

## Transmitting pro-environmental behaviours to the next generation: A comparison between Germany and Japan

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The present study examined the processes by which children acquire pro-environmental behaviours in different cultures. Our focus was on parental influence. Several studies have been conducted on adults' environmental behaviours; however, we know little about how children's environmental attitudes and behaviours are formed. We conducted a questionnaire survey with elementary school children and one of their parents in Germany and Japan. Two hundred and twenty-one pairs participated in Germany and 365 in Japan. The results of structural equation modelling showed that parents' behaviours affected children's environmental behaviours directly and also via the subjective norm (the children's experienced expectations of their parents). A comparison of the two countries revealed that hypothesized cultural differences between the impact of personal norms and subjective norms were clearer for adults. The results also showed that the effects of subjective norms were stronger for children, indicating that children are more likely to be influenced by expectations of others. The results of the study suggest that for promoting children's environmental behaviours, showing the behaviours in daily life would be most effective.

*Key words:* children's environmental behaviour, cultural comparison, observational learning, parental influence, paired analysis.

### Introduction

Environmental issues, such as the increase in waste products, are seen as serious problems worldwide. Accordingly, adopting pro-environmental behaviour is considered socially desirable in many cultures. A number of studies have investigated the determinants of pro-environmental behaviours (for a review, see Steg & Vlek, 2009). However, these previous studies have, for the most part, conducted research that focuses on adult subjects; thus the processes through which we acquire pro-environmental norms and behaviours in childhood have not been fully investigated. We are not born with innate knowledge of environmental issues; rather, we must acquire attitudes, behaviours and knowledge about the environment as we grow up.

This study investigates the processes by which children acquire pro-environmental behaviours. Uncovering these processes will contribute to the understanding of how the environmental behaviours of adults are formed. In this study we aim to compare the environmental behaviours of children and adults.

Another issue addressed in the present study is whether there are cultural differences in parental influences on children, and if these have an effect on determinants of environmental behaviours. Environmentally friendly behaviours are in some ways global, but the reasons to adopt a particular behaviour might be different across cultures. Understanding the cultural differences in the determinants of environmental behaviours would be useful to further the understanding of the obstacles to environmentally friendly behaviours in different cultures. Currently there is almost no research investigating cultural differences of environmental behaviours in children; thus this research should provide a useful contribution to the field of environmental behaviour studies.

In the present study we conducted a survey in which participants were elementary school children and their parents; specifically, we focused on one parent and one child in each household, and schools in two different countries, Germany and Japan, were chosen for the study. Therefore, this study has two axes of comparison: one is the comparison between children and adults, and the other is the comparison between two countries.

### **Parental influence on children's environmental behaviour**

It can be assumed that parents would have a significant impact on their children's behaviour, as parents are the

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primary facilitators of childhood socialization. Here, 'socialization' refers to the processes by which children acquire values, skills and behavioural patterns that are considered 'desirable' in the culture in which they live (Brim, 1966). Children see their parents as the most important others until they reach the higher grades in elementary school (Bower, 1979). While other external influences (e.g. media, peers) may account for discontinuities and inconsistencies, family environment has continuity and consistency (Grønhøj & Thøgersen, 2009).

Parents may try to influence their children to adopt pro-environmental behaviours through verbal reinforcement, such as praising and warning, but according to social learning theory (Bandura, 1977), children primarily learn socially desirable values through observing behaviours of a model. Rogoff, Paradise, Mejía Arauz, Correa-Chávez and Angelillo (2003) pointed out that young children usually learn through observation without any reinforcement. Acquisition of language is an example of this type of learning (Akhtar, Jipson & Callanan, 2001). It has also been demonstrated in various studies that young children monitor events around them, and learn through observation (e.g. Piaget, 1962; Trevarthen, 1997; Yando, Seitz & Zigler, 1989). We therefore predict that the environmental behaviour of parents should have significant effects on their children's environmental behaviours.

In the domain of pro-environmental behaviours, several studies tested parental influences on children's environmental behaviours. Grønhøj and Thøgersen (2009, 2012) compared young adolescents' environmental values and behaviours with those of their parents, and found positive correlations in environmental attitudes and behaviours between young adolescents and their parents. They also reported that young adolescents are environmentally less committed than their parents. Nakamura (2003) surveyed children (from those in junior high school to young adolescents)–mother dyads on 13 pro-environmental behaviours. She found that the mothers' pro-environmental behaviours had a significant effect on those of their children, especially when the mothers requested their children to behave in specific ways. However, the mothers' behaviours did not affect the children's environmental attitudes. Both Grønhøj and Thøgersen (2009, 2012) and Nakamura (2003)'s studies demonstrate the link between parents' and children's environmental behaviours.

However, there have been very few studies focusing on elementary school age children. Grønhøj and Thøgersen (2009, 2012) and Nakamura (2003) surveyed young adolescents or those who were of high school age. It is conceivable that the environmental attitudes and norms of young adolescents are already established and similar to those of adults. In order to understand the processes by which we acquire environmental norms at an early age research with younger children is necessary.

One study that focused on younger children was that of Evans *et al.* (2007), which examined elementary school first and second graders. The results did not show a significant relationship between children's pro-environmental behaviours and those of their parents. Yorifuji (2003, 2011) carried out research on children from fourth to sixth grade and one of their parents. In Yorifuji's studies parents' behaviours affected children's environmental behaviours. The effect of parental behaviour was also stronger than that of verbal reinforcement. There are difficulties in conducting research with younger children, and this may be the reason why Evans *et al.* (2007) did not find a relationship between children's behaviour and their parents' behaviour.

Thus the present study conducted a survey with elementary school third and fourth graders and one of their parents in order to understand the processes by which children acquire environmental norms and attitudes. We focused on children in this age range because 9–10 is assumed to be the earliest age at which children can understand and answer written questions. Since we used both children and parents as participants, the survey design allowed us to investigate the parental influence on children's behaviour through paired analysis, not through parental behaviour perceived by children.

In accordance with social learning theory (Bandura, 1977) and previous studies (e.g. Rogoff *et al.*, 2003), we predicted that parents' pro-environmental behaviours would affect children's pro-environmental behaviours.

### **Cultural differences**

A number of studies in cultural psychology have devoted attention to the dichotomy of individualism–collectivism (e.g. Triandis, Bontempo, Villareal, Asai & Lucca, 1988; Triandis, 2001). In these studies, Germany is considered to have an individualistic culture, while Japan is said to have a collectivistic culture (Oetzel & Ting-Toomey, 2003; Schimmack, Radhakrishnan, Oishi, Dzokoto & Ahadi, 2002). Similarly, Markus and Kitayama (1991) suggested that in Western cultures including Germany, an independent view of the self is dominant, while an interdependent view of the self is more dominant in Asian cultures including Japan. According to Markus and Kitayama (1991), fulfilling the expectations of others is more important in interdependent cultures, which implies that subjective norms, defined as expectations of significant others (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), would play a more important role in Japanese society. This notion is supported in Abrams, Ando and Hinkle (1998), who found that subjective norms played an important role in workplace turnover in British and Japanese corporations. Ando, Ohnuma and Chang (2007) and Ando, Ohnuma, Blobaum, Matthies and Sugiura (2010) also found that subjective

norms had a greater influence on environmental behaviour in Japan when compared to the USA and Germany.

According to these studies, we can predict that subjective norms will play a more important role in determining the environmental behaviour in Japan than in Germany, as greater importance is placed on interpersonal relationships in the Japanese culture. In Germany, it can be expected that personal norms will play a more important role because of the focus on individual values in Western cultures. This is supported by studies conducted in Europe showing that personal norms have a significant impact on environmental behaviours (e.g. Bamberg, Hunecke & Blöbaum, 2007; Hunecke, Blöbaum, Matthies & Höger, 2001; Matthies, Selge & Klöckner, 2010).

Milfont (2012) reviewed research showing that collectivistic individuals in a given country tend to be more environmentally concerned. However, these studies were based on analyses conducted at an individual level and did not include the comparison between countries. Therefore, it is not possible to predict that Japanese citizens would be more concerned about the environment than would their counterparts in Germany, and we do not have specific predictions about the mean level of environmental behaviour in each country. This is also the case with cultural differences in children's environmental behaviour, as there is not much available evidence on the cultural differences in determinants of this behaviour in children.

Children gradually learn cultural values during the process of socialization as they grow into adulthood. Thus it can be assumed that young children have not fully acquired cultural values, at least at the level that adults have. Therefore, we predict that cultural differences in determinants of environmental behaviours will be greater for adults than for children.

### **Determinants of environmental behaviours in children and adults**

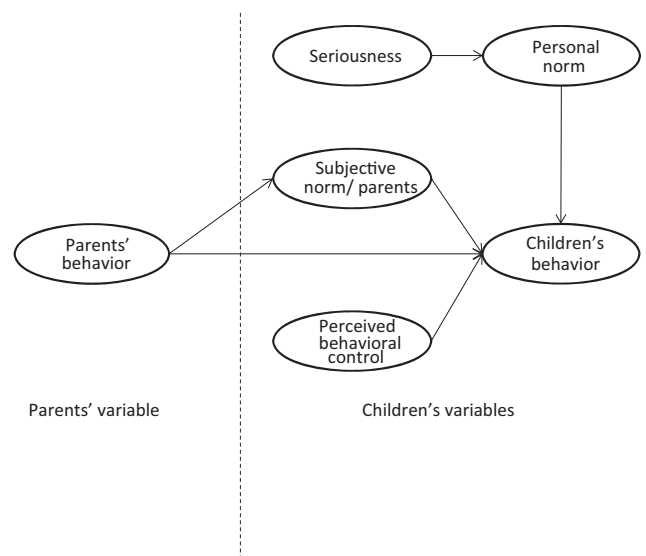
The present study explored the determinants of environmental behaviours in children and adults, with a specific focus on the process of parental influence. It was assumed that parental behaviour itself would directly affect children's behaviour and would also have effects through subjective norms. In Yorifuji's (2003, 2011) study, it was found that parents' environmental behaviour affects that of their children through subjective norms. Children perceived that parents expected them to adopt environmental behaviours when parents exhibited these behaviours themselves.

The subjective norm is defined as perceived expectations from significant others and willingness to comply with them in the theory of reasoned action (TRA: Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TRA proposed that behavioural intentions are determined by attitudes toward the behaviour and also by subjective norms.

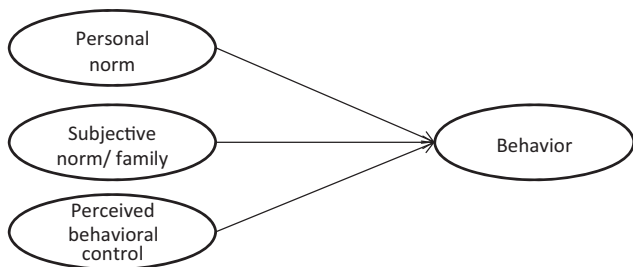
The theory of planned behaviour (TPB: Ajzen, 1985, 1991) expanded the TRA to incorporate perceived behavioural control as an additional direct determinant of behaviour. The TPB has been employed in pro-environmental behaviour research in many countries (Ando *et al.*, 2010; Groot & Steg, 2007; Harland, Staats & Wilke, 1999; Heath & Gifford, 2002; Kaiser, Hübner & Bogner, 2005; Nigbur, Lyons & Uzzell, 2010; Stern, Kalof, Dietz & Guagnano, 1995; Taylor & Todd, 1995; Yu-Long Chao, 2012).

The present study measured subjective norms and perceived behavioural control as defined by TPB as a determinant of environmental behaviour. We used personal norms, defined as 'the feeling of personal moral obligation based on the individual's personal values' (Schwartz, 1977). Personal norm is a central variable in Schwartz's norm activation model (Schwartz, 1977; Schwartz & Howard, 1980) and has been found to be a consistent predictor of environmental behaviour (Bratt, 1999; Hunecke *et al.*, 2001; Stern, 2000; Widegren, 1998). In the norm activation model, as the first activation step, awareness of needs and responsibility are required as antecedents of personal norms (Schwartz, 1977). We incorporated personal norms in the analysis because they are more specific than general attitudes and also easier to differentiate as an internal determinant from the concept of a subjective norm, which is considered to be an external determinant. The following analysis examines the relative importance of personal norms and subjective norms as internal and external values on the environmental behaviour of the participants.

The predicted determinants for children's environmental behaviour in the present study are shown in Figure 1. Parents' behaviour would affect children's behaviour



**Figure 1** The predicted determinants of children's environmental behaviour.



**Figure 2** The predicted determinants of parents' environmental behaviour.

directly, through simple imitation of the observed behaviour by children as suggested by Rogoff *et al.* (2003), and also mediated through subjective norms as found in Yorifuji's study (2003, 2011). Personal norms and perceived behavioural control (PBC) should also affect children's behaviour independently. As a predictor of personal norms, we measured the perception of seriousness, which is the equivalent of awareness of needs in the norm activation model. Paths from parental behaviour for perceptions of seriousness and PBC were not confirmed in the previous studies, but we aimed to examine the effects in the present analysis for exploratory reasons. Parental behaviour might affect children's perceptions of seriousness because it will show there actually is a problem that has to be taken seriously. PBC might be also affected by parental behaviour because it will show, say, how to recycle used paper.

For parental behaviours, we also assumed that personal norms, subjective norms and PBC would all act to determine behaviour (Fig. 2). We sought to compare the relative importance of these variables on behaviour between children and parents.

### Hypotheses

The present study first aimed to investigate parental influences on children's environmental behaviours. Observation learning theory (Bandura, 1977) and Rogoff *et al.* (2003) suggest that children learn new behaviours mainly through observation. In this study we examined whether environmental behaviours are also acquired through observation of parental behaviour.

The second aim of the study was to compare the impact of subjective norms and personal norms on environmental behaviours in Germany and Japan. Greater importance is placed on individual values in Germany, which is considered to have an individualistic culture; hence personal norms should play a larger role in Germany than in Japan. In Japan, which is considered to have a collectivistic culture, interpersonal relationships have greater importance; hence subjective norms should play a larger role in Japan than in Germany.

Our third aim was to compare the determinants of environmental behaviour in children and adults. Since children are in the process of socialization, it is assumed that children are more sensitive to parental expectations, and are more likely to be influenced by external values. Therefore, subjective norms would have stronger effects on children.

Hypotheses for the present study are as follows:

- H1a: Environmental behaviours of parents will directly affect the behaviour of children.
- H1b: Environmental behaviours of parents will also affect children's environmental behaviours through subjective norms.
- H2: In Germany, personal norms should have larger effects on behaviour compared to Japan, while subjective norms should have larger effects on behaviour in Japan than in Germany.
- H3: Between children and parents, subjective norms should have larger effects on behaviour for children than for parents.

## Method

### Respondents

A questionnaire survey was conducted in elementary schools in Cologne, Germany and Nagoya, Japan. Fourth grade students in 10 primary schools in Cologne, and third and fourth grade students in five primary schools in Nagoya were asked to participate in the survey.<sup>1</sup>

### Procedures

In Cologne 10 elementary schools<sup>2</sup> cooperated in the survey. Schools in Germany with low numbers of immigrants were chosen for cross-cultural comparison. Teachers distributed questionnaires to students, and the students filled out the questionnaires in the classrooms. Subsequently each student took both this questionnaire and a second questionnaire home and asked one parent to complete the second form. Participants were given pre-paid envelopes and the parents returned the children's questionnaires, along with their own, to the researchers using the envelopes provided.

In Japan, 27 schools in Nagoya were randomly chosen from two districts, which were chosen from 16 districts in the city. We sent letters to the 27 elementary schools requesting participation in the survey; this was followed by confirmation via telephone. Five schools allowed us to visit their campuses, and all five agreed to participate in the survey. In each school, teachers handed questionnaires to students in the third and fourth grades. All the students in the target grades received the questionnaires. Students then handed a second questionnaire to one of their parents at home. We asked all participants to complete the



questionnaires separately without discussing each other's answers. Both completed questionnaires were sealed together in envelopes provided by the researchers and collected at the schools.

In both Germany and Japan we asked the parent who felt most responsible for the household duties – such as cooking and cleaning – to fill in the questionnaire.

## Responses

In Germany 284 pairs of responses were collected from the 680 questionnaires distributed. In cases where a child or parent's questionnaire was missing, or where there were many missing values in the questionnaire, or where the questionnaire was completed by respondents who indicated a nationality other than German, responses were excluded from the analysis. After these criteria were applied, we obtained 221 pairs of valid answers (the valid response rate was 32.5%).

In Japan we collected 397 pairs of answers from the 478 questionnaires distributed. The same criteria as those used for questionnaires collected in Germany were applied; the number of valid questionnaires was 365 (valid response rate 76.4%).

## Measures

We composed the questionnaires first in Japanese and then translated them into German. The translated questionnaires were verified by German native speakers, then pre-tested in both countries and adjusted. All items were measured using a five-point scale (1 = strongly disagree, 5 = strongly agree) except for behaviour. Behaviour was measured on a five-point scale (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = always).

*Behaviours.* Pro-environmental behaviours of children and parents were measured by two items: 'I assort used paper so that it can be taken to collection of recyclables': cB1/pB1, 'I separate used paper': cB2/pB2. This sorting behaviour was chosen from the pre-study as a behaviour which is possible for school children to conduct in both countries because: 1) there is a recycling system used for paper in both countries; 2) it is possible for children to conduct this action at home; and 3) it is not an action that people take in order to save money.

*Personal norms.* Personal norms were measured by two items asking about an individual's sense of obligation to separate used paper ('I feel I am obliged to keep used paper to bring it for collection of recyclables': cPN1/pPN1, 'I feel I am obliged to the environment to separate used paper': cPN2 and pPN2).

*Subjective norms.* Subjective norms in the children's questionnaire were also measured by two items asking about parents' expectations of children to separate used papers ('My parents want me to separate used paper': cSN1, 'My parents want me to assort paper to the used paper container': cSN2). For parents' questionnaires, subjective norms were measured by one item ('My family expects me to separate used paper': pSN).

*Perceived behavioural control.* PBC was assessed using one item ('It is difficult for me to assort paper into the used paper container': PBC).

The questionnaires for both children and parents contained items related to the above variables unless otherwise specified.

*Seriousness.* We asked children about their perception of the seriousness of waste problems using two items ('It is a big issue for the people of Nagoya/Köln that there is so much waste': SP1, 'It is a serious problem that there is so much waste': SP2).

## Results

All three hypotheses were tested using SEM. Below are demographic data on the respondents, a comparison of the means, correlations that give an outline of the data, and the results of the SEM.

### Demographics of respondents

About half of the children were female in both countries (49.8% in Germany, 51.7% in Japan). Most of the parents were females, with a slightly higher percentage of females in the Japanese sample (83.6% in Germany, 98.3% in Japan:  $\chi^2(1) = 44.6, p < 0.001$ ). The mean age of children was similar but statistically significantly higher in Germany (9.6 years old in Germany, 9.4 years in Japan:  $t(579) = 3.56, p < 0.001$ ). Parents' age was also slightly higher in Germany (41.09 in Germany, 38.89 in Japan:  $t(567) = 5.60, p < 0.001$ ).

### Reliability of measures

The reliability of each measure was checked by Cronbach's alpha. For the children's questionnaire, alpha for German and Japanese respondents were as follows respectively. Behaviour: 0.66 and 0.62; subjective norm: 0.88 and 0.68; personal norm: 0.71 and 0.63; seriousness: 0.71 and 0.64. For the parents' questionnaire, behaviour: 0.85 and 0.82; personal norm: 0.76 and 0.64. Alpha coefficients for each measure were not very high, but all the coefficients

**Table 1** Means and standard deviation of behavioural and cognitive variables

	Country			
	Germany		Japan	
	Children	Parents	Children	Parents
Behaviour	3.77 (1.19)	3.22 (1.24)	3.87 (0.75)	2.53 (1.27)
Personal norm	3.79 (1.05)	4.02 (0.97)	4.36 (0.79)	3.94 (0.93)
Subjective norm	3.89 (1.20)	3.62 (1.10)	3.43 (1.37)	3.20 (1.15)
PBC	4.00 (1.21)	3.08 (1.32)	4.42 (0.95)	3.49 (1.27)
Seriousness	4.28 (0.85)	4.16 (0.92)	–	–

(SD)

scored over 0.60, which showed reasonably high internal consistency.

### Cultural differences in the behavioural and cognitive variable means

Means of pro-environmental behaviour and cognitive variables between two countries were compared using t-tests (Table 1). For the children's sample, behaviour ( $t(583) = 5.22, p < 0.001$ ), subjective norms ( $t(584) = 2.74, p < 0.01$ ) and PBC ( $t(584) = 8.43, p < 0.001$ ) were higher in Germany, while personal norms ( $t(584) = -2.70, p < 0.01$ ) were higher in Japan. As for the frequency of behaviours, 68.6% in Germany and 56.2% in Japan answered 'often' or 'always' ( $\chi^2(2) = 24.1, p < 0.001$ ) for cB1. The corresponding number for cB2 was 64.1% in Germany and 43.1% in Japan ( $\chi^2(2) = 14.0, p < 0.001$ ). The largest difference was found for PBC, which showed Japanese children felt sorting paper was more difficult than did children in Germany. No significant difference was found for perceptions of seriousness, which were high in both countries.

In order to check the gender differences,  $2 \times 2$  ANOVA using country and sex as independent variables were conducted for behaviour and each cognitive variable. The results show that the main effect of sex and the interaction term of sex and country were not significant for all variables except seriousness ( $F(1, 565) = 5.0, p < 0.05$ ). The gender difference of seriousness was larger in Germany, in which male students scored higher than female students ( $M = 4.44$  vs.  $4.12$ ). The main effects of country were significant for all the variables except seriousness.

For the parent sample, behaviour ( $t(583) = 12.59, p < 0.001$ ), personal norms ( $t(584) = 5.56, p < 0.001$ ), subjective norms ( $t(583) = 2.10, p < 0.05$ ) and PBC ( $t(583) = 9.39, p < 0.001$ ) were all higher in Germany. In particular, there were large differences for both behaviour and PBC. German parents demonstrated sorting behaviour more frequently than did Japanese parents and perceived it to be an easier activity.

### Correlations

The correlations between the variables for children and parents are shown in Table 2. In Germany, children's behaviour had significant correlations with all the variables. A relatively higher correlation was found with subjective norms ( $r = 0.632, p < 0.001$ ). In Japan, the pattern of correlations with children's behaviour and other variables were similar to that of the German sample, with a relatively higher correlation with subjective norms ( $r = 0.520, p < 0.001$ ). The correlations in the matrix ranged from low to medium, thus showing a low possibility of multicollinearity.

### Determinants of children's and parents' environmental behaviours in two countries

Multi-group analysis was used to test the influence of parents' behaviour on that of their children in Germany and Japan simultaneously. The analyses were conducted using AMOS 21. The full information maximum likelihood method was used for missing values.

Results for children and parents' models are shown in Figures 3 and 4. Model fit statistics indicate a good fit for both models (children's model: CMIN = 154.12,  $df = 66$ , GFI = 0.953, RMSEA = 0.048, parents' model: CMIN = 30.43,  $df = 10$ , GFI = 0.982, RMSEA = 0.059).<sup>3</sup> The children's model explained 87% and 65% variation in children's environmental behaviour in Germany and Japan respectively. The parents' model explained 65% and 64% variation in environmental behaviour in Germany and Japan respectively. To compare the fit of the two countries, pairwise comparisons between the path coefficients were conducted. The significantly larger path coefficients are framed by rectangles.

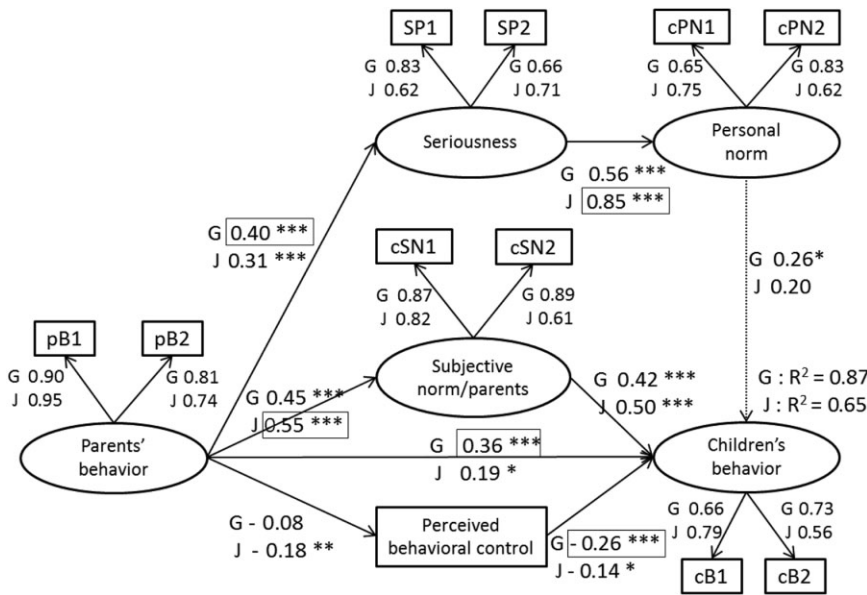
Regarding Hypotheses 1a and 1b on the effects of parental behaviour, results show that, in both Germany and Japan, parental behaviour had a direct effect on children's behaviour (direct effect: 0.36 in Germany 0.19 in Japan) and also had an effect via subjective norms (indirect effect:

**Table 2** Correlations between children and parents' behavioural and cognitive variables

		1	2	3	4	5	6	7	8	9
Children	1. Behaviour	—	0.50***	0.63***	0.42***	0.41***	0.44***	0.36***	0.24***	0.19**
	2. Personal norm	0.41***	—	0.54***	0.23***	0.43***	0.21***	0.19**	0.23***	0.06
	3. Subjective norm	0.52***	0.49***	—	0.31***	0.35***	0.39***	0.32***	0.28***	0.23***
	4. PBC	0.24***	0.15**	0.20***	—	0.18**	0.09	-0.05	-0.05	0.04
	5. Seriousness	0.30***	0.53***	0.34***	0.01	—	0.31***	0.25***	0.15*	0.02
Parents	6. Behaviour	0.42***	0.25***	0.46***	0.17***	0.14**	—	0.64***	0.36***	0.32***
	7. Personal norm	0.29***	0.19***	0.35***	0.13*	0.17***	0.57***	—	0.49***	0.26***
	8. Subjective norm	0.30***	0.21***	0.29***	0.14**	0.11*	0.51***	0.53***	—	0.19**
	9. PBC	0.25***	0.20***	0.32***	0.08	0.11*	0.55***	0.46***	0.33***	—

Note. 1 Correlations for German sample are above the diagonal; those for the Japanese sample are below the diagonal.

2 \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .



**Figure 3** The result of multi-group model between Germany and Japan for children's behaviour.

Note.

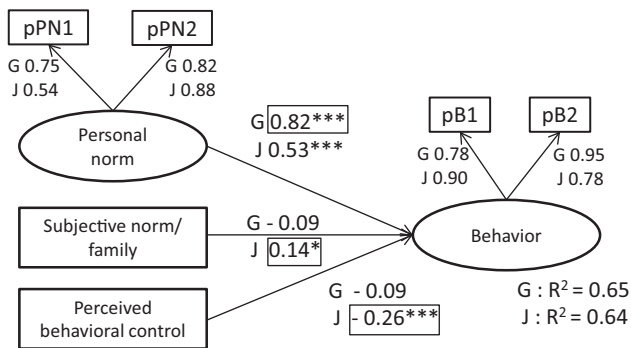
- \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .
- Country: G = Germany, J = Japan.
- Model fit:  $\chi^2(66) = 154.12$ , GFI = 0.953, AGFI = 0.906, CFI = 0.958, RMSEA = 0.048.
- The significantly larger path coefficients are framed by rectangles.

0.19 in Germany, 0.28 in Japan). The direct effect was significantly stronger in Germany. The significance levels of the indirect paths were tested by calculating confidence interval of the indirect effect,<sup>4</sup> which showed they were significant in both countries. Children perceived that they were expected to demonstrate sorting behaviour by observing the behaviour of their parents. Hypotheses 1a and 1b were thus supported in both Germany and Japan.

Parental behaviour also affected the perception of seriousness, which determined personal norms. Personal norm affected children's behaviour only in Germany. The indirect path from parents' behaviour to children's behaviour through seriousness and personal norm was significant (indirect effect: 0.06). In Japan the paths from parents' behaviour to PBC, and PBC to children's behaviour were also significant, and the indirect effect was also marginally significant (indirect effect: 0.03).

As for the second hypothesis on cultural differences, the effect of personal norms was larger in Germany in the parents' model. The difference in path coefficient was significant. Only in Japan did subjective norms have a significant path coefficient on behaviour in the parents' model. Therefore, the results support our hypothesis regarding cultural differences in the parents' model. For the children's model, the path from personal norms to behaviour was significant only in Germany. But the difference of the path coefficient was not significant. For children, subjective norms had strong effects on behaviour in both countries. Thus, the results show that the cultural differences were larger for adults.

Regarding the third hypothesis on differences between children and parents, subjective norms had a significant impact on behaviour for the children's model in both countries. The effect was much weaker for parents, although it



**Figure 4** The result of multi-group model between Germany and Japan for parents’ behaviour.

Note.

- 1 \* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .
- 2 Country: G = Germany, J = Japan.
- 3 Model fit:  $\chi^2(10) = 30.43$ , GFI = 0.982, AGFI = 0.924, CFI = 0.984, RMSEA = 0.059.
- 4 The significantly larger path coefficients are framed by rectangles.

was significant in Japan. On the other hand, the effect of personal norms was larger for parents. Children were more likely to be affected by the expectations of others. Thus, overall the results support Hypothesis 3.

### Discussion

The present study examined parental influence on the pro-environmental behaviour of children through paired analysis of data collected from children and their parents. Regarding parental influence on children’s pro-environmental behaviours, the results show that parents’ behaviour affects children’s behaviour directly and through subjective norms. Learning through observation, as Rogoff *et al.* (2003) pointed out, was more influential in Germany, but it also had impact in Japan. Parental influence through subjective norm was found in both countries, which indicates that the processes reported in Yorifuji’s study (2003, 2011) are also common in Western countries.

The possibility that parents’ behaviour affects children’s behaviour via seriousness perception and PBC of children was tested in the present study. The results show that parents’ behaviour could affect children’s behaviour by affecting seriousness perceptions and personal norms in Germany. By demonstrating the behaviour to children, parents are also indicating that they consider waste problems to be serious matters that individuals need to cope with; this in turn makes children consider the issue as serious, which forms the children’s personal norms. Parents’ behaviours also affected the seriousness perception in Japan, but the link between personal norm and

children’s behaviour was weaker. In Japan, parents’ behaviour affected children’s behaviour through PBC. Parents’ behaviour showed the children how they could separate the used papers, and where they could put the papers for recycling. The link between parents’ behaviour and PBC was not found in Germany; a possible reason may be that children in Germany already know how to recycle paper.

The results indicate that parental influence on the behaviour of their children is universal. The results of the present study support those shown in previous studies on children’s environmental behaviours, that is, that parents are a powerful influence on their children (e.g. Grønhoj & Thøgersen, 2009, 2012; Nakamura, 2003; Yorifuji, 2003, 2011), which proves the consistency of Bandura’s social learning theory (1977). The present study also shows that parents’ behaviour can affect children’s behaviour through seriousness perception and PBC. The respondents of the present study were children aged 9–10 years old, for whom parents are the most important others, as Bower (1979) pointed out. The results indicate that in order to promote children’s environmental behaviours, parents should be careful of their own behaviours, rather than trying to verbally change children’s behaviours.

Regarding cultural differences, differences in the importance of personal norms and subjective norms were clearer for adults, and this supported the hypothesis that personal norms were a more powerful determinant of behaviour in Germany, while subjective norms were significant only in Japan. This result is in line with previous findings, which showed that subjective norms had stronger effects in Japan (Abrams *et al.*, 1998; Ando *et al.*, 2007, 2010). It also suggests that since there is a greater importance placed on one’s relationships with others in Asian cultures, the expectations of others play a larger role in collectivistic cultures than they do in individualistic cultures. The cultural differences in the effect of subjective norm were not found for the children’s model. The results suggest that cultural differences are greater for adults as they have fully adapted to the cultural values of their respective societies, while children have not yet fully adapted to these cultural values.

One of the aims of the study was to compare the children and adults’ model of environmental behaviour. The SEM result shows that the effect of subjective norm is stronger for children. This indicates that children are more likely to be influenced by the expectations of others. The results also show that the personal norm effect was the strongest determinant of behaviour for the adult model even in Japan, which indicates that personal values are relatively more important for adults. These findings may suggest that because children need to learn social expectations during the process of socialization, they are more sensitive to the expectations of others, while adults are more independent.



The results of cultural comparison and comparison of children and adults suggest that subjective norms are internalized as a personal norm as we grow up, which may be a universal process. But there are cultural differences in the degree of internalization and the magnitude of the influence of subjective norms. We do not have enough evidence in the present findings to fully investigate this assumption, but it would be worth investigating this point further as a topic of social psychology, not just in the area of environmental behaviour.

## Mean differences

Comparison of the means reveals that the mean for sorting behaviour was higher in Germany for both children and adults. Milfont (2012) argues that collectivistic individuals are more concerned with the environment; however, this was found not to be the case in the present study, which conducted a country-level comparison. The seriousness perception was relatively high in both Germany and Japan, which suggests that elementary school children in both countries already have concerns about environmental issues.

There was a large cultural difference in the mean of PBC; it was higher in Germany for both children and adults. In Japan some of the respondents wrote in a space provided for free answers that they did not know paper is collected separately. If this is the case for some individuals in Japan, providing better information will promote sorting behaviour.

## Conclusions

The results of the present study suggest that considerable parts of the processes by which children acquire environmental behaviours are common, even in different cultures. Here, specifically, it was shown that children learn from observing the behaviour of their parents.

The present study also found that, as children grow up, they will adopt the cultural norms of the society in which they are raised; thus cultural differences in the determinants of behaviour are greater for adults. This also applies to the relative weight of the expectations from others and personal values.

The suggestions for promoting environmental behaviours from the present study would be that, for children, encouragement from others, especially demonstrating behaviour in one's everyday life is effective because it enhances the cognition that this behaviour is desired in a particular society. For adults, approaches to modify personal norms through communication such as demonstrating the seriousness of a problem are also seen as effective.

One of the major limitations of the study is the issue regarding measurements, which consisted of mainly one or two items. Since the present study aimed to gain responses from young children aged between 9 and 10, we tried to minimize the number of questions to get reliable answers, and the expressions were made simple. It was important to ensure that the children understood the questions, but it does limit the statistical power of the analysis.

Another limitation of the present study is that it examined parental influence on children and did not incorporate other societal influences in its model. It has been pointed out in previous research that parental influence is one of the largest factors in a child's development. However, it would be of interest to examine influences from other sources.

Despite these limitations, the present study offers a unique contribution in that we analyzed paired data between children and adults, which enabled us to examine the effects of parental behaviour on children's environmental behaviour. We also compared the children's model between different cultures. Studies on children's environmental behaviours are few compared to those of adults; however, this does not undermine the importance of studies in this area. Further research is necessary to illuminate the processes through which individuals acquire environmental attitudes and behaviours in a given society.

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## End notes

1. We recruited third and fourth grade students in Japan because of differences in the school systems in Germany and Japan. In Germany, children can start elementary school as early as five years old, while in Japan children begin elementary school at six.
2. We conducted the survey at a larger number of schools in Germany, as student enrolment in each grade is smaller than it is in Japan.
3. The null hypothesis for the model was rejected; however, Hoelter's critical N for 5% significance level was 353 for the parents' model and 327 for the children's model. The number of the pairs used for the analysis was 586, which exceeds both values; this indicates that the model was rejected because the sample size was large.
4. Confidence interval of the indirect effect was calculated based on standard errors, which was calculated by the delta method (Sobel, 1982, 1986). It was considered significant when the 95% confidence interval of the indirect effect did not include zero.

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