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Testing VBN theory in Japan: Relationships between values, beliefs, norms, and acceptability and expected effects of a car pricing policy

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ABSTRACT

The VBN (value-belief-norm) theory of environmentalism postulates that values influence pro-environmental behaviour via pro-environmental beliefs and personal norms. A few studies provided support for the theory in explaining pro-environmental behaviour in Europe and Latin America. Beyond these studies, the question remains to what extent the VBN theory can also explain pro-environmental beliefs, norms, and behaviour in other cultures. This study tests the VBN theory in Japan and demonstrates that, as expected, the more people endorse biospheric values, the stronger they believe that car use has negative environmental impacts, the more they feel responsible for the problems caused by car use, and the more they feel personally obliged to reduce their car use. In contrast, stronger hedonic and, to a lesser extent, stronger egoistic values were related to less strong pro-environmental beliefs and norms. Furthermore, support was found for the mediation effects of pro-environmental beliefs in the relationships between hedonic and biospheric value orientations and norms. The VBN theory explained the acceptability and expected effects of a car pricing policy on an individual's transport choices, but less strongly than in previous studies. Interestingly, biospheric and hedonic values not only predicted adjacent beliefs, but also other beliefs and norms farther down the causal chain, suggesting that values play an important role in promoting sustainable mobility.

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1. Introduction

Environmental problems, such as climate change and urban air pollution caused by human behaviour, have been increasing (e.g., IPCC, 2014; UNEP, 2012). In order to mitigate these problems, we must consider how to change human behaviour to become environmentally-friendly. For that, it is important to know which factors influence behaviour. Many scholars argue that values influence or guide preferences and behaviour (e.g., Lewin, 1951; Rokeach, 1973; Steg & De Groot, 2012). Values reflect general goals that people strive for in life (Schwartz, 1992). It is generally believed that values influence behaviour mostly indirectly, through more specific beliefs, attitudes, and norms (e.g., Ajzen & Fishbein, 1972; Dietz, 2015; Feather, 1995; Fujii & Taniguchi, 2014; Nordlund & Garvill, 2002, 2003; Oreg & Katz-Gerro, 2006). This has been further specified by the value-belief-norm (VBN) theory of environmentalism (Stern, 2000; Stern, Dietz, Abel, Guagnano, & Kalof, 1999). The VBN theory specifies that three types of value orientations, notably egoistic, altruistic, and biospheric value orientations,

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determine pro-environmental behaviour. People with strong egoistic values will particularly value and consider consequences for their personal resources. In contrast, those with strong altruistic values will focus more on consequences for other people. Finally, people with strong biospheric values will focus on consequences for nature and the environment. The VBN theory proposes that these value orientations affect ecological worldviews, that is, people's general beliefs about the relationship between humans and the environment, as reflected in the revised new ecological (environmental) paradigm (NEP; Dunlap, Van Liere, Mertig, & Jones, 2000; Hawcroft & Milfont, 2010). In turn, ecological worldviews are proposed to influence pro-environmental behaviour through awareness of adverse consequences of behaviour for the environment (awareness of consequences, or AC) and one's perceived ability to avert these threats (ascription of responsibility, or AR), which is believed to create the feeling of a moral obligation to act pro-environmentally (personal norms, or PN). Yet, the theory also proposes that direct effects may take place further downstream than the adjacent variable. For example, values may influence directly not only AC but also AR, PN, and behaviour.

The VBN theory has received some empirical support and proven to be successful in explaining self-reported behaviours and behavioural intentions in some countries and cultures. For example, Stern et al. (1999) found that the VBN theory was predictive of three types of environmental actions in the US: consumer behaviour (i.e., frequency of buying environmentally-friendly products), willingness to make sacrifices to protect the environment (e.g., willingness to pay much higher taxes in order to protect the environment), and environmental citizenship (e.g., signing a petition in support of protecting the environment, donating money to an environmental group). Moreover, the VBN theory proved successful in explaining the acceptability of energy policies in the Netherlands (Steg, Dreijerink, & Abrahamse, 2005), self-reported energy conservation behaviour in Tunisia (Ibtissem, 2010) and Turkey (Sahin, 2013), and the acceptability of a car pricing policy and intention to change car use behaviour in five European countries (De Groot, Steg, & Dicke, 2008) and Argentina (Jakovcevic & Steg, 2013). The latter studies confirmed the causal order from value orientations, AC (e.g., "Car use causes exhaustion of scarce resources, such as oil"), AR (e.g., "I feel joint responsibility for the exhaustion of fossil fuels by car use"), PN (e.g., "I feel personally obliged to travel in an environmentally sound way, such as by using a bicycle or public transport") to behavioural variables. More specifically, PN mediated the relationship between AR and acceptability and intention, AR mediated the relationship between AC and PN, and AC mediated the relationship between value orientations and AR, in line with predictions from the VBN theory.

Recent studies suggest that the VBN theory could be slightly modified to enhance predictive power and to make the model more parsimonious. First, recent studies suggest that it may be useful to extend the model with the hedonic value orientation that makes people focus on pleasure or sensuous gratification for oneself. Research has shown that hedonic values can empirically be distinguished from egoistic, biospheric, and altruistic values in the Netherlands, and the hedonic value orientation is significantly and negatively related to pro-environmental attitudes, preferences, and behaviour, particularly when pro-environmental behaviour is not pleasurable or is uncomfortable (Steg, Perlaviciute, van der Werff, & Lurvink, 2014). Hedonic values may be particularly important for understanding car use reductions. Car use may be associated with hedonic benefits (e.g., pleasure to drive, comfort), and therefore people with strong hedonic values may not want to reduce their car use. Hedonic values may inhibit the process of norm activation as specified in VBN theory. A study in Argentina tested the VBN theory including the four value orientations to predict the acceptability of a car pricing policy that involved a doubling of car-related costs and the intention to change car use behaviour if the policy was implemented (Jakovcevic & Steg, 2013). The study provided empirical support for the distinction of the four value orientations and most of the causal relations between variables as postulated in the VBN theory. It showed that the hedonic value orientation predicted significantly and negatively AR when other variables were controlled for.

Second, research has shown that values better predict PN and behaviour than NEP, probably because values reflect a wider range of motivations than NEP, as the latter focuses on environmental concerns only (Steg, De Groot, Dreijerink, Abrahamse, & Siero, 2011). This suggests that NEP can be excluded from the VBN theory, resulting in a more parsimonious model to explain behaviour. Given these recent insights, in this study we test an adapted VBN theory as shown in Fig. 1; a similar version of the VBN theory was tested in Argentina (Jakovcevic & Steg, 2013).

Although the VBN theory has been tested in different countries and cultures, as described above, the question remains whether the VBN theory is valid across other cultures and countries. As yet, the VBN theory has hardly been tested in some regions, including Asia. Hence, we aim to test whether the VBN theory also predicts pro-environmental behaviour in Asian countries. A study in Taiwan was designed to test the VBN theory and found some initial empirical support for the causal relationships between values, NEP, AC, AR, PN, and pro-environmental behaviour (Chen, 2015). However, one aggregated measure of values was included in the model, and thus the results did not reveal which value orientations promoted or inhibited the norm activation process as specified in the VBN theory. Furthermore, the variables in this study were not consistently measured at the same level of specificity: energy-related items were used to measure AC, AR, and PN, while the pro-environmental behaviour scales consisted of a wide range of behavioural items that were not limited to energy-related behaviours (e.g., frequency of the purchase, use, and disposal of personal and household products that have environmental impacts). Furthermore, a cross-cultural study showed that values predicted pro-environmental behaviour (recycling behaviour, not using a car, and environmental citizenship, such as signing a petition about an environmental issue) through pro-environmental attitudes and willingness to sacrifice across most of the 27 countries studied, including Asian countries (Japan and Indonesia); however, the model contained country-level values (i.e., harmony and postmaterialism) but did not include individual values (Oreg & Katz-Gerro, 2006). All in all, there is some initial evidence across countries on the relationships between values, pro-environmental beliefs, norms, and behaviour. Yet, this evidence is scattered and a systematic and
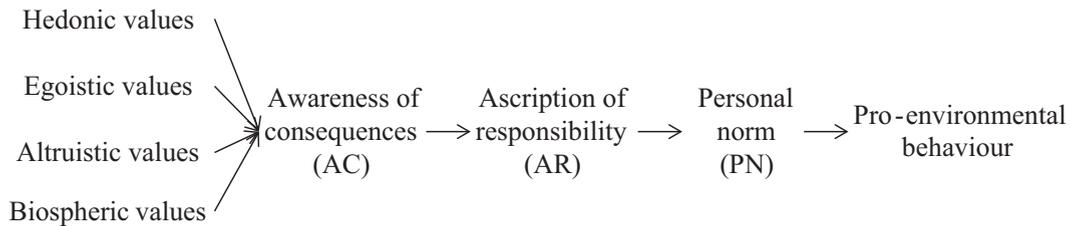
Fig. 1. Relationships between values, pro-environmental beliefs, norms, and behaviour in an adapted VBN theory tested in this study.

consistent empirical support for the universality of the VBN theory is missing, especially because the theory has hardly been tested in Asia.

Moreover, to authors' knowledge, no studies have tested whether hedonic, egoistic, altruistic, and biospheric values can be distinguished empirically in Asia. Yet, there is some evidence to suggest that the structure of values is universal and can be found across many different cultures around the world (Aoyagi-Usui, Vinken, & Kuribayashi, 2003; Schwartz, 1992; Schwartz & Sagiv, 1995; Steg & De Groot, 2012). Therefore, we expect that the four types of values can be distinguished in Asian countries as well.

In sum, the present study was conducted to test the VBN theory in Japan. As a case in point, we focus on the acceptability of the car pricing policy (i.e., a doubling of car related costs) and the intention to change car use behaviour if the policy was implemented, as behaviour-related variables. This allows us to replicate similar studies conducted in Europe and Argentina (De Groot et al., 2008; Jakovcevic & Steg, 2013).

The question is whether the VBN theory predicts pro-environmental behaviour in Asian countries the same way as in other countries. According to the Hofstede's cultural dimensions theory (Hofstede, Hofstede, & Minkov, 2010), important cross-cultural differences between Asia and other countries exist that may affect the predictive power of the VBN theory in Asia. Notably, East Asian countries including Japan, China, South Korea, and Taiwan are characterised as cultures with a high long-term orientation (LTO). As a way to prepare for the future, on the one hand, people in high-LTO countries foster perseverance (Hofstede et al., 2010), and thus they may be more motivated to accept policies aiming for a better future despite imposing personal costs, for example a policy to increase environmentally-related tax rates, than those in low-LTO countries. On the other hand, people in high-LTO countries consider thrift as a desirable trait for children (Hofstede et al., 2010), which may make them more sensitive to economic cost and thus pricing. From the VBN perspective, a higher LTO in which people focus more on creating a better future could result in particularly biospheric and altruistic values predicting positively pro-environmental beliefs, norms, and behaviour. If, however, a higher LTO focuses people primarily on saving money and other resources for their own sake, particularly egoistic values may be the strongest predictor of financially costly pro-environmental actions, having negative effects on pro-environmental beliefs, norms, and behaviour that involve financial costs, as the behavioural indicators included in our study.

We tested to what extent different values predicted the variables in our revised version of the VBN theory in a high-LTO country. We hypothesise that the VBN theory will be supported in Japan, as reflected in the expected causal relations from value orientations, AC, AR, PN, to behavioural variables (Hypothesis 1). In line with the VBN theory, we expect that variables affect adjacent variables in the causal chain more than one level downstream. Also, we expect that AC, AR, and PN mediate the relationships between their adjacent variables (i.e., AC mediates the relationship between value orientations and AR, AR mediates the relationship between AC and PN, and PN mediates the relationship between AR and acceptability of the car pricing policy and intention to change car use behaviour). We expect that biospheric and altruistic values are positively related to AC, AR, PN, and acceptability and intention, while egoistic values are negatively related to these variables. We expect that hedonic values are, if anything, also negatively related to AC, AR, PN, and behavioural variables. We explore which values are most predictive of pro-environmental beliefs, norms, and behavioural variables in a high-LTO country. We also hypothesise that we can empirically distinguish the hedonic, egoistic, altruistic, and biospheric value orientations in line with theoretical predictions (Hypothesis 2).

2. Method

2.1. Procedure and respondents

Similarly to De Groot et al. (2008) and Jakovcevic and Steg (2013), an Internet questionnaire was set up and the URL of the questionnaire was distributed through e-mail to the first author's acquaintances, family and colleagues with the request to access the questionnaire, fill it out, and forward the link to as many other people as possible (the snowball method, see De Groot & Steg, 2007). Upon accessing the questionnaire, respondents firstly read general information and instructions for the completion of the questionnaire and clicked a button to start the questionnaire if they agreed with the terms and conditions. This was followed by questions about values, NEP (not included in the analyses), awareness of consequences of problems caused by car use (AC), feelings of responsibility for problems caused by car use (AR), and personal norm to reduce car

use (PN), the intention to change car use behaviour if a car pricing policy was implemented, and the acceptability of the car pricing policy; we used the same phrasing of questions and scales as were used in De Groot et al. (2008; we added the three hedonic value items) and in Jakovcevic and Steg (2013). Finally, respondents filled out questions about their general background and car use behaviour. After completing the questionnaire, respondents read an acknowledgment and a request to forward the link to the survey to their acquaintances. The questionnaire was translated into Japanese from the original questionnaire using back-translation procedures (Hofstede, 2001; Schwartz, 1992). First, the Japanese native author translated the original English version into Japanese, and then a Japanese native translator back-translated the Japanese version into English. Finally, discrepancies from the original version were identified and modified if needed by the Japanese native author.

In total, the online questionnaire was accessed 766 times, of which 395 persons (51.6%) started the questionnaire after reading the instructions; in total 224 respondents (29.2%) completed the questionnaire. The responses of 11 non-Japanese respondents and 3 respondents who did not fill out the socio-demographic questions including the nationality were removed from the analyses. We further removed 10 respondents who used the same rating many times in reporting the importance of values as described in 2.2.1.

The remaining Japanese respondents were 104 males and 96 females, whose ages ranged from 20 to 75 years (M = 37.8, SD = 11.1). In total, 4.0% had completed high school, 10.0% had completed junior or vocational college and 86.0% had graduated university. The distribution of respondents' household annual income was 10.0% 'less than 2.5 million yen[1]', 22.5% 'between 2.5 and 5 million yen', 38.0% 'between 5 and 10 million yen', 27.5% 'between 10 and 20 million yen', and 2.0% 'more than 20 million yen'. The current sample was representative of the general Japanese population with regard to gender; however, younger respondents, higher educational groups, and higher income groups were overrepresented in comparison with the Japanese population.

2.2. Measures

2.2.1. Value orientations

Value orientations were measured using a scale consisting of 16 value items reflecting the hedonic, egoistic, altruistic, and biospheric value orientations (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014), as shown in Table 1. Respondents indicated to what extent these values were important "as a guiding principle in your life" on a nine-point scale: *opposed to my guiding principles* (−1), *not important* (0), (unlabelled; 1, 2), *important* (3), (unlabelled; 4, 5), *very important* (6), and *of supreme importance* (7). Respondents were prompted to distinguish between value items as much as possible by using different ratings and instructed not to rate more than two values as being of supreme importance. Responses with the same rating appearing more than 10 times out of 16 items were considered to have failed in differentiating among different values and excluded from further analyses in the present study.[2] This led to dropping 10 responses (4.8%).

2.2.2. AC, AR, and PN

Respondents indicated the extent to which they agreed with 19 statements related to car use reflecting awareness of negative consequences of car use (AC, e.g. "By reducing car use the level of air pollution will decrease"), ascription of responsibility for the problems of car use to oneself (AR, e.g. "I am jointly responsible for the problems caused by car use"), and personal norms, that is, feelings of a moral obligation to reduce car use (PN, e.g. "I feel personally obliged to travel in an environmentally sound way, such as by using a bicycle or public transport") on a seven-point scale ranging from 1 (*totally disagree*) to 7 (*totally agree*) (see De Groot et al., 2008; Jakovcevic & Steg, 2013 for the full list of items). These items were presented in a mixed order. The results of a multiple group method (MGM; see 3.1 for details) generally supported the distinction between AC, AR, and PN items. However, one AR item, "In principle, one person cannot decrease the problems of car use", did not correlate significantly with any of the three scales,[3] and therefore, this item was excluded from further analyses. Mean scores of five AC items, five AR items (after excluding one item) and eight PN items were computed after recoding reverse-scored statements, to form scales of AC (α = 0.65; M = 5.00, SD = 0.89), AR (α = 0.78; M = 4.55, SD = 1.06), and PN (α = 0.90; M = 4.58, SD = 1.11), respectively. Higher scores represent high awareness of consequences, strong ascription of responsibility, and strong personal norms.

2.2.3. Intention and acceptability

Respondents were first asked to read the following description of a car pricing policy: "Imagine that the government doubled the prices of car use. Increasing the cost of parking, fuel levies, transport pricing measures, and increases in insurance costs would mean that for each car you use you would pay 100% more than you currently do" (De Groot et al., 2008). Then, respondents indicated their intention to change car use behaviour, using five items: "If this policy was implemented, I would drive less; travel more with other transport modes instead of the car; trade my car for a cheaper car; buy a small, more efficient car; get rid of my car", using a five-point scale ranging from 1 (*definitely not*) to 5 (*certainly*). As the intention to change car use behaviour is only relevant to those who use a car, 46 respondents who did not travel at all by car were excluded from

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[1] $23,000 ($1 = 108 yen).
[2] Schwartz (1992) excluded responses if the same rating was given more than 35 times out of 56 items; we applied the same proportion in this study.
[3] This was also the case in the European study (De Groot et al., 2008).

Table 1
Corrected correlations between value items and value orientations through the multiple group method (N = 200).

	Hedonic orientation	Egoistic orientation	Altruistic orientation	Biospheric orientation
Hedonic values				
Pleasure	**0.51**	0.38	0.22	0.12
Enjoying life	**0.44**	0.26	0.28	0.15
Self-indulgent	**0.33**	0.32	−0.03	−0.13
Egoistic values				
Social power	0.27	**0.52**	−0.01	−0.07
Wealth	0.37	**0.47**	−0.04	−0.14
Authority	0.22	**0.68**	0.05	−0.02
Influential	0.29	**0.50**	0.23	0.19
Ambitious	0.30	**0.31**	0.30	0.13
Altruistic values				
Equality	0.15	0.09	**0.48**	0.44
A world at peace	0.16	−0.04	0.40	**0.55**
Social justice	0.12	0.29	**0.59**	0.47
Helpful	0.14	0.18	**0.42**	0.40
Biospheric values				
Respecting the earth	0.01	−0.03	0.56	**0.72**
Unity with nature	0.07	0.07	0.56	**0.70**
Protecting the environment	0.09	0.03	0.56	**0.90**
Preventing pollution	0.02	−0.01	0.54	**0.78**

Note. Correlation coefficients are corrected for self-correlations. For each item, the highest correlation is printed in bold.

further analyses that include the intention to change car use behaviour as the dependent variable. Respondents could choose *not applicable* when a particular option was not relevant for them. The responses of 28 respondents who chose *not applicable* for at least one of these items were also excluded from further analyses. Mean scores for the five intention items were computed, with a higher score indicating stronger intention to change car use behaviour (N = 126, α = 0.72; M = 3.55, SD = 0.73).

Subsequently, respondents evaluated the acceptability of the same policy, using five items: "If this policy was implemented, I would protest against it (reverse-scored); resign myself to it; accept it; feel that the policy was unfair to me (reversed-scored); agree with it" on the same five-point scale as above. Scale scores on acceptability were constructed by computing the mean scores of the five items after converting the reverse-scored items, so that higher scores reflect higher acceptability (α = 0.88; M = 3.53, SD = 0.84).

2.3. Analyses

The VBN theory was tested in a series of regression analyses following the procedures used in earlier studies (De Groot et al., 2008; Jakovcevic & Steg, 2013; see also Steg et al., 2005). Each variable was regressed onto the preceding variables in the causal chain in two steps. The first model comprised only the independent variable that directly preceded the dependent variable in the analysis (model 1). In the second model, all variables preceding the dependent variable were included as independent variables in the analysis (model 2) to test whether variables also directly explained variables farther down the causal chain when the variable used in model 1 was controlled for.[4] In order to test whether each variable in the causal chain mediated the relationship between adjacent variables in the causal chain (see Fig. 1), the mediation analysis using the bootstrap resample procedure (Preacher & Hayes, 2004) was applied. We concluded that the mediation could be found if (i) there was a total effect between independent and dependent variables (i.e., an independent variable affected significantly the dependent variable) and (ii) the 95% confidence interval for the indirect effect determined by percentiles in the distribution estimated from 5000 resamples did not include zero. We used IBM SPSS Statistics for Windows, Version 20.0 for the statistical analyses.

3. Results

3.1. Distinction of four value orientations

In order to corroborate the *a priori* distinction of value items into the four value orientations empirically, the multiple group method (MGM), a conceptually simple and effective type of confirmatory factor analysis (e.g., Nunnally, 1978; Stuive, Kiers, Timmerman, & Ten Berge, 2008), was applied, following the same procedure as De Groot et al. (2008). Table 1 shows that value items indeed correlated most strongly with the value orientation to which they were theoretically

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[4] We tested the models with and without NEP and found very similar results. The results of the model with NEP showed that NEP positively and significantly explained the variance in AC, AC mediated the relationship between NEP and AR, and NEP mediated the relationship between the biospheric value orientation and AC, but most of the relationships between other variables in the VBN theory were unchanged from the model without NEP.

assigned. While the score of the altruistic value item "a world at peace" correlated positively and strongly with the altruistic value orientation scale, this item correlated slightly more strongly with the biospheric value orientation scale. However, this item was included in the altruistic value orientation scale because excluding "a world at peace" from the altruistic value orientation scale would decrease the reliability of this scale.

Reliability for each value orientation scale was as following: α = 0.62 (*M* = 3.62, *SD* = 1.32) for the hedonic value orientation, α = 0.74 (*M* = 2.67, *SD* = 1.18) for the egoistic value orientation, α = 0.69 (*M* = 4.49, *SD* = 1.27) for the altruistic value orientation, and α = 0.89 (*M* = 4.32, *SD* = 1.57) for the biospheric value orientation, respectively.

3.2. Testing the VBN theory

Table 2 shows the results of regression analyses aimed at testing the causal chain of the VBN theory shown in Fig. 1. First, we examined whether PN explained the variance in the behavioural variables. PN explained 5% of the variance in the intention to change car use behaviour if the car pricing policy was implemented. The more one feels a moral obligation to reduce car use, the more one intends to change car use behaviour (β = 0.24, *p* = .007). When AR, AC, and value orientations were

Table 2
Test of the causal relations in the VBN theory.

	β	*t*	*p*	Adj. R^2	*F*	*p*
DV: Intention to change car use behaviour						
Model 1				0.05	7.39	0.007
PN	0.24	2.72	0.007			
Model 2				0.12	3.46	0.002
PN	0.38	2.54	0.01			
AR	−0.21	−1.64	0.10			
AC	−0.06	−0.54	0.59			
Hedonic values	0.17	1.67	0.10			
Egoistic values	−0.02	0.18	0.86			
Altruistic values	0.20	1.58	0.12			
Biospheric values	0.08	0.58	0.56			
DV: Acceptability of a car pricing policy						
Model 1				0.04	9.04	0.003
PN	0.21	3.00	0.003			
Model 2				0.04	2.25	0.03
PN	0.07	0.59	0.56			
AR	0.16	1.78	0.08			
AC	0.12	1.33	0.18			
Hedonic values	−0.00	−0.05	0.96			
Egoistic values	−0.03	−0.38	0.70			
Altruistic values	0.04	0.47	0.64			
Biospheric values	−0.10	−0.92	0.36			
DV: PN						
Model 1				0.36	111.10	<0.001
AR	0.60	10.54	<0.001			
Model 2				0.62	55.03	<0.001
AR	0.28	5.29	<0.001			
AC	0.38	7.51	<0.001			
Hedonic values	−0.15	−3.10	0.002			
Egoistic values	−0.03	−0.67	0.50			
Altruistic values	0.02	0.32	0.75			
Biospheric values	0.31	5.09	<0.001			
DV: AR						
Model 1				0.19	47.11	<0.001
AC	0.44	6.86	<0.001			
Model 2				0.28	16.26	<0.001
AC	0.31	4.77	<0.001			
Hedonic values	−0.07	−0.98	0.33			
Egoistic values	−0.17	−2.45	0.01			
Altruistic values	0.00	0.03	0.98			
Biospheric values	0.28	3.46	0.001			
DV: AC				0.14	9.34	<0.001
Hedonic values	−0.20	−2.78	0.006			
Egoistic values	−0.04	−0.54	0.59			
Altruistic values	0.10	1.18	0.24			
Biospheric values	0.28	3.25	0.001			

Note. Dependent variable (DV); personal norms (PN); ascription of responsibility (AR); awareness of consequences (AC).

Table 3
Indirect effects of independent variables on dependent variables through mediators.

Independent variables	Mediator	Dependent variable	Indirect effect	SE	95% confidence interval for indirect effect
AR	PN[*]	Intention	0.20	0.08	0.06–0.36
AC	AR	PN	0.22	0.05	0.12–0.34
Hedonic value orientation	AC	AR	−0.05	0.02	−0.11 to −0.01
Biospheric value orientation	AC	AR	0.06	0.02	0.02–0.11

Note. Awareness of consequences (AC); ascription of responsibility (AR); personal norms (PN).

[*] PN is not a mediator because the total effect of AR on Intention was absent.

included in the regression analysis as well, 12% of the variance in intention was explained and PN was the only significant predictor (β = 0.38, p = .01) in the model.

Next, PN explained 4% of the variance in the acceptability of the car pricing policy. The more one feels a moral obligation to reduce car use, the more one accepts the car pricing policy (β = 0.21, p = .003). Interestingly, when all variables further up the chain were included in the regression analysis, 4% of the variance in acceptability was explained but no single variable contributed significantly to the model.

AR explained 36% of the variance in PN. The more one felt responsible for the problems caused by car use, the more one felt a moral obligation to reduce car use (β = 0.60, p < .001). The explanation of the variance in PN increased to 62%, when all variables were included in the model. Not only AR (β = 0.28, p < .001), but also AC (β = 0.38, p < .001), the biospheric value orientation (β = 0.31, p < .001), and the hedonic value orientation (β = −0.15, p = .002) contributed significantly to the explanation of the variance in PN. That is, the more one was aware of the problems caused by car use, the more strongly one endorsed biospheric values and the less strongly one endorsed hedonic values, the more one felt a moral obligation to reduce car use.

AC explained 19% of the variance in AR. The more respondents were aware of the problems caused by car use, the more they felt responsible for these problems (β = 0.44, p < .001). The full model including all variables preceding AR explained 28% of the variance in AR. In addition to AC (β = 0.31, p < .001), the biospheric value orientation (β = 0.28, p = .001) and the egoistic value orientation (β = −0.17, p = .01) contributed significantly to the explanation of the variance in AR. The more strongly respondents endorsed biospheric values and the less strongly they endorsed egoistic values, the more they felt responsible for the problems caused by car use.

Finally, the four value orientations explained 14% of the variance in AC. The stronger respondents' biospheric values (β = 0.28, p = .001) and the weaker their hedonic values (β = −0.20, p = .006), the more they were aware of the problems caused by car use.

3.3. Mediation effects

The results of the bootstrapped estimates showed that AR mediated the relationship between AC and PN, and AC mediates the relationship between the hedonic value orientation and AR as well as between the biospheric value orientation and AR. More specifically, as shown in Table 3, the significant indirect effects of AR on the intention to change car use behaviour through PN, of AC on PN through AR, of the hedonic value orientation on AR through AC, and of the biospheric value orientation on AR through AC were found, that is, zero is not in the 95% confidence intervals. With regard to the total effects of independent variables on dependent variables, AC affected significantly PN (r = 0.64, p < .001), and the hedonic (r = −0.18, p = .01) and biospheric (r = 0.38, p < .001) value orientations affected significantly AR, while AR did not affect significantly the intention to change car use behaviour (r = 0.09, p = .33). Thus, PN is not considered a mediator of the relationship between AR and the intention to change car use behaviour (see Preacher & Hayes, 2004; Rucker, Preacher, Tormala, & Petty, 2011). From these results, the hedonic value orientation affected AC negatively while the biospheric value orientation affected AC positively, which in turn affected positively AR, itself positively affecting PN, positively resulted in the intention to change car use behaviour. In sum, the mediation model partly supported the causal relations of variables postulated in the VBN theory.

4. Discussion

In this study, we tested the VBN theory in Japan for the first time, first by looking at whether the four value orientations, that is, hedonic, egoistic, altruistic, and biospheric value orientations, can be empirically distinguished, and then by testing the causal relationships in the model. As a case in point, we focused on the acceptability and perceived effects of a car pricing policy on one's car use behaviour.

The VBN theory was partly supported: all variables predicted succeeding variables in the causal chain, and the expected mediation effects of AC and AR and an indirect effect of AR on the intention to change car use behaviour through PN were found. More specifically, we found a positive effect of the biospheric value orientation and a negative effect of the hedonic value orientation on AC, a positive effect of AC on AR, a positive effect of AR on PN, and positive effects of PN on both the intention to change car use behaviour and acceptability of a car pricing policy. Furthermore, there were significant mediation effects of AR in the relationship between AC and PN, of AC between the biospheric value orientation and AR as well as

between the hedonic value orientation and AR. Also, an indirect effect of AR on intention through PN, but not on acceptability, was observed. While PN was not a mediator as the total effect of AR on intention was not significant, the product of AR → PN path and PN → intention path was significant, that is, AR affected positively intention through PN. This suggests that value orientations indeed affect intention indirectly via the process of norm activation as proposed in the VBN theory. More specifically, the stronger people endorsed biospheric values, the more they intended to change car use behaviour if a car pricing policy was implemented, while the stronger people endorsed hedonic values, the less they intended to change car use behaviour. Especially, the mediation effect of AC between the hedonic value orientation and AR is a novel finding of this study and confirms that the inclusion of hedonic values to the model has an added value. Comparing the results of the present study with those of the European study (De Groot et al., 2008) and the Argentinean study (Jakovcevic & Steg, 2013), the relationships between value orientations, beliefs, and norms are very similar; most of the expected mediation effects were observed, while contrary to the previous studies, no mediation effect of PN between AR and behavioural variables was found in the present study. We will elaborate this point later.

Direct relationships with variables more than one level down the causal chain were found as well. This was particularly true for values, which affected not only indirectly but also directly AR and PN. Notably, the hedonic value orientation contributed negatively to the explanation of the variance in PN in addition to AC, the adjacent variable to value orientations. The stronger people endorsed hedonic values, the less they felt morally obliged to reduce car use. As car use pertains to pleasure and comfort, hedonic values related negatively to awareness of negative environmental consequences of car use and feelings of moral obligation to reduce car use. That is, strong hedonic values may inhibit people's willingness to reduce car use as long as people expect much more comfort and pleasure from car use than from alternative means of transportation, such as public transport. Therefore, in order to gain support for public transport, governments or public transport operators seeking to obtain the public's support for public transport and to encourage people to reduce car use may emphasise beautiful sights to be seen from a train or bus window, comfortable seats and other facilities, and an enjoyable time without having to drive.

The negative effects of the hedonic value orientation on AC and PN are interesting particularly for our sample from a country with high LTO because a long-term orientation may imply that egoistic values (e.g., motivating to save money and other resources for their own sake), altruistic values (e.g., motivating to secure needs of future generations), and biospheric values (e.g., motivating to protect the environment) better predict the process of norm activation than hedonic values. Interestingly, however, we found that even in a high-LTO country, hedonic values, which drive the focus on the immediate comfort and pleasure, predicted negatively people's pro-environmental beliefs and norms. Future studies could be done to find out whether this would be true in other cultures and for other behaviours as well, and under which conditions hedonic values would be particularly relevant to pro-environmental beliefs, norms, and behaviour.

The egoistic value orientation, which is included in the original VBN theory, contributed negatively only to the explanation of the variance in AR. The stronger people endorsed egoistic values, the less they felt responsible for the problems caused by car use. The biospheric value orientation contributed to the explanation of variance in AR and PN, in addition to AC. The stronger one endorsed biospheric values, the more one felt responsible for the problems caused by car use and felt a moral obligation to reduce car use. Interestingly, the altruistic value orientation did not contribute to the explanation of the variance in pro-environmental beliefs, norms, and behavioural variables when other variables were controlled for. Consequently, the VBN theory is partly supported in Japan, thus Hypothesis 1 is partly supported, and we found that biospheric values were the most predictive of pro-environmental beliefs and norms. While we expected that in high-LTO countries biospheric and altruistic values could have a positive effect on pro-environmental beliefs, norms, and behavioural variables and that egoistic values could negatively affect them, the results showed that biospheric and egoistic values did indeed contribute to the explanation of the variance in some of pro-environmental beliefs and norms in the expected directions but did not contribute to behavioural variables in Japan. In the previous studies in low-LTO countries (De Groot et al., 2008; Jakovcevic & Steg, 2013), biospheric values contributed positively to the explanation of the variance in most of pro-environmental beliefs, norms, and behavioural variables, while altruistic values contributed less strongly and positively, and hedonic and egoistic values contributed less strongly and negatively to the explanation of the variance in these variables.

Overall in Japan, a high-LTO country, we found results similar to those of previous studies, with one main difference being that behavioural variables were less well explained in the current study. From the regression analyses, the amounts of variances in the intention to change car use behaviour and acceptability of the car pricing policy explained by the VBN theory were modest (12% and 4%, respectively). Hence, in this study the VBN theory was less predictive of behaviour than in previous studies using the same behavioural variables in five European countries (32% and 16%; De Groot et al., 2008) and in Argentina (14% and 22%; Jakovcevic & Steg, 2013). Previous research suggested that the VBN theory was less successful in explaining behaviours with strong constraints, such as when the behaviour is very expensive or requires a lot of time (Guagnano, Stern, & Dietz, 1995; Steg et al., 2005, 2014). In such cases, contextual factors, such as the possibility of choosing an alternative mode of transportation, may explain the acceptability of a car pricing policy and intention to change car use behaviour better than variables in the VBN theory. In Japan, public transport is highly reliable because of its punctuality, and the train and bus networks are well developed. Thus, public transport accounts for 37.1% of inland passenger transport (passenger-km) in Japan, which is much higher than the 16.6% of Europe (EU-28) (Eurostat, 2015; Ministry of Land & Transport, 2010). People in the cities of Japan who still use a car instead of public transport may do so because of strong constrains, for example because going by public transport takes them much longer than by car, or public transport is not available for their destinations. Additionally, while the public transport network, especially trains, is highly developed in urban cities, it is insufficient or completely unavailable in rural areas. Future research could test the extent to which behavioural

constraints affect the predictive power of the variables in the VBN theory to explain pro-environmental behaviour. Furthermore, the implications of doubling the costs for car use may differ across countries (e.g. because of the initial costs for car use and welfare in the country), which could influence the predictive power of values, beliefs, and norms on pro-environmental behaviour. Future research could look into which contextual factors across countries influence the extent to which variables in the VBN theory can explain behaviour.

In line with previous studies in the Netherlands (Steg et al., 2014) and Argentina (Jakovcevic & Steg, 2013), the present study generally provides support for distinguishing four value orientations in Japan, an East Asian high-LTO country, which suggests that the structure of values is similar across cultures. Yet, one item "a world at peace" correlated positively but less strongly with the altruistic value orientation to which it belongs on theoretical grounds than with the biospheric value orientation. Similar results were found in some European studies (Czech Republic, De Groot & Steg, 2007; the Netherlands, Steg et al., 2014). Therefore, we presume that stronger correlation between this item and the biospheric value orientation compared to the altruistic value orientation can not merely be attributed to cultural differences. So generally, this study reveals that the hedonic, egoistic, altruistic, and biospheric value orientations can be distinguished in line with theoretical predictions using a Japanese sample, which supported Hypothesis 2.

The modification of the VBN theory tested in the present study seems to be useful for understanding transportation decisions. First, as we expected, including hedonic values improved the model because the hedonic value orientation predicted negatively not only AC but also PN, while the egoistic value orientation only predicted negatively AR, when other variables were controlled for. Therefore, it seems important to include hedonic values in the model. Second, we found that the results were very similar to the model that included NEP, which confirms the validity of the adapted model. Since parsimony is a reasonable criterion for a model, we omitted the NEP scale as it requires 15 items but does not contribute to explaining variances. Future research can test whether this is also true for other environmental decisions.

A limitation of the present study is that we relied on a convenience sample. We used the snowball method for data collection in this study, and the final sample was not fully representative of the Japanese population with respect to age, education, and income. While the results of the present study were similar to those of the previous studies in countries with different cultures, future studies could replicate the present study using other national samples, especially high-LTO countries, such as China and South Korea, to see whether the results could be generalised and whether certain contextual factors across countries could influence the predictive power of variables in the VBN theory.

5. Conclusions

We tested the VBN theory in Japan and found that the biospheric value orientation explained positively the variances in pro-environmental beliefs and personal norms, while the hedonic and, to a lesser extent, egoistic value orientations explained negatively the variances in these variables. The current study provides further evidence that hedonic values, which were typically not included in models to explain pro-environmental beliefs, norms, and behaviour, are an important predictor of these variables, and therefore, hedonic values should be included when testing these models.

Value orientations, pro-environmental beliefs, and norms were only modestly strong predictors of behavioural variables in the present study. Several reasons may account for this result: the strong constraints (e.g., high cost and time consuming) of reductions in car use and other contextual factors such as the implications of doubling the costs for car use that are not included in the causal chain of the VBN theory, which may reduce its explanatory power. Future studies could investigate the extent to which these factors affect the predictability of behavioural variables.

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