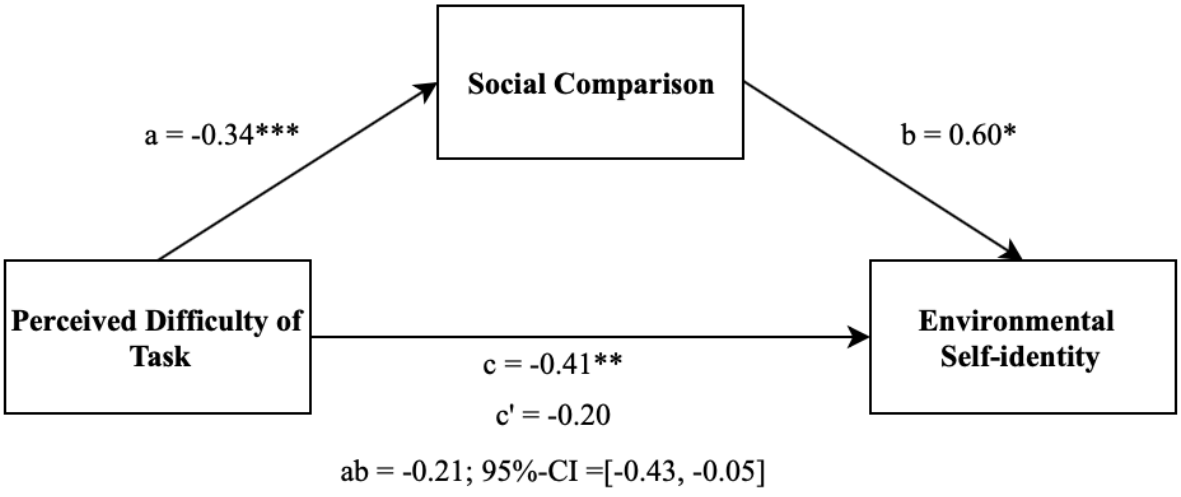
Mediation model with Perceived Difficulty of Task as the independent variable ('High' Ease of Retrieval condition isolated)



*Note. *p<.05; **p<.01; ***p<.001*

Figure 5

Mediation model with Perceived Difficulty of Task as the independent variable ('Low' Ease of Retrieval condition isolated)



*Note. *p<.05; **p<.01; ***p<.001*

Discussion

Summary

The current study focused on the relationship between ease of retrieval and environmental self-identity and the role of social comparison in this relationship. Additionally, it was investigated in how far environmental self-identity predicts pro-environmental behaviour. For the former investigation, it was proposed that social comparison takes on a mediatory role in the relationship between ease of retrieval and environmental self-identity.

The results from the mediation analysis show that ease of retrieval had no effect on environmental self-identity, ease of retrieval had no effect on social comparison and no mediation was found. This led to the rejection of Hypothesis 1, 2, and 4 respectively. Thus, it is unlikely that the present ease of retrieval task affects environmental self-identity via social comparison. The only statistically significant effect found in the mediation model was the effect of social comparison on environmental self-identity, lending support to Hypothesis 3. This means that when people thought of themselves as having done better on the task than imagined others, they evaluated their own self-identity 'greener' compared to people who thought of themselves as having performed relatively worse.

With regards to the relation between environmental self-identity and pro-environmental behaviour no statistically significant relation was found, leading to the rejection of Hypothesis 5. Thus, environmental self-identity does not seem to predict pro-environmental behaviour in this study.

Apart from the main findings, the study found that manipulating the ease of retrieval by differential task requirement - namely the number of behaviours to be recalled - turned out to be a feasible means to increase the perceived difficulty of the task.

Additionally, it was found that instead of ease of retrieval, the perceived difficulty of the task had a significant effect on environmental self-identity, that was fully mediated by social comparison.

Considering the research question, *'Can ease of retrieval facilitate a pro-environmental self-identity and hence pro-environmental behaviour and what is the role of social comparison?'* the results can give further clarity. The study findings suggest that the here presented ease of retrieval tasks cannot be used as a means to influence environmental self-identity. Considering the results, the latter also does not have an effect on pro-environmental behaviour. Additionally, it may be concluded that social comparison rather mediates the relationship between perceived difficulty of the task and environmental self-identity. These

conclusions should be viewed critically as there are several important limitations to the study that will be discussed in the following sections.

Explanation of results

The findings of the present study cannot confirm the expected results and are mostly not in line with previous research. Yet, there are some results that yield support to previous theories and hypotheses. In the following the findings are put into the context of prior research and the theoretical reasoning lined out in the theoretical framework of the present study.

Ease of retrieval

Specifically, the findings are incongruent with the findings of Schwarz et al. (1991), who found that ease of retrieval had self-identity altering effects in terms of assertiveness ratings after a relevant ease of retrieval task. The present study could not confirm a similar effect in the study context of environmental self-identity. One possible reason for failing to replicate the effect in this study context might be social desirability – the act of giving altered responses on questionnaires, etc. to make a more favourable impression on others (Crowne & Marlowe, 1960).

There have been large debates about social desirability especially in environmental psychology (Vesely & Klöckner, 2020). Environmentalism, being sustainable, green and the like, are increasingly publicised and publicly valued characteristics. Notably for such morally significant behaviours and its predictors, people at times alter their responses to more socially desirable answers to appear in a more positive light (Kaiser et al., 1999). This has the implication that some people might be more prone to giving a social-desirable answer than others.

Specifically motivational theories point out that self-enhancement could occur when self-esteem is at stake (Robins & Paulhus, 2001). Individuals may then engage self-enhancement strategies. One strategy may be self-deceptive enhancement, in which the individual is unaware of giving rather socially desirable answers (Chung, 2012).

Since the task of the present study concerned a culturally significant topic – namely environmental behaviour – this might have caused people in the low ease of retrieval condition to have experienced a stronger feeling of divergence from the socially desirable answer, causing their self-esteem to be threatened. Consequently, this would incentivise to, knowingly or unknowingly, give more socially desired answers to preserve self-esteem.

Alternatively, this might be a product of attrition. When investigating the experimental group sizes, it becomes apparent that the 'High' ease of retrieval subset was considerably larger (*N*=59) than the 'Low' ease of retrieval subset (*N*=38). This however should not be the case since participants were randomly placed into either one of the conditions and the distribution should therefore be more equal. In turn, one might argue that the unequal final subset sizes are a product of attrition. People exposed to the low ease of retrieval task, namely recalling 12 behaviours, may have been overwhelmed with the task requirement and decided to drop out of the study leading to greater attrition in the 'Low' compared to the 'High' ease of retrieval condition. Consequently, this might have influenced subsequent results in a variety of ways. For example, it might have led to people that struggle the most and thus - theoretically – could have experienced the greatest decrease in environmental self-identity, to drop out. Ultimately this constitutes another possible reason for not finding the expected results.

Social comparison

As outlined in the theoretical framework, Schwarz et al. (1991) concludes that in their study the participants used their subjective experience as judgment input to evaluate their own performance on the task. Following this reasoning it was hypothesized that participants in this study would similarly draw on their subjective experience of the task as judgment input. It was hypothesized that individuals may compare this judgment input to how they believed others did on the task, as humans have an innate tendency to compare themselves to gain closure about their own performance (Festinger, 1954). However, results can only partially confirm this hypothesis. The experimental ease of retrieval task did not predict how they compared themselves to imagined others. However, their overall experience of task difficulty did.

There might be several reasons that could explain why results yield that the participants might not use ease of retrieval as judgment input for social comparison purposes in the present study. They could for example result to more global beliefs about how they compare to others as judgment input, irrespective of how easily they retrieved the behaviours. This would ultimately mean that their answers on the measure would rather reflect trait social comparison than state social comparison.

Another possible reason for failing to find the hypothesized results might be that some individual had troubles answering and understanding the items from the social comparison measure. During data collection some participants approached the researchers as they did not understand who they should compare themselves to and mentioned that they did not know what answer to select and therefore selected the most neutral one. On average, more than half of the

participants selected the neutral answering option across items, 50.74%. When considering that the answers on the Social Comparison measure centred around the neutral answering option, the afore-presented argument gains further strength. Ultimately, this homogeneous answering leads to questionable usefulness of the scale.

However, perhaps the most convincing reason is that they do indeed use their experience of the task as some sort of judgment input but that the experimental variable insufficiently manipulates the difficulty of the task. This is because when using the overall perceived difficulty of the task, respective and irrespective of the experimental condition they were exposed to, as the independent variable in the model full mediation was found. This could indicate that the experimental groups were not sufficiently affected in terms of perceived task difficulty by the retrieval task, since otherwise the mediation effect of perceived task difficulty would have carried over to the experimental conditions.

Pro-environmental behaviour

Another finding that stands contrary to previous findings is that there was no relation found between environmental self-identity and pro-environmental behaviour measure. This finding is not in line with previous investigations of the relation between environmental self-identity (Balundė et al., 2019; Van der Werff et al., 2013c; Whitmarsh & O'Neill, 2010). The findings of the present study fail to confirm the findings of Whitmarsh and O'Neill (2010). This might be for two reasons.

First, Whitmarsh and O'Neill (2010) found that there appears to be some pro-environmental behaviour categories that are not predicted by self-identity, namely “one-off domestic energy conservation, travel and political behaviours” (Whitmarsh & O'Neill, 2010). However, the requested pro-environmental behaviour in the present study does not fit these categories. It might be that the behaviour – clicking a button for donating to an environmental cause - belongs to another category of behaviours that is not influenced by Environmental self-identity that was not discovered by Whitmarsh and O’Neill previously. If this was the case, finding no results is no surprise and one should consider using a measure that employs a pro-environmental behaviour that, according to Whitmarsh and O’Neill, can be influenced by environmental self-identity e.g., energy conservation or food intake (Whitmarsh & O'Neill, 2010).

Second, conceivably the more plausible reasons, is that the measure of pro environmental behaviour in the present study is problematic. This reason is assessed as more likely, as some participants reported that the questionnaire froze when they clicked on the

donation link in a high frequency. This is likely due to the click counter being rather complex in its creation, resulting in a processing power intensive survey flow underlying the measure. This might have caused the questionnaire to freeze. Participants mentioned, that when re-entering the questionnaire via the link, they wanted to avoid this from happening again and skipped the measure. Additionally, the participants had a strong tendency to either completely skip the measure, thus scoring minimally, or finishing the measure, scoring maximally. This means that the measure is not able to discriminate more differentiated in terms of degree of Pro-environmental behaviour. Investigating alternative ways to measure Pro-environmental behaviour in an online setting might thus constitute a better way to determine the degree of Pro-environmental behaviour.

Environmental self-identity

In addition to these rather disconfirming findings, there are also results that are in line with previous literature and the hypothesised effects. The results suggest that when people report to have done better on the task than imagined others, they more often reported higher levels of environmental self-identity, compared to participants that compared themselves less favourable. These findings are in line with social comparison theory (Festinger, 1954; Stets & Burke, 2014), which stipulates that people use others as benchmarks to reduce uncertainty about themselves. It may be argued that people might have used their mental constructs of how they fared compared to others as an indication of the extent of their environmental self-identity. Namely, when they thought they did better than others they also rated their environmental self-identity higher.

Difficulty of the task

Another finding that lends support to previous research is that the Ease of retrieval manipulation functioned as intended - manipulating the difficulty of the task. Reason for selecting the ease of retrieval task for the study was its ease of use for manipulating the subjective experience of a task. The present study managed to replicate Schwarz et al. (1991) findings that subjective experience of task difficulty can be influenced by means of a retrieval task in which one group is asked for six and the other group for twelve behaviours.

However, while ease of retrieval does not seem to have an effect via social comparison on environmental self-identity, perceived difficulty of the task does. A full mediation was found for the total sample and the isolated ease of retrieval conditions. This suggests that if people found the task difficult, they compared themselves more unfavourable to others consequentially

leading to diminished environmental self-identity. This finding generally is in line with the theoretical framework of the present study that relates to ease of retrieval.

Ease of retrieval has an influence on perceived difficulty of the task. Perceived difficulty of the task indirectly affects environmental self-identity via social comparison. Yet, Ease of retrieval does not have any effects in the mediational model, neither directly nor indirectly on environmental self-identity. A reason for these unintuitive findings, might be that the ease of retrieval task did not sufficiently manipulate the experienced difficulty of the task. Thus, the ease of retrieval conditions influenced the perceived difficulty of the task, however, might have not manipulated the difficulty enough for the found effects of perceived difficulty of the task to be carried over on the ease of retrieval conditions.

Shortcomings and strengths

In addition to these theoretical implications and alternative explanations for the findings, it is important to also reflect on methodological shortcomings that might have had an effect on the results more generally.

First, the sample should be considered. Though sufficiently large, the sample population is fairly homogeneous in terms of its demographics. Generally, participants can be described as stemming from WEIRD societies (White, Educated, Industrialized, Rich, Democratic). This becomes apparent as most people are Western European (particularly German or Dutch) and young academics. This might introduce bias, since post-materialistic values e.g., environmental care, are widely held and valued in these WEIRD Western European societies compared to other non-Western European societies (Balundė et al., 2019). The sample might thus be particularly prone to socially desirable answering on the topic of environmentalism as it is a highly valued topic in their circles. As of less heterogeneous answering, some effects might remain uncovered. To avoid potential bias in the data and ultimately make future research regarding such a culturally sensitive topic more generalizable, a more heterogeneous sample would be preferable.

Second, two of the study's measures were problematic. First, as mentioned in the explanation of the results, the participants had trouble understanding the Social Comparison measure which might have led to homogeneous answering. To resolve this, research wanting to employ the questionnaire should clarify who is meant by 'others'. The other problematic measure, again as explained earlier, was the Pro-Environmental Behaviour measure. In the future a processing power extensive click counter may be used. This way pro-environmental behaviour in the online setting could still be directly observed. Additionally, retrospective

insights on the Pro-Environmental Behaviour measure brought up the question if choosing another company that supposedly donates the money may be more senseful. This is because participants may have been confused why the WWF's donating is dependent on them clicking on the link; since the WWF is an environmental organisation, they should donate money regardless of the clicking. Thus, using another organisation that is not affiliated with environmental causes and supposedly pledged to donate money for each click might constitute an option which could reduce confusion of participants. Due to the shortcomings of the measures, future research is advised to improve the measures before employing them in a study.

Third, though the study established correlational evidence for the relation between social comparison and environmental self-identity, one cannot be certain that there is a causal link. This makes the application of the knowledge in the real world, for pro-environmental promotional purposes, rather difficult. For more closure about the nature of the relationship – it being causal or correlational- future studies may employ a study design that experimentally manipulates social comparison directly. If the correlational evidence can be confirmed, the already well researched link between social comparison and self-identity would gain additional causational confidence. In turn this would be useful for social-marketing purposes in a sense that managing to make people belief that they did better than others on a task relating to environmental behaviour might affect people's environmental self-identity. Provided that there is a causation between environmental self-identity and Pro-environmental behaviour, in turn might affect an individual to make more pro-environmental behavioural choices. However, this needs further research to make a definite causal statement. Additionally incorporating previously omitted potentially mediating variables in the study should be considered. This is sensible as it is a way to increases predictive power of the statistical model (Yuriev et al., 2020).

Apart from the mentioned limitations, the study also has some strong points. First, the study attempts to tackle the difficulty of measuring the pro-environmental behaviour. In the past, optimally measuring pro-environmental behaviour has been subject to debate (Xia & Liu, 2021). Traditionally, Pro-environmental behaviour was investigated by means of self-reports or observation, however, both come with impactful limitations (Xia & Liu, 2021). The former, self-reports (e.g., questionnaires), allows participants to have concealments (Van de Mortel, 2008). Additionally, they might not measure what they are supposed to measure, as the answers about their pro-environmental action can often times not be discriminated from willingness or awareness of pro-environmental behaviour (Rosenthal, 2018; Yuriev et al., 2020). The latter, observational measurement, comes with its own limitations. For example, the accountability of observers to correctly record with accuracy (Xia & Liu, 2021). Additionally, observational data

often holds much noise due to inter-rater variability (Xia & Liu, 2021). Also demand effects may occur, in which the subjects reacts in accordance with what they belief the researcher considers as the right behaviour (Lonati et al., 2018). This constitutes another factor which could have a biasing effect on the data.

The present measure explores an interesting way to deal with aforementioned limitations of traditionally employed measures. Automated encoding eradicates the problems of inter-rater variability and rater accuracy. Additionally, since behaviour is measured directly, one might be able to deal with problems that arise from measuring behaviour indirectly through self-reports. Furthermore, some participants reached out to the researchers after the study and uttered that they were disappointed that no money was donated in the end. This lends support to the believability of the measure's deceptiveness. Thus, if further investigated and improved, the method of measuring pro-environmental behaviour in the online setting - as used in the present study - constitutes an interesting, scalable, direct measure that might be able to deal with previous limitations of measurements.

Another strong point of the study are the found results themselves. For once, the study contributes to the literature, by once again confirming that ease of retrieval tasks constitutes an effective way to manipulate the subjective experience of task difficulty. This allows future researchers to have more confidence in employing ease of retrieval tasks.

Furthermore, the study found that the ease of retrieval task the participants were exposed to, failed to differentially affect environmental self-identity. However, this is not the case for perceived difficulty of the task. As mentioned in the explanation of the results this might be due to the manipulation of difficulty of the task by means of the ease of retrieval not being sufficiently severe. Future studies should thus try to employ a more difficult requirement for the low ease of retrieval condition. For example, increasing the to be recalled number of pro-environmental behaviours.

Having investigated if social comparison holds a mediating role between ease of retrieval and environmental self-identity and concluding that it likely does not hold such a role for the present ease of retrieval task, however for the perceived difficulty of the task, still contributes to a fuller body of knowledge on mediating variables for green behaviours and environmental self-identities. This is important since previous literature on environmental behaviours has failed to adequately consider mediating variables (Yuriev et al., 2020).

Conclusion

Overall, regardless of several methodological shortcomings and failures to confirm previous literature and a hypothesized mediation, the present study adds onto the body of knowledge in environmental psychology. Specifically, it demonstrates that people who engaged in downward social comparison, with regards to the performance on the task, more often evaluated environmental self-identity higher compared to people who engaged in upward social comparison. Additionally, it contributes to the confidence in ease of retrieval tasks as a means to manipulate the perceived difficulty of a task.

Furthermore, the study revealed that not the experimentally manipulated ease of retrieval, but the perceived difficulty irrespective of the task had an effect on environmental self-identity via social comparison. Therefore, it is important to mention that there might have been significant limitations, e.g., insufficient manipulation of perceived difficulty by means of the experimental ease of retrieval conditions. These limitations may have contributed to not finding a direct or indirect effect of ease of retrieval on environmental self-identity.

Future research is advised to consider increasing the difficulty demand of the ease of retrieval task, alternative scales to measure the constructs of interest and maybe adding other measures that can account for socially desirable answering and additional mediating variables. By doing so, research may be able to gain more insights into the complex relation between environmental behaviour, environmental self-identity, and its antecedents.

References

Baldwin, M., & Mussweiler, T. (2018). The culture of social comparison. *Proceedings of the National Academy of Sciences, 115*(39). https://doi.org/10.1073/pnas.1721555115

Balundė, A., Perlaviciute, G., & Steg, L. (2019, 2019-October-15). The Relationship Between People's Environmental Considerations and Pro-environmental Behavior in Lithuania [Original Research]. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.02319

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182. https://doi.org/10.1037/0022-3514.51.6.1173

Boehm, S., Lebling, K., Levin, K., Fekete, H., Jaeger, J., Waite, R., Nilsson, A., Thwaites, J., Wilson, R., & Geiges, A. (2021). State of Climate Action 2021: Systems Transformations Required to Limit Global Warming to 1.5° C. https://doi.org/10.46830/wrirpt.21.00048

Butzer, B., & Kuiper, N. A. (2006). Relationships between the frequency of social comparisons and self-concept clarity, intolerance of uncertainty, anxiety, and depression. *Personality and Individual Differences, 41*(1), 167-176. https://doi.org/10.1016/j.paid.2005.12.017

Carter, J. J., & Vartanian, L. R. (2022). Self-concept clarity and appearance-based social comparison to idealized bodies. *Body Image, 40*, 124-130. https://doi.org/10.1016/j.bodyim.2021.12.001

Chung, J. M. (2012). The contribution of self-deceptive enhancement to display rules in the United States and Japan. *Asian Journal of Social Psychology, 15*(1), 69-75. https://doi.org/10.1111/j.1467-839X.2011.01358.x

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*(4), 349-354. https://doi.org/10.1037/h0047358

Danziger, S., Moran, S., & Rafaely, V. (2006). The Influence of Ease of Retrieval on Judgment as a Function of Attention to Subjective Experience. *Journal of Consumer Psychology, 16*(2), 191-195. https://doi.org/10.1207/s15327663jcp1602_9

Dijksterhuis, A., Macrae, C. N., & Haddock, G. (1999). When Recollective Experiences Matter: Subjective Ease of Retrieval and Stereotyping. *Personality and Social Psychology Bulletin, 25*(6), 766-774. https://doi.org/10.1177/0146167299025006010

Feather, N. T. (1995). Values, valences, and choice: The influences of values on the perceived attractiveness and choice of alternatives. *Journal of Personality and Social Psychology, 68*(6), 1135-1151. https://doi.org/10.1037/0022-3514.68.6.1135

Festinger, L. (1954). A Theory of Social Comparison Processes. *Human Relations, 7*(2), 117-140. https://doi.org/10.1177/001872675400700202

George, D., & Mallery, P. (2003). *SPSS for Windows step by step : a simple guide and reference 11.0 update*. Allyn and Bacon.

Guttman, L. (1954). Some necessary conditions for common-factor analysis. *Psychometrika, 19*(2), 149-161. https://doi.org/10.1007/BF02289162

Hayes, A. F. L. T. D. (2018). *Introduction to mediation, moderation, and conditional process analysis : a regression-based approach*. http://www.dawsonera.com/depp/reader/protected/external/AbstractView/S9781462534678

IPCC. (2019). *Global warming of 1.5°C An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas*

emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2016). Environmental impact assessment of household consumption. *Journal of Industrial Ecology, 20*(3), 526-536. https://doi.org/10.1111/jiec.12371

Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist, 4*(2), 59-74. https://doi.org/10.1027/1016-9040.4.2.59

Kaiser, H. F. (1960). The Application of Electronic Computers to Factor Analysis. *Educational and Psychological Measurement, 20*(1), 141-151. https://doi.org/10.1177/001316446002000116

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239-260. https://doi.org/10.1080/13504620220145401

Lee, L., Piliavin, J. A., & Call, V. R. A. (1999). Giving time, money, and blood: Similarities and Differneces. *Social Psychology Quarterly, 62*(3), 276-290. https://doi.org/10.2307/2695864

Leonidou, L. C., Leonidou, C. N., & Kvasova, O. (2010). Antecedents and outcomes of consumer environmentally friendly attitudes and behaviour. *Journal of Marketing Management, 26*(13-14), 1319-1344. https://doi.org/10.1080/0267257X.2010.523710

Lonati, S., Quiroga, B. F., Zehnder, C., & Antonakis, J. (2018). On doing relevant and rigorous experiments: Review and recommendations. *Journal of Operations Management, 64*, 19-40. https://doi.org/10.1016/j.jom.2018.10.003

Pomery, E. A., Gibbons, F. X., & Stock, M. L. (2012). Social Comparison. In V. S. Ramachandran (Ed.), *Encyclopedia of Human Behavior (Second Edition)* (pp. 463-469). Academic Press. https://doi.org/10.1016/B978-0-12-375000-6.00332-3

Raghubir, P., & Menon, G. (2005). When and why is ease of retrieval informative? *Memory & cognition, 33*, 821-832. https://doi.org/10.3758/BF03193077

Robins, R. W., & Paulhus, D. L. (2001). The character of self-enhancers: Implications for organizations. In *Personality psychology in the workplace.* (pp. 193-219). American Psychological Association. https://doi.org/10.1037/10434-008

Rosenthal, S. (2018). Procedural Information and Behavioral Control: Longitudinal Analysis of the Intention-Behavior Gap in the Context of Recycling. *Recycling, 3*(1), 5. https://doi.org/10.3390/recycling3010005

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. *Journal of Personality and Social Psychology, 61*(2), 195-202. https://doi.org/10.1037/0022-3514.61.2.195

Stern, P. (2000). Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues, 56*(3), 407-424. https://doi.org/10.1111/0022-4537.00175

Stets, J., & Burke, P. (2014). Social Comparison in Identity Theory. In *Communal Functions of Social Comparison* (pp. 39-59). Cambridge University Press. https://doi.org/10.1017/CBO9781139035583.004

Tormala, Z. L., Falces, C., Briñol, P., & Petty, R. E. (2007). Ease of retrieval effects in social judgment: the role of unrequested cognitions. *Journal of Personality and Social Psychology, 93*(2), 143-157. https://doi.org/10.1037/0022-3514.93.2.143

Tormala, Z. L., Petty, R. E., & Briñol, P. (2002). Ease of Retrieval Effects in Persuasion: A Self-Validation Analysis. *Personality and Social Psychology Bulletin, 28*(12), 1700-1712. https://doi.org/10.1177/014616702237651

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5*(2), 207-232. https://doi.org/10.1016/0010-0285(73)90033-9

Urdan, T. C. (2010). *Statistics in plain English*. Routledge. http://public.eblib.com/choice/publicfullrecord.aspx?p=668346

Van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, 25*(4), 40-48. https://researchportal.scu.edu.au/esploro/outputs/journalArticle/Faking-it-social-desirability-response-bias/9910128218380023 68#file-0

Van der Werff, E., Steg, L., & Keizer, K. (2013a). I Am What I Am, by Looking Past the Present: The Influence of Biospheric Values and Past Behavior on Environmental Self-Identity. *Environment and Behavior, 46*(5), 626-657. https://doi.org/10.1177/0013916512475209

Van der Werff, E., Steg, L., & Keizer, K. (2013b). It is a moral issue: The relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour. *Global Environmental Change, 23*(5), 1258-1265. https://doi.org/10.1016/j.gloenvcha.2013.07.018

Van der Werff, E., Steg, L., & Keizer, K. (2013c). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology, 34*, 55-63. https://doi.org/10.1016/j.jenvp.2012.12.006

Vesely, S., & Klöckner, C. A. (2020). Social Desirability in Environmental Psychology Research: Three Meta-Analyses. *Frontiers in Psychology, 11*. https://doi.org/10.3389/fpsyg.2020.01395

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*(3), 305-314. https://doi.org/10.1016/j.jenvp.2010.01.003

Wilson, J., Tyedmers, P., & Spinney, J. E. (2013). An exploration of the relationship between socioeconomic and well-being variables and household greenhouse gas emissions. *Journal of Industrial Ecology, 17*(6), 880-891. https://doi.org/10.1111/jiec.12057

Xia, Z., & Liu, Y. (2021). Aiding pro-environmental behavior measurement by Internet of Things. *Current Research in Behavioral Sciences, 2*, 100055. https://doi.org/10.1016/j.crbeha.2021.100055

Yuriev, A., Dahmen, M., Paillé, P., Boiral, O., & Guillaumie, L. (2020). Pro-environmental behaviors through the lens of the theory of planned behavior: A scoping review. *Resources, Conservation and Recycling, 155*, 104660. https://doi.org/10.1016/j.resconrec.2019.104660

Zacarés, J. J., & Iborra, A. (2015). Self and Identity Development during Adolescence across Cultures. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences* (2 ed., pp. 432-438). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.23028-6

Appendix

Appendix A

Online Consent form

Welcome!

The **purpose** of this research project is to measure and gain insight on the formation of environmental behaviour. This research project is being conducted by third-year students from the University of Twente.

Your participation in this research study is **voluntary**. You may choose not to participate. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalised and your data will be deleted.

We will do our best to keep your **information confidential**. All data is stored in a password protected electronic format. To help protect your privacy and personal data, the survey will not contain information that will personally identify you. Your responses will be held confidential and we do not collect identifying information such as your name, email address or IP address. The results of this study will be used for scholarly purposes only and may be shared with University of Twente representatives.

The **procedure** involves filling in an online survey that will take approximately 15 minutes. First you will be asked general demographic questions. Subsequently, you will be given a small task and are asked to fill out a few questions. The topic of the questions pertains to the task and sustainable behaviour.

We ask that you answer the questions truthfully. **It is also important that you finish the entire questionnaire up until you are explicitly informed that you can close the survey**. You are, however, free to quit the survey at any point in time by closing the window, in which case your response will not be recorded.

If you have any **questions** about the research study, please contact:

This research is **reviewed according to University of Twente BMS procedures** for research involving human subjects.

ELECTRONIC CONSENT:

Please select your choice below.
Clicking on the "**I agree**" button below indicates that:
• You have read the information given above
• You voluntarily agree to participate
• You are at least 16 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the "I disagree" button.

- ○ I agree
- ○ I disagree

Appendix B

Demographic information

Start of Block: Default Question Block

D1 What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Diverse (3)
- ○ I prefer not to say (4)

D2 What is your age? (Please indicate in numbers!)

_____

D3 What is your nationality?

- ○ German (3)
- ○ Dutch (4)
- ○ Other (5) _____

Q68 What is your highest completed level of education?

- ○ Secondary education (2)
- ○ Vocational training (3)
- ○ Bachelor's degree (4)
- ○ Master's degree (5)
- ○ Doctor's degree (6)
- ○ Other: (7) _____

Q69 What is your current occupation?

- ○ Student (2)
- ○ Trainee (3)
- ○ Working (4)
- ○ Unemployed (5)
- ○ Retired (6)
- ○ Other: (7) _____

Appendix C

Environmental Self-identity scale

Start of Block: Environmental self-identity

Q20 I am the type of person who acts environmentally friendly

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Q21 Acting environmentally friendly is an important part of who I am

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Q22 I see myself as an environmentally friendly person

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

End of Block: Environmental self-identity

Appendix D

Debrief, thanksgiving and the contact details

Start of Block: Debrief

At the beginning of the experiment, you were randomly assigned to one of two groups that each were asked to recall a different number of behaviours. Additionally, the link that you were just provided with was used as a measure of Pro-environmental behaviour. No monetary value was donated. It solely served the purpose of recording pro-environmental behaviour in an online setting.

If you do not consent with this, please indicate so below.

If you have any questions about the research study, please contact:

[redacted]

This research is reviewed according to University of Twente BMS procedures for research involving human subjects.

ELECTRONIC CONSENT:

Please select your choice below.

Clicking on the "I agree" button below indicates that:

• you have read the information given above
• you acknowledge the deception measure and agree to the use of your data in this research study

If you do not wish for your answers and data being used in the research study, please decline participation by clicking on the "I disagree" button.

○ I agree (1)

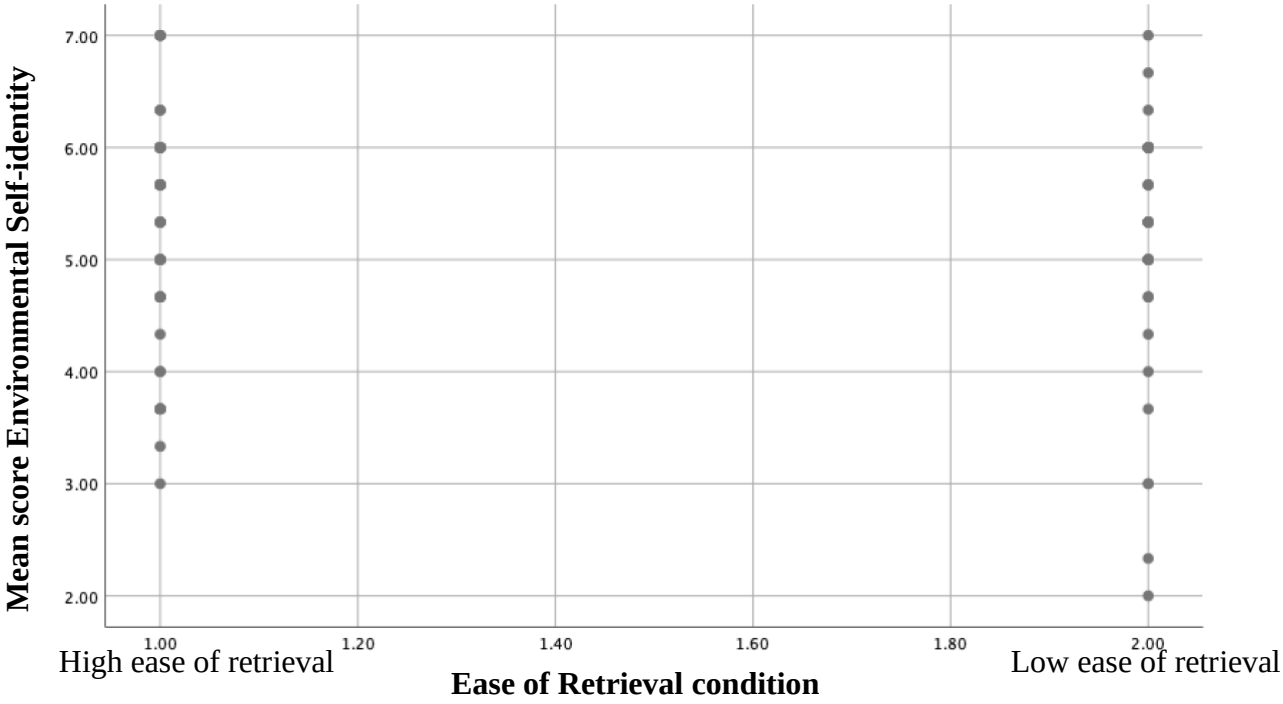
○ I disagree (2)

End of Block: Debrief

Appendix E

Assumption checks for ease of retrieval on environmental self-identity

Linearity Assumption



Independence of residual Assumption

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin–Watson
1	.046[a]	.002	-.008	1.03417	1.887

a. Predictors: (Constant), Which task was completed

b. Dependent Variable: Score_ESI

Normality assumption:

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Score_ESI	.153	97	.000	.927	97	.000

a. Lilliefors Significance Correction

Equal variance assumption:

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Score_ESI	Based on Mean	.257	1	95	.613
	Based on Median	.099	1	95	.754
	Based on Median and with adjusted df	.099	1	85.468	.754
	Based on trimmed mean	.157	1	95	.693

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

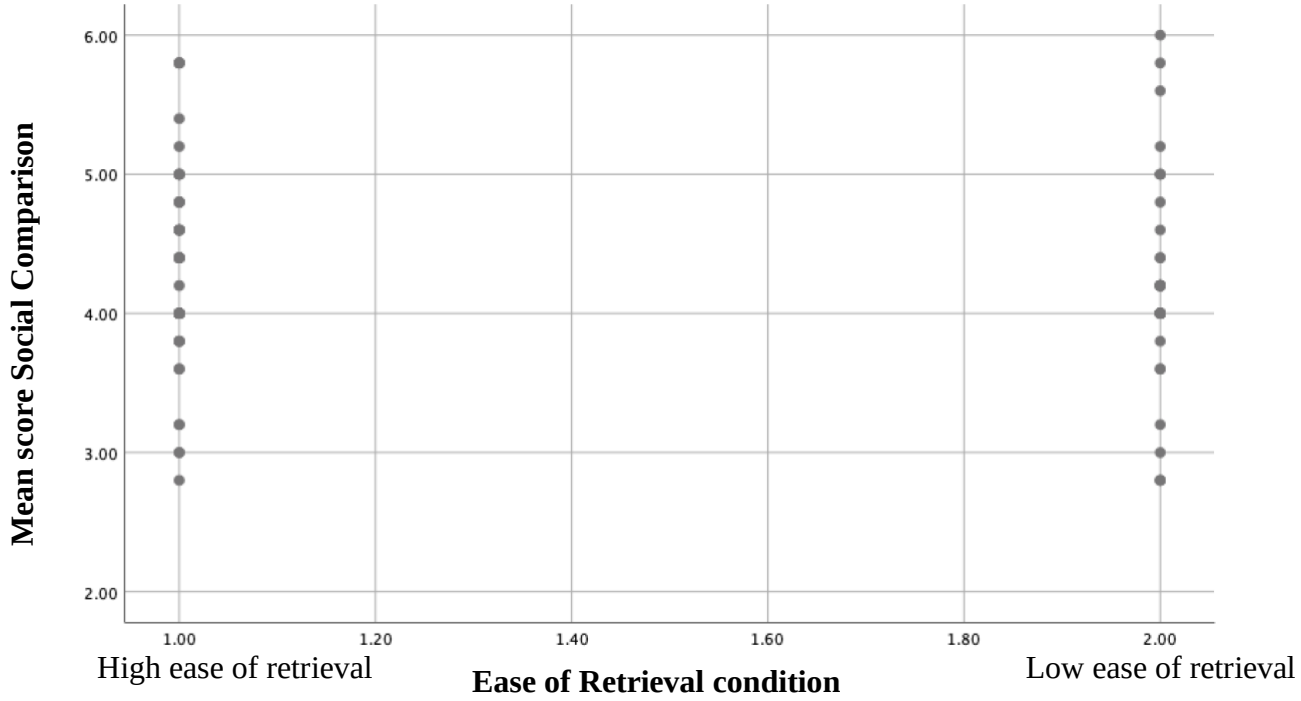
a. Dependent variable: Score_ESI

b. Design: Intercept + EOR_Condition

Appendix F

Assumption checks for ease of retrieval on social comparison

Linearity assumption:



Independence of residual Assumption:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.096[a]	.009	-.001	.70749	2.002

a. Predictors: (Constant), Which task was completed

b. Dependent Variable: Score_Soc_comp

Normality assumption:

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Score_Soc_comp	.156	97	.000	.949	97	.001

a. Lilliefors Significance Correction

Equal variance assumption:

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Score_Soc_comp	Based on Mean	.003	1	95	.954
	Based on Median	.002	1	95	.965
	Based on Median and with adjusted df	.002	1	90.074	.965
	Based on trimmed mean	.004	1	95	.953

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

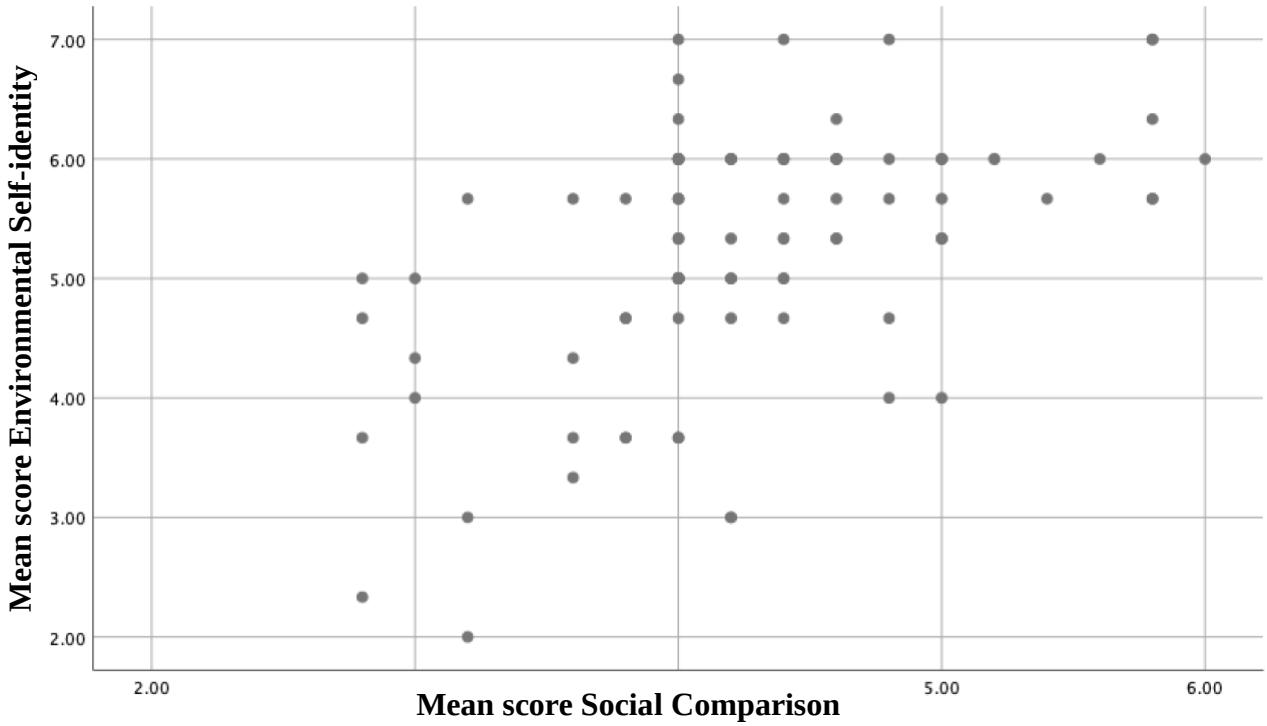
a. Dependent variable: Score_Soc_comp

b. Design: Intercept + EOR_Condition

Appendix G

Assumption checks for social comparison on environmental Self-identity

Linearity assumption



Independence of residual Assumption

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.522[a]	.272	.264	.88328	2.029

a. Predictors: (Constant), Score_Soc_comp

b. Dependent Variable: Score_ESI

Normality assumption

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Score_ESI	.153	97	.000	.927	97	.000

a. Lilliefors Significance Correction

Equal variance assumption

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Score_ESI	Based on Mean	1.810	12	81	.060
	Based on Median	1.207	12	81	.293
	Based on Median and with adjusted df	1.207	12	44.305	.308
	Based on trimmed mean	1.746	12	81	.072

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Score_ESI

b. Design: Intercept + Score_Soc_comp

Appendix H

Pattern matrix three factor direct-oblimin-rotation

Pattern Matrix[a]

	Component		
	1	2	3
Environmental self-identity Item 1	.926		
Environmental self-identity Item 3	.920		
Environmental self-identty Item 2	.805		
Social comparison Item 1	.423		
Social comparison Item 3		-.918	
Social comparison Item 2		-.909	
Social comparison Item 5		-.560	
Perceived difficulty Item 1			.837
Perceived difficulty Item 2			.829
Social comparison Item 4	.488		-.488

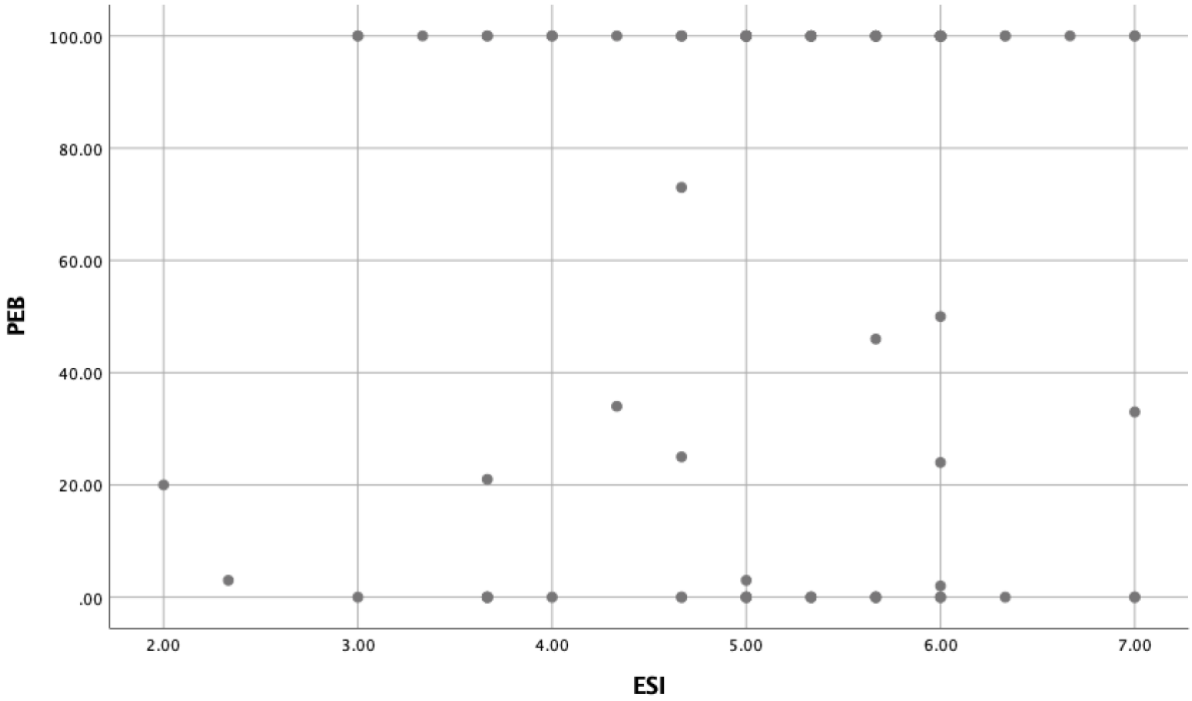
Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Appendix I

Assumption checks for Environmental self-identity on Pro-environmental behaviour

Linearity assumption



Independence of residual Assumption

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin–Watson
1	.157[a]	.025	.014	46.02604	1.738

a. Predictors: (Constant), ESI

b. Dependent Variable: PEB

Normality assumption

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PEB	.384	97	.000	.661	97	.000

a. Lilliefors Significance Correction

Equal variance assumption

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
PEB	Based on Mean	.862	10	82	.572
	Based on Median	.241	10	82	.991
	Based on Median and with adjusted df	.241	10	72.864	.991
	Based on trimmed mean	.849	10	82	.583

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: PEB

b. Design: Intercept + ESI

Appendix J

Frequency distribution of scores on Pro-environmental Behaviour measure