



# Connecting to Nature in the Lab through “Earth Song”: The Malleability of Implicit and Explicit Attitudes towards Nature<sup>1</sup>

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**ABSTRACT** The focus of our empirical study was to determine whether a short laboratory-based intervention manipulating the self-nature relation through a new construct of environmental problem salience is capable of causing a situational change in implicit and explicit attitudes towards nature. We were interested in how the self would connect itself to the state of nature portrayed as a threatening problem for which the self is possibly responsible. The participants were divided into two groups based on their environmental profiles and exposed to a video clip which implied a global environmental problem. The study treatment was designed to make the environmental problem salient. We have observed a clear effect of the field of study, yet the sample size (N=77) was not sufficient for the treatment effect to be statistically significant. Our study brings mainly preliminary result and further and more robust research is needed. We observed a slight change in attitudes. The attitudes had divergent directions according to the environmental profile of the recipient. The results suggest that the participants with a low environmental profile more deeply perceived the problem as someone else’s problem and dissociated themselves from the nature framed by the treatment, while the participants with a high environmental profile accepted the problem and associated themselves with the nature framed by the treatment. Our findings are in agreement with the critique of the apocalyptic discursive pattern, which considers planned change of environmental policy with apocalyptic discursive pattern to be ineffective.

**KEYWORDS** Environmental attitudes, Connectedness to Nature Scale, New Ecological Paradigm Scale, Implicit Association Test, implicit attitudes, context sensitivity

## Introduction and Theory

Personal dispositions such as attitudes, values, beliefs, norms and worldviews are an important area of study when considering the immediate non-situational causes of human behaviour. Environmental attitudes, among other related constructs, have a prominent place in the research of ecological psychology (Thompson and Barton 1994).

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The environmental movement in the Czech Republic (Binka 2008; Novák 2014) and elsewhere (O’Leary 1993; Foust and O’Shannon Murphy 2009) has held a continuous debate whether a more radical and apocalyptic or a more pragmatic and solution-based discourse in the communication of environmental problems is appropriate. In our study, we aim to discuss a particular but important argument in the debate: what are the imminent effects of emotionally presented information about an environmental threat on one’s attitudes towards nature and its protection?

If generally an attitude refers to a person’s evaluative judgement about a particular entity (Eagly and Chaiken 1993), the construct of environmental attitudes refers to the collection of beliefs, effects and behavioural intentions a person holds regarding environmentally related activities or issues (Schultz et al. 2004). Attitudes can be understood as part of the more general space of values, which can be seen as an organizing system for attitudes or even their determinant. If we understand values as “desirable goals that serve as guiding principles in people’s lives” (Schwartz 1992: 21), we usually find a dividing horizon for nature as a value in itself or as a means for getting to other values.

Worldview is the broadest and most integrative concept of personal dispositions used in both environmental studies and elsewhere. Generally the term *environmental worldview* refers to a person’s adhered belief about humanity’s relationship with nature. In this sense, a person’s worldview serves as a cognitive paradigm or belief system. An important part of the concept is its connection to a shared group identity, or, in the broadest sense, to culture (Johnson, Hill, and Cohen 2011). Due to its large scope and possible redundancy, the term has not received much theoretical attention in cognitive psychology (see Koltko-Rivera 2004), but, for example, a substantial amount of socio-psychological research using worldview is centred around the Terror Management Theory (see Koltko-Rivera 2004: 20). Here worldview is understood as a culturally infused defence mechanism for coping with the existential fear of uncertainty. In a similar worldview-defence way, this concept is studied in the psychology of religion (e.g. Van den Bos, van Ameijde and van Gorp 2006; Jong, Halberstadt and Bluemke 2012).

Our study traverses the space between environmental attitudes and worldview along the human-nature relationship. Here we want to follow the eco-psychological research of connectedness to nature (see below), but in addition to the dimension of bio-psychological human-environment relations, we also want to stress another cultural dimension of the relationship. Our article proposes that studying a person’s connectedness with contextualized nature could help us navigate the socio-cultural complexities of people’s understanding of their relation to nature. This research perspective should be especially helpful for environmental education and policy makers who want to create a change in environmental concerns.

#### Implicit and Explicit Attitudes towards Nature

According to Dunlap and Van Liere (1978) and Dunlap et al. (2000), a person’s environmental paradigm constitutes a fundamental part of his/her belief system and can be described as a set of “primitive beliefs” (basic truth state conviction, see Rokeach 1968) which are able to

influence a wide range of more focused concerns and attitudes (see Schultz et al. 2004). The NEP (New Environmental Paradigm) items try to tap into the “primitive beliefs” about the nature of the earth and humanity’s relationship with it.

Dunlap’s ambition to capture the root of personal environmental dispositions has been criticized by Mayer and Frantz (2004). They do not view the NEP as an adequate measure of one’s own affective, experiential relationship to the natural world. According to them, the NEP scale measures cognitive beliefs rather than affective experience. We tend to agree with their critique because Rokeach’s “primitive belief,” defined as a personal position on whether something is true or not, is closer to a cognitive belief, i.e. conscious convictions expressible by language statements. Moreover, Mayer and Frantz (2004) want to concentrate the worldview construct onto the core social identity – the self. Following the tradition of the ecological perspective (e.g. Leopold 1970) and many ecopsychologists (e.g. Roszak, Gomes and Kanner 1995; Roszak 2001; Fischer 2002), they stress the importance of the feeling of connectedness to the natural world. They continue the discussion about the personal psychological roots of pro-environmental behaviour by operationalizing the construct of connectedness to nature as an individual’s affective experiential self-included in nature. Their position is similar to Schultz (2000), who points out the role of value-objects which are included in the schema of the self. Schultz evaluates the NEP as being more sociological than psychological in its stress on the general human-nature relationship, and he calls for analysing the psychological connection of both concepts (humans and nature) to the cognitive representation of the self.

The discussion about the core element of the environmental personal disposition and its psychological nature has an important counterpart in the discussion about the appropriate methods of its measure. The prevailing method of measuring individual dispositions like attitudes or worldviews are self-reported questionnaires, which are sometimes called explicit measures. Schultz and his colleagues (Schultz et al. 2004; Bruni and Schultz 2010) have criticized questionnaire measures in terms of their dependence on self-report responses. As they write, first there is a strong social desirability element, and second, these beliefs about one’s connectedness with nature are considered to be “zero-order” beliefs which are outside of our sense of self-awareness and might not lend themselves to conscious elaboration and self-report. Developments in social cognition research have provided alternative indirect measurement techniques for assessing personal attitudes outside of self-reports through utilizing the behavioural reaction time paradigm (see Payne and Gawronski 2010). The constructs of this indirect measure are usually called *implicit* and their self-report counterparts *explicit*. There exists a debate about the possible different ways of understanding the explicit-implicit differentiation of attitudes. The initial interpretations stressed the conscious-unconscious conceptualization (Greenwald and Banaji 1995; cf. Payne and Gawronski 2010: 4); present research suggests understanding implicit more as automatic rather than unconscious. Implicit-explicit then generally differentiates the automatic-controlled processes and serves as the basis for the theories of dual processing cognition (e.g. Evans and Frankish 2009). A prominent example of such indirect measures of attitudes is the implicit association test (Greenwald, McGhee and Schwartz 1998). Its self-esteem application (Greenwald and Farnham 2000) was used by

Schultz et al. (2004) in the development of an indirect measure of the implicit part of the connectedness to nature construct.

With indirect measures comes the well-known problem of their situational malleability. The obtained scores of indirect measures often increase, decrease, or even reverse as a function of the context (see Gawronski and Sritharan 2010). This is one of the reasons some researchers doubt the dispositional nature of attitudes in general (e.g. Schwarz 2007; Ledgerwood 2008) and reframe the paradigmatic background of research away from personal dispositions and towards situated cognition (see Aydede and Robbins 2009). As both stability and variability are present in measured constructs, researchers resolve the incongruence by postulating the context sensitivity of evaluative judgements. In this context even the possible biases of explicit methods such as social desirability and self-presentation are not noise but an effect of this context sensitivity (Schwarz 2007: 640-641). This could be interpreted as a need for shifting research attention from the quest to find the true attitude responsible for the behaviour based on the respective methodology to a more detailed study of the situational interaction behind the stability-variability problem (*ibid.*).

This illustrates the dispute about the right methods of assessing the connectedness of nature between Mayer and Frantz on the one side, and Schultz and his colleagues on the other (Mayer and Frantz 2004: 504; Bruni and Schultz 2010: 95). Although Mayer and Frantz (2004) support Schultz's work with indirect methods, they think that the method is unreliable because of the low correlations between implicit measures and the measures of relevant behaviours reported by Schultz (2004), and they come with their own Connectedness to Nature Scale (CNS) based on a questionnaire. It should measure individuals' trait levels of feeling emotionally connected to the natural world. On the other hand, Bruni and Schultz (2010) criticize Mayer and Frantz for the classic self-report problems. Within the broader context of these studies, it seems that they both are closer to the connectedness to nature understood as "real core disposition" than to the situational cognition position, which takes "evaluative judgments as made on the spot". But Mayer's and Schultz's teams actually study the context influence when they test the effects of exposure to nature on the malleability of their constructs (Schultz and Tabanico 2007; Mayer et al. 2009).

Schultz and Tabanico (2007) created a complex field study in which they measured the implicit connectedness to nature in several physical environments. They found that implicit associations with nature were malleable within a longer exposure to the natural environment, such as several hours, and were stable within a small scale exposure, such as a 5-minute walk in a park (Schultz and Tabanico 2007: 1241). Their results suggest that the connectedness to nature attitude is not easily changed by the context. Further, because of the complex properties of the "exposure to natural environment" stimulus, there is not much to say in detail about the causal interplay of the relevant factors.

Schultz and Tabanico (2007) and Mayer et al. (2009) studied the effect of exposure to nature due to the assumption of its immediate benefit. They tried to manipulate the nature part in the self-nature relation. This makes very good sense when we see connectedness to nature as a core affective experiential trait and if we are looking for how the self is included into nature. But it could be also interesting to change the focus on how nature is included in the self. That means, we should try to assess different implicit models of nature and find out how

the trait is malleable from the other side, i.e. from the situated context of the self. Both of the studies cited here model nature as an open sky environment filled with organic life (forest, park, but also zoo) and contrast it with a built artificial environment (buildings, streets, lab). They do not try to address the problem of defining the border between nature and non-nature. But if we problematize the self-nature relation from the self-part, e.g. if we change the perspective from the raw biological effect of the natural environment on humans to the discourse of environmental education or policy making, the situation is no longer intuitive. It is not possible to rely on a raw “biological” model of nature contrasted with an artificial one, because the normative approach has to balance and mix extreme types together in some presupposed harmony. Environmental policy making cannot work with an isolated value of nature, because it needs to position it within the frame of other values which are present in society. This problem of interconnected values brings us back to the system of values or to the worldview in the context of the broader category of environmental concern, and this offers an additional line of research. Our current knowledge of the constructs and of the debate about their nature, as well as our ability to understand their link in the prediction of actual behaviour, would benefit from further studies of their contextual malleability. If connectedness to nature is a core construct which affects the related attitudes and values about nature, it should also be possible to predictively manipulate it from the situated context of the self.

#### Discourse of Environmental Problems

In the possible set of strategies in present public environmental discourse, there is one typical frame of portraying the human-nature relationship which makes the human part specifically relevant. It presents the natural environment as highly damaged by human hubris and introduces the present state of the natural environment as an imminent global environmental threat. We could generally recognize it as the apocalyptic discursive pattern (Brummett 1984; O’Leary 1993). A typical example would be the Guggenheim movie *An Inconvenient Truth* (2006). Important parts of this discursive pattern are the emotion of fear and the fact of mortality.

In its scale, the message connects the topic of nature as planetary life and humankind in such a way that it has almost religious, prophetic connotations (O’Leary 1997). This brings global relevancy to the matter, but impairs the actual possibility to change it. That is one of the reasons why some scholars (Arthur and Quester 2004; Hastings, Stead and Webb 2004; Ruiter, Abraham and Kok 2001) have suggested abandoning this discursive pattern. Although such general campaigns bring attention to environmental issues, they also instil low behavioural efficacy due to the impossibility of an individual’s behaviour to avert or remove the threat (Moser and Dilling 2004). On the contrary, research suggests that providing specific information aimed at increasing threat-averting behaviour may enhance the effectiveness of threat appeals (Hartmann 2014). Nevertheless, the scale of the message corresponds well with the aim of the worldview construct and taps into the responsibility part of the human-nature relationship, even though the responsibility in such a scale (humankind for the planet) has an almost transcendent dimension.

We decided to use such a depiction of nature as our “self-part” manipulation. Concerning the discussion of the rootedness of connectedness to nature, it should be interesting to find out how the self would connect itself to nature portrayed as a threatening problem for which the self is possibly responsible. Theoretically, we were inspired by the established line of research in social psychology studying the adaptive functions of worldview, i.e. the Terror Management Theory and its manipulative technique of mortality salience, so we defined our manipulation as (global) *environmental problem salience (EPS)*.

Although mortality salience is considered to be effective universally, the same manipulation does affect people differently, depending on their worldviews (see Burke, Martens and Faucher 2010). Some research suggests that mortality salience has a lesser effect on people with religious worldviews. They can provide a buffer for the death anxiety relief through offering the means to symbolically live on after death (Landau, Greenberg and Solomon 2004). As Jong, Halberstadt and Bluemke (2012: 1) put it, a specific cultural worldview allows individuals to feel like valuable parts of something larger and more enduring than themselves. A key mechanism in TMT studies is *world-view defence*. The TMT theory supposes that in the situation of existential psychic discomfort, endorsing and protecting one’s worldview mitigates the discomfort. This explains the standard effect of mortality salience manipulation, where people score higher in the in-group worldview measures. But as Jong, Halberstadt and Bluemke (2012) show with the case of religious belief, if the people are affected by the manipulation, they can exhibit a discrepancy between explicit and implicit attitudes. These authors divided their sample into two groups - atheists and believers, and they found that while the believers strengthened their beliefs on both implicit and explicit measures, the atheists showed only higher explicit beliefs. On the implicit measure of supernatural belief realized through a variant of the implicit association test (IAT), they exhibited a decrease in adhering to their atheistic worldview. Jong, Halberstadt and Bluemke (2012: 5) explained this effect by a “distinct cognitive inclination” account of supernatural belief (Norenzayan and Hansen 2006: 183), in which human beings are naturally and uniquely attracted to believe in supernatural agents. The universality or naturalness of the human tendency toward supernatural belief and the connectedness to nature as a core belief are actually both theoretically posited on the argument of evolutionary history. It should then be natural for humans to feel themselves to be a part of nature. But it should also be quite natural for humans to weave this affection into their cultural embedding. This leads us back to the cultural worldview debate.

### Experimental study

To explore the theoretical frame, we designed an experimental study. Here we treat connectedness to nature as a dimension of cultural worldview. We suppose, however, that similar to religious belief, this may have a universal (non-cultural) grounding.

The key part of the design of the study was the appropriate implementation of the environmental problem salience manipulation. To make our study more relevant to the research of the effects of environmental discourse, we have chosen a passive exposure to media material instead of active self-manipulation where participants write an essay on a specific topic. We



decided to build our salience manipulation on the immediate effect of video content which fits the EPS concept (for the use of video in TMT, cf. Pyszczynski 2004).

Michael Jackson's music video "Earth Song" represents an influential message with a high degree of the features described above as part of the tragic apocalyptic environmental discourse. Namely, it possesses a teleological and catastrophic framing which focuses on the transcendence of the cultural and natural environment which is being destroyed. Even though it was also accused of being an unoriginal, dramatic showpiece, a ballad with an environmental and social moral appeal, in 1995 it was a leading hit in many European countries. Despite the ethos of effective, radical personal action, the song is based on empathy and sorrow. We have thus chosen this specific video clip of Michael Jackson's song "Earth Song" as strong emotional priming. The message points out the responsibility of the human civilization for environmental problems, and stresses that people's trust of nature is a necessary mitigating force in solving these problems. Due to this emotional appeal and spiritual connotation, we supposed that it should work in our design in a similar way as mortality salience did for religious belief. On the one side, the video should activate environmental problem associations and personal attitudes towards nature, and on the other side, it should offer the strategy of trusting nature as a solution to the problems posed.

We decided to study the effects of the treatment on a divided sample which could reflect some socio-cultural diversity in relation to nature. To achieve a group cultural worldview contrast, we based our sample division on a specific socio-cultural background – the choice of a career in environmental studies. We assumed that no matter the internal diversity, those who study environmental studies should generally score higher on the connectedness to nature scales and be better accommodated to the effects of EPS than those who do not study this field. Therefore, we divided the participants into two groups according their field of study, which we have shortened as a high environmental profile (students of environmental studies) and a low environmental profile (other students).

In an analogy to the Jong, Halberstadt and Bluemke (2012) study and in accordance with the research about the apocalyptic discourse in environmental campaigns, we assume that the EPS should generally increase the explicit connectedness to nature within the group with a high pro-environmental profile due the activation of the relevant attitudes. We also predict that there should be an increase in implicit connectedness to nature for both groups, even though our manipulation could bring divergent results for our groups, depending on the perceptive framing of the clip's second "trust of nature" message.

Along the lines of the Jong, Halberstadt and Bluemke study, our hypothesis is that the reaction of the low pro-environmental profile group to the treatment would differ in explicit worldview measures. We therefore predict a decrease in the explicit pro-environmental worldview as a result of the activation of the world-view defence mechanism. If the treatment message is interpreted as a problem without a solution, connecting to nature would just be connecting to an insolvable problem. The situation where nature is in trouble and a person actually does not have high pro-environmental attitudes should create a cognitive dissonance, which should be mitigated by endorsing the opposite of pro-nature values. This should be visible as a decrease in explicit reports of connectedness to nature.

## Methods and Materials

The focus of our pilot empirical study was to determine whether a short laboratory-based intervention can cause a change in implicit and explicit attitudes measured by tests of personal attitudes towards nature. We conducted an experimental study on a sample of 77 (32 male and 45 female) participants, mostly students from Masaryk University, Brno, who responded to our request.

We split the pool of participants according to their field of study, i.e. their (non)affiliation with environmental studies (47 environmental and 30 other study specializations). The treatment condition consisted of exposure to the video clip evaluated as a source of Environmental Problem Salience. Each participant watched the video clip individually. To study the effect of the treatment, we used one implicit measure and two explicit measures of relationship to nature: the CNS-IAT Test (Schultz and Tabanico 2007; Greenwald and Farnham 2000) was implicit, and the New Ecological Paradigm Scale (NEP) (Dunlap et al. 2000), and the Connectedness to Nature Scale (CNS) used by Mayer and Frantz (2004) were explicit. The CNS-IAT Test was conducted prior to the administration of the NEP and CNS questionnaires.

At the end of the experiment, each participant was asked to self-estimate their environmental attitude by responding to questions about the number of hours spent weekly in nature and about whether the participant considers his/her life-style to be connected with nature.

Generally, we have implemented a 2x2 factorial between subjects design with exposure to the video and an environmental profile as independent variables, and the CNS, NEP and CNS-IAT as our dependent variables.

### Implicit, explicit measures and treatment

As our indirect measure of connectedness to nature, we used the implicit association test (CNS-IAT), with two categories and two attributes (the construct of self-polarized to self and not self)<sup>2</sup> in the same design as Schultz and Tabanico (2007). For stimuli see Table 1.

As an evaluation method, we used an improved scoring algorithm (Greenwald, Nosek and Banaji 2003). The resulting D-value is in a range of -2 and 2: the higher the D-value, the stronger the subject's relation towards nature. Due to the known effects of the first contact category in the test, the results are affected in favour of the pro-environmental attitude. As we are not interested in the state but in the change of the attitudes between conditions, we did not vary the order of categories. We used a standard seven blocks IAT procedure, see Table 2.

In our study we used the Connectedness to Nature Scale developed by Mayer and Frantz (2004) and translated it into Czech. The CNS consists of 14 items designed to measure the extent to which participants generally feel themselves to be a part of the natural world. Participants responded to these statements on a 5-point Likert scale (1=strongly disagree; 5=strongly agree).

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<sup>2</sup> The IAT script was created by modifying the standard Self Esteem IAT Inquisit script (available from <http://www.millisecond.com/download/library/IAT/>).



**Table 1:** Categories and Words of CNS-IAT (Schultz and Tabanico 2007)

| Category | Nature („Přirodní“) | Built („Vytvořené lidmi“) | Me („Já“)        | Not me („Ne já“) |
|----------|---------------------|---------------------------|------------------|------------------|
| Items    | Birds („Ptáci“)     | Car („Auto“)              | I („Já“)         | It („To“)        |
|          | Plants („Rostliny“) | City („Město“)            | Me („Mne“)       | Other („Druzí“)  |
|          | Whales („Velryby“)  | Factory („Továrna“)       | Mine („Můj“)     | Their („Jejich“) |
|          | Trees („Stromy“)    | Street („Ulice“)          | Myself („Sebou“) | Them („Jim“)     |
|          | Water („Voda“)      | Computer („Počítač“)      | Self („Sebe“)    | They („Oni“)     |
|          |                     |                           | My („Moje“)      | Theirs („Jimi“)  |

Note: Categories and stimuli were translated into the Czech language, some words were modified.

**Table 2:** Sequence of CNS-IAT Procedure

|  |
|--|
| 1. Me vs. Not me                         |
| 2. Nature vs. Built                      |
| 3. Me - Nature vs. Not me - Built: train |
| 4. Me - Nature vs. Not me - Built: test  |
| 5. Built vs. Nature                      |
| 6. Me - Built vs. Not me - Nature: train |
| 7. Me - Built vs. Not me - Nature: test  |

We also used the revised version of the New Ecological Paradigm Scale (Dunlap et al. 2000) which consists of 15 items. The items in the scale were rated on a 5-point Likert scale (1= strongly disagree; 5= strongly agree).

As additional scales, our experimental study contained two additional questions which focused on the relationship of our respondents towards nature. The first asked, “How many hours do you spend weekly in nature? (e.g. walking outdoors, cycling, playing games, doing sports, camping, fishing, reading outdoors, yard work, etc.)” The respondents were asked to place their answers on the given scale of six alternatives – from almost no time to plus 21 hours.

The second question had the following wording: “Most people follow a certain lifestyle in their life. When you think about it, would you say that your lifestyle is connected to nature?” The answers were recorded on a 5-point Likert scale.

At the very end of the session, all participants filled in several demographic questions. We were interested in their age, occupation, field of study, and the size of the municipality they live in.

The treatment was designed to affect the participants' attitudes towards nature. During this period, individuals watched the video clip of Michael Jackson's "Earth Song" on a laptop computer screen. The video screen was maximized and Czech subtitles were included. The concept of "environmental problem salience" is our innovation, so there is no standard proved operationalization. We assessed the video in a preliminary small study (N=10) which consisted of writing a short associative essay about the participants' feelings after watching it. From these essays, we have concluded that the video clip does affect the participants' feelings concerning the state of nature and human responsibility for it, i.e. the clip creates a state of "environmental problem salience" in the participants' minds.

Methods and data acquisition

The participants were randomly assigned to "BASE" and "TREATMENT" groups. The subjects in the BASE group conducted the experiment without the video intervention and the subjects in the TREATMENT group watched the Jackson video and performed the tests afterwards. The study design is shown in Table 3. Altogether 42 subjects (17 men, 25 women, 26.2 ± 6.2 years old) participated in the BASE version of the study, 35 subjects (15 men, 20 women, 26.3 ± 4.7 years old) in the TREATMENT version. The groups did not significantly differ in the age (p = 0.33) or gender (p = 0.83) of the participants.

To address our assumption of diverse results in subjects with high and low pro-environmental attitudes, we divided the participants' data according to their field of study. The field of study was assessed as *environmental studies* and *other studies*. Henceforth, we will mark these subgroups as *l-pro(study)* and *h-pro(study)* referring to expected low pro-environmental and high pro-environmental attitudes.

Eighteen *l-pro* and 24 *h-pro* subjects were present in the BASE group, 12 *l-pro* and 23 *h-pro* in the TREATMENT group. The BASE and TREATMENT groups did not significantly differ in the fields of study of their subjects (p = 0.44).

**Table 3:** Experimental design adopted in this study to evaluate effect of the treatment

| Group                | Base  | Treatment                                       |
|----------------------|---|---|
| Pre-treatment phase  | Introduction                                    | Introduction                                    |
| Treatment            | No  | Yes   |
| Post-treatment phase | IAT   | IAT   |
|                      | NEP questionnaire                               | NEP questionnaire                               |
|                      | CNS questionnaire                               | CNS questionnaire                               |
|                      | demographics questions                          | demographics questions                          |
|                      | self-estimated environmental attitude questions | self-estimated environmental attitude questions |

The whole procedure was administered through a personal computer. Each participant was tested individually. After introductory spoken instructions by an administrator, the participant

was guided by onscreen instructions. Explicit questionnaires were provided by Google Forms. The IAT test was administered on a computer with a trial version of Inquisit 4 software.

### Data pre-processing and analysis

The NEP and CNS batteries contain questions whose meanings are opposite to the other questionnaires, therefore some answers were reversed in order to correspond. This is the case for all the NEP answers to the even questions and the CNS answers to question numbers 4, 12 and 14. Further, the global scores of explicit tests (NEP, CNS scores) were computed and quantified in a range from 0 to 1. In all responses, the higher the value, the higher the participant's pro-environmental attitude in that aspect.

Cronbach's alpha was used to evaluate reliability for both batteries. For the NEP it was 0.837 and for the CNS it was 0.839, suggesting a high consistency within both batteries.

Because of the non-Gaussian distributions of the data, we have implemented the McCall area transformation (Krus and Krus 1977; McCall 1922), using percentiles of the original values of a given variable and transforming them to values from the normal distribution of a zero mean and standard deviation equal to one.

Using MANCOVA, we have evaluated the effect of the intervention (treatment) on implicit and explicit scales separately for the high- and low-profile environmental groups (as the interaction between independent factors "treatment" and "environmental profile"), with control of covariates (gender (Zelezny, Chua and Aldrich 2000), age). To justify the importance of this interaction, we also report the effect of the environmental profile (the field of study) on the scales.

To provide the relations between the tests, the Pearson and Spearman correlations were used according to the data distributions (relations computed on the whole dataset and separately for subgroups).

## Results

Targeting our assumption about the differences between low and high pro-environmentally oriented respondents, MANCOVA revealed statistical significance ( $p < 0.001$ ) and post-hoc tests found this difference in both the NEP and life-style related to nature, and the trends in the CNS and IAT ( $X_{l-pro\ study} < X_{h-pro\ study}$ ), see Table 4 for respective p-values. Figure 1 illustrates these differences.

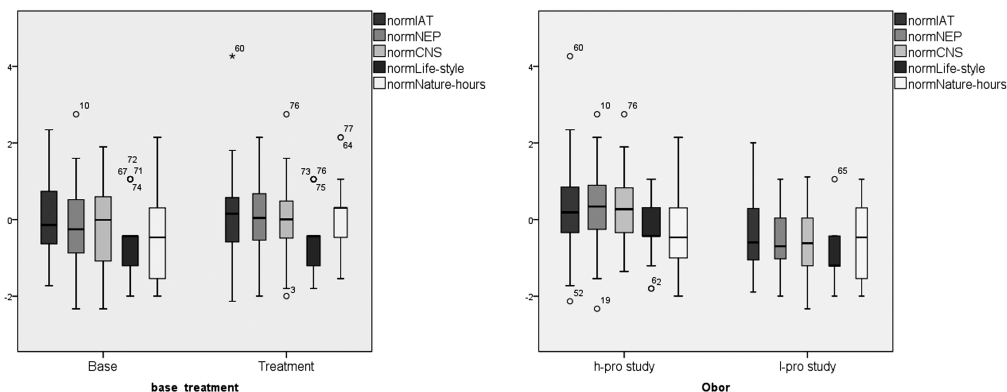
The MANCOVA further did not reveal any statistically significant general effect of treatment ( $p = 0.531$ ). We hypothesized an interactive effect of the treatment and the environmental profile and measured a trend ( $p = 0.165$ ); exploratory descriptive analysis shows a marginally significant effect of the field of study and the treatment interaction on the IAT (both  $X_{l-pro\ study\ TREATMENT} < X_{l-pro\ study\ BASE} < X_{h-pro\ study\ BASE} < X_{h-pro\ study\ TREATMENT}$ ), and the hours spent in nature ( $X_{h-pro\ study\ BASE} < X_{l-pro\ study\ BASE} < X_{l-pro\ study\ TREATMENT} < X_{h-pro\ study\ TREATMENT}$ ). Table 5 captures the post-hoc results. The differences are depicted in boxplots (see Figure 2).

**Table 4:** The effects of the field of study on implicit and explicit scales and environmental attitude questions

| Test       | IAT         |              | NEP         |              | CNS         |              | connectedness of life-style with nature |              | number of hours subject spent per week in nature |              |
|------------|-------------|--------------|-------------|--------------|-------------|--------------|---|--------------|--|--------------|
|            | h-pro       | l-pro        | h-pro       | l-pro        | h-pro       | l-pro        | h-pro                                   | l-pro        | h-pro  | l-pro        |
| p          | 0.188       |              | < 0.001*    |              | 0.062       |              | 0.004*                                  |              | 0.274  |              |
| Mean ± STD | 0.16 ± 0.93 | -0.17 ± 1.04 | 0.15 ± 1.06 | -0.52 ± 0.78 | 0.21 ± 0.97 | -0.49 ± 0.96 | -0.30 ± 0.82                            | -0.81 ± 0.69 | -0.65 ± 1.06                                     | -0.53 ± 1.03 |

Note: P-values of the differences displayed, significant differences ( $p < 0.05$ ) highlighted by asterisks.

**Figure 1:** The general effects of a) treatment, b) the field of study on explicit, implicit scales and self-evaluated questions about the connectedness of life-style with nature (marked as life-style) and number of hours the subject spent per week in nature (marked as nature-hours).



Note: The y-axis values come from normalized scores. Numbers at extreme values mark incident subjects.

Considering the relations between factors, including covariates, a significant correlation was measured between the field of study and gender ( $p < 0.001$ ,  $p = 0.461$ ), meaning that the division into *h-pro* and *l-pro* subjects includes more women in the *h-pro* subgroup. Further, the gender covariate has a significant influence on the IAT ( $p = 0.030$ ) and the CNS ( $p = 0.006$ ). Other variables are not significantly influenced by covariates.

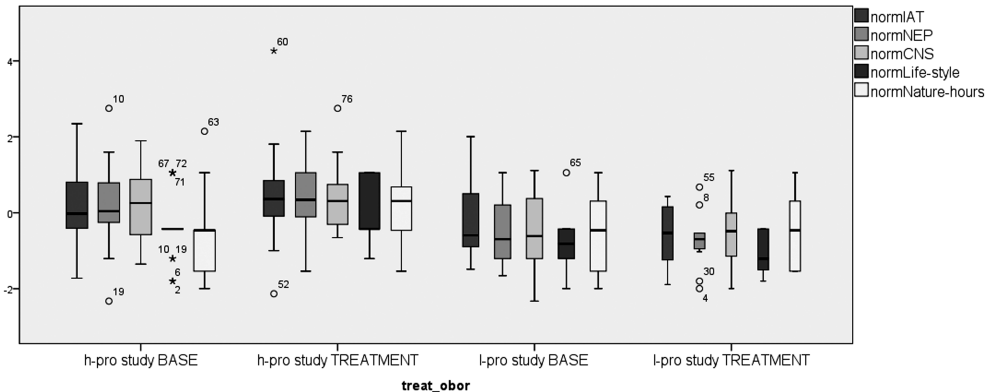
As mentioned above, we are aware of the gender differences and are using gender as a covariate to ensure the analysis would not be misleading, although we have further examined this difference. The difference between males and females was found in every explicit and implicit score ( $p_{NEP} = 0.057$ ,  $p_{CNS} < 0.001$ ,  $p_{IAT} = 0.002$ , in all cases the  $X_{male} < X_{female}$ ), the difference was also found in the self-evaluated connectedness of life-style with nature ( $p = 0.003$ ,  $X_{male} < X_{female}$ ).

**Table 5:** The effects of interaction of environmental profile and treatment, on implicit and explicit scales and environmental attitude questions

| Test                       | IAT             |                 | NEP             |                 | CNS             |                 | connectedness of life-style with nature |                 | number of hours subject spent per week in nature |                 |
|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|-----------------|--|-----------------|
|                            | Base            | Treatment       | Base            | Treatment       | Base            | Treatment       | Base                                    | Treatment       | Base   | Treatment       |
| p                          | 0.161†          |                 | 0.226           |                 | 0.702           |                 | 0.279                                   |                 | 0.099†   |                 |
| h-pro:<br>Mean<br>±<br>STD | 0.16 ±<br>0.93  | 0.44 ±<br>1.19  | 0.15 ±<br>1.06  | 0.47 ±<br>0.86  | 0.21 ±<br>0.97  | 0.36 ±<br>0.83  | -0.30 ±<br>0.82                         | -0.11 ±<br>0.84 | -0.65 ±<br>1.06                                  | 0.24 ±<br>0.94  |
| h-pro:<br>Cohen's d        | 0.260           |                 | 0.332           |                 | 0.166           |                 | 0.229                                   |                 | 0.888  |                 |
| l-pro:<br>Mean<br>±<br>STD | -0.17 ±<br>1.04 | -0.58 ±<br>1.07 | -0.52 ±<br>0.78 | -0.71 ±<br>0.73 | -0.49 ±<br>0.96 | -0.52 ±<br>0.98 | -0.81 ±<br>0.69                         | -1.03 ±<br>0.58 | -0.53 ±<br>1.03                                  | -0.44 ±<br>0.92 |
| l-pro:<br>Cohen's d        | 0.389           |                 | 0.251           |                 | 0.031           |                 | 0.345                                   |                 | 0.092  |                 |

Note: P-values of the differences displayed, no significant differences ( $p < 0.05$ ) found. Cohen's d as a measure of effect size (Cohen 1988). († = debated result)

**Figure 2:** The effect of interaction between treatment and environmental profile (field of study).



Note: The y-axis values come from normalized scores. Numbers at extreme values mark incident subjects.

We also aimed to analyse the discrepancy between the IAT and the explicit scores, and how it differs among the subgroups. For each subject, the explicit value was subtracted from the IAT D-value, both normalized (the same McCall area transformation as in the previous analysis). These differences follow the Gaussian distribution ( $p = 0.200$ ), therefore the same

MANCOVA test was used – the effect of gender and age was regressed out. The analysis revealed a non-significant effect of the environmental profile (field of study;  $p = 0.164$ ). Table 6 and Table 7 show the post-hoc results of the discrepancies. The negative average values indicate that the explicit score is higher than the IAT and the positive average value means that the explicit score is lower than the IAT. We have found a non-significant difference on the “IAT-NEP scissors” in the field of study variable ( $p=0.115$ ) where the more pro-environmentally inclined subjects have more consistent implicit and explicit attitudes (the average difference is close to zero) than the less pro-environmentally inclined subjects who score, on average, higher on the IAT than on the NEP.

**Table 6:** Effect of the field of study on the discrepancies between implicit IAT test and explicit scores

| Tests      | IAT - NEP   |             | IAT - CNS    |             |
|------------|-------------|-------------|--------------|-------------|
|            | h-pro       | l-pro       | h-pro        | l-pro       |
| p          | 0.115†      |             | 0.757        |             |
| Mean ± STD | 0.02 ± 1.57 | 0.35 ± 1.39 | -0.05 ± 1.28 | 0.32 ± 1.14 |

Note: † = debated result

In contrast to our predictions, we did not find any increased “implicit-explicit” scissors between the groups after the treatment. The treatment did not polarize the groups according to the implicit-explicit consistency.

**Table 7:** Effect of treatment plus the field of study interaction on the discrepancies between implicit IAT test and explicit scores

| Tests             | IAT - NEP   |              | IAT - CNS    |              |
|-------------------|-------------|--------------|--------------|--------------|
|                   | Base        | Treatment    | Base         | Treatment    |
| p                 | 0.817       |              | 0.415        |              |
| h-pro: Mean ± STD | 0.02 ± 1.57 | -0.33 ± 1.58 | -0.05 ± 1.28 | 0.08 ± 1.46  |
| l-pro: Mean ± STD | 0.35 ± 1.39 | 0.13 ± 1.17  | 0.32 ± 1.14  | -0.06 ± 1.19 |

Finally, we examined the correlations among the measures we had used. Since we did not find a significant effect of the treatment on the implicit and explicit scales, we decided to concentrate our analysis on the whole set of subjects. Pearson correlations were calculated to provide the relations between the normalized scores of the IAT, NEP and CNS. Spearman correlations were calculated to examine the relations of all measures with questions about connectedness of life-style with nature and the number of hours a subject spent in nature per week.

Our analysis revealed that the IAT significantly correlated only with the CNS ( $r = 0.230$ ;  $p = 0.045$ ). The results showed significant correlations of the NEP and the CNS ( $r = 0.342$ ;  $p = 0.002$ ) and correlations of the question about connectedness of life-style with nature with both the NEP ( $r = 0.246$ ;  $p = 0.029$ ) and the CNS ( $r = 0.367$ ;  $p = 0.001$ ). The question about the self-evaluated hours spent in nature per week did not correlate with any other measure.



## Discussion

The rationale of our study was in the expected analogy of connectedness to nature as a dimension of a cultural worldview. We aimed to study the effects of environmental problem salience (EPS) manipulation on two groups based on their environmental profile as Jong, Halberstadt and Bluemke (2012) studied the effects of mortality salience manipulation on a sample divided into two groups based on their worldview. We were interested to see if a short laboratory-based intervention manipulating the human-nature relation from the self-part is capable of causing a change in implicit and explicit attitudes towards nature.

In line with our expectations, we have found significant differences between the high and low pro-environmental subgroups (see Table 4 and Figure 1). The participants studying environmental studies scored significantly higher on the NEP and connectedness of life-style with nature question than the participants from other fields of study, and this trend can also be seen in the CNS and IAT results. Similar effects were also found in some previous studies (Mayer and Frantz 2004; Bruni and Schultz 2010). The groups' differences created the needed experimental conditions for studying the effects of EPS manipulation on a divided sample to achieve a group cultural worldview contrast.

Given our main assumptions about the different reactions within the grouped sample, we need to look at the interactive effect of the treatment and the environmental profile (see Table 5 and Figure 2). Even though the effects were not statistically significant, we provide a tentative interpretation. Contrary to our predictions, the results of the implicit pro-environmental worldview measured by the CNS-IAT did not increase in both groups after the treatment, but actually decreased in the group with a low pro-environmental profile. On the other hand, the effect of the treatment on explicit attitudes was present as predicted. We interpret this in two ways. First, our implementation of the EPS did not penetrate to the personal core attitudes towards nature in the same way as mortality salience does towards people's certainty about supernatural existence, i.e. our operationalization of the EPS manipulation was inefficient in creating the blind alley of existential uncertainty. Second, and more importantly, our relation of the EPS and connectedness to nature actually reflects more of a cultural rather than existential conflict, or, more specifically, our treatment created a socio-culturally constructed existential conflict rather than an individually existential one. This allowed the participants with a low environmental profile to refuse the anxiety more easily through dissociation of their selves from the nature specifically framed by the treatment. Where individually constructed and experienced mortality salience is hardly avoidable, the socio-culturally constructed one is avoidable by challenging the content as implausible. The explicit endorsement of a low environmental worldview by the low environmental profile participants could be an effect of an activated defence mechanism reacting to anxiety or actually just a framing effect of the precaution towards a possible instalment of such anxiety. It would not be a reaction to the felt problem, it would be a complete avoidance of the problem by framing it as a personally implausible problem or as someone else's problem.

The shifts in the results within the CNS and NEP explicit scales in both groups were more consistent with our predictions. The scores in the high pro-environmental profile group increased after the treatment, whereas the scores in the low pro-environmental profile group decreased. This tendency was more noticeable within the NEP scale, which may imply

a stronger bond between this scale and the selected EPS manipulation (“Earth Song”). In this respect, we agree with other authors (Mayer and Frantz 2004; Schultz et al. 2004) who stress that the NEP measures cognitive beliefs and is oriented toward a general human-nature relationship. This scale appears suitable for reflecting the effects of EPS manipulation, since the message of “Earth Song” points out the responsibility of human civilization for environmental problems.

In our predictions, we assumed that the treatment would cause a discrepancy between explicit and implicit attitudes in the low environmental profile participants. The prediction was shown to be unfounded by the opposite than expected change in the implicit attitudes towards nature within the low environmental profile group. Generally, our high variation in the data does not allow us to determine any conclusive specific relation between implicit and explicit attitudes. Moreover, we have to reject our hypothesis about the cognitive dissonance between the feeling and conscious reflection in the low environmental profile group. The data suggest that the participants actually avoided dissonance, or we were not able to measure it.

We were also interested in the statistical relationships between the selected measures. The only correlation between the implicit and explicit scale was identified in the relation between the IAT and CNS. A comparable correlation between these measurements was identified also by Mayer and Frantz (2004). Following the results obtained by Schultz et al. (2004), we did not find a correlation between the IAT and NEP. Our results support the assumption of a closer tie between the CNS and IAT rather than a link between the NEP and IAT; both the CNS and the IAT are designed to measure the affective sense of connectedness to nature. The identified correlations between the NEP and CNS were also reported by Mayer and Frantz (2004). The question about the connectedness of life-style with nature correlated with both the NEP and CNS, but not with the IAT. This question seems to be closer to the CNS, because it asks about an individual’s connection with nature, which is reflected also in its stronger correlation.

Our analysis of the gender effects showed that female participants scored higher than male participants in both explicit and implicit measures (IAT, NEP, CNS, life-style). These findings are in line with the previous studies using the IAT (Schultz and Tabanico 2007; Bruni and Schultz 2010) and the NEP (Zelezny, Chua and Aldrich 2000), and they extend the results to the CNS and life-style.

Although statistically inconclusive, our results seem to support the critique of the apocalyptic discursive pattern. The EPS treatment made salient thinking about the problematic state of nature and the direction of reaction was dependent on the environmental profile of the participant. It worked contrary to the message intention for those it should have convinced, even though it activated the pro-environmental attitudes in those who already had them. We assume that the effect of such priming manipulation is short-term, although it reflects specific real life conditions of environmental communication. We generally explain it in terms of situational malleability, particularly context sensitivity of evaluative judgments cognition (Schwarz 2007). Our empirical findings and their consequences for environmental communication are in alignment with an interesting study by Harrison and Mallett (2013), who used mortality salience (Greenberg, Solomon, and Pyszczynski 1997) manipulation directly in the context of pro-environmental values and human responsibility for the destruction of the

natural environment (ecoguilt). We fully agree with their results suggesting that ecoguilt creates a potential pro-environmental behaviour only in those who already actively endorse pro-environmental values.

## **Conclusions, limitations and future work**

We conclude that the current study has not provided sufficient evidence for a robust malleability of implicit and explicit attitudes by experimental manipulation in a laboratory setting. The inconclusiveness of the current study can be ascribed to several limitations of the experimental design. It looks like the effect of the manipulation was present in the data, but it was weak because of the indirect coupling between the independent and dependent variables. Our manipulation targeted the self-part of the human-nature relationship and accentuated especially the responsibility for the problematic state of nature, yet we tried to detect the effect on the general attitude to nature. In a way, we measured something different than we manipulated. We assume that the effect would be more robust on attitudes towards responsibility for the state of the natural environment, however we wanted to find out if this manipulation would be visible in basic attitudes. We suppose the explanation for the low significance of the results needs to be searched for in the operationalization and implementation of the experiment, especially in controlling our sample and in the participants' subjective strategies for interpreting the treatment material.

The trends in the sample divided by environmental profiles show that the manipulation probably has quite different effects based on the specific previous behaviour (choice of the field of study) relevant to worldview. Our results suggest that our treatment differentially affects groups with different worldviews. This promises that an even more robust effect could have been observed if we had taken the intragroup differences into account. The worldview division of a high and low environmental profile based just on the field of study is too rough due to the internal variation of the worldview in such groups. We suppose that a sample divided by some finer tool, like a scale of environmental profile, would decrease the variation and the effect of the EPS would become significant. It would be more appropriate to create the environmental profile through an assessed continuous worldview dimension and not as a social category.

We suppose that a substantial part of the data variability comes from the specific realization of the EPS treatment via the "Earth Song" video which contains not only the EPS but also offers a specific solution to the EPS. We were aware that such a complex message could have different connotations for different participants based on their background, yet we did not control for these differences because of the general point we tried to make – we were interested in effect of the general malleability of the connectedness to nature construct in the direction of environmental campaign research. Nevertheless, no matter the scope of possible interpretations, it would have been helpful to control for each participant's reception of the video content. From a methodological perspective, the design of the control group also suffers from a non-equivalent condition. While the participants exposed to the treatment watched a music video, the participants in the control group completely skipped the stimulation part.

We need to further highlight that the selected form of EPS manipulation is not ideally suited to the selected measurement tools. Environmental attitude measured as connectedness to nature is something different than holding an environmental paradigm (which may appear controversial) or a feeling of responsibility towards environmental problems. To create a broader understanding of our results, it would be useful to have a baseline for the chosen implicit measure where we could use clear raw nature treatment material, i.e. we should study the malleability effects with artificial natural environment exposure (pictures, or video of raw nature, cf. Mayer et al. 2009) and supplement our EPS treatment with the indirect measure of felt responsibility towards nature.

Our experimental study wanted to explore the situational malleability of selected attitudes towards nature by inducing a specific global context of human-nature relation and by framing the natural environment as a problem. We tried to adjust basic attitudes towards nature in accordance with the adhered worldview differences to reflect some environmental communication research. We also wanted to highlight some methodological aspects of attitudes research. We tried to follow Schwarz (2007: 640) in the conviction that the context sensitivity of evaluative judgements cognition, which is behind the malleability of attitudes, should be taken seriously and not just from a bias perspective. The research effort in optimizing our measuring tools of “true” behaviour predicting attitudes towards nature should be supplemented by giving more attention to the research of cognitive aspects of different social situations in which people encounter nature. An understanding of different implicit models of nature, and possibly also of the human-nature relation, could enroot the research of environmental attitudes in a broader cultural and consequently universal scope.

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