SOME PSYCHOLOGICAL DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR[1]

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Abstract: A study was conducted 1) to develop a scale of the frequency of environmentally responsible behavior (ERB), 2) to investigate how ERB is related to voluntary simplicity lifestyle (VSL), control of needs, social responsibility and concern about global environment for future generations, and 3) to investigate how VSL is related to the control of needs, social responsibility and the concern about global environment for future generations. Complete data were obtained from 137 undergraduates (102 male and 35 female). Variables were measured by factor-analyzed multiple-item 5- or 7-point scales. Analysis of multiple regression shows 1) VSL predicts ERB; 2) the control of needs predicts VSL; and 3) the concern about global environment for future generations predicts both ERB and VSL.

Key words: environmentally responsible behavior, proenvironmental behavior, ecological behavior, voluntary simplicity

Various indices show alarming and rapid global environmental deterioration due to problems such as global warming, depletion of ozone layer and deforestation. Various projections present global environmental change having lethal impact on human life in the near future. It is our responsibility to alleviate negative effect of global environmental change. There must be social restructuring for encouraging environmental protection and individuals must activate environmentally responsible behavior (ERB) which

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contributes to environmental protection.

ERB alleviates or restrains environmental pollution and destruction. Recycling has been extensively studied, as in Hopper and Nielsen (1991), Guagnano, Stern and Dietz (1995), Berger (1997), Thorgersen (1997) and Obregon-Salido (1997). Energy conservation has been frequently researched, as in Baum and Singer (1981), Geller, Winett and Everet (1982). But studies of recycling and energy conservation have focused primarily on environmental factors, relatively neglecting psychological factors.

On the other hand, some research uses ERB frequency to investigate psychological determinants of ERB. Scott and Willits (1994) found that support for Dunlap and Van Liere's New Environmental Paradigm is predictive of environmental consumer behavior and political behavior. De Young (1985-86) examined the relationship between environmentally appropriate behavior and intrinsic motivation. De Young (1996) also investigated the role of intrinsic satisfaction on reduced consumption behavior. Tarrant and Cordell (1997) discovered that three from five attitude scales are associated with self-reported general behavior index. Karp (1996) examined the relationship between values and proenvironmental behavior. Schultz and Zelezny (1998) investigated the relationship between Schwartz's values and self-reported proenvironmental behavior. Finally, Stern and Dietz (1994) investigated the relationship between four value orientations and proenvironmental behavioral intentions.

However, Scott and Willits (1994) and De Young (1996) used an inappropriately small range of behavior and cannot develop an appropriate index of ERB frequency. Karp (1996) and Tarrant & Cordell (1997) used larger numbers of ERB items, but a small range of ERB. To investigate psychological characteristics encouraging ERB, the first objective of the present study is to develop an appropriate ERB index.

There are many attitudinal determinants of ERB. Hines, Hungerford and Tomera (1986-87) conducted meta-analysis of 128 studies reported since 1971, but many important attitudinal variables were not investigated in these studies, including voluntary simplicity lifestyle (VSL), social responsibility and "the concern about global environment for future generations."

Iwata (1997) simply defined VSL as lifestyle of low consumption which includes material self-dependency. VSL is an attitude contributing to low consumption which is one aspect of ERB. So VSL and ERB are not the

same as each other. Significant relationships exist between factors of VSL and some perceptual, attitudinal or behavioral measures (Iwata, 1997), suggesting that VSL essentially determines ERB. Presumably, the control of needs (strength of controlling one's own needs) also determines ERB. A significant relationship exists between environmental concern and social responsibility (Iwata, 1981), leading to the assumption that social responsibility may encourage ERB. A significant and positive relationship exists between a measure of future orientation and VSL (Iwata, 1997), implying that "the concern about global environment for future generations" may predict ERB.

The second objective of the present study is to investigate whether or not ERB is related with VSL, the control of needs, social responsibility and "the concern about global environment for future generations."

Finally, relationships exist between VSL and some self-reported behavior indices (Iwata, 1997). As the third objective, the present study investigates whether or not VSL is related with the control of needs, social responsibility and "the concern about global environment for future generations."

METHOD

Subjects One-hundred and forty-three undergraduates enrolled in an Introductory Psychology course at the University of Tokushima participated in this study. Complete data of 137 undergraduates (102 male and 35 female) were analyzed. The average age was 18.65 years and standard deviation was 1.98.

Questionnaires Three-page questionnaires contained five scales. A 23-item 7-point scale of VSL was used (see Table 2). The control of needs, social responsibility and "the concern about global environment for future generations" were measured respectively by an 8-item 5-point scale, an 8-item 5-point scale and a 5-item 5-point scale. Subjects were asked to read statements carefully and to rate degree of agreement or disagreement. A score from 1 through 5 or from 1 through 7 was given to each response, higher scores representing stronger VSL, stronger control of needs, stronger social responsibility or stronger "concern about global environment for future generations."

Finally, ERB was measured by a 25-item 5-point scale (see Table 1).

Frequency scale of ERB was: Never do so; seldom do so; occasionally do so; often do so; almost always do so. Subjects were asked to read statements carefully and to rate frequency of specified behavior. A score from 1 through 5 was given to each response. When a statement represented environmentally responsible behavior, a higher score was given for a higher frequency response. Conversely, a higher score was given to a response showing lower frequency when a statement represented environmentally irresponsible behavior. Thus, higher scores indicate higher frequency of each ERB.

Procedure Questionnaires were administered to students in the first class of an Introductory Psychology course as a course requirement. Statistical analyses were carried out by Statistica™ programs developed by StatSoft.

RESULTS

Factor analysis was applied to data of the 25 items of ERB. Principal factor method produced two factors without rotation which were interpreted by items having factor loadings of .40 or over. Subsequent factor analyses followed the similar procedure except VSL. Varimax rotation was applied only to VSL because it was necessary. Table 1 shows factor loadings without rotation, with means and standard deviations. Items 1, 2, 3, 6, 9, 16, 17, 18, 21 and 24 had loadings of .40 or over on Factor I, the factor was interpreted to be ERB. Contribution of Factor I was very small, but these 10 items produced Cronbach's alpha coefficient of .72. Score range of ERB was from 10 through 50. Factor II could not be interpreted.

Factor analysis with Varimax rotation was applied to data of the 23 items of VSL. Table 2 shows factor loadings with means and standard deviation. Items 1, 2, 3, 6, 7 and 20 had significant loadings on Factor I, indicating "cautious attitudes in shopping." Items 12 and 13 had high loadings on Factor II, showing "acceptance of self-sufficiency." Items 15, 16, 17, 19 and 20 had significant loadings on Factor III, representing "emphasis on long-term usage oriented toward environmental protection." Items 5, 8 and 11 had significant loadings on Factor IV, but this factor could not be interpreted. Factor scores were calculated by adding relevant item scores. Score ranges were: 6-42 for Factor I; 2-14 for Factor II; 5-35 for Factor III; 3-21 for Factor IV.

Table 1
Factor loadings of the scale of environmentally responsible behavior

Items	Factors I	Factors II	$\bar{X}$	SD
1. I use new paper as little as possible.	55	04	3.15	1.14
2. I use recycled paper.	54	22	3.02	0.91
3. I buy paper products with a "green mark."	50	36	2.03	0.82
4. I use paper towels in my home.	-10	-37	4.06	0.99
5. I use tissue paper to wipe stain off.	26	-33	2.30	1.22
6. I wash my face with faucet water running.	43	-03	1.90	1.27
7. I wash tableware in sink water rather than in running water.	23	19	2.15	1.30
8. I reuse hot water left in a bathtub to wash clothes.	32	-09	1.90	1.34
9. I make efforts to save electricity when I air-condition in my home.	50	-15	3.61	1.20
10. I keep an air conditioner in my home well maintained.	34	01	2.58	1.10
11. I leave my TV set turned on while I do something somewhere else.	39	-26	2.61	1.28
12. I turn lights on or off frequently.	25	-10	3.40	1.18
13. I use water-soluble marking pen.	19	16	3.21	1.02
14. I use aerosols containing Freon gas.	30	-04	4.09	0.98
15. I use aluminum foil and plastic food wrap.	00	-14	2.36	1.07
16. When I buy articles, I pay attention to whether or not they contain toxic chemicals.	44	-02	2.30	1.13
17. I buy vegetables and fruits even if they appear slightly imperfect.	51	-04	3.26	1.23
18. I give old newspaper to waste collectors for recycling.	44	-05	3.15	1.47
19. I use throwaway cups and tableware.	11	-41	4.01	1.01
20. I buy bottled drinks.	-21	31	2.44	0.93
21. I buy commodities with an "eco-mark."	40	42	2.24	0.79
22. I buy articles in plastic containers.	-03	-51	2.85	0.84
23. I refuse to have articles that I buy put into a paperbag or a vinyl bag.	29	10	1.55	0.86
24. I avoid as much as possible vegetables treated by agricultural chemicals.	43	-16	2.91	1.16
25. I use insecticides.	22	-37	3.22	1.22
eigenvalues	3.14	1.50		
contributions(%)	12.6	6.0		

Decimal points of factor loadings are omitted.

Using these factor scores, factor analysis was conducted and, Factors I and III had loadings over .40. Factor II had a loading of .30, but was used as a factor of VSL. The six items associated with Factor I had Cronbach's alpha coefficient of .74 and the five items associated with Factor III had alpha coefficient of .70. Factor II had two items with a very high loading. Total VSL score was calculated by combining the three factor scores.

Factor analysis applied to data of the 8 items relevant to the control of needs produced one factor. Four items had loadings of .40 or over (the lowest loading was .51): 1) I am likely to endure what I want to do; 2) I can wait patiently until what I want to have will come into my hands; 3) I

Table 2

Rotated factor loadings of the scale of voluntary simplicity lifestyle

Items	Factors I	II	III	IV	$\bar{X}$	SD
1. I try to live a simple life and not to buy articles which are not necessary.	60	01	02	-00	4.55	1.27
2. I do not do impulse buying.	53	-02	-04	-12	4.12	1.73
3. When I shop, I decide to do so after serious consideration of whether an article is necessary to me or not.	73	11	02	-10	5.18	1.45
4. I am more concerned with mental growth and fulfillment than material affluence.	27	-10	26	36	5.05	1.32
5. Material affluence is very important tohuman happiness.	02	-18	08	40	3.38	1.32
6. Economic development provides food for men to live.	62	07	15	18	5.20	1.65
7. Except for traveling, I enjoy my leisure time without spending too much money.	48	24	10	02	4.83	1.42
8. It is wrong to pursue a convenient and comfortable life insatiably.	-03	-00	08	41	3.43	1.39
9. I prefer products with simple functions to those with complex functions.	-02	16	-23	27	4.28	1.66
10. Products having convenient and comfortable functions make people spoiled.	-04	13	07	30	3.69	1.39
11. Sophisticated functions of products are useless.	-13	12	-09	53	2.77	1.25
12. It is desirable to provide ourselves with vegetables.	10	78	10	10	4.66	1.59
13. It is a desirable human life to be selfsufficient as much as possible.	05	78	04	-08	4.41	1.59
14. People are too indifferent as to how they pollute or destroy the environment.	19	-23	15	31	5.67	1.32
15. Behavior which is helpful to environmental conservation is valuable.	-00	05	57	-06	5.93	0.99
16. I usually try not to pollute or destroy the environment.	-00	07	58	-02	4.45	1.42
17. I try to use articles which I bought as long as possible.	26	06	52	01	5.43	1.38
18. Frequent remodeling of products should be reduced.	00	14	30	11	4.74	1.40
19. I cannot tolerate articles still usable being dumped in large quantities as pieces of rubbish.	03	11	66	06	5.31	1.19
20. When I shop, I seriously consider being able to use an article for a long time without tiring of it.	41	14	45	12	5.20	1.38
21. I feel happy when I am surrounded by articles which I bought.	-01	-14	02	-10	3.64	1.59
22. I buy new products even if I have some old products.	31	05	23	09	4.79	1.56
23. I try to buy high quality articles rather than practical and cheap ones.	18	-13	10	22	5.09	1.55
eigenvalues	2.29	1.54	1.93	1.18		
contributions(%)	9.9	6.7	8.4	5.1		

Decimal points of factor loadings are omitted.

can control my desires well; 4) controlling myself, I can give up what I want to have. Cronbach's alpha coefficient of .74 was obtained from the four items concerning "the control of needs."

Factor analysis on data of the 8 items of social responsibility produced one factor and five items had loadings of .40 or over (the lowest loading was .69): 1) I have a strong sense of responsibility; 2) I always finish my task well; 3) I am seldom late for a deadline or a time limit; 4) Others regard me as a person with strong sense of responsibility; 5) I keep my promises well.

Factor analysis was carried out on data of the scale of "the concern about global environment for future generations." Five items with loadings .40 or over (the lowest loading was .62) yielded Cronbach's alpha coefficient of .89 and were used to measure "the concern about global environment for future generations": 1) I am concerned that crises of food supply may face my children and grandchildren; 2) I am concerned that depletion of natural resources may face my children and grandchildren; 3) I am concerned about effects on future generations caused by destruction of global environment due to development; 4) I am concerned that problems relevant to global environment may oppress my children and grandchildren; 5) I am concerned that future generations may have serious difficulties because of continuing mass production and consumption.

Table 3 shows multiple regression analysis conducted on ERB, with four predictors entered simultaneously. According to standardized regression coefficients, VSL and "the concern about global environment for future generations" produce substantial betas regarding ERB, suggesting that stronger VSL and such concern may encourage ERB. VSL had a moderate beta. The combined four predictors accounted for a substantial proportion of variance concerning ERB (R=.52).

"The control of needs," social responsibility and "the concern about global environment for future generations" were assumed to be related to VSL. Multiple regression analysis was carried out on VSL, with three predictors entered simultaneously. Standardized regression coefficients are in Table 4. "The control of needs" and "the concern about global environment for future generations" are substantially related to VSL, suggesting that stronger such control and such concern may strengthen VSL. The combined three predictors accounted for significant variance in VSL (R=.54).

Table 3
Multiple regression on
environmentally responsible behavior

Predictors	Betas
VSL	.455**
the control of needs	-.021
social responsibility	-.040
the concern about global environment for future generations	.188*
R^2	.271

F(4, 132)=12.280 $p<.001$
*$p<.01$ **$p<.001$

Table 4
Multiple regression on
voluntary simplicity lifestyle

Predictors	Betas
the control of needs	.409*
social responsibility	.134+
the concern about global environment for future generations	.262*
R^2	.292

F(3, 133)=18.264 $p<.001$
+.05<$p<.10$ *$p<.001$

Table 5
Multiple regression on each
factor of voluntary simplicity lifestyle

	Betas		
redictors/Factors	I	II	III
he ontrol of needs	.469***	.125	.187*
ocial responsibility	.074	-.061	.238**
he concern about global environment for future generations	-.002	.261**	.407***
	.250	.082	.289

=cautious attitudes in shopping II=acceptance of self-sufficiency
II=emphasis on long-term usage oriented toward environmental protection
*$p<.05$ **$p<.01$ ***$p<.001$

Finally, Table 5 shows standardized regression coefficients based on egression of these three predictors on each of the three factors of VSL. Only "the control of needs" was substantially related to "cautious attitudes n shopping," suggesting strong such control may enhance such attitudes.

Only "the concern about global environment for future generations" was related to "acceptance of self-sufficiency," implying that strong such concern may strengthen the acceptance. All predictors, especially, "the concern about global environment for future generations" had a significant beta regarding "emphasis on long-term usage oriented toward environmental protection," indicating these predictors can predict such emphasis.

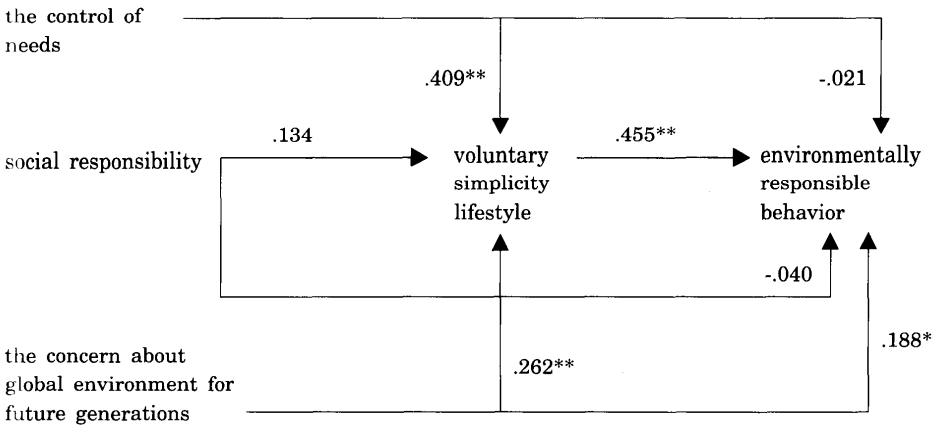
DISCUSSION

Factor analysis of ERB produced one interpretable factor and 10 items associated with this factor had internal consistency, allowing valid measurement of ERB frequency. Regarding the first objective, this study successfully developed an index of ERB.

Another factor analysis produced three interpretable factors regarding VSL: 1) "cautious attitudes in shopping"; 2) "acceptance of self-sufficiency"; 3) "emphasis on long-term usage oriented toward environmental protection." Factor I and Factor II, but not Factor III, were discovered in factor analysis of a 20-item VSL scale (Iwata, 1997). Thus, factor structure of the present study was moderately different from the earlier study, possibly because of difference in the number of items and in characteristics of target populations.

Fig. 1 shows results of multiple regressions incorporated into a path model which addresses the second and the third objectives, to investigate how VSL and ERB are related with predictors. VSL had the highest beta regarding ERB, suggesting that promoting ERB requires environmental education that nurtures solid VSL. "The concern about global environment for future generations" was related to VSL and ERB, perhaps because influences of deterioration of global environment will appear in the future rather than immediately. Apparently, only those people concerned about the future may have salient VSL and engage in ERB that benefits future generations.

"The control of needs" could not predict ERB, but could predict VSL, possibly relating to ERB via VSL. Regarding the strong beta of "the control of needs" regarding VSL, in our affluent societies, adopting VSL means controlling material desires. Additionally, controlling such desires is supposedly more closely related to VSL than to ERB because VSL and only



Betas $*p<.01$ $**p<.001$

Fig. 1 A path diagram of environmentally responsible behavior

a small range of ERB associated with VSL are assumed to lead to low consumption which is performed by controlling such desires.

Social responsibility is assumed to be related to VSL and ERB, but standardized regression coefficients do not support this assumption. Regarding VSL, only a marginal beta of social responsibility was discovered. Hines, Hungerford and Tomera (1986-87) meta-analyzed six studies and found personal responsibility-behavior relationships, but personal responsibility in those studies was expressed in reference to the environment. In the present study, social responsibility was not "environmental social responsibility," but "social responsibility in general." So, social responsibility could not predict VSL and ERB substantially.

Generally, three predictors predicted VSL in the assumed directions. But when the four predictors were regressed on ERB, only VSL and "the concern about global environment for future generations" predicted ERB.

The present study discovers an important path from "the control of needs" to ERB through VSL. It is indispensable to develop effective environmental education curricula to identify important psychological determinants of ERB and to integrate these determinants into a model.

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