Master thesis

Exploring the association between compassion, pro-environmental behaviour and nature connectedness in daily life

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Abstract

Background: Acting pro-environmentally is important to address current global environmental problems, that were caused but can also be addressed through human activities. The intention to act pro-environmental might be based on how much a person recognises the suffering of nature or other humans and the motivation to act on it. Recent literature has shown that empathy towards the environment as well as towards other humans leads to higher pro-environmental attitude and behaviour. However, little research is conducted to explore the link between compassion and pro-environmental behaviour, although compassion seems to be more appropriate when investigating pro-environmental behaviour because it focuses on direct feelings for the suffering of others instead of a broad range of emotions. According to previous research, nature connectedness seems to explain the association between compassion and pro-environmental behaviour, but the mediation effect was not investigated yet.

Objective: The study aims to explore the link between compassion and pro-environmental behaviour. Moreover, it is expected that if someone is compassionate, it is more likely to behave pro-environmentally if they feel connected to nature.

Method: An experience sampling study was conducted for 8 days with 3 measurements per day among a sample of 29 participants. To measure compassion a single item of the Compassion scale was used, and pro-environmental behaviour was measured using four items based on the Pro-Environmental Behaviour Scale (PEBS). Nature connectedness was measured by the adapted single item question of the Nature in itself (INS) scale. A mediation analysis was conducted by using Linear mixed model analyses for the between-person scores as well as for the within-person scores.

Results: Differences between participants in levels of state compassion and state pro-environmental behaviour were found. Although the relationship between compassion and pro-environmental behaviour was not found to be mediated by nature connectedness, it was found that nature connectedness has an influence on the pro-environmental behaviour in daily variations.

Conclusion: It can be concluded that compassion and nature connectedness are independent factors that increase pro-environmental behaviour.

Keywords: Pro-environmental behaviour, Pro-environmental attitude, Compassion, Nature connectedness, Experience sampling method (ESM)

Introduction

Our global society is facing unprecedented environmental challenges involving climate change, ozone depletion, persistent organic pollutants, population and species declines and extinctions, emerging diseases, antibiotic resistance, and much more (Kinzig, et al., 2013). Previous research studies have shown that human activities are responsible for these deeply troubling changes in the Earth's ecosystems and the biosphere itself and that these problems can be addressed through changing the societies behaviour to be more pro-environmental (Balundė, Perlaviciute, & Steg, 2019; Stern, Sovacool, & Dietz, 2016). Measures to address the environmental problems are already implemented by many countries, however, the efficiency of the implementation differs (Balundė et al., 2019). Thus, knowledge about which factors are related to pro-environmental behaviours is necessary for developing effective measures that promote pro-environmental behaviour.

Pro-environmental behaviour

Pro-environmental behaviour (PEB) can be defined as a behaviour that has a significant impact on the environment and which is intentional (Bamberg & Rees, 2015; Krajhanzel, 2010). Some pro-environmental behaviours may be unintentional and thus, individuals do not realize the impact of their behaviour. For example, a person who does not care about the environment can have a less negative impact on the environment because he does not own a car, than a person who intentionally takes care to act in a pro-environmental way but drives to work everyday. However, a behaviour is labelled pro-environmental if the motivation behind the behaviour is to benefit the environment (Bamberg & Rees, 2015). Pro-environmental behaviours can include the following: recycling behaviours, shopping behaviours, energy-and water-saving behaviours, mobility and transportation behaviours, environmental citizenship, and food consumption (Markle, 2013; Preisendörfer, 1998; Schultz & Zelesny, 1998). These behaviours can be distinguished between pro-environmental behaviours in the public sphere (e.g. petitioning on environmental issues), in the private sphere (e.g. green purchasing, recycling), and in organizations (e.g. designing manufactured products in more or less environmentally friendly ways) (Stern, 2000). The behaviours in the private sphere have a direct positive influence on the environment. Although the influence is mostly small, if many people perform the same pro-environmental behaviours, it can have a significant impact on the environment and therefore should be focused on by developing measures to improve pro-environmental behaviours (Stern, 2000).

Compassion

Pro-environmental behaviour could be predicted by compassion, because of its involvement in feeling for others' suffering and being motivated to help which is based on Lazarus' (1991, p.289) definition of "being moved by another's suffering and wanting to help" and the definition of Goetz, Keltner, and Simon-Thomas (2010, p.351): "the feeling that arises in witnessing another's suffering and that motivates a subsequent desire to help". Compassion consists of three facets: noticing (cognitive), feeling (affective), and responding (behavioural) (Kanov et al., 2004). 'Noticing' means being aware of a person's suffering, 'feeling' includes adopting the person's perspective and imagining how the person must feel, followed by an emotional response to the suffering and by being concerned, and 'responding' is defined by the desire to act to reduce that suffering. It might be assumed that noticing and feeling concern for the suffering others, or the suffering of nature, strengthen environmental attitudes and the need to help, which might strengthen pro-environmental behaviour. Previous research supports this, but the research is limited because until now, only one study investigated compassion in relation to pro-environmental behaviour (Pfattheicher, Sassenrath & Schindler, 2015). That study found a positive relationship between compassion for suffering individuals and pro-environmental values and intentions as well as a relation between compassion and one specific pro-environmental behaviour, namely reported donations to nature or the environment.

Although little research was conducted to examine the association between compassion and pro-environmental behaviour, more research was conducted with empathy and pro-environmental behaviour, which is a highly similar construct to compassion. Empathy means "the ability to share emotions as well as the ability to understand the other's thoughts, desires, and feelings" (Shamay-Tsoory, 2010). Similar to compassion, empathy consists of a cognitive and affective component too, that includes understanding and being affected by another person's emotions and perspective (Hogan, 1969; Mehrabian & Epstein, 1972). However, compassion is different in that it has an additional behavioural component above empathy, which is the desire to help the other, and compassion is felt in response to others' suffering whereas empathy can be felt in a broad range of situations and emotions, such as anger, fear, or even joy (Goetz et al., 2010). The research about empathy has shown that higher empathy for the environment or a natural object as well as for other humans relates to a more pro-environmental attitude, strengthened intention to help, and more engagement in pro-environmental helping behaviour (Berenguer, 2007, 2010; Schultz, 2000, 2001; Shelton & Rogers, 1981; Tam, 2013). In contrast, Berenguer (2010) found no correlation between

empathy with humans and environmental concern. Similarly, the empathy-altruism theory of Batson et al. (1991) states that helping behaviours can be explained by feelings of empathy towards others, that arouse an altruistic motivation in which the goal is to increase the other person's welfare. Thus, if applied to the environmental field, higher levels of empathy might improve the motivation to help the environment and thus the pro-environmental behaviours. It is noteworthy, that in this theory, it is assumed that not all empathic emotions produce altruistic motivation, only those empathic emotions that are felt when another person is perceived to be in need, which in turn is very similar to the aspect in compassion that includes feeling for a suffering person (Batson, Lishner, & Stocks, 2014). The current study investigates compassion instead of empathy to explicitly focus on suffering rather than on a broad range of empathic emotions and to focus, in addition to the cognitive and affective component, on the behaviour component as well, which is the motivation to reduce the other's suffering.

Nature connectedness

The feeling of nature connectedness might explain the association between compassion and pro-environmental behaviour. Nature connectedness can mean that a person believes to be the same as nature (Dutcher, Finley, Luloff, & Johnson, 2007), the person's love or emotional affinity towards nature or simply feeling connected to it (Kals, Schuhmacher, & Montada, 1999; Mayer & Frantz, 2004). It is often thought of as a trait-like characteristic that is relatively stable in time and across various situations (Nisbet et al., 2009, 2010). However, it can also fluctuate if it is thought of as one's subjective connection to nature and can then be measured at the state level as well (Nisbet & Zelenski, 2011; Schultz, 2002). Being compassionate might let a person feel more connected to nature which could make someone become more aware of the suffering of nature and thus increase pro-environmental behaviour. Thus, if you are compassionate, you are more likely to behave pro-environmentally if you feel connected to nature. Lumber, Richardson, & Sheffielt (2017) support the assumption by revealing that compassion is important to be able to feel more connected to nature. Further, according to Mayer and Franz (2004), nature connectedness is equivalent to the emotional attachment to others' suffering or the suffering of nature, as nature connectedness measures the emotional connection to nature. Greater connection to nature was in turn found to be associated with more pro-environmental attitudes and willingness to engage in pro-environmental behaviour (Mackay & Schmitt, 2019; Martin, et al., 2020; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murpy, 2009). Similarly, Whitburn, Linklater, & Abrahamse (2019) concluded based on a meta-analysis of previous research studies that

people who show greater nature connectedness are more engaged in pro-environmental behaviours, and that association was not influenced by gender, geographic location, or age group. According to this research study, it can be expected that a compassionate person is more likely to behave pro-environmentally if they feel connected to nature, however, nature connectedness as a mediator has not yet been investigated in previous studies.

Current study

In the current study, it will be examined how compassion and pro-environmental behaviour are associated between individuals as well as within individuals. Because compassion could make one become more aware of the suffering of nature if you are connected to it, and thus one might behave pro-environmentally, this study also examines the mediation effect of nature connectedness on the association of compassion and pro-environmental behaviour. It is expected that compassion is positively related to pro-environmental behaviour and that this association can be explained by nature connectedness (Figure 1).

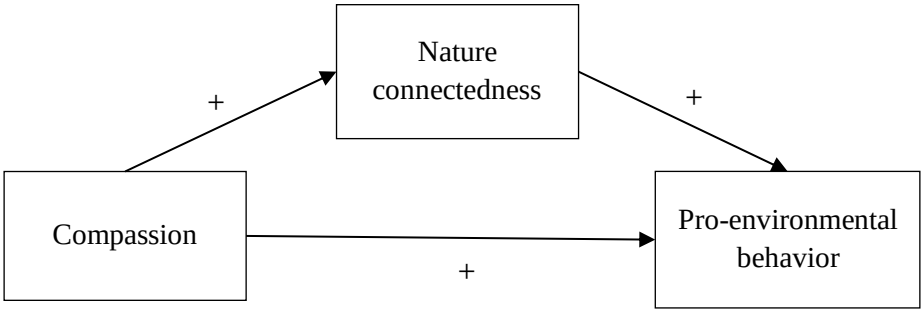

Figure 1. Research design

Methods

Design

The design of the study was quantitative, using an experience sampling method (ESM) to measure daily experiences of compassion and pro-environmental behaviours three times per day over a period of 8 days. The survey used was measuring the independent variable compassion, the dependent variable pro-environmental behaviour, and the mediator variable nature connectedness. The study was approved by the Behavioural, Management, and Social Sciences (BMS) ethics committee of the University of Twente (nr. 210386).

Participants

The study contained a total of 41 respondents who filled out the survey daily, whereas 29 participants were included for the analysis. Inclusion criteria were being above the age of 18, speaking and understanding English sufficiently, and owning a mobile device to download and use the application "Ethica". The data from individuals who completed less than 50% of the assessments and individuals who indicate only poor or fair English skills were excluded from the analysis. The participants were recruited using a convenience sampling method by approaching friends and family through the social environment and social media platforms.

Materials and measures

The application "Ethica" was used, which was developed for ESM-studies. The participants could access the application using their mobile devices that have Android or iOS operating systems to fill in the daily questionnaires. As this study was part of a greater research, the survey included state measures for pro-environmental behaviours, compassion, mindfulness, nature connectedness, affect, nature exposure, and social environment and trait measures for pro-environmental behaviour, compassion, nature connectedness, and mindfulness. For the purpose of the current study, only the measures of both state and trait pro-environmental behaviour, compassion and nature connectedness were used.

Demographic data

The survey about the demographic data included questions about the participants' gender (female, male, other), nationality (German, Dutch, other), age, education level (no formal education, High school diploma, College degree, Vocational training, Bachelor's degree, Master's degree, Professional degree, Doctorate degree), and English reading skills (1 = poor; 5 = excellent).

State questionnaires

State Compassion. Compassion was measured using one item from the Compassion scale of Pommier, Neff, & Tóth-Király (2019). Participants rated the statement "I like to be there for others in times of difficulty." on a seven-point Likert scale (1 = totally disagree; 7 = totally agree). The statement was selected because of its closeness to the definition of compassion "a felt response to suffering that involves caring and an authentic desire to ease distress" of Goetz et al. (2010). To access the reliability, the dataset was split into half to check the stability of the responses. Split-half reliability is the recommended manner to test for reliability in experience sampling because it gives insight into the stable patterns during the scoring and previous research found individuals to be relatively stable in their everyday emotional experiences despite the dynamic constructs (Csikszentmihalyi & Larson, 2014). A

Pearson Correlation analyses was used to compare the first half of the data timepoints until the twelfth timepoint with the second half from the thirteenth timepoint on and to compare the answers based on odd and even numbers of timepoints in order to obtain two correlation coefficients per structure. A Pearson coefficient r of > .1 (-.1) indicated a weak association, > .3 (-.3) a moderate correlation, and > .5 (-.5) was considered a strong correlation (Cohen, 1988). The results of the Pearson Correlation revealed a significant strong positive correlation (first and second half: $r = 0.82$, $p < .05$; even and odd numbers: $r = 0.79$, $p < .05$). In order to calculate the validity, the relation between the mean trait and mean state compassion was examined. The average of the state variable should correlate with the trait scores, so a correlation between these would indicate that a similar construct was measured (Fleeson, 2001; Fleeson & Jayawickreme, 2015). However, the correlation is not expected to be strongly correlated, because the average-state scores are sensitive to manipulations that the target might experience during data collection and therefore, does not measure the same construct as the trait variable (Horstmann & Ziegler, 2020). For this, a Pearson Correlation was conducted with the trait measure as fixed factor and the person mean (PM) score of the state measure as dependent variable. The Pearson Correlation revealed that trait compassion was found to be significant moderate related to state compassion ($r = 0.61$, $p < .05$) (Moore, Notz, & Flinger, 2013).

State Pro-environmental behaviour. Pro-environmental behaviour was measured by four items based on the four factors (conversation, food, environmental citizenship, transportation) of the Pro-Environmental Behaviour Scale (PEBS; Markle, 2013). The participants indicated to what extent they agree to the following statements on a seven-point Likert scale (1 = totally disagree; 7 = totally agree): **"**To me it is important to limit my energy use" (conversation), **"**To me it is important to limit my meat consumption" (food), **"**To me it is important to talk to others about their environmental behaviors" (environmental citizenship), "To me it is important to limit my use of the car" (transportation). The four components are computed into a new variable measuring the overall level of state pro-environmental behaviour. To assess the reliability, the internal consistency of the four components of pro-environmental behaviour was assessed using Cronbach's alpha. A Cronbach's alpha of .76 was found, indicating an acceptable level of internal consistency for the state PEB scales (Blanz, 2015). The validity of the measure was assessed by a Pearson Correlation between trait pro-environmental behaviour as fixed factor and the person mean (PM) scores of the state pro-environmental behaviour as dependent variables. The results

revealed, that state PEB and trait PEB have a statistically significant strong linear relationship ($r = 0.81$, $p < .05$) (Moore et al., 2013).

State Nature connectedness. Nature connectedness was measured using the single item question of the Nature in itself (INS) scale of Schultz (2002), but the item was slightly rephrased in order to obtain a moment measure for the feeling of nature connectedness. The participants were asked to choose between one of seven pairs of circles to indicate how interconnected they feel with nature right now. Each pair of circles include one circle labelled self and the other circle labelled nature. The pairs differ in the extent how much the two circles overlap (Figure 2). Participants who would choose the circles that completely overlap (scored as 7) indicate they are feeling completely connected to nature, whereas participants who feel not connected to nature at all would choose the circles that are not overlapping (scored as 1). To access the reliability, the dataset was split into half to check the stability of the responses and a Pearson Correlation analyses was used to compare the first half of the data timepoints until the twelfth timepoint with the second half from the thirteenth timepoint on and to compare the answers based on odd and even numbers of timepoints. The Pearson Correlation analysis indicated a significant strong positive correlation (first and second half: $r = .66$, $p < .05$; even and odd numbers: $r = .72$, $p < .05$). The validity of the measure was assessed by a Pearson Correlation between trait nature connectedness as fixed factor and the PM scores of state nature connectedness as dependent variable. The PM score for the single item nature connectedness was found to have a significant low association with the mean score of trait nature connectedness ($r = 0.15$, $p < .05$) (Moore et al., 2013).

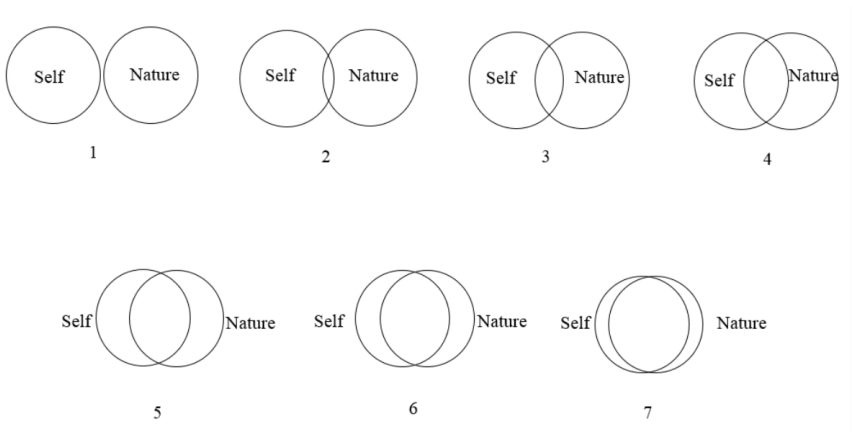

Figure 2. Nature in itself (INS) scale of Schultz (2002).

Trait questionnaires

Trait Compassion. Compassion was measured using the Compassion Scale (CS; Pommier et al., 2019). The questionnaire includes 16 items measuring a general factor of compassion for others which is composed of greater kindness, common humanity, mindfulness, and lessened indifference (e.g. "I pay careful attention when other people talk to me about their troubles"). The participants were asked to indicate to what extend they agreed or disagreed with the items on a seven-point Likert scale ranging from one ("totally disagree) to seven ("totally agree"). Cronbach's alpha and test–retest analyses shown a good overall reliability for the CS and for the subscales (Pommier et al., 2019). Analysis of the current sample revealed a Cronbach's alpha of .54 indicating a poor/ low internal consistency for the total compassion scale (Blanz, 2015).

Trait Pro-environmental behaviour. Pro-environmental behaviour was measured with the Pro-Environmental Behaviour Scale (PEBS; Markle, 2013). The scale consists of 19 items with four dimensions. The first dimension was conservation, that was assessed by eight items in which the participants were asked to indicate how often they perform a specific behaviour on a five-point Likert scale ranging from one ("never") to five ("always") (e.g. "How often do you turn off the lights when leaving a room?") and the question "At which temperature do you wash most of your clothes?" on a three-point Likert scale (1 = "hot", 3 = "warm", 5 = "cold"). The second dimension was environmental citizenship, which was assessed by asking the participants to indicate if they perform/performed a specific behaviour (1 = "no" 5 = "yes") (e.g. "Are you currently a member of any environmental, conservation, or wildlife protection group?") and how often they perform a specific behaviour on a five-point Likert scale ranging from one ("never) to five ("constantly"). The third dimension food was assessed by asking the participants to indicate if they performed a specific behaviour (1 = "no", 5 = "yes"/ "I don't eat beef/pork/poultry") (e.g. "During the past year have you increased the amount of organically grown fruits and vegetables you consume?"). The fourth dimension transportation was assessed by asking the participants how often they performed a specific behaviour on a three-point Likert scale (1 = "never", 3 = "occasionally", 5 = "frequently") (e.g. "During the past year how often have you car-pooled?"). The Coefficient alpha and test-retest analysis showed a good overall reliability for the PEBS and for the subscales and Bivariate Person Correlations with similar scales showed sufficient construct validity (Markle, 2013). Analysis of the current sample revealed a Cronbach's alpha of .75 indicating an acceptable internal consistency for the total PEB scale (Blanz, 2015).

Trait Nature connectedness. Nature connectedness was measured using the Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004). The 14 items measure how emotionally connected people feel to nature (e.g. "I often feel a sense of oneness with the natural world around me") and are rated on a seven-point Likert scale from one ("totally disagree") to five ("totally agree"), where higher scores demonstrate a higher connection to nature. The scale showed a good reliability, and the validity ws demonstrated by the association with environmental scales such as the New Ecological Paradigm Scale (Mayer & Franz, 2004). Analysis of the current sample revealed a Cronbach's alpha of .83 indicating a good/high internal consistency for the total Connectedness to Nature Scale (Blanz, 2015).

Procedure

The participants were approached by the researchers through their social environment and social media platforms during a period of two weeks. No incentive was received by the participants for their participation. The participants were instructed to download the application "Ethica" on their mobile devices to take part in the study. The URL link to sign up for the study was provided by the researchers. Before the start of the study, the participants were informed and gave their consent to take part. The consent form included a broad explanation about the study, important participant rights, information about the researchers, contact details, and a question that has to be accepted to take part in the study (Appendix A). Afterwards, the participants were asked to fill in their demographic data about their age, gender, nationality, education, English skills, and diet.

During the following 8 days, the participants received notifications to answer short questions about pro-environmental behaviours, compassion, mindfulness, nature connectedness, affect, nature exposure, and social environment, which took about 5 minutes. The notifications were scheduled three times per day at a random time between the time periods of 9.00 AM and 12 AM, 2 PM and 5 PM, and 7 PM and 10 PM. After 1.5 hours after the reminder notification, the questions will expire. On the last day of the study, the participant was asked to complete the long form of the daily questionnaires measuring the trait variables pro-environmental behaviour, compassion, nature connectedness, and mindfulness, which took about 20 minutes.

Data analysis

The data was inserted from the "Ethica" application into the programme SPSS Statistics. For the data analysis, IMB SPSS Statistics version 25 was used. Further, person means (PM) of compassion, pro-environmental behaviour, and nature connectedness were calculated in order to reflect on the average level for 8 days per participant and to allow for

between-person analysis. Person-mean-centred scores (PM-centred) of compassion, pro-environmental behaviour, and nature connectedness from each participant were calculated to check the difference between each single measurement point and the PM score, allowing for within-person analysis (Curran & Bauer, 2011).

Little's Missing Completely at Random (MCAR) test was conducted to test if the data are missing completely at random. If the pattern of missing values does not depend on the data values, the data are missing completely at random and no further analysis has to be conducted (IBM, 2016). If the data are not missing at random, the data has to be further analysed in order to determine the reasons for the missing data. The implementation of the Little's MCAR test revealed that the data of the studied variables are missing completely at random, χ^2 (9) = 3.82, p = .92, and does not depend on the data values.

The descriptive statistics in form of means, standard deviations, frequencies, and percentages were used to calculate and get insight into the demographic data (age, gender, nationality, education, English skills, diet) as well as the study variables' average level. The average levels of the variables that had a response range of one to seven were rated according to the following scale: 1.00 – 3.00 = low, 3.01 – 5.00 = moderate, 5.01 – 7.00 = high (Hassan et al., 2016; Idrus, Idris, Omar, Anuar, & Ariffin, 2019). The response range of trait PEB was between one and five, with the scores 1.00 – 2.33 rated as low, 2.34 – 3.67 as moderate, 3.68 – 5.00 as high (Nunnally & Bernstein, 1994; Rocha & Arcinas, 2020). Boxplots were calculated to illustrate the participant's fluctuations in state compassion, state pro-environmental behaviour, and state nature connectedness for a visual analysis of the variable's variability.

The Baron & Kenny (1986) approach was used to investigate the mediation effect of nature connectedness using state compassion as independent variable, state pro-environmental behaviour as dependent variable and nature connectedness as mediator. Six different Linear mixed model (LMM) analyses were conducted, three with the Person-mean (between-person) scores and three with the Person-mean-centred (within-person) scores of all variables. First, an analysis was conducted with PEB as dependent variable and compassion as fixed factor, then an analysis was conducted with compassion as dependent variable and nature connectedness as fixed factor, and the third analysis was conducted with compassion and nature connectedness as dependent variable, and compassion as fixed factor. The analyses were conducted, using an autoregressive structure (AR1), to deal with potentially missing data in the momentary assessment and to control for dependency between data. The significance of the mediation was examined with the Sobel test (Preacher & Leonardelli, 2010).

Lastly, individual participant data were outlined in line graphs to display pro-environmental behaviours, the experience of compassion and nature connectedness over the course of the study period. These graphs were used for a visual analysis of differences in the state variables over time to get s more detailed picture of the participant's state experiences.

Results

Descriptive statistics

Of the 41 participants that signed up for the study, 12 participants were excluded from the analysis because of more than 50% missing data (n = 10) and English skills ≤ 2 (n = 2), which resulted in a total of 29 participants that were included in the analysis. Of the remaining respondents, most participants were female (72.4%), highly educated, and German (86.2%). All demographic data are provided in Table 1.

Table 1

Means (M) and standard deviations (SD), frequencies (n) and percentages (%)

Variables	Categories	Participants (N=29)
Age, M (SD)	Years	26.07 (6.03)
Gender, n (%)	Male	8 (27.6%)
	Female	21 (72.4%)
Nationality, n (%)	German	25 (86.2%)
	Dutch	1 (3.4%)
	British	1 (3.4%)
	Nigerian	1 (3.4%)
	French	1 (3.4%)
Education, n (%)	High school diploma	12 (38.7%)
	College degree	2 (6.5%)
	Vocational training	1 (6.5%)
	Bachelors degree	8 (25.8%)
	Masters degree	6 (19.4%)
	Professional degree	2 (6.5%)
English skills, n (%)	Good (3)	11 (37.9%)
	Very good (4)	13 (44.8%)
	Excellent (5)	5 (17.2%)
Diet, n (%)	Omivore	5 (17.2%)
	Pesco-vegetarian	1 (3.4%)
	Semi-vegetarian	4 (13.8%)
	Vegetarian	3 (10.3%)
	Vegan	1 (3.4%)
	Missing	15 (51.7%)

The participants' scores are high in the state variable PEB, but medium in the trait variable PEB. With regard to the variable compassion, the participants' scores are high in both the state variable compassion and the trait variable compassion. The participants scored medium in both the state variable nature connectedness and the trait variable nature connectedness (Table 2).

Table 2

Means (M) and standard deviations (SD) for the state and trait measures.

Variable (N = 29)	M (SD)	Scale range	Level
State compassion (PM)	6.24 (0.85)	1-7	high
State PEB (PM)	5.43 (1.04)	1-7	high
State nature connectedness (PM)	4.30 (1.15)	1-7	medium
Trait compassion	5.67 (0.55)	1-7	high
Trait PEB	2.86 (0.31)	1-5	medium
Trait nature connectedness	4.87 (0.82)	1-7	medium

Variability

The participants encountered overall little variability in their pro-environmental behaviour as well as in their experience of compassion and nature connectedness in the study period which is seen on the box lengths (Figure 3, 4, 5). Overall, the participants experienced on average rather high level of compassion with little variation between the participants and within the participants, because only participants 1, 3, 9, 16, 17, 21, and 27 had variability in their scores because only those participants have boxplots. In contrast, the other participants had the same score at almost every measurement point (Figure 3). The pro-environmental behaviour of the participants was on average on a rather high level as well with more variations in the scores between the participants with scores that range from around two to seven. Pro-environmental behaviour had overall more variability than compassion within persons, because most of the participants, except of the ten participants 4, 6, 8, 14, 16, 18, 19, 21, 22, and 26, showed variability in their scores, because they have boxplots (Figure 4). Nature connectedness was experienced on average on a medium level and had similar variations than pro-environmental between the participants with scores ranging from one to seven. In contrast to pro-environmental behaviour, nature connectedness had less participants with variability (Participants 1, 2, 3, 5, 6, 7, 10, 11, 13, 16, 20, 21, 24, 26, 29), but the participants with variability had slightly more variability within person, which is seen by the longer box lengths (Figure 5).

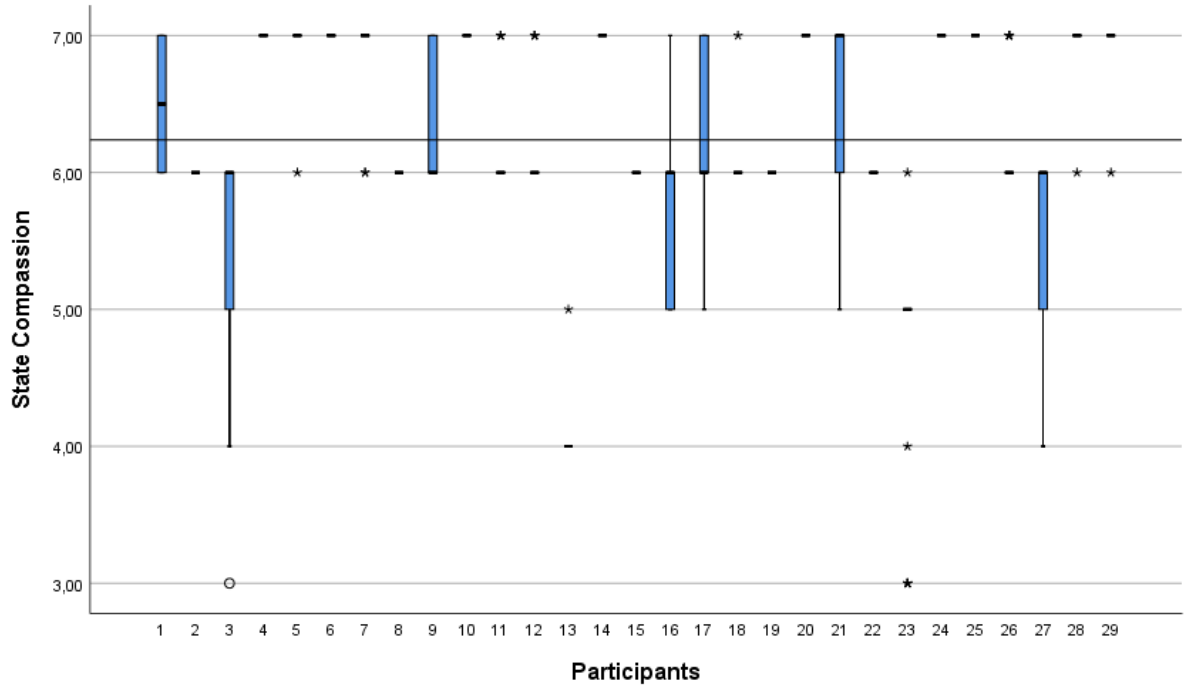

Figure 3. Boxplot depicting the variation in experiencing compassion for each participant with a refence line set at the group mean (M = 6.24, SD = 0.85).

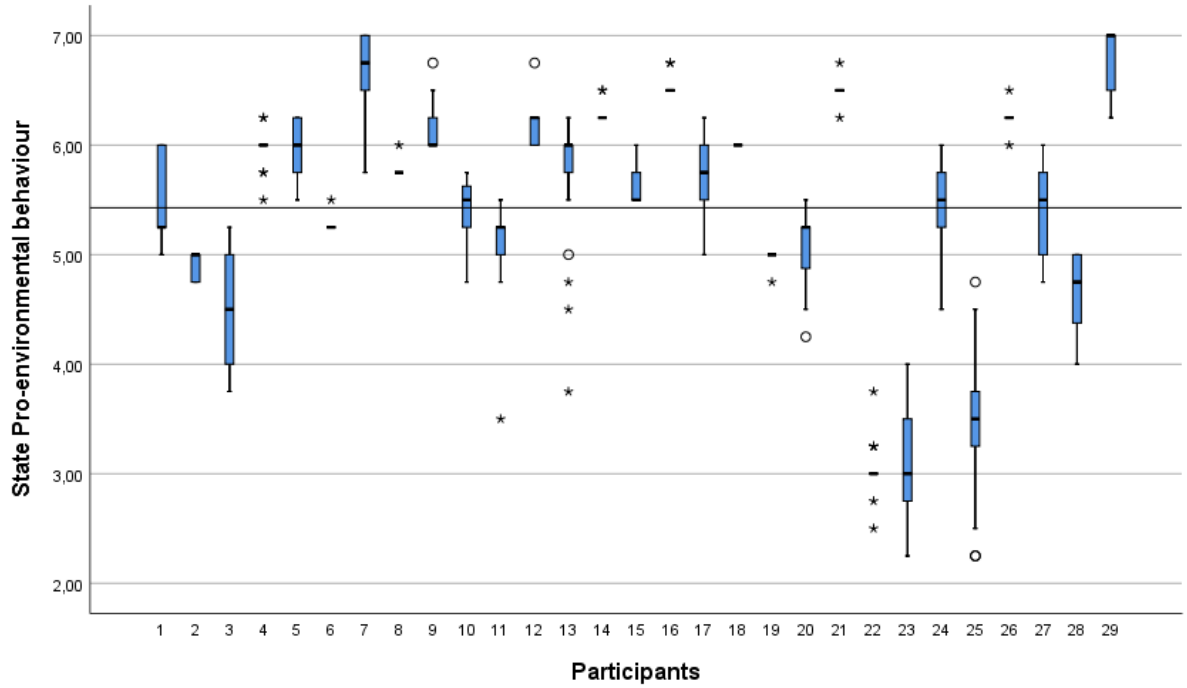

Figure 4. Boxplot depicting the variation in pro-environmental behaviour for each participant with a refence line set at the group mean (M = 5.43, SD = 1.04).

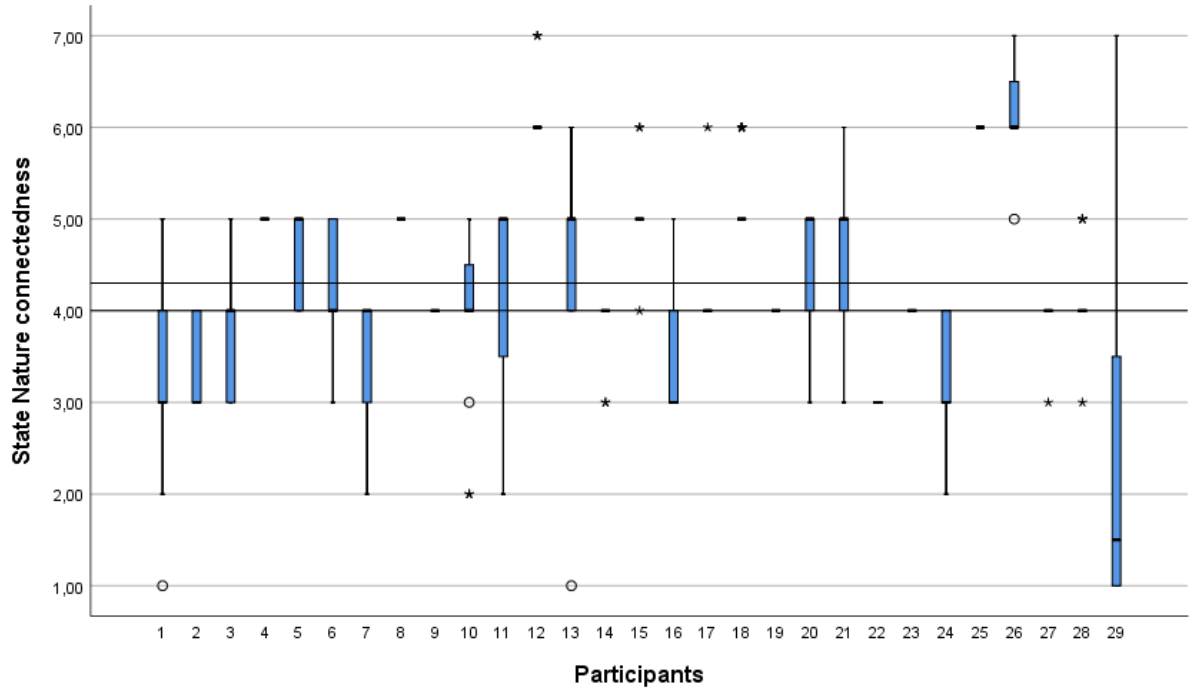

Figure 5. Boxplot depicting the variation in experiencing nature connectedness for each participant with a refence line set at the group mean (M = 4.30, SD = 1.15).

Between Subject Analysis (PM)

The results of the Linear mixed model analysis revealed that the total effect (path *c*) of compassion on pro-environmental behavior was significant, $F(1, 1985.42) = 68.93$, $p < .05$. The effect of compassion on nature connectedness (path *a*), $F(1, 925.93) = 0.84$, $p = .36$, and the effect of nature connectedness on pro-environmental behaviour (path *b*), $F(1, 105.5) = 0.098$, $p = .76$, were not significant. The association between compassion on PEB with nature connectedness as mediator (path *c* ‘) was significant, $F(1,107.03) = 5.20$, $p < .05$. A Sobel test revealed that the mediation effect of nature connectedness on the association between compassion and pro-environmental behaviour was not significant (z = -0.3, SE = 0.01, p = .77). The conditions of Baron and Kenny (1986) were not met.

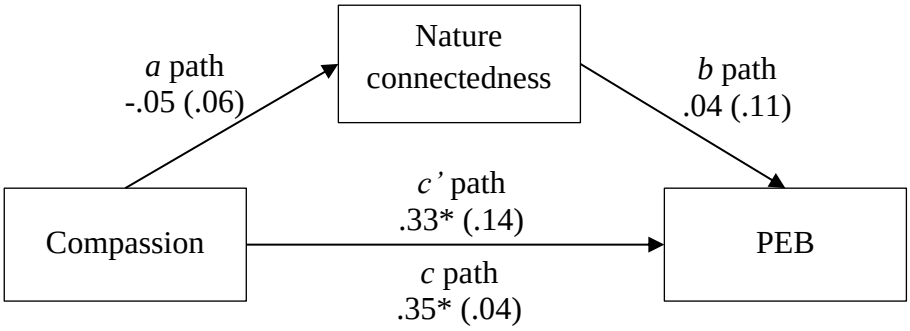

Figure 6. Mediation analysis of Compassion (IV), PEB (DV) and Nature connectedness (M) with a, b, c, c‘ indicating the respective paths with betas and standard errors; *$p < .05$.

Within Subject Analysis (PM-centered)

The results of the Linear mixed model analysis revealed that the total effect (path *c*) of compassion on pro-environmental behavior, $F(1, 538.62) = 0.45$, $p = .50$, and the effect of compassion on nature connectedness (path *a*), $F(1, 528.46) = 0.06$, $p = 0.81$, were not significant. A statistically significant effect of nature connectedness on pro-environmental behaviour (path *b*) was found, $F(1, 524.69) = 10.57$, $p < .05$. The association between compassion on pro-environmental behaviour with nature connectedness as mediator (path *c'*) was not significant, $F(1,537.36) = 0.34$, $p = .56$. A Sobel test revealed that the mediation effect of nature connectedness on the association between compassion and pro-environmental behaviour was not significant ($z = 0.25$, $SE = 0.01$, $p = .81$). The conditions of Baron and Kenny (1986) were not met.

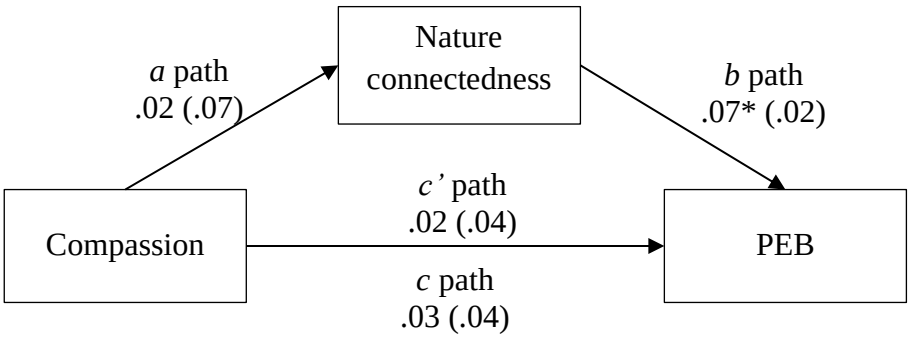

Figure 7. Mediation analysis of Compassion (IV), PEB (DV) and Nature connectedness (M) with a, b, c, c‘ indicating the respective paths with betas and standard errors; *$p < .05$.

Individual Cases for Visualisation

Participant 13

This participant scored medium in state compassion (*PM* = 4.04) with no fluctuations except of timepoint 24 where the participant experienced more compassion. Further, fluctuations can be seen in state pro-environmental behaviour (*PM* = 5.70) from timepoint one to seven ranging from the score range four (neutral) to six (agree) and stayed almost stable at six (agree) from timepoint eight on. State nature connectedness (*PM* = 4.61) shows high fluctuations ranging from one (totally disagree) to six (agree), which level off between score range four (neutral) and five (slightly agree) from the ninth timepoint on. In comparison to the group mean, the participants scored lower on state compassion, and higher in state PEB and state nature connectedness. There is no association seen between compassion and PEB/nature connectedness. However, in the first eight measurement moments, PEB and nature connectedness both first decrease and increase afterwards greatly, which could be interpreted as an association, but afterwards, no association can be seen anymore and thus another influence probably have caused this change (Figure 8).

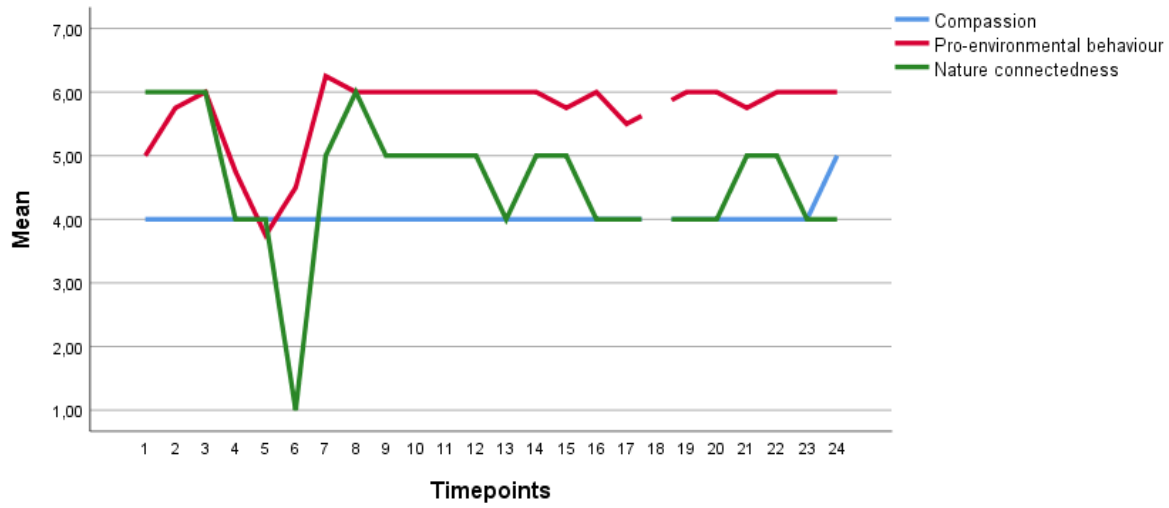

Figure 8. Line graph depicting state compassion, pro-environmental behaviour and nature connectedness levels per timepoint of participant 13.

Participant 29

This participant scored high in both, state pro-environmental behaviour (*PM* = 6.80) and state compassion (*PM* = 6.95) with little fluctuations ranging from the score range six (agree) to seven (totally agree), while state compassion being more stable than pro-environmental behaviour. Nature connectedness (*PM* = 5.86) was experienced with high fluctuations, ranging from one (totally disagree) to seven (totally agree). In comparison to the

group mean, the participants scored higher on all variables. No association can be seen between all three variables (Figure 9).

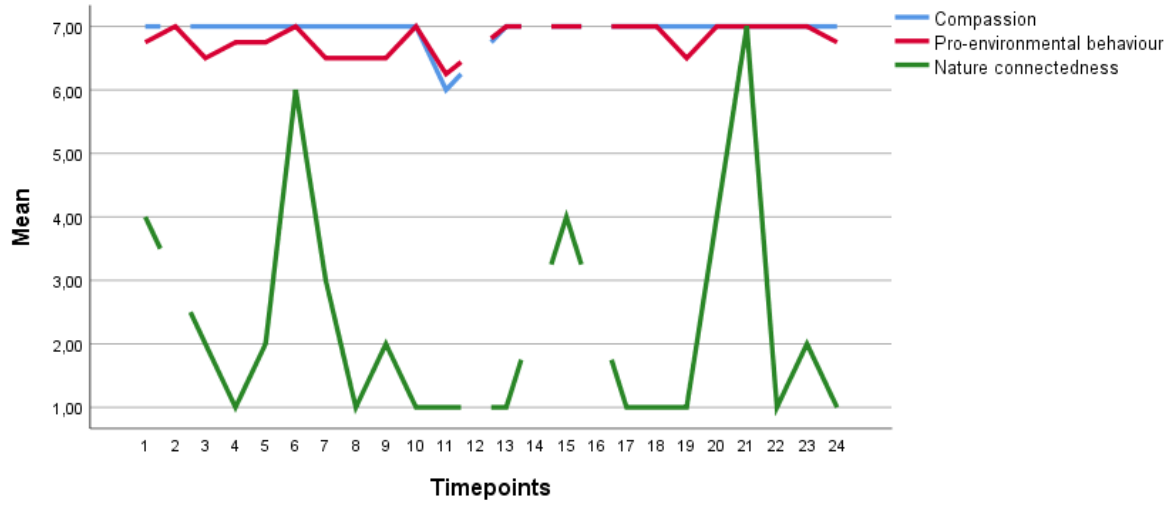

Figure 9. Line graph depicting state compassion, pro-environmental behaviour and nature connectedness levels per timepoint of participant 29.

Discussion

The purpose of this study was to explore whether state compassion in everyday life is associated with state pro-environmental behaviour and whether state nature connectedness in everyday life can mediate this association within and between persons. This study was conducted to understand how compassion and nature connectedness influence pro-environmental behaviours in daily life in order to develop measures to promote pro-environmental behaviour to address global environmental problems. The current research addresses a gap in this field in that we explore compassion instead of empathy for other individuals to focus on the suffering of others and the motivation to act on it. Further, this is to our knowledge the first study that measured the daily changes in compassion in relation to pro-environmental behaviour and nature connectedness.

Findings

The results indicate an association between state compassion and state pro-environmental behaviour between persons. This means that the participants who experienced a higher level of compassion on average in the study period also had higher intention to perform pro-environmental behaviours. This finding is in line with the previous research of Pfattheicher et al. (2015) who found an association between compassion with humans and pro-environmental attitudes and behaviour as well as other previous research approaches of

Schultz (2001) and Tam (2013), who found an association between empathy with humans and pro-environmental behaviour, all measured on a trait level. When comparing the current study with previous ones, it is noteworthy that, apart from Pfattheicher et al. (2015), previous studies measured empathy instead of compassion, which are overall highly similar constructs, but compassion focuses on the response to suffering persons whereas empathy focuses on a broad range of emotions, positive and negative. Finding similar results with compassion as with empathy might indicate that not all empathic emotions promote pro-environmental attitudes or behaviour, but only those empathic emotions that are felt if another person is suffering, which is the aspect that is similar to compassion. This is consistent with how the empathy-altruism theory of Batson et al. (1991) explained this association. Further, the current study found no association between state compassion and state pro-environmental behaviour within persons in contrast to the expectations. This finding indicates that compassion at a specific moment does not influence the pro-environmental behaviour at that moment, rather only a person's average level of compassion influences their pro-environmental behaviour.

Nature connectedness was not found to explain the association between compassion and pro-environmental behaviour, so a person can care for others and act pro-environmentally without feeling connected to nature. This finding is contradictory to expectations due to the findings of Lumber et al. (2017) who found a connection between trait compassion and trait nature connectedness, and the findings of the association of trait nature connectedness to trait pro-environmental behaviour (Mackay & Schmitt, 2019; Martin et al., 2020; Mayer & Frantz, 2004; Nisbet et al., 2009; Whitburn et al., 2019). This finding might have the reason that the compassion item in this study ("I like to be there for others in times of difficulty") mainly measures the behavioural dimension of compassion ("responding"), and less the cognitive and affective dimension of compassion. This might lead to different results because people might score differently in each dimension. They might score high in the behaviour dimension of compassion because they like to help others in need, but they would have scored low in the cognitive aspect of compassion that includes recognizing the person's suffering. As nature connectedness has the core of being cognitive (Schultz, 2002), it would be expected that people scoring highly in the cognitive part of compassion would also score highly in the cognitive part of nature connectedness, as they would probably recognize the suffering of nature more and thus might feel more connected. Therefore, it might be that only the cognitive and emotional part of compassion is related to nature connectedness which then promotes pro-environmental behaviour, but not the behavioural dimension of compassion.

Moreover, it was found in the study that an individual does perform more pro-environmental behaviour while feeling connected to nature at that specific moment, but the average level of nature connectedness was not found to promote pro-environmental behaviour. These findings are contradictory to the previous studies, that found trait nature connectedness to be related to pro-environmental behaviour (Mackay & Schmitt, 2019; Martin et al., 2020; Mayer & Frantz, 2004; Nisbet et al., 2009; Whitburn et al., 2019). One reason for these differences might be, that the current study measures the variables as state-like in contrast to the previous studies, that measured nature connectedness and pro-environmental behaviour as trait-like. People might have another average state score than trait score because they rate their moment experiences of nature connectedness differently than their trait level of nature connectedness. The low significant association between trait nature connectedness and the person-mean score of the state nature connectedness in this study underlines these.

The results might also be evaluated by the context of being in a pandemic during the data collection that has brought about changes in the lifestyle, norms, and attitude of the people in many ways that have an impact on how people feel connected to nature (Soga, Evans, Cox, & Gaston, 2021). In general, research showed that due to home confinement people spend much time at home but had an increased awareness and appreciation of interaction with nature because the motivation behind engaging with nature was different, for example to compensate for reduced physical activity, to buffer stress levels or to strengthen the immune system, which might strengthen the experience of nature (Soga, Evans, Cox, & Gaston, 2021). Thus, it might be expected that people rate their trait nature connectedness as lower because of the amount of time spent inside, but their moment experiences of nature connectedness as higher. Therefore, the people's pro-environmental behaviour might be rather influenced by the moment experiences of nature connectedness than by the overall level of nature connectedness.

Strengths & Limitations

The current study contains some strengths. The use of the experience sampling method was useful to assess immediate data from the participants in everyday life and increases ecological validity by avoiding recollection or memory biases (Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016). The current study was to our knowledge the first study that uses the experience sample method to measure the moment experiences instead of the trait level of compassion in relation to pro-environmental behaviour and nature connectedness and therefore addresses a literature gap. Furthermore, the sample size of 29 participants was

adequate with a responses rate of around 77% in comparison to a median number of 19 participants and an average response rate of 69.6% for a number of previous ESM studies (van Berkel, Ferreira, and Kostakos, 2018). In addition, the study found high reliability for all variables and good validity values for all state variables, indicating that the study measures all variables sufficiently. The strong correlation values of state pro-environmental behaviour with trait pro-environmental behaviour should be taken with caution in order to interpret the validity because a too strong correlation might indicate measuring the exact same construct.

Despite the strengths that this ESM study contains, some limitations should be considered. First, the variable compassion was expected to be a dynamic variable, that varies during the day, however, this study shows only little variability in the variable compassion from timepoint to timepoint. Thus, the compassion item seems to not measure daily changes in compassion sufficiently due to the wording of the item and rather measures the average level of compassion. Further, the total compassion scale of the trait variable showed poor internal reliability, which means that the correlation between the state and trait variable cannot sufficiently show the validity of the state variable as a result. During the data collection period, some participants gave feedback that the questions asked were always the same, and implied that this must be wrong. This assumption might have influenced the participants to repeatedly reporting the same answer which also could explain the overall low variability in all variables. Another explanation might be the phenomenon of response fatigue. During the duration of the study, participants' motivation might decrease and with it the response rate and quality of response (Reynolds, Robles, & Repetti, 2016). Thus, after some days participants might not answer the questions accurately according to their current experiences anymore, rather repeat the same answers as before. To minimize the risk of response fatigue when repeatedly questioning participants, it is necessary to limit the number of questions asked. As a result, compassion was measured by one question which only reflected the behaviour dimension. As compassion consists of three dimensions, the cognitive part of 'noticing', the affective part of 'feeling', and the behavioural part of 'responding', compassion cannot be truly assessed if only one domain is taken into account instead of all three (Kanov et al., 2004). A person might score high in the behavioural part but low in another, which would influence the results. Thus, including all three dimensions of compassion might be important in future research studies to measure compassion sufficiently. Lastly, the experience sampling study was conducted across only 8 days, in comparison to van Berkel, Ferreira, and Kostakos (2018), who found a median of 14 days across different ESM studies. Also, the participants were mostly female, highly educated, and German. Thus,

one should be cautious about generalizing these findings in particular to less educated groups from different countries, which might also be poorer. Future studies might include participants over a longer period of time and across more diverse demographics to further clarify our understanding of compassion in relation to pro-environmental behaviour and nature connection in everyday life. Nevertheless, understanding the behaviour of educated individuals with greater financial means is important as they can have a greater impact when engaging in environmentally damaging behaviour.

Implications & Future research

The current findings provide a certain contribution to the research framework and have implications for the understanding of compassion and pro-environmental behaviour. First, the findings give additional evidence for compassion being related to pro-environmental behaviour on an average level, and therefore compassion can serve as a basis for developing measures to promote pro-environmental behaviour to challenge global environmental problems. Further, this study shows that it could be expected that previous studies that found a relationship between empathy and pro-environmental behaviour actually found a relationship only between the empathic emotions that are felt if another person is suffering and pro-environmental behaviour and thus supports the assumption to use compassion instead of empathy to focus on the suffering aspect in future research studies. More research is needed to further explore this assumption.

In addition, the current study has implications for the understanding of nature connectedness in the association between compassion and pro-environmental behaviour. It was found that people who are compassionate do not have to feel connected to nature to act pro-environmentally. The findings give additional evidence that nature connectedness was found to be related to pro-environmental behaviour and adds to previous research in that this association was found at state level rather than trait level. Therefore, nature connectedness at one moment was found to be related to pro-environmental behaviour at that moment, and thus could be beneficial to interventions aimed at promoting pro-environmental behaviour as well. For this, future studies might also explore how nature connectedness can be influenced by exploring what people do if nature connectedness increases. Previous studies found nature exposure, such as time spent outside or watching nature documentaries, to be associated with higher levels of nature connectedness (Beery, 2013; Mayer & Frantz, 2004; Nisbet et al., 2009). Thus, nature exposure might be one factor that should be taken into account further in future studies. Moreover, compassion and nature connectedness were not found to be associated in this study, which might be explained by the assumption that the cognitive and/

or the affective part of compassion does relate to nature connectedness, as opposed to the behavioural part, as explained earlier, which should be further investigated in future research.

Gender was not investigated in the current study but might be another factor influencing compassion which is related to pro-environmental behaviour. Previous literature indicates that women tend to report more compassion than men (Beutel & Marini, 1995, Salazar, 2015) and also more pro-environmental everyday behaviour (Matthies, Kuhn, & Klöckner, 2002; Schahn & Holzer, 1990). The reason for that might be that women are often socialized to be more emotional, self-disclosive, and supportive to others than men (Salazar, 2015). As the current study included above 70% women, gender might explain the high levels of compassion in the current study and therefore, the high levels of pro-environmental behaviours. Therefore, it might be interesting in future research to take gender into account.

Conclusion

The current study provides insights into the daily changes, as well as into the average levels, of the constructs of compassion, nature connectedness and pro-environmental behaviour. The findings give evidence for compassion, and nature connectedness being independent factors that increase pro-environmental behaviour. These findings are important for developing measures aimed at promoting pro-environmental behaviour, however, expanding our understanding by investigating further factors of the influences to pro-environmental behaviour as well as factors to increase compassion and nature connectedness remains important.

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Appendices

Appendix A – Consent form

You are being invited to participate in a research study about **compassion** and **environmental behaviors.** This study is being conducted by students from the Faculty of Behavioural, Management and Social Sciences at the University of Twente as part of their bachelor and master thesis.

Your participation in this study is entirely voluntary. You can withdraw from the study at any time, without having to give a reason.

Your answers in this study are confidential. All data are collected anonymously as directly identifying information will not be obtained.

This study is approved by the BMS ethics committee. You can contact them if you want to file a complaint (ethicscommittee-bms@utwente.nl).

If you have any questions about this study, please contact one of the involved students:

Meron Makonnen (m.m.makonnen@student.utwente.nl**)**
Ina Marschall (i.marschall@student.utwente.nl)
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Appendix B – State Questionnaires

To me it is important to limit my energy use

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

To me it is important to limit my meat consumption

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

To me it is important to talk to others about their environmental behaviors

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

To me it is important to limit my use of the car

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree

A ID: 6
Agree
A ID: 7
Totally agree

I like to be there for others in times of difficulty

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

It seems I am "running on automatic" without much awareness of what I'm doing

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

I am enthusiastic right now

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree

A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

I am distressed right now

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree

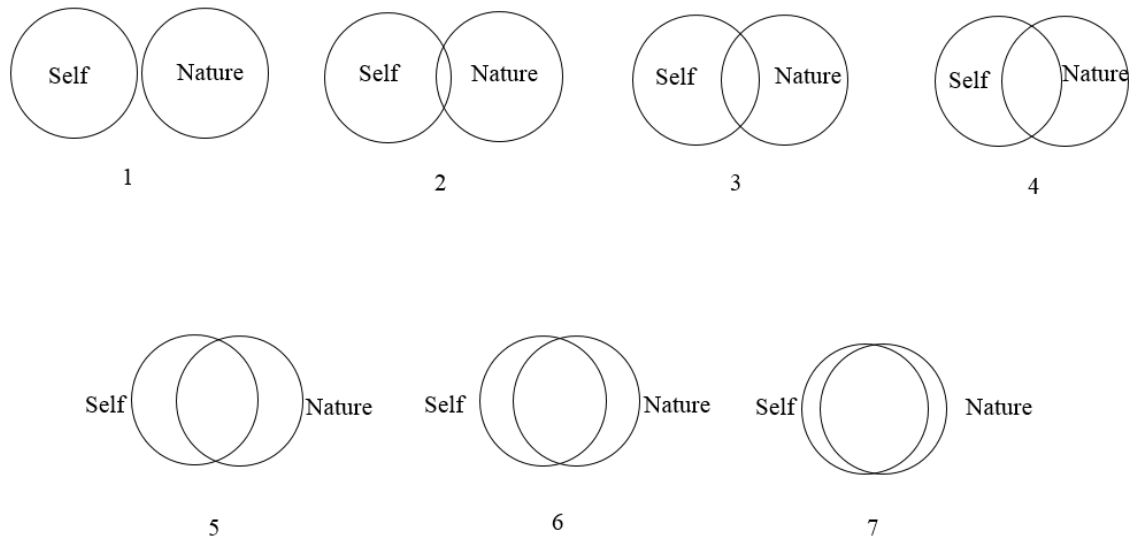
Are you with someone now or in the past hour?

A ID: 1
Yes
A ID: 2
No

The person(s) I am with find(s) it important to care about the environment

A ID: 1
Totally disagree
A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree

Please choose the picture below that best describes your relationship with the natural environment. How interconnected are you with nature?



A ID: 1
1
A ID: 2
2
A ID: 3
3
A ID: 4
4
A ID: 5
5
A ID: 6
6
A ID: 7
7

Are you outdoors now or in the past hour?

A ID: 1
Yes
A ID: 2
No

I enjoyed nature while being outside

A ID: 1
Totally disagree

A ID: 2
Disagree
A ID: 3
Somewhat disagree
A ID: 4
Neither
A ID: 5
Somewhat agree
A ID: 6
Agree
A ID: 7
Totally agree