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Author/s:
Meis-Harris, J;Kashima, Y

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Navigating sustainably within the urban environment: The role of environmental identity and attitudes on sign and object evaluation

Abstract

In contemporary urbanised society, people are increasingly disconnected from nature. Environmental identity, as a promoter of various pro-environmental outcomes, may bridge the human-nature gap. However, it is less clear how environmental identity helps people to navigate sustainably within the urban environment. In three studies, we investigate how environmental identity relates to evaluations of two different types of item functions that populate the human-made environment: *signs* that communicate environmentally appropriate behaviours (e.g., recycling signs) and *objects* that are instrumentally used in everyday life (e.g., plastic bags). We also examine how environmental identity differs from other related environmental constructs (i.e., environmental attitudes and behaviours) in terms of their relationship with evaluations of signs and objects. Heider's balance theory (1958) helps us clarify this conceptual distinction, and in line with this analysis, we find that explicit environmental identity was associated with more positive evaluations of environmental signs communicative functions, but not objects instrumental functions. In contrast, pro-environmental attitudes are associated with function evaluations of environmentally harmful objects as a greater hindrance to sustainability. Thus, environmental identity and environmental attitudes help people to respond more pro-environmentally in the urbanised environment by informing them of the environmentally beneficial or harmful implications of signs and objects.

Key words

Environmental attitudes, environmental identity, human-made environment, objects, signs, prompts

With more than half the human population living in cities (United Nations, 2014), people are not only physically, but also culturally and psychologically disconnected from nature (Kesebir & Kesebir, 2017; Leung, Koh, & Tam, 2015; Wolff, Medin, & Pankratz, 1999). What helps people to reconnect with nature and to manage their life sustainably? *Environmental identity* may be an answer. It provides a psychological connection between a person and the natural environment (Clayton, 2003). Clayton and Opotow (2003) define environmental identity as "a sense of connection to some part of the nonhuman natural environment that affects the way we perceive and act toward the world; a belief that the environment is important to us and an important part of who we are" (pp. 45-46). A strong environmental identity motivates a broad spectrum of environmental behaviours such as waste reduction, eco-shopping, water and energy conservation (e.g., Brick & Lai, 2018; Clayton, 2003; Clayton, 2012; Kashima, Paladino, & Margetts, 2014; Mayer & Frantz, 2004; Schultz, Shriver, Tabanico, & Khazian, 2004; Whitmarsh & O'Neill, 2010). In other words, the research so far has provided a resounding affirmative to the question *whether* environmental identity helps people navigate sustainably within the urbanizing society.

In the present paper, we introduce the next generation of research questions about environmental identity, that is, *how* environmental identity helps people navigate sustainably within the contemporary urban environment. We examine how people with different environmental identity respond to the human-made environment, namely, the world created by humans and populated by human-made artefacts. In particular, we investigate how environmental identity relates to evaluations of two different types of items that populate our world and that have different functions: *signs* that communicate environmentally appropriate behaviours in an urbanised environment (e.g., recycling signs) and *objects* that are instrumentally used in everyday life (e.g., cars, coffee cups). If people with stronger environmental identity respond more positively to communications requesting pro-environmental behaviours (i.e., signs), then environmental identity is likely to help people

respond more pro-environmentally in an environment filled with these signs. Similarly, if people with stronger environmental identity regard environmentally beneficial objects (e.g., reusable coffee cups) as more beneficial to the environment, and harmful objects (e.g., non-reusable cups) as more harmful for the environment, then environmental identity is likely to help people respond more pro-environmentally in the environment filled with these items.

In what follows, we first discuss our rationale for the focus of the present research, i.e., people's evaluations of signs and objects, particularly, how an individual's environmental identity relates to his or her evaluations of signs and objects function. We then introduce our secondary research question, i.e., how environmental identity relates to evaluations of signs and objects differently to environmental attitudes and environmental behaviours. As we will argue below, Heider's (1958) balance theory helps us to clarify a theoretical reason for asking this secondary question.

Signs and Objects: Cultural Artefacts in the Human-Made Environment

"If you look at your surroundings right now, most things that you see are probably artefacts created by people to fulfil different functions. Chairs, pens, light bulbs, and computers are part of an artificial environment that humans have created for themselves" (Chaigneau, Puebla, & Canessa, 2016, p. 39). These lines clearly illustrate how artefacts surround our everyday activities in the contemporary world. Although the psychological implications of material artefacts have been investigated (e.g., Dittmar, 1992; Gosling, Ko, Mannarelli, & Morris, 2002; Kahneman, Knetsch, & Thaler, 1990; Morling & Lamoreaux, 2008), much less is known about how people interact with them within the context of environmental behaviour.

Environmental issue are presenting increasingly greater problems for humanity now and well into the future (IPCC, 2014). In order to sustainably participate in the world, humans need to be mindful of how their use of material artefacts (e.g., single-use plastic) influences the natural environment (e.g., plastic in the oceans). Objects such as coffee cups are artefacts that are instrumentally used in daily activities. Just as we use coffee cups to drink coffee, we use

objects as instruments to achieve our goals, and thus the instrumental function of objects is central to people's understanding about those objects (Chaigneau & Barsalou, 2008; Chaigneau et al., 2016; Futó, Téglás, Csibra, & Gergely, 2010). For instance, when people are asked to list features of a category of objects, they often include the behaviours that people perform with them, namely, the object's instrumental functions (Rosch & Lloyd, 1978; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976). Moreover, when people see objects, they see what the objects 'afford' them to do (Gibson, 1979), which Gibson called *affordances.* In accordance with this line of thinking, behavioural and neuroimaging studies found that when visually presented with an object, people not only perceive the object's visual properties, but also appear to activate object-relevant actions (Grèzes, Tucker, Armony, Ellis, & Passingham, 2003; Makris, Hadar, & Yarrow, 2011; Tucker & Ellis, 1998).

If indeed people perceive objects in terms of their instrumental function, they may not always perceive the objects' environmental implications. For instance, a carry bag with handles affords people to carry something in the bag while holding its handles. Although the affordance of plastic bags and reusable bags is the same in this regard, their effect on the natural environment is not. In order for people to behave more pro-environmentally in the human-made environment, they have to evaluate environmentally harmful objects as harmful, and beneficial objects as beneficial, so as to avoid or adopt them more appropriately.

However, instrumental objects are not the only artefacts. There are other human-made items that can help people with their pro-environmental behaviours. They are *signs*, which are a means of stationary communication by which the sign designer requests the perceiver to perform or not to perform a specific behaviour (e.g., McDougall, Curry, & de Bruijn, 1999; Meis & Kashima, 2017), and a number of studies have shown their effectiveness in shaping environmental behaviours (Kurz, Donaghue, & Walker, 2005; Sussman & Gifford, 2012; for a review see Meis & Kashima, 2017). The main function of signs is not instrumental, but *communicative.* Examples abound in daily life – a stop-sign at a corner prompting a driver to

stop – as well as in environmental contexts – "Turn off the light" prompt near a light switch, or "Reuse bag" on shopping bags. Put differently, environmental signs are reminders about how to interact with instrumental objects, prompting people to interact with them in environmentally friendly ways. For a sign to be effective, its message needs to be acted upon and thus a sign needs to be perceived and evaluated as effective in influencing one's behaviour (Meis & Kashima, 2017).

In the present research, our primary research question is how environmental identity relates to the evaluations of signs and objects. It is important to clarify what we mean when we talk about evaluations. That is whether people recognize the function of the artefact on the natural environment. In other words, the evaluation is about the artefact's function, which is a communicative function for environmental signs to help protect nature and an instrumental function for objects which can have beneficial or harmful consequences for nature. Evaluations can equally ask about the liking or disliking of artefacts or behaviours. For us, asking whether people like or dislike a sign or object would only show their personal preferences towards an artefact (e.g., a person likes the picture of the car we show or may not like this specific type of car) but it would not necessarily reveal anything about the artefact-nature relation. Because signs and objects have different environmental functions, we need to adjust our question about the function of these artefacts and how it relates with environmental identity. If environmental identity is associated with appropriate evaluations of the signs and objects function, it is likely to help people sustainably navigate through the artefact-filled environment. In addition, we examine a secondary research question, i.e., how environmental identity differs from environmental attitudes and environmental behaviours in its relationship with the evaluations of signs and objects. This is because there is a reason to believe this may be the case, and Heider's (1958) balance theory helps us clarify the reasoning.

Heider (1958) provides a theoretical framework in which to conceptualize our research questions clearly (see Figure 1). Heider's framework is concerned with a triadic relationship

among an individual person (P), an object (O), and another entity (X), that is, how the individual (P) relates to an object (O) and another entity (X) given a relation between the object O and the entity X. Now, our research questions can be conceptualized as investigations about the triadic relations among an individual, nature, and a cultural artefact, where P is the individual person whose environmental identity we are concerned with, O is nature or the natural environment, and X is a cultural artefact such as signs and objects.

Environmental Identity and Evaluations of Cultural Artefacts. Strong and positive environmental identity can be conceptualized as a unit relation between P (individual) and O (nature) in Heider's terminology (Heider, 1958, p. 200). P and O can be in a unit-forming relation when they are seen to be closely linked in one's phenomenal experience. Heider lists similarity and causality as examples, and we believe that identification is one such relation. Environmental identity can be an *explicit* proposition about one's self in relationship with nature, such as connectedness to nature (Mayer & Frantz, 2004), environmentalist identity (Van der Werff, Steg, & Keizer, 2013, 2014b; Whitmarsh & O'Neill, 2010), and environmental striving (Kashima et al., 2014; O'Brien et al., 2018). Alternatively, it may be an *implicit* cognitive association between the self and the natural environment. Schultz et al. (2004) suggested that a person's sense of connectedness to nature may not be conscious, and developed a measure of a person's implicit identification with the natural environment (e.g., Brick & Lai, 2018; Bruni & Schultz, 2010). Either way, conceptually, environmental identity appears to be all concerned with the P-O relation, that is, the relationship between the person and the environment.

Evaluation of a sign and evaluation of an instrumental object are concerned with different relations in the P-O-X triad. First, sign evaluation is about whether the sign (X) would influence a person and his or her behaviour (P), i.e., P-X relation. This is because the evaluation of a signs communicative function is about the judgement whether the sign as a reminder on how to interact with instrumental objects, is successful in prompting people to interact with

them in an environmentally friendly way. A sign asking the viewer to turn off the tap while brushing teeth, soaping hands and shaving communicates specifically what to do with the object (e.g., the tap). It's beneficial function for nature thus depends on whether the sign perceiver follows the direction or not.

In contrast, evaluation of an instrumental object is about whether it (X) benefits or harms nature (O), i.e., O-X relation. It thus captures whether people recognise the beneficial or harmful function of the object for nature. We purposefully disconnected the evaluation of the object from the person because there are many instances in which a person does not like or use a specific object, but still recognises its function for nature. For example, a person may not like or use a bike because she never learned how to ride it or the area in which she lives is too hilly. Nevertheless, the person recognises the environmental benefit of bikes in general. Similarly, a lot people are aware of the environmental damage of cars, but still drive a car because there is no public transport where they live or they do not like catching the train. Consequently, asking about the use or liking of an object does not seem to help us investigating the environmental beneficial or harmful function of an object in general. The wording of the sign and object evaluation thus addresses the specific function different artefact have on the environment. We therefore hypothesise that because of the different relations of signs (P-X relation) and objects (O-X relation), environmental identity may relate to evaluations of signs and objects differently.

FIGURE 1

According to Heider's balance principle, one relation depends on the state of the other two relations. Let us say that a relation is positive (+) if it is unit-forming or in some sense one is positively inclined to the other (e.g., linking, benefiting), whereas a relation is negative (-) if it is not unit-forming (or separate) or in some sense one is negatively oriented to the other (e.g., disliking, harming). A triad is balanced (imbalanced) if the product of the three relations is positive (negative). Heider suggests that there is a psychological tendency to balance the triad. Thus, if two relations are positive, the third is likely positive, whereas if one relation is positive

and another is negative, the third is likely negative. For instance, when a person (P) has a unit-forming relation with an object (O), and another entity (X) has a positive relationship with the object (O), the relationship between the person (P) and the entity (X) is likely to be positive because a positive P-X relation balances the triadic relations (unit-relation P-O and positive O-X). It follows then how environmental identity (P-O) relates to evaluation of a sign (P-X) depends on the O-X relation, i.e., whether the sign urges pro-environmental behaviour or not. If the sign is pro-environmental, an individual with strong environmental identity is likely to evaluate it positively, i.e., a positive association between environmental identity and environmental signs (see Table 1).

In contrast, how environmental identity (P-O) relates to evaluation of an instrumental object (O-X) depends on the P-X relation, i.e., whether the instrumental object is closely linked with the individual or not. In the absence of any specification of the P-X relation, then, environmental identity may or may not correlate with the evaluation of instrumental objects. For example, if a unit-forming relation exists between an individual and an instrumental object because the individual owns it (in fact, Heider, 1958, p. 178 and p. 201, mentions ownership as a unit-forming relation) or psychologically involved, environmental identity may influence evaluations of the instrumental object. A good example is a person's social identity as a car driver. This is a form of indirect identification with cars, which influence people's opinions about public transport use and policy support (Gardner & Abraham, 2007). Therefore, Heider's (1958) analysis would suggest that, if a specific unit-forming relation is not specified between an individual and a given instrumental object, his or her environmental identity may or may not be related to his or her evaluation about the instrumental object (see Table 1).

In addition, we explore how explicit and implicit measures of environmental identity are related to artefact evaluations. Studies using implicit environmental identity measures are relatively few, and it is useful to gain further information about their utility. For instance, Brick and Lai (2018) recently reported that explicit measures of environmental identity predicted self-

reported pro-environmental behaviours, but implicit measures did not. We will investigate whether explicit and implicit environmental identity measures show a similar pattern of relations with artefact evaluations.

TABLE 1

Environmental Attitudes and Environmental Behaviours. Our next research question is how environmental attitudes and environmental behaviours relate to evaluations of signs and objects differently from environmental identity. In answering this question, we hope to be able to conceptually distinguish environmental identity from environmental attitudes and environmental behaviours clearly, and provide empirical data about how environmental identity, attitudes, and behaviours differentially relate to artefact evaluations. This is an important issue because we can then find out what needs to be changed (identity, attitude, or behaviour) to influence people's relationships with their cultural artefacts (e.g., sign and instrumental object evaluation).

Environmental attitudes are broadly defined as concerns for the environment or the extent to which a person cares about environmental issues (Dunlap, Van Liere, Mertig, & Jones, 2000; Gifford & Sussman, 2012). At one level, environmental identity and environmental attitudes appear to be similar. From the perspective of balance theory (Heider, 1958), we conceptualize environmental identity as a unit-forming relation, whereas environmental attitudes may be more about the person's liking of nature. Nonetheless, they both imply a positive P-O relation, and indeed they both correlate with pro-environmental behaviours, and with each other (e.g., Whitmarsh & O'Neill, 2010). There is, however, some evidence to suggest that environmental identity is distinct from environmental attitudes, as environmental identity predicts environmental behaviour over and above environmental attitudes (e.g., Sparks & Shepherd, 1992; Whitmarsh & O'Neill, 2010). However, much less is known about precisely how environmental identity differs from environmental attitudes.

Environmental behaviours (De Leeuw, Valois, Ajzen, & Schmidt, 2015; Markle, 2013; Richetin et al., 2012) are another class of psychological constructs, whose conceptual distinctiveness needs to be further considered. Environmental behaviours are correlated with both environmental identity and environmental attitudes (e.g., Brick, Sherman, & Kim, 2017; Kaiser, Merten, & Wetzel, 2018; Whitmarsh & O'Neill, 2010). However, they are often cross-sectional correlational studies (Bamberg & Möser, 2007; De Leeuw et al., 2015; Iversen & Rundmo, 2002; Kuhlemeier, Van Den Bergh, & Lagerweij, 1999; Poortinga, Steg, & Vlek, 2004), and it is important to identify whether there are any portions of variance in environmental behaviours that are distinct from environmental identity and attitudes. Theoretically, it is quite likely that there are bidirectional cause-effect relations between environmental behaviours and environmental attitudes through dissonance reduction (e.g., Festinger & Carlsmith, 1954) or self-perception processes (Bem, 1972), and studies show that performing environmental behaviour can lead to more positive attitudes towards environmental policies (Poortinga, Whitmarsh, & Suffolk, 2013; Thøgersen & Noblet, 2012). Environmental behaviours and environmental identity are also likely to have a bidirectional relationship through self-perception processes, e.g., I always do pro-environmental things, and so nature must be an important part of who I am. Studies have shown, that when people perceive that they have acted in an environmentally friendly way, they are likely to express a stronger pro-environmental identity (Chaiken & Baldwin, 1981; Poortinga et al., 2013; van der Werff, Steg, & Keizer, 2014a; Van der Werff et al., 2014b).

There is an additional reason for investigating the ways in which environmental attitudes and environmental behaviours relate to artefact evaluations. Attari, DeKay, Davidson, and Bruine de Bruin (2010) investigated householders' evaluation of the extent to which a variety of objects and their use can save energy (e.g., energy efficient light bulbs), and found that most tend to underestimate the extent of energy use of environmentally harmful objects (e.g., air conditioner) and overestimate the extent of energy saving of environmentally beneficial objects

(e.g., setting thermostat lower in winter). Attari et al. (2010) reported that environmental attitudes and behaviours correlated differently with the accuracy with which people evaluated instrumental objects' environmental benefits and harmfulness. In particularly, environmental attitudes (as measured with the New Ecological Paradigm, NEP; Dunlap et al., 2000) were *positively* associated with more accurate evaluation of instrumental objects (for a similar finding, see Poortinga, Steg, Vlek, & Wiersma, 2003), but that self-reported environmental behaviours were *negatively* associated with evaluation accuracy of the instrumental objects' energy use.

Although they reported their results in terms of the accuracy of evaluations of instrumental objects, their results can be re-interpreted in terms of the extent to which people evaluated instrumental objects as beneficial or harmful to the natural environment. That is to say, given people's general tendency to overestimate the benefit of environmentally beneficial objects and to underestimate the harmfulness of environmentally harmful objects, Attari et al.'s (2010) findings imply that people generally evaluated environmentally beneficial objects' benefits to the environment too highly and environmentally harmful objects' harmfulness too low. That people with more positive environmental attitudes tended to be more accurate in their evaluation means that they tended to evaluate the environmentally beneficial objects as less beneficial, and environmentally harmful objects as more harmful. Re-interpreted this way, Attari et al.'s findings imply that environmental attitudes negatively, but environmental behaviours positively, correlated with the evaluations of instrumental objects.

Summary. In three studies, we investigate how environmental identity, environmental attitudes, and environmental behaviour relate to evaluations of environmentally relevant signs and objects. Evaluations of signs and objects shed light on the question whether people recognise the function that a particular artefact has on the environment. Based on Heider's (1958) balance theory, we expect environmental identity to be predictive of evaluations of environmental signs. In particular, we hypothesise that people with a strong environmental

identity will evaluate environmental signs as more influential than those with a weak environmental identity. However, we are less clear on the relation between environmental identity and the evaluation of environmental implications of instrumental objects. We test these hypotheses for both implicit and explicit environmental identity.

In addition, we examine whether environmental attitudes and environmental behaviours differentially predict the evaluation of signs and objects. The findings about energy evaluations (e.g., Attari et al., 2010) suggest that environmental attitudes as measured by the NEP (Dunlap et al., 2000) and environmental behaviours may predict the evaluation of instrumental objects differently. We then also explore how they relate to the evaluation of environmental signs.

Study 1

Study 1 focused on the relationship between environmental attitudes and identity with objects and signs.

Method

Participants. As we are the first to explore the relation between environmental identity and environmental attitudes with sign and object evaluations, we followed the general lab policy of approximately 80-100 participants to detect correlations of .3 with $\alpha = .05$ and an effect size of .80 (see aswell Faul, Erdfelder, Buchner, & Lang, 2009). In the end, 87 Australian psychology students took part for course credit (60 females; M_{age}=20.01, SD=4.75).

Materials. The following materials were used:

Signs. Seventy-one sign pictures were sourced from the internet. Half the signs communicated environmentally relevant actions covering recycling, paper use, water use, electricity use, and sustainable transport; the other half environmentally irrelevant actions related to safe community living, hospital, emergency, marine traffic, and construction (see SuppInfo Table A1.1). A separate group of 50 participants, who did not participate in this experiment, judged the majority of signs, on whether it advises about environmentally relevant

information (i.e., environmentally friendly behaviour and wildlife) or environmentally irrelevant information (e.g., health and first aid). Participants had to indicate one out of eight possibilities. Signs characterized as advising about environmentally relevant information were included as environmental signs.

Objects. Seventy-five object pictures (25 environmentally harmful objects, 25 environmentally beneficial objects, 25 environmentally neutral objects) related to the sign categories (e.g., recycling, water use) were taken from the internet and rated by two independent judges whether the object was environmentally harmful, irrelevant, or beneficial. In case of disagreement, the object was rated by a third person (see SuppInfo Table A1.2).

Procedure and measures. Participants took part in this study online and were first shown 35 signs randomly sampled from the 71 signs. Then, participants were shown 25 objects randomly sampled from the 75 objects. Following the sign and object evaluations, the measures of environmental attitude and environmental identity were administered in random order.

Sign evaluation. Each sign was presented for five seconds, and participants indicated how likely the sign would impact their behaviour on a scale from 0 *(not likely at all)* to 100 *(very likely)*. Whether a message was perceived to be likely to affect one's behaviour, was a valid predictor of actual effectiveness in various situations (e.g., dieting, smoking cessations, Brennan, Durkin, Wakefield, & Kashima, 2014; Dillard, Weber, & Vail, 2007; Dixon et al., 2015) and thus facilitating how the effectiveness of signs can be investigated (Meis & Kashima, 2017). The mean of all environmental signs was used as the sign evaluation score.

Object evaluation. Participants were asked to indicate how helpful each object would be for ten different goals (five environmentally relevant goals: e.g., to increase recycling and reuse of things, to conserve water; five environmentally neutral goals: e.g., to increase safe community living, to increase first aid and medical help) on a scale ranging from 1 (*hinder)* to 7 (*help).*

For each object, we calculated the mean across the five environmental goals and sorted all objects in decreasing order. The top 20 objects were grouped as environmentally beneficial objects (e.g., solar car, bike); the bottom 20 objects were grouped as environmentally harmful objects (e.g., plastic bag, air conditioner; see SuppInfo Table A1.2). Two objects (elevator and gun) were deemed inappropriate and excluded.

Two types of object scores were calculated: Firstly, the mean score of the top 19 environmentally beneficial (referred to as *beneficial objects Mean)* and bottom 19 environmentally harmful objects (referred to as *harmful objects Mean)*, indicating the average level of helpfulness in achieving the five environmental goals.

Given that this score was based on the mean evaluation of all five pro-environmental goals, it may be too general. Therefore, we calculated a second score focusing on the most relevant goal. For environmentally beneficial objects, the mean score based on the highest out of the five environmental goal evaluations was calculated across the 19 beneficial objects (referred to as *beneficial objects Max)*. Similarly, for environmentally harmful objects, the mean score based on the lowest environmental goal evaluations was calculated (referred to as *harmful objects Min)*.

Evaluation scores were also calculated for environmentally ambivalent objects (i.e., those objects that are evaluated as not clearly beneficial or harmful); however, results were no different from the previous scores and will not be reported here.

New ecological paradigm (NEP). The 15-item New Ecological Paradigm by Dunlap et al. (2000) was used to measure environmental attitudes (e.g., “When humans interfere with nature it often produces disastrous consequences”; 1=*strongly disagree*; 5=*strongly agree;* α=.81; *M*=3.51; *SD*=0.47).

Environmentalist Identity (EI). To measure environmentalist identity the 4-item scale by Whitmarsh and O’Neill (2010) was administered (e.g., “I think of myself as an

environmentally-friendly consumer"; 1=*strongly disagree*; 5=*strongly agree;* α=.62; *M*=3.76; *SD*=0.57).

Environmental Striving (ES). The 4-item measure of environmental striving by Kashima et al. (2014) was included (e.g., "I feel a lot of sorrow or unhappiness when I fail to sustain or improve the natural environment"; 1=*strongly disagree*; 5=*strongly agree;* α=.84; *M*=3.38; *SD*=0.67).

Low Carbon Readiness Index (LCRI). Participants' striving to reduce carbon emission was measured with the 3-item Low Carbon Readiness Index (O'Brien et al., 2018). Agreement was given on items like "I work hard to reduce my greenhouse gas emissions whenever possible" (1=*strongly disagree*; 5=*strongly agree;* α=.78; *M*=3.52; *SD*=0.67).

Results and discussion

For all three studies, we focused on partial correlation to determine the unique association between environmental constructs and evaluations of signs and objects, while controlling for the remaining constructs. For Study 1, we controlled for environmental identity measures when looking at the association between environmental attitudes and evaluations of signs and objects and for environmental attitudes when investing the association between environmental identity and cultural artefacts. We only report partial correlations in the text, but included zero order correlations in the tables.

TABLE 2

Environmental Signs. Both environmental attitudes (*pr*(NEP)=.27, *p*=.01) and identity (*pr*(EI)=.39, *p*<.001; *pr*(ES)=.49, *p*<.001; *pr*(LCRI)=.45, *p*<.001) were positively related to environmental sign evaluations when controlling for the respective other (see Table 2).

Environmentally harmful objects. Environmental attitudes were negatively related with evaluations of environmentally harmful objects, when controlling for environmental identity constructs; (*pr*(NEP)=-.40, *p*<.001 for Harm. O. Mean; *pr*(NEP)=-.31, *p*<.001 for Harm. O. Min), but environmental identity was not (see Table 2).

Study 1 suggest that environmental attitudes and identity are related to evaluations of environmental signs, but only environmental attitudes are associated with evaluations of environmentally harmful objects.

Study 2

Study 2 replicated and expanded on Study 1 by adding a further explicit environmental identity measure and including implicit environmental identity. Furthermore, environmental behaviour was included. A smaller selection of signs and objects was used to reduce the repetitive nature of the sign and object evaluation task and to not extend the time of the experiment.

Method

Participants. According to G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007), for power = .8 and α = .05 with an effect size of r = .27 (based on lowest correlations between environmental attitudes and sign in Study 1), we needed at least 83 participants. In the end, we recruited 98 Australian psychology students taking part for course credit (73 females; M_{age}=19.78, SD=4.91).

Procedure and measures. Half the participants responded to measures of environmental attitudes and identity before evaluating signs and objects; the other half performed the same tasks in the opposite order. Analysis revealed that task order did not influence responses; task order was therefore not included in the subsequent analyses.

For the evaluation task, participants rated six signs randomly sampled from 15 signs selected from Study 1, and six objects randomly sampled from 20 objects as in Study 1 (see SuppInfo Table B1.1 and B1.2 for signs and objects). Signs and objects were based on familiarity ratings (see Meis & Kashima, 2017) and covered the same five environmental and non-environmental areas as in Study 1. The same scoring procedure was followed. Lastly,

environmental behaviours were measured. Measures new to Study 2 were reported below (see SuppInfo Table B 2.1 for detailed information about all measures).

Connectedness to Nature (CNS). The 14-item Connectedness to Nature scale from Mayer and Frantz (2004) was administered (e.g., "I often feel disconnected from nature"; 1=*strongly disagree*; 5=*strongly agree;* α=.80; *M*=3.38; *SD*=0.54).

Implicit environmental identity (GNAT). To measure a person's implicit environmental identity a go/no-go association task (GNAT) based on Schultz et al.'s (2004) implicit association with nature task (IAT) was developed. Participants saw a target and an attribute category, and decided whether a briefly presented stimulus was part of the target or attribute category by pressing the spacebar (i.e., 'go' response). If the presented stimuli did not belong to either category, participants had to do nothing (i.e., 'no-go' response). In total, four blocks each with 64 randomly presented trials were shown and following Williams and Kaufmann (2012) recommendations thus resulting in adequate to very good reliability. Target categories were either 'nature' or 'built' for 'built environment' and attribute categories 'me' or 'not me'. Target/attribute words were the same as in Schultz et al. (2004). D-prime was used to calculate the proportions of correct reactions for target/attributes (i.e., 'go' responses to target items) and false alarms (i.e., 'go' responses to distracter items). These were converted to z-scores, and false alarms were subtracted from hits. Final d-primes for association between nature and me ('Nature Me') and association between built environment and me ('Built Me') ranged between -2 and +2 with higher scores indicating a stronger implicit association (*M*=0.00; *SD*=0.77 for Built Me and *M*=0.94; *SD*=0.77 for Nature Me).

We chose the GNAT over the IAT because its interpretation is more flexible and it allows each category to be read independent of the other (e.g., nature and me as opposed to nature and not me; Nosek & Banaji, 2001; Williams & Kaufmann, 2012)

Environmental behaviours. Three scales measured participants' engagement in environmental behaviours.

Environmental scenarios. Participants read two short stories, in which they were the main character and asked what they would do in these situations (Richetin et al., 2012). An example scenario was: “You are in your bathroom cleaning your teeth. You know that by closing the tap you would consume less water, but you find it very inconvenient to have to close it and then to open it again”. Participants rated the likelihood of reducing resource consumption (0=*not likely at all*; 100=*very likely).*

Self-reported environmental behaviour. Participants stated how frequently they performed six routine environmental behaviours taken from Richetin et al. (2012). An example items was “Switching off the lights” (0=*never;* 100=*always).*

Pro-environmental behaviour. The 13-item pro-environmental behaviour scale by De Leeuw et al. (2015) was administered (e.g., “I leave the TV on while I’m doing other things in the house”; 1=*never;* 5=*always).*

A principal component analysis showed that all three environmental behaviour measures loaded onto one component; the scores were standardised and averaged to compute a composite environmental behaviour score (see SuppInfo B1.3).

Results and discussion

TABLE 3

Environmental signs. Unlike Study 1, only measures of explicit environmental identity were related to environmental sign evaluations when controlling for environmental attitudes, implicit measures and behaviour; *pr*(EI)=.33, $p<.001$; *pr*(ES)=.29, $p=.01$; *pr*(LCRI)=.38, $p<.001$; *pr*(CNS)=.43, $p<.001$ (see Table 3).

Environmentally harmful objects. Repeating findings from Study 1, environmental attitudes were correlated with evaluations of harmful objects when controlling for environmental identity constructs, implicit environmental identity, and behaviour (*pr*(NEP)=-.24, $p=.04$ for Harm. O. Mean), but environmental identity was not (see Table 3).

Measures of implicit environmental identity and environmental behaviours did not correlate with any evaluations.

Study 2 shows that constructs of environmental identity were related to sign evaluations while environmental attitudes were again associated with evaluations of harmful objects.

Study 3

In Study 3, we increased the sample size due to the experimental nature of the study and used three slightly different environmental behaviour scales to capture broad ranges of environmental behaviours.

Method

Participants. A total of 121 psychology students volunteered to participate as part of a course requirement (76 females, one participant did not indicate gender; M_{age}=20.65, *SD*=5.52). Due to a priming condition unrelated to this study, the sample size for Study 3 was increased.

Procedure and measures. Participants were randomly assigned to a control or environmental priming condition as part of a task unrelated to the present study. Given that priming did not influence the evaluation of signs and objects, we do not further report findings here (see SuppInfoC1.1 for more details). First, participants responded to constructs of environmental attitudes and environmental identity. Second, they rated four signs randomly sampled from the same 15 signs as in Study 2, and then four objects randomly sampled from the same 20 objects as in Study 2. Due to the additional tasks in Study 3, we decided to reduce the sign and object selection further. Finally, environmental behaviours were measured. As Study 2 did not show any differences regarding task order, the order of the tasks was the same for all participants. Measures new to Study 3 were reported below (see SuppInfo Table C 2.1 for detailed information about all measures).

Environmental behaviour. To capture a range of environmental behaviours, we used three slightly different measures.

Environmental scenarios. Two additional scenarios were added to Richetin et al. (2012) scenarios in Study 2 and rated on the same scale.

Simple environmental behaviours. A 5-item measure assessed environmental behaviours, typically occurring in a student's life, based on Richetin's scale (2014). A sample item was "How often do you read a pdf instead of printing a document?" (1=*never,* 5=*always).*

Pro environmental behaviour. Markle's (2013) pro-environmental behaviour scale was used as a measure of a more holistic sustainable lifestyle (e.g., "How often do you cut down on heating or air conditioning to limit energy use?")

All three environmental behaviour measures loaded onto one component and the same procedure was followed as in Study 2 (see SuppInfo C1.2).

Results and discussion

TABLE 4

Environmental signs. As in Study 2, explicit measures of environmental identity were positively correlated with sign evaluations, when controlling for attitudes, implicit identity and behaviour (*pr*(EI)=.23, *p*=.02; *pr*(ES)=.35, *p*<.001; *pr*(LCRI)=.35, *p*<.001; *pr*(CNS)=.31, *p*<.001), but environmental attitudes were not. Unlike Study 2, the implicit measure Built Me was negatively correlated with sign evaluations, when controlling for measures of environmental attitudes, explicit identity, and behaviour (*pr*(Built Me)=-.20, *p*=.04; see Table 4).

Environmentally harmful objects. As in the previous studies, environmental attitudes were negatively correlated with evaluations of harmful objects (*pr*(NEP)=-.25, *p*=.03 for Harm. O. Min), but environmental identity was not (see Table 4).

Study 3 replicates the findings from Study 2 showing again that explicit and not implicit environmental identity relates with sign evaluations and environmental attitudes with evaluations of environmentally harmful objects. Environmental behaviour was no longer related with environmental signs when we controlled for attitudes, explicit and implicit identity.

General discussion

Across all studies, all explicit environmental identity constructs were consistently positively related to evaluations of environmental signs but not objects. Environmental attitudes on the other hand, were consistently negatively associated with the evaluations of environmentally harmful objects. Overall, these findings suggest that explicit environmental identity, but also environmental attitudes play a role in navigating sustainably through the artefact-filled environment, and Heider′s (1958) balance theory helped to conceptualise these relationships. By looking at the unique portion of the variance of each environmental construct, we showed how environmental identity and attitudes, both characterising the person-nature relationship in Heider′s triad, differently relate to the evaluation of environmental signs (focusing on the person-artefact relation) and instrumental objects (addressing the nature-artefact relation). It seems possible that the unique variance that differentiates environmental identity and environmental attitudes, may be responsible for the positive correlation between signs and constructs of environmental identity. Implicit environmental identity and environmental behaviour do not seem relevant in the evaluation of cultural artefacts.

Unlike explicit environmental identity, implicit identity was not consistently related with evaluations of signs and objects. Studies suggest that implicit and explicit measures may tap distinct underlying constructs and therefore not be consistently related with the same outcomes (Bissing-Olson, Iyer, Fielding, & Zacher, 2013; Bosson, Swann Jr, & Pennebaker, 2000; Bruni & Schultz, 2010). Findings by Brick and Lai (2018) showing that explicit but not implicit environmental identity predicts environmental behaviour support this assumption in the environmental domain. More recent theorising about implicit associations refers to the Bias of Crows (Payne, Vuletich, & Lundberg, 2017), suggesting that implicit associations are better understood as properties of groups rather than individuals. Within this line of thinking stronger correlations could be expected when group levels of implicit environmental identity are correlated with group-level evaluations of signs and objects. Future research could look more

closely into this link. Similarly, people′s engagement in environmental actions was not related to sign and object evaluations. It seems that our 'internal green compass′ consisting of explicit environmental identity and attitudes has a greater influence on the evaluation of artefacts. It could be possible that by partialling out the shared variance of environmental identity and attitudes, the unique variance of behaviour captures more habitual behavioural processes that require little conscious processing. In this regard, behaviour may be seen more similar to implicit processes that also did not relate to evaluations of signs and objects. The conscious nature of the evaluation task (i.e., thinking about the impact of a sign for one′s own behaviour or an object for nature) may not be compatible with more unconscious processes of implicit measures and potentially habitual behaviour.

Overall, these findings provide important insights into how both environmental identity and environmental attitudes may help people navigate sustainably through modern society. Although environmental identity and environmental attitudes have some shared variance, the difference between them still seems to matter in the relationship with signs and objects. It is important to consider how we measured environmental identities and attitudes. Whereas the focus of this study was on environmental identity and we captured it through using a few different measures (i.e., environmentalist identity, environmental striving, low-carbon-readiness index, and connectedness to nature), we measured environmental attitudes with the New Ecological Paradigm (NEP) one of the most widely used measures (Kaiser, Wölfing, & Fuhrer, 1999; Stern, Dietz, & Guagnano, 1995). Unlike measures of environmental identity, the NEP captures the environmental beliefs around the broader implications of humanity on nature. It thus may address the Person-Nature (i.e., P-O relation) less direct as measures of environmental identity. This has implication on what we may need to target (i.e., environmental identity) to increase the effectiveness of signs differently to increasing the perceptions about the harmful environmental implications of objects (i.e., environmental beliefs and attitudes). Endorsing a strong environmental identity is associated with evaluating environmental signs as

affecting one's behaviour, thus increasing the likelihood of following the signs' requests (e.g., turning off lights). However, those with a strong environmental identity are already the people engaging in more pro-environmental actions (e.g., Brick & Lai, 2018; Clayton, 2003; Clayton, 2012; Kashima et al., 2014; Mayer & Frantz, 2004; Schultz et al., 2004; Whitmarsh & O'Neill, 2010). From this perspective, signs and prompts may not reach the right target group and therefore be less influential in promoting sustainability. Fostering environmental identity may consequently be one way to increase the effectiveness of signage, and more broadly the effectiveness of pro-environmental communication. Environmental identity is driven partly by environmental values and partly by past environmental actions (Van der Werff et al., 2014b). Means to promote environmental values and actions may therefore not only foster a stronger identification with nature but also a greater compliance with environmental signs and communications. Environmental values represent stable individual difference characteristics that are learned over time and that are not easily changed (Dietz, Fitzgerald, & Shwom, 2005; Stern & Dietz, 1994). Cultivating pro-environmental values in an early age through educational programs in kindergartens and schools (Steg, 2016) may be one mechanism to foster environmental identity. Engagement in pro-environmental behaviours can be increased through the use of a various behaviour change interventions as outlined in Michie, van Stralen, and West (2011) for example, and applied to increase recycling (Gainforth, Sheals, Atkins, Jackson, & Michie, 2016) and energy saving in the workplace (Staddon, Cycil, Goulden, Leygue, & Spence, 2016). Similarly, this route is likely to foster further environmental identity.

On the other hand, characteristics of the sign itself can increase its effectiveness, independent of the sign's perceivers' environmental stance (Meis & Kashima, 2017). This research suggested that signs with which the viewer is highly familiar (e.g., universal recycling sign with the three arrows) and are easy to understand (e.g., the clarity of the sign's purpose is high so that the viewer knows what the sign asks her or him to do) can increase perceived effectiveness. Perceived effectiveness is in turn a valid predictor for actual message

effectiveness in various studies (Brennan et al., 2014; Dixon et al., 2015). In sum, to make use of signs as an inexpensive way to change behaviour and provide feedback in our highly modified world, it is important to address characteristics in the sign perceiver (i.e., environmental identity) as well as characteristics of a sign (i.e., clarity of the sign, Meis & Kashima, 2017).

To affect evaluations of objects, so that people can recognise the harmful impact of some instrumentally used objects, the findings of this paper suggest that people need to be encouraged to think in line with the NEP. Just as Attari et al. (2010) found that NEP is related to more accurate perceptions of energy use and energy savings, NEP may help to understand the impact of human artefact use on the natural environment. The NEP addresses aspects of an ecological worldview relating to the fragility of nature, the reality of limits on growth, and the possibility of an eco-crisis. These abstract cognitions about nature may sensitise people further to environmental implications of harmful objects. As a measure of a person's environmental worldview or belief, the value-belief-norm theory (Stern, Dietz, Abel, Guagnano, & Kalof, 1999) is likely to provide insights on how to improve NEP aligned thinking. Consequently, fostering environmental values may not only be important for the evaluation of signs through environmental identity, but also for the evaluations of environmentally relevant objects as related to environmental attitudes.

Limitations and future directions

This research has some limitations that should be addressed in future work. Firstly, whereas environmental identity was the focus of this work and we measured various aspects of it, the current research used only one measure of environmental attitudes. Although the NEP is one of the most prominent attitudinal measures in environmental psychology (Kaiser et al., 1999; Stern et al., 1995), future research may use a more diverse set of measures similar to the environmental identity constructs, to support the validity of the results. Secondly, this research incorporated measures of implicit and explicit environmental identity and found associations of

environmental signs predominantly with explicit measures of environmental identity. Although this is in line with Brick and Lai's (2018) findings, given that we are the first to use the go/no-go task as a measure of implicit environmental identity, future research may provide further support for the validity of the go/no-go task in measuring environmental identity. Lastly, findings are based on Australian university students with similar cultural backgrounds. In general, university students are often reported as having strong orientations to sustain the natural environment (Van der Werff et al., 2014b). Similarly, environmental attitudes have been shown to differ between cultures (Tam & Chan, 2017). Consequently, the results may not be easily generalisable for the broader population in regards to different age groups and non-western cultures. For future research, it would be advisable to focus on a broader and more diverse sample to gain a more representative picture.

Conclusion

The present study provides initial evidence about how environmental identity helps to navigate sustainably within the urban environment by increasing the odds to follow an environmental sign and how it differs from environmental attitudes that raise awareness about the environmentally harmful aspects of some objects. Both environmental identity and environmental attitudes help people to respond more pro-environmentally to an environment filled with human-made artefacts. Overall, these insights highlight the importance of environmental identity and environmental attitudes for sustainably urban living and will hopefully encourage further investigations.

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Tables

Table 1

Hypothesised Relations between P-O, O-X, and P-O relations according to the balance principle.

P-O Relation		**O-X Relation**		**P-X Relation**	
Environmental Identity	+	Environmental Sign	+	Sign Evaluation	+
		IO Evaluation	?	Unknown	?
Environmental Identity	-	Environmental Sign	+	Sign Evaluation	-
		IO Evaluation	?	Unknown	?

Note. IO Evaluation=Instrumental Object Evaluation.

Table 2

Zero order and partial correlations for Study 1

		Attitudes[1]	**Explicit Environmental Identity**[2]		
		NEP	EI	ES	LCRI
Env. Signs	Zero	-.01 (.91)	**.35** (.00)	**.46** (.00)	**.41** (.00)
	Partial	**.27** (.01)	**.39** (.00)	**.49** (.00)	**.45** (.00)
Harm. O. Mean	Zero	**-.43** (.00)	**-.23** (.03)	-.04 (.70)	-.03 (.80)
	Partial	**-.40** (.00)	-.07 (.51)	.09 (.40)	-.16 (.14)
Harm. O. Min	Zero	**-.36** (.00)	**-.26** (.02)	-.05 (.66)	-.05 (.62)
	Partial	**-.31** (.00)	-.13 (.24)	.05 (.57)	.09 (.39)
Ben. O. Mean	Zero	.05 (.65)	.10 (.36)	.08 (.45)	.11 (.31)
	Partial	-.01 (.91)	.09 (.43)	.07 (.51)	.10 (.37)
Ben. O. Max	Zero	.07 (.50)	.03 (.77)	-.01 (.92)	.01 (.95)
	Partial	.07 (.55)	.00 (.99)	-.03 (.76)	-.02 (.84)

Note. [1]Attitudes controlling for EI, ES, LCRI in partial correlation; [2]Explicit Env. Identity controlling for NEP in partial correlation; significant correlations highlighted in bold.

Table 3

Zero order and partial correlations for Study 2 with p-values in brackets

		Attitudes[1]	**Explicit Environmental Identity**[2]				**Implicit Environmental Identity**[3]		**Behaviour**[4]
		NEP	EI	ES	LCRI	CNS	Nature Me	Built Me	Behaviour
Env.	Zero	.15	**.35**	**.32**	**.40**	**.44**	-.04	-.01	.07
Signs	*(p)*	(.15)	(.00)	(.00)	(.00)	(.00)	(.70)	(.89)	(.49)
	Partial	-.11	**.33**	**.29**	**.38**	**.43**	-.05	-.04	-.09
	(p)	(.31)	(.00)	(.01)	(.00)	(.00)	(.62)	(.69)	(.40)
Harm.	Zero	**-.27**	-.12	-.03	-.02	-.05	-.08	.16	-.02
O. Mean	*(p)*	(.01)	(.28)	(.81)	(.87)	(.65)	(.48)	(.13)	(.85)
	Partial	**-.24**	.01	.06	.05	.05	-.08	.14	.04
	(p)	(.04)	(.95)	(.57)	(.63)	(.69)	(.49)	(.22)	(.76)
Harm.	Zero	-.15	-.06	.03	.05	.03	.03	.05	.03
O. Min	*(p)*	(.17)	(.60)	(.79)	(.68)	(.78)	(.80)	(.64)	(.77)
	Partial	-.15	-.01	.06	.09	.07	.04	.04	.06
	(p)	(.20)	(.92)	(.59)	(.44)	(.52)	(.75)	(75)	(.61)
Ben. O.	Zero	-.01	-.07	-.11	.08	.04	-.18	-.11	-.14
Mean	*(p)*	(.95)	(.56)	(.31)	(.47)	(.73)	(.10)	(.34)	(.20)
	Partial	.04	-.04	-.08	.14	.07	-.18	-.14	-.13
	(p)	(.70)	(.73)	(.48)	(.23)	(.53)	(.10)	(.22)	(.28)
Ben. O.	Zero	.00	.04	-.04	-.04	.03	-.14	-.04	-.10
Max	*(p)*	(.97)	(.70)	(.73)	(.73)	(.80)	(.19)	(.71)	(.38)
	Partial	.01	.08	-.01	-.03	.05	-.16	-.03	-.10
	(p)	(.96)	(.46)	(.92)	(.82)	(.64)	(.17)	(.80)	(.38)

Note. [1]Attitudes: controlling for EI, ES, LCRI, CNS, Nature Me, Built Me, Behaviour in partial correlation; [2]Explicit Env. Identity: controlling for NEP, Nature Me, Built Me, and Behaviour in partial correlation [3]Implicit Env. Identity: controlling for NEP, EI, ES, LCRI, CNS, and Behaviour in partial correlation; [4]Behaviour: controlling for NEP, EI, ES, LCRI, CNS, Nature Me, Built Me in partial correlation; significant correlations highlighted in bold.

Table 4

Zero order and partial correlations for Study 3 with p-values in brackets

		Attitudes[1]	**Explicit Environmental Identity[2]**				**Implicit Environmental Identity[3]**		**Behaviour[4]**
		NEP	EI	ES	LCRI	CNS	Nature Me	Built Me	Behaviour
Env.	Zero	.17	**.31**	**.43**	**.43**	**.40**	.02	**-.23**	**.28**
Signs	*(p)*	(.07)	(.00)	(.00)	(.00)	(.00)	(.84)	(.01)	(.00)
	Partial	-.01	**.23**	**.35**	**.35**	**.31**	.04	**-.20**	-.04
	(p)	(.89)	(.02)	(.00)	(.00)	(.00)	(.67)	(.04)	(.67)
Harm.	Zero	-.21	-.07	.00	-.02	.01	.05	.01	-.01
O. Mean	*(p)*	(.06)	(.50)	(.99)	(.85)	(.89)	(.67)	(.94)	(.91)
	Partial	-.21	.01	.05	.00	.08	.01	.01	.03
	(p)	(.07)	(.92)	(.68)	(.97)	(.47)	(.92)	(.96)	(.81)
Harm.	Zero	**-.25**	-.09	-.05	-.02	.00	-.01	.06	-.03
O. Min	*(p)*	(.02)	(.43)	(.67)	(.83)	(.99)	(.92)	(.56)	(.81)
	Partial	**-.25**	.01	.01	.02	.09	-.05	.06	.06
	(p)	(.03)	(.93)	(.96)	(.89)	(.43)	(.65)	(.58)	(.62)
Ben. O.	Zero	.19	**.26**	.07	.16	.03	.01	-.01	.12
Mean	*(p)*	(.08)	(.01)	(.48)	(.15)	(.78)	(.96)	(.90)	(.28)
	Partial	.10	.18	-.02	.12	-.06	.08	-.03	.01
	(p)	(.39)	(.10)	(.85)	(.29)	(.58)	(.49)	(.79)	(.94)
Ben. O.	Zero	**.22**	.08	.02	.10	.13	.05	-.05	-.01
Max	*(p)*	(.04)	(.46)	(.84)	(.36)	(.23)	(.61)	(.63)	(.95)
	Partial	.19	.02	.00	.11	.11	.09	-.06	-.08
	(p)	(.08)	(.83)	(.99)	(.30)	(.31)	(.40)	(.60)	(.47)

Note. [1]Attitudes: controlling for EI, ES, LCRI, CNS, Nature Me, Built Me, Behaviour in partial correlation; [2]Explicit Env. Identity: controlling for NEP, Nature Me, Built Me, and Behaviour in partial correlation [3]Implicit Env. Identity: controlling for NEP, EI, ES, LCRI, CNS, and Behaviour in partial correlation; [4]Behaviour: controlling for NEP, EI, ES, LCRI, CNS, Nature Me, Built Me in partial correlation; significant correlations highlighted in bold.