

## **Sustainable Behaviors and Perceived Psychological Restoration**

Victor Corral-Verdugo<sup>1</sup>, Fernanda I. García, Cesar Tapia-Fonllem &  
Blanca Fraijo-Sing  
University of Sonora

### **Abstract**

This study was aimed at exploring one potential psychological benefit of sustainable behaviors: the perceived psychological restoration (PR) associated to engaging in pro-environmental activities at both the physical and social levels. PR involves the recovery of lost psychological resources (attention, positive mood states, psychological wellbeing) mostly caused by attentional fatigue and stress, while sustainable behavior constitutes a set of actions aimed at the protection of natural and social resources. One-hundred- and thirty-seven individuals living in a Northern Mexican city participated in a study assessing four instances of sustainable behavior: altruistic, proecological, frugal, and equitable actions. In addition, four dimensions of a construct related to the perceived psychological restorative effects of sustainable behaviors were measured: being away, fascination, extent and compatibility, assumedly resulting from pro-environmental and pro-social actions. Using structural equation modeling, the first four constructs were aggregated into a higher-order factor (sustainable behavior), while the rest of the constructs constituted a second higher-order factor (perceived restoration). These two higher-order factors resulted highly and significantly associated, indicating that practicing actions of environmental and social conservation might likely result in the restoration of lost psychological functions. These results reinforce the idea that sustainable behavior produces positive psychological consequences.

*Key Words:* Perceived restoration, Sustainable behavior, Altruism, Equity, Frugality.

## **Conductas Sustentables y Restauración Psicológica Percibida**

### **Resumen**

El propósito del presente estudio se centró en explorar un potencial beneficio psicológico de las conductas sustentables: la restauración psicológica percibida que las personas asocian a su involucramiento en actividades pro-ambientales, tanto en lo que se refiere al cuidado del ambiente físico, como del social. La restauración psicológica involucra la recuperación de funciones (atención, estados de ánimo positivos, sensaciones de bienestar) perdidas por la fatiga atencional y el estrés, mientras que la conducta sustentable constituye un conjunto de acciones encaminadas al cuidado de recursos naturales y sociales. Dado que la investigación previa sugiere que las personas anticipan efectos restaurativos de la exposición a ambientes sustentables, surge la interrogante acerca de un posible efecto restaurador de las conductas sustentables. Se desarrolló un estudio en el que participaron ciento treinta y siete habitantes de una ciudad del norte de México; la investigación midió cuatro instancias de la conducta sustentable: acciones altruistas, proecológicas, frugales y equitativas. Adicionalmente, se evaluaron cuatro dimensiones de un constructo relacionado con los efectos restaurativos psicológicos de las conductas sustentables. Estas dimensiones comprendieron la evasión, la fascinación, la extensión y la compatibilidad, las cuales, se asumían como estados resultantes de las acciones pro-ambientales y pro-sociales. A través del uso de ecuaciones estructurales se agregaron los primeros cuatro constructos dentro de un factor de orden superior, al que denominamos "conducta sustentable", en tanto que el resto de los constructos medidos constituyó un segundo factor de orden superior, etiquetado como "restauración psicológica percibida". Los resultados señalan que los dos factores de orden superior se asocian de manera sobresaliente y significativa, lo que indicaría que la práctica de acciones de conservación ambiental y social pueden ayudar a la restauración de funciones psicológicas perdidas. Estos resultados se añaden a una serie de evidencias que muestran beneficios psicológicos de la actuación a favor del ambiente.

*Palabras claves:* Restauración percibida, Conducta sustentable, Altruismo, Equidad, Frugalidad.

Original recibido / Original received: 02/02/2012

Aceptado / Accepted: 28/06/2012

<sup>1</sup> Correspondencia: Department of Psychology, University of Sonora, 83000, Mexico. E-mail: victorcorral@sociales.uson.mx

*Sustainable behaviors and perceived psychological restoration*

During the last three decades a significant effort has been invested in studying the determinants of sustainable behavior: the set of deliberate and effective actions that result in the conservation of the socio-physical environment for present and future generations (Bonnes & Bonaiuto, 2002). Sustainable behavior (SB) includes, at least, four instances of pro-environmental and pro-social activities: pro-ecological, frugal, altruistic, and equitable actions (Corral-Verdugo, García, Castro, Viramontes, & Limones, 2010; Iwata, 2001; Schultz, 2001). Pro-ecological behaviors are actions aimed at conserving natural resources (Kaiser, 1998; Thøgersen, 2005); frugal behaviors are implied in a voluntary lifestyle of reduced consumption, avoiding unnecessary buying, expending and wasting of resources (Iwata, 2001); in turn, altruistic behaviors are defined as actions intended at maximizing others' benefits (Van Lange, 2000); while equitable behaviors are meant to, both, fairly distributing resources and treating –without biases– others regardless of their demographic, biological, or personal characteristics (Winter, 2002).

Most of the investigative effort on the determinants of SB is directed to investigating its contextual and dispositional antecedents. Those factors are assumed to be antecedent because precede (and instigate) the display of pro-environmental and pro-social behaviors (PB). The dispositional antecedents of PB include pro-ecological worldviews, future orientation, environmental values and norms, emotions towards nature, affinity towards bio-socio-diversity, intentions to act, among many others (Bamberg & Möser, 2007; Corral-Verdugo et al., 2009; Joireman, Lasane, Bennett, Richards & Solaimani, 2001; Vining & Ebreo, 2002). Although necessary and important, the study of those antecedents does not provide the whole picture of the determinants of SB. Lacking in this picture is the consideration of the consequences of sustainable behavior. This consideration is fundamental, since positive consequences of behavior incite further engagement in a pro-environmental and/or pro-social action (Geller, 2002).

Positive consequences may be of extrinsic or intrinsic nature. Extrinsic benefits of behavior are provided by sources that are external (i.e., monetary reward, social recognition, etc.) to the individual who is practicing a due behavior and they reinforce and maintain pro-environmental actions (Geller, 2002; Lehman & Geller, 2004). Although such consequences are powerful instigators of sustainable behavior, their use as strategies to encourage sustainable actions has proven somehow problematic: One problem is the very fact that the individual depends on external sources when receiving the benefit (i.e., if no source is available, the consequence does not appear); other is that extinction of the (sustainable) behavior occurs after the removal of the extrinsic consequence (see Lehman & Geller, 2004).

Intrinsic consequences (i.e., the “natural” and automatic consequences that result from engaging in a behavior), alternatively, are experienced in the form of psychological positive states, such as intrinsic satisfaction, competence motivation, and subjective wellbeing or happiness, and they represent an important research area to consider within the field of environmental psychology, as several studies have shown. De Young (1996) and Iwata (2001), for instance, found that pro-

environmentally oriented people develop a state of intrinsic satisfaction that is derived from practicing those actions; De Young (1996) also reported competence motivation (a feeling caused by knowing that one is effective in solving environmental problems) as a consequence of engaging in conservation behaviors. Brown and Kasser (2005), and Bechtel and Corral-Verdugo (2010), in turn, found higher levels of happiness in individuals that were more frugal and pro-ecological, and this also applies to altruistic people, who gain subjective wellbeing from their pro-social acting (Schroeder, Penner, Dovidio & Piliavin, 1995; Van de Vliert, Huang & Parker, 2007). This brief review suggests that studying those positive intrinsic consequences might provide ways to develop effective and automatic incentives to pro-environmental and pro-social acting.

### *Psychological restoration*

One potentially intrinsic consequence of sustainable behavior is the psychological restoration experienced by the practice of pro-environmental and pro-social actions. Restorative experiences involve the recovery of lost psychological resources mostly caused by attentional fatigue (Hartig, Kaiser & Bowler, 2001). Those resources are necessary for maintaining the homeostatic states required in a healthy living. Attention, positive mood states and mental health are among those resources. There is evidence suggesting that people can be motivated to act pro-environmentally by anticipating restorative effects of those actions (Hartig et al., 2001).

Kaplan (1995) suggests four mechanisms involved in restoration experiences: being away, fascination, extent and compatibility. Being away occurs in experiences that put psychological distance from aspects of an individual's routines and demands on directed attention (Hartig et al., 2001). Kaplan (1995) considers that being away is produced by mentally removing distractions from the immediate environment, stopping the cause of attentional fatigue, or ceasing the pursuit of certain goal. Fascination occurs when the individual experiences effortless attention by objects in her/his milieu or in the process of making sense of the environment (Hartig et al., 2001). Fascination ranges on a continuum from hard fascination (requiring more voluntary attention) to soft fascination (which is non-directed and effortless). Thus, soft fascination would lead to the restorative experience (Kaplan, 1995). Extent is involved in situations that facilitate immersion in a coherent environment, which provides ways to sustain exploration (Hartig et al., 2001). This propitiates the individual to become fully absorbed in the experience and evokes imagination of something more to come (Norling, Sibthorp & Ruddell, 2008). Compatibility is provided by a congruence between personal predispositions/objectives, and environmental support and demands for action. Norling et al (op cit, p. 185) propose that "compatibility might be a function of activity dictates and personal intentions."

Those four experiences might be caused by exposing oneself to natural environments (Hernández & Hidalgo, 2005; Herzog, Maguire & Nebel, 2002).

Psychological restoration might be also promoted by engaging in certain activities. For example, physical exercise (Norling et al., 2008) and meditation

(Kaplan, 2001) appear to promote restoration. The question is whether some other activities might also be inductors of restorative experiences, and sustainable actions are potential candidates.

#### *Sustainable behavior and psychological restoration*

There are reasons to suppose a relationship between restorative experiences and sustainable behaviors. For instance, sustainable environments that result from pro-environmental behaviors are necessarily more coherent (as natural environments are) than unsustainable contexts. They may provide a situation for extent experiences, as conceived in the literature of psychological restoration (Hartig et al., 2001). Pro-environmental and altruistic conducts may also help to putting psychological distance from aspects of people's daily demands, especially when those conducts are not assumed to be a burden (i.e., the experience of personal sacrifice) for the individual (Lindenberg & Steg, 2007). Compatibility might be provided by congruence between pro-environmental goals and pro-sustainable demands, as occurs in the case of pro-environmental competence (Corral-Verdugo, 2002; Kaplan, 2001). It is also likely that sustainable behaviors can provide fascination if they are assumed as captivating experiences or if they draw people's attention to a number of interesting things about helping others and/or conserving the environment, as altruistic people and pro-environmentally committed persons manifest (Kals & Ittner, 2003; Post, Underwood & Hurbur, 2002).

Furthermore, there is empirical evidence suggesting a link between sustainable behavior and restoration. In their study, Van den Berg, Hartig and Staats (2007) associated pro-environmental behavior with setting design and restoration. The authors claimed for a balance between the natural features of urban landscapes and other built aspects of the city. Since their study's participants acknowledge the restorative effect of the environment, the authors conclude that a sustainable design should lead to physical and psychological restoration.

In one more study, Hartig et al. (2001) established a link between sustainable acting and restoration. The authors found that perceptions of restorative qualities of nature predicted 23% of the variance in general ecological behavior. In a more recent study, Hartig, Kaiser & Strumse (2007) replicated those findings and reported a relationship between use of natural environments for psychological restoration and pro-ecological behaviour. Thus, according to these results, psychological restoration is a likely consequence of sustainable acting. If an intact and natural environment induces such consequence, then, the actions making possible nature conservation are ultimately the causes of restoration. Yet, so far, no study investigating the relationship between the practice of sustainable activities and the report of restorative experiences produced by engaging in those activities had been conducted. Thus, we hypothesized that people who practice sustainable behaviors will also perceive more restorative experiences from acting pro-environmentally and pro-socially.

## Method

### *Participants*

One-hundred and thirty-seven individuals living at the city of Hermosillo, a northern Mexican city participated in this study. They were selected from representative (low, middle and higher socio-economic) zones of the city, according to the parameters of INEGI (2000), the Mexican Census Bureau. Eighty were females and fifty-seven were males. Almost fifty percent of them reported a monthly family income between 500 and 2000 U.S. dls., with thirty four percent falling below the \$500 line, and only sixteen percent reporting more than a \$2000 income. About half of the sample had less than university-grade schooling. Seventy-six percent owned the household they lived.

### *Instruments*

A scale assessing altruistic actions was utilized. This consists of the self-report of ten behaviors aimed at assisting or helping others. Corral-Verdugo et al. (2010) reported the use of this scale, providing indications of convergent and concurrent validity and reliability (internal consistency). The scale uses a four-point response-option format (0=never... 3=always engage in such an action). One more used scale measured proecological behavior, considering 15 items from Kaiser's (1998) General Ecological Behavior Scale, which are assessed in a zero (never) to three (always) scale. We also assessed Frugality in ten actions reported using a five-point likert-options of response (0 = totally agree... 4=totally disagree); this instrument was designed by Corral-Verdugo and Pinheiro (2004), also producing indication of validity and reliability. Equity was measured with a scale developed by Corral-Verdugo et al. (2010), which included seven items using response options from zero (totally disagree) to four (totally agree). A factor analysis of the instrument provided evidence of convergent validity and its internal consistency was adequate.

The perceived restoration associated to engaging in pro-environmental activities was assessed by using a modified version of the Perceived Restorativeness for Activities scale (Norling et al., 2008). In the original scale, Norling et al asked the respondents to state how much a series of sentences indicating restorative effects of physical activities apply to them. In our modified version participants were asked to rate how much they get restoration from helping others and from conserving the physical environment. The scale is assumed to measure the four restoration dimensions, according to the theory: Being away (e.g., "Conserving the environment helps me get away from it all"), Fascination (e.g., "For me, helping others has many fascinating qualities"), Extent (e.g., "The more I participate in helping others the more I want to explore it"), and Compatibility (e.g., "By participating in environmental conservation I expect will feel well when I am done"). Each subscale or dimension consisted of six items, three considering environmental conservation activities, and three considering actions

directed to helping others. The items were responded using a five-point likert-options scale (0 = totally agree... 4=totally disagree).

### *Procedure*

Participants were approached and their informed consent to participate in this study was obtained. Everyone accepted to respond to the instruments. It took about 20 minutes to respond to these instruments.

### *Data analysis*

Univariate statistics for the used scales and their items were obtained, as well as Cronbach's alphas indicating the scales' internal consistency. Two confirmatory factor analyses (CFA) were specified, testing alternative models regarding the factor structure of the restoration items, as Norling et al (2008) did. One model conceived those items as producing a single factor (perceived restoration) while the second model assumed a four-factor structure (being away, fascination, extent, and compatibility). In order to conduct those CFAs, the items of every factor were parceled into three indicators for each assessed construct.

A structural equation model (SEM) was also specified to test the hypothesis of a significant relation between the assessed sustainable behaviors and the perceived restoration. The measurement model (Bentler, 2006) consisted of four CFA's for the sustainable-behavior (pro-ecological, frugal, altruistic, equitable) factors, and four CFA's for the restoration (being away, fascination, extent, compatibility) factors. Since the results of the CFA showed high and significant interrelations between the four restoration factors, a second-order construct (perceived restoration) was specified from those interrelations. Based on previous results (Corral-Verdugo et al., 2010), a second-order factor (sustainable behavior) was also specified and tested for the sustainable behavior factors. The structural model consisted of the specification and estimation of the effect of the Sustainable Behavior higher-order construct on the Perceived Restoration second-order factor. Goodness of fit indicators (chi-squared, practical goodness of fit indices, RMSEA, etc.) were obtained to reveal whether or not the data support the adequacy of the hypothesized factor structure for the CFAs and the pattern of presumed interrelations between factors for the SEM (Bentler, 2006).

Finally, group-mean comparisons by dichotomic demographic characteristics (gender) were conducted in regard to the studied sustainable-behavior and restoration factors, as well as regression analyses testing the influence of continuous demographic variables (income, schooling, age) on the studied factors.

## Results

Tables 1 and 2 exhibit the univariate statistics and internal consistencies of the used scales. The Cronbach's alpha values resulted above .70 in all the cases, indicating an acceptable reliability of the instruments. The frugal and equitable behaviors were more reported than the altruistic and proecological ones. In regard to the restoration subscales, the participants reported less being-away experiences as compared to the rest of the restorative dimensions.

Table 1

*Univariate statistics and reliabilities of the sustainable behavior subscales*

SCALE/Items	Mean	SD	Min	Max	Alpha
ALTRUISM					.71
Donates clothing to poor people	2.21	0.81			
Assists a person in need on the street	2.27	0.77			
Contributes financially with the Red Cross	2.13	0.87	0	3	
Visits the sick at hospitals/homes	1.16	1.03	0	3	
Helps elders or handicapped crossing street	1.92	0.98	0	3	
Guides persons asking for directions	2.38	0.71	0	3	
Provides some money to homeless	2.00	0.79	0	3	
Participates in fund-collection rallies	1.06	0.98	0	3	
Donates blood when required	0.57	0.93	0	3	
Cooperates with colleagues	2.21	0.82	0	3	
PROEKOLOGICAL BEHAVIOR					.75
Waits until having a full load before laundry	2.24	0.99	0	3	
Drives on freeways at speeds under 100 kph	1.18	1.10	0	3	
Collects and recycle used paper	1.12	1.03	0	3	
Points out unecological behavior to someone	1.68	0.98	0	3	
Buys prepared food	1.52	0.79	0	3	
Buy products in refillable packages	1.62	0.88	0	3	
Buys seasonal produce	2.48	0.69	0	3	
Use clothes dryer	2.05	1.25	0	3	
Reads about environmental issues	1.46	0.93	0	3	
Talks with friends about environmental problems	1.62	0.92	0	3	
Uses chemical insecticides	1.54	0.97	0	3	
Turns down air conditioning when leaving place	2.56	0.84	0	3	
Looks for ways to reuse things	2.00	0.91	0	3	
Encourage friends and family to recycle	1.34	0.92	0	3	
Conserves gasoline by walking or bicycling	1.39	1.00	0	3	
FRUGALITY					.71
Does not buy a new car if old one is functional	2.55	1.47	0	4	
Wears same clothing of past season	3.03	1.10	0	4	
Does not buy jewelry	2.95	1.40	0	4	
Buys lots of shoes	2.65	1.30	0	4	
Buys more food than needed	2.80	1.33	0	4	
Uses most earnings for buying clothing	2.66	1.29	0	4	
Always takes meals at home	3.00	1.24	0	4	
Rather walks than drives	2.90	1.40	0	4	
Reuse notebooks and papers	2.59	1.46	0	4	
Lives lightly even when affording luxuries	2.53	1.36	0	4	

(continued)

Table 1. Univariate statistics and reliabilities of the sustainable behavior subscales (continued)

SCALE/Items	Mean	SD	Min	Max	Alpha
EQUITY					
					.75
Partner (wife/husband) has same rights at home	3.57	0.85	0	4	
At work, treats subordinate fellow like equals	3.58	0.82	0	4	
Her/his children have same rights than adults in making important decisions	2.71	1.18	0	4	
Men and women have the same cleanup chores	3.42	0.98	0	4	
Treats Native Americans as equals	3.57	0.79	0	4	
Treats rich and poor people equally	3.65	0.71	0	4	
In her/his family, girls and boys have the same educational opportunities	3.76	0.60	0	4	

Table 2

*Univariate statistics and reliabilities of the perceived restorativeness subscales*

SCALE/Items	Mean	SD	Min	Max	Alpha
BEING AWAY					
					.88
Conserving the environment helps me get away from it all.	1.58	1.54	0	4	
Conserving the environment is an escape experience for me.	1.61	1.50	0	4	
Helping others helps me get away from it all.	1.70	1.51	0	4	
Helping others is an escape experience for me.	1.94	1.52	0	4	
Participating in helping others helps me get relief from unwanted demands on my attention	2.97	1.16	0	4	
Participating in environmental conservation helps me get relief from unwanted demands on my attention	2.81	1.25	0	4	
FASCINATION					
					.90
My attention is drawn to many interesting things about helping others.	3.09	1.06	0	4	
For me, conserving the environment has many fascinating qualities.	3.14	1.06	0	4	
Participating in environmental conservation is a captivating experience.	3.08	1.02	0	4	
Participating in helping others is a captivating experience.	3.12	0.96	0	4	
My attention is drawn to many interesting things about conserving the environment.	3.05	1.08	0	4	
For me, helping others has many fascinating qualities	2.95	1.03	0	4	
EXTENT					
					.91
For me, helping others has qualities that draw me further in.	3.18	0.93	0	4	
Participation in environmental conservation will sustain my interest	3.19	0.98	0	4	
Participation in helping others will sustain my interest.	3.25	0.98	0	4	
The more I participate in helping others the more I want to explore it.	3.04	0.95	0	4	
For me, conserving the environment has qualities that draw me further in	2.88	1.03	0	4	
The more I conserve the environment the more I want to explore it.	2.93	1.15	0	4	

(continued)



Table 2. Univariate statistics and reliabilities of the perceived restorativeness subscales (continued)

SCALE/Items	Mean	SD	Min	Max	Alpha
COMPATIBILITY					.86
By participating in environmental conservation I expect will feel well when I am done	3.44	0.91	0	4	
Helping others matches my fitness and mental health objectives.	3.31	0.97	0	4	
By participating in helping others I expect I will feel fine when I am done	3.29	1.05	0	4	
Conserving the environment matches my fitness and mental health objectives	3.22	1.01	0	4	
Participation in helping others helps me Achieve my physical activity goals	2.44	1.31	0	4	
Participation in environmental conservation helps me achieve my physical activity goals	2.73	1.16	0	4	

Table 3 shows the results of the confirmatory factor analysis for both the single- and four-factor solutions of the Perceived Restoration scale. In all cases the factor loadings were more salient in the four-factor solution than in the single factor one.

Table 3

*Standardized Loadings for Confirmatory Factor Analysis for Single- and Four-Factor Solutions of the perceived restoration instrument*

	Model 1: Single factor solution	Model 2: Four-factor solution Being away Fascination Extent Compati bility
Being-away parcels		
Being away 1	.48	.53
Being away 2	.46	.50
Being away 3	.74	.80
Fascination parcels		
Fascination 1	.84	.87
Fascination 2	.79	.82
Fascination 3	.88	.91
Extent Parcels		
Extent 1	.88	.95
Extent 2	.82	.88
Extent 3	.78	.84
Compatibility parcels		
Compatibility 1	.71	.74
Compatibility 2	.76	.78
Compatibility 3	.75	.77

Note: all factor loadings are significant ( $p < .05$ )

The goodness of fit indexes resulted slightly higher in the four-factor model than in the one-factor solution (see Table 4), with values of .97 for BNFI and 1 for BNNFI and CFI for the former and .96 and .99 for the latter.

Table 4

*Goodness of fit statistics for single and four-factor models*

	Model 1: Single factor solution	Model 2: Four factor solution
Bentler-Bonett Normed Fit Index	.96	.97
Bentler-Bonett Non-Normed Fit Index	.99	1.00
Comparative Fit Index	.99	1.00
Root mean-square error of approximation (RMSEA)	.02	.00

The covariances among the four factors were notoriously salient and significant ( $p < .05$ , see Table 5). In conjunction, these results apparently revealed that, although the hypothesized four-factor model fit better the data, the significant interrelations between those factors seemingly indicate the presence of a higher-order construct, namely "Perceived restoration," which results from those interrelations. Consequently, the structural model aimed to test the idea of a significant relation between restoration and sustainable behavior specified such a higher-order factor. In addition, a second higher-order factor, resulting from the four instances of sustainable behavior was also specified.

Table 5

*Correlation between the restoration subscales*

	Being away	Fascination	Extent	Compatibility
Fascination	.86			
Extent	.76	.93		
Compatibility	.95	.90	.89	

Figure 1 shows the specified and tested structural model. High and significant ( $p < .05$ ) loadings from every parcel to their corresponding first-order factor (pro-ecological, altruistic, frugal, and equitable-behavior factors, on the one hand, and the being-away, fascination, extent, and compatibility factors, on the other) resulted, and this was repeated in the case of the loadings from each first-order factors on their corresponding higher-order constructs. The structural coefficient linking Sustainable Behavior to Perceived Restoration was salient (.59) and significant ( $p < .05$ ). The  $R^2$  value of the model was .35, indicating that sustainable behavior explains a 35% of the variance in the perceived restorative effects of being pro-environmental and pro-social. The practical goodness of fit indexes reveal that the data support the hypothesized relation between those constructs.

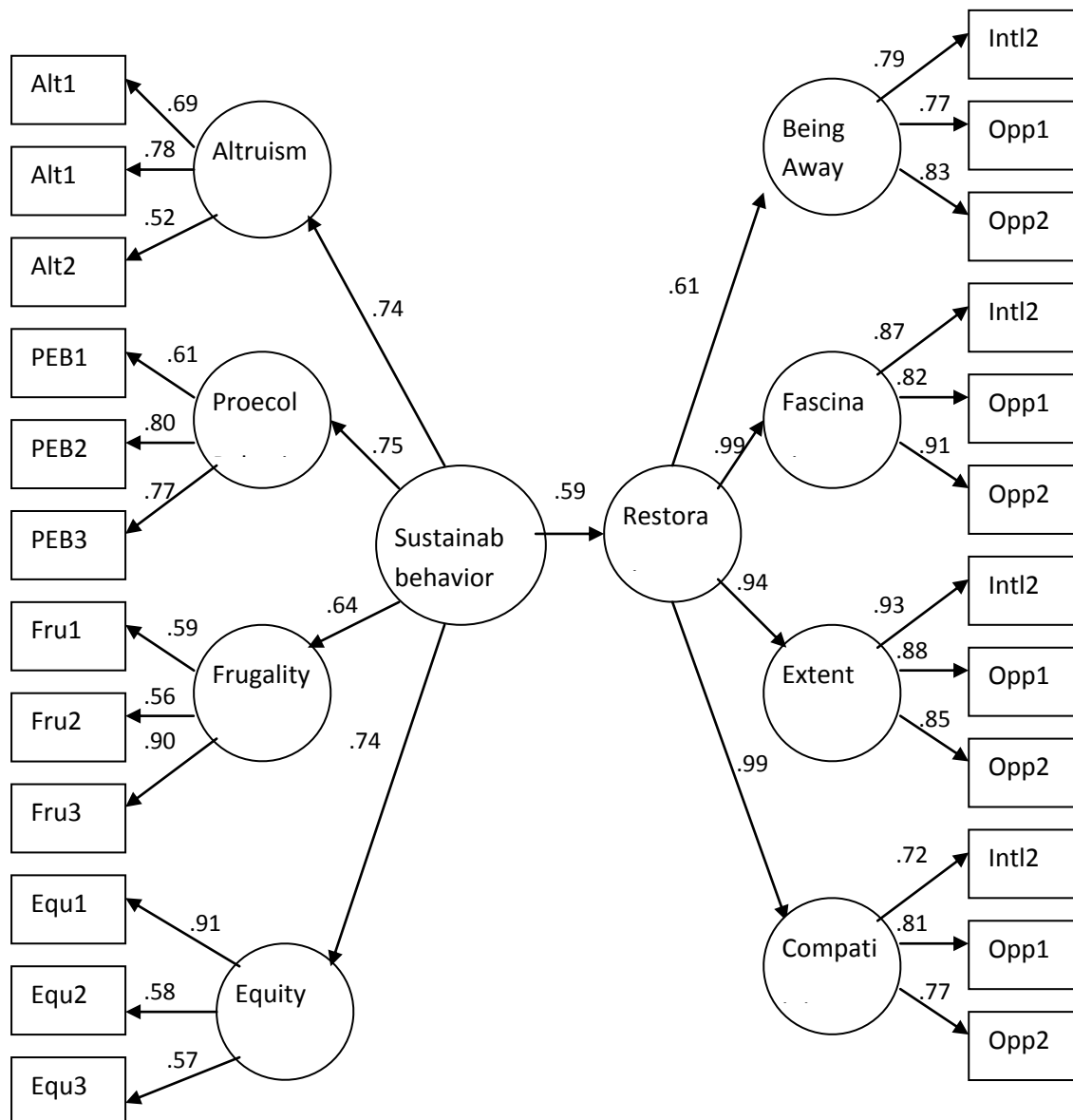


Figure 1. The relationship between sustainable behavior and the perceived restorative effects of engaging in sustainable actions. All factor loadings and the structural coefficient are significant ( $p < .05$ ). Goodness of fit: Chi-squared=540.80 (243 df),  $p < .001$ ; BBNFI=.93, CFI=.94; RMSEA=.06. Restoration's  $R^2=.35$

In regard to the effect of the demographic variables on the studied factors, group-mean comparisons produced no significant differences caused by gender among any of the eight assessed sustainable-behavior and restoration factors. Yet, the multiple regression analyses showed that age had a significant (although slight) positive effect on frugal ( $\beta=.34$ ;  $t=7.33$ ,  $p<.0001$ ), altruistic ( $\beta=.35$ ;  $t=4.14$ ,  $p<.0001$ ), proecological ( $\beta=.18$ ;  $t=2.04$ ,  $p=.04$ ), and equitable ( $\beta=.21$ ;  $t=2.37$ ,  $p=.02$ ) behaviors, as well as on the being away ( $\beta=.18$ ;  $t=2.08$ ,  $p=.04$ ), fascination ( $\beta=.35$ ;  $t=4.19$ ,  $p<.0001$ ), extent ( $\beta=.39$ ;  $t=4.79$ ,  $p<.0001$ ), and compatibility ( $\beta=.27$ ;  $t=4.79$ ,  $p<.0001$ ) dimensions of restoration. Income only affected being away ( $\beta=-$

.18;  $t=-2.01$ ,  $p<.04$ ), and schooling influenced compatibility ( $\beta=-.22$ ;  $t=-2.47$ ,  $p<.01$ ), both in a negative way.

## Discusión

A commonly accepted notion associates environmental conservation with discomfort or sacrifice, that is: with negative psychological consequences. For instance, Lindenberg and Steg (2007) suggest that hedonic goals (searching for pleasure) often oppose to pro-environmental acting, so that people aimed at feeling good should not maintain environmental conservation among their objectives because these imply personal sacrifice, a decreased consumption and other factors that oppose –apparently- to pleasure and wellbeing. Yet, Lindenberg and Steg also acknowledge that the search for comfort could guide pro-environmental behavior: some people would look for environmental protection in order to feel pleasure and wellbeing. There is evidence in the literature showing that this is a plausible case. Pelletier, Tuson, Green-Demers, Noels and Beaton (1998), for example, found that it is more likely that people display pro-ecological behaviors when these derive pleasure and satisfaction, and their claim is supported by the literature (De Young, 1996, 2000; Bechtel & Corral-Verdugo, 2010; Brown & Kasser, 2005; Kals, Schumacher & Montada, 1999). Therefore, there is a potential for positive psychological consequences emerging from sustainable behaviors.

Our study seems to confirm that psychological restoration is one of those consequences. According to our data, participants acknowledged that engaging in pro-environmental and altruistic actions provided them with being-away, fascination, extent and compatibility experiences, which are indicative of restorative states. Previous writings and theorization suggested that altruistic and pro-environmentally-oriented individuals might experience fascination, extent and compatibility states (Hartig et al, 2001; Kals & Ittner, 2003; Norling et al, 2008; Post et al., 2002). Yet, as far as we know, no study investigating the influence of sustainable actions on the perception of restorative experiences had been conducted.

As in the case of the Norling et al. (2008) study, we found that our participants discriminated the four allegedly restorative dimensions, as the four-factor solution CFA demonstrated. Yet, the high and significant interrelations between those dimensions not only provided a good base for a one-factor model (which was not saliently different from the four-factor model) but also allowed the specification of a higher-order factor –which we identified as “perceived restoration-” subsuming the four first-order restorative factors.

The association between restoration and pro-environmental and pro-social actions seemed to be more marked for the experiences of compatibility, extent and fascination than for the being away state. The participants’ responses were of higher level for those three restorative dimensions, while being away was less affected by pro-environmental and pro-social practices (perhaps because people perceived them to involve a certain degree of effort, preventing them from feeling a totally escape experience); yet, they admitted to feel at least some level of being-away states by practicing pro-environmental and altruistic actions.

Furthermore, the perceived restoration associated to pro-environmental and pro-social activities resulted saliently and significantly linked to the set of sustainable behaviors assessed in our study. This finding apparently indicates that the more a person engages in pro-ecological, frugal, altruistic, and equitable behaviors, the more (s) he experiences restorative experiences caused by protecting the socio-physical environment. If our results were to be replicated, they would indicate that psychological restoration is one more positive psychological consequence of sustainable behavior.

No apparent influences of most demographic characteristics operated either on the restoration factors or the sustainable practices, with the exception of age, which positively and slightly affected all those experiences and behaviors. This replicates some previous findings pointing out to a positive influence of age on pro-ecological and altruistic behaviors (Domina & Koch, 2002; List, 2004), but the effect of this demographic factor on the experience of restorative states seem to contradict previous findings showing no effect of age on restorative experiences caused by exposing to natural environments (Hartig et al., 2007). Income affected negatively the being away experience, and schooling influenced compatibility also in a negative way. Yet, in general, the null or limited effect of demographics on restorative states is in agreement with previous research results (Hartig et al., 2007).

There are limitations in our study that should be taken into account in conducting future research. The sample size is small, which could limit the findings' generalizability. Thus a larger sample is required in further studies. Another possible limitation has to do with the non-experimental design used in our research. Although we assume that restoration is a consequence of being sustainable, we cannot conclude for sure that the significant covariation between these two factors prove a causal relationship, with restoration being the effect and sustainable behavior the cause. Also, the use of self-reports assessing restoration might likely be a biased strategy to measure such psychological state (i.e., respondents may not necessarily report their actual feelings), so that a more objective measure (for example, electrophysiological recordings) could be used (see Kaplan, 1995; Ulrich, 1993, for instance). Therefore, an experimental study could be conducted in order to verify the assumption of a causal relationship, using both objective and subjective measures of restoration. Yet, in our discharge, in this study we explicitly asked the participants to declare how much restoration they felt as a result of practicing pro-environmental and pro-social actions, and this could be considered an indication of a causal (sustainable behavior-restoration) relation. Besides, we ultimately intended to assess the perceived restoration, not necessarily the actual one, which justifies the use of self-reports.

Thus, in spite of the above-mentioned limitations our findings seem to be in line with the investigative effort aimed at studying the positive psychological correlates of sustainable behavior. Since sometimes environmental conservation produces discomfort or displeasure, and some other times it elicits wellbeing, the challenge of further research will be to figure out what conditions or instances of pro-environmental acting lead to either psychological state (wellbeing, displeasure). Results could help to induce positive feelings in people –

psychological restorative states included- as a consequence of their pro-ecological and pro-social acting. In such a manner, the conditions that maintain the conservation of the socio-physical environment would be significantly facilitated.

## References

- Bamberg, S. & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behavior. *Journal of Environmental Psychology*, 27, 14-25.
- Bechtel, R.B., & Corral-Verdugo, V. (2010). Happiness and Sustainable Behavior. In V. Corral-Verdugo, C. García, & M. Frías (Eds.), *Psychological Approaches to Sustainability*. New York: Nova Science Publishers.
- Bentler, P.M. (2006). *EQS, Structural Equations Program Manual*. Encino, CA: Statistical Software, Inc
- Bonnes, M. & Bonaiuto, M. (2002). Environmental psychology: from spatial-physical environment to sustainable development. In R.B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology* (pp. 28-54). New York: Wiley.
- Brown, K.W. & Kasser, T. (2005). Are Psychological and Ecological Well-being Compatible? The Role of Values, Mindfulness, and Lifestyle. *Social Indicators Research*, 3, 74, 349-368.
- Corral-Verdugo, V. (2002). A structural model of pro-environmental competency. *Environment & Behavior*, 34, 531-549.
- Corral-Verdugo, V., Bonnes, M., Tapia, C., Fraijo, B., Frías, M. & Carrus, G. (2009). Correlates of pro-sustainability orientation: The affinity towards diversity. *Journal of Environmental Psychology*, 29, 34-43.
- Corral-Verdugo, V., García, C., Castro, L., Viramontes, I. & Limones, R. (2010). Equity and sustainable lifestyles. In V. Corral-Verdugo, C. García, & M. Frías (Eds.), *Psychological Approaches to Sustainability*. New York: Nova Science Publishers.
- Corral-Verdugo, V. & Pinheiro, J. Q. (2004). Aproximaciones al estudio de la conducta sustentable [Approaches TO the study of sustainable behavior]. *Medio Ambiente y Comportamiento Humano*, 5, 1-26.
- De Young, R. (1996). Some psychological aspects of a reduced consumption lifestyle: The role of intrinsic satisfaction and competence motivation. *Environment & Behavior*, 28, 358-409.
- De Young, R. (2000). Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*, 56, 509-526.
- Domina, T. & Koch, K. (2002). Convenience and frequency of recycling. Implications for including textiles in curbside recycling programs. *Environment & Behavior*, 34, 216-238.
- Geller, E.S. (2002). The challenge of increasing pro-environment behavior. In R.B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology*. New York: Wiley.

- Hartig, T., Kaiser, F. & Bowler, P. (2001). Psychological restoration in nature as a positive motivation for ecological behavior. *Environment & Behavior*, 33, 590-607.
- Hartig, T., Kaiser, F. & Strumse, E. (2007). Psychological restoration in nature as a source of motivation for ecological behavior. *Environmental Conservation*, 34, 291-299.
- Hernández, B., & Hidalgo, M. C. (2005). Effect of urban vegetation on psychological restorativeness. *Psychological Reports*, 96, 1025-1028.
- Herzog, T., Maguire, C. P. & Nebel, M. B. (2002). Assessing the restorative components of environments. *Journal of Environmental Psychology*, 23, 159-170.
- INEGI (2000). *Sistema de Consulta para la Información Censal (SCINCE)* [Census Information Consulting System]. Mexico City: Instituto Nacional de Geografía e Informática.
- Iwata, O. (2001). Attitudinal determinants of environmentally responsible behavior. *Social Behavior and Personality*, 29, 183-190.
- Joireman, J. A., Lasane, T. P., Bennett, J., Richards, D. & Solaimani, S. (2001). Integrating social value orientation and the consideration of future consequences within the extended norm activation model of proenvironmental behaviour. *British Journal of Social Psychology*, 40, 133-155.
- Kaiser, F. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28, 395-442.
- Kals, E., & Ittner, H. (2003). Children's environmental identity: Indicators and behavioral impacts. In S. Clayton, & S. Opatow (Eds.), *Identity and the natural environment* Cambridge, MA: MIT Press.
- Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment & Behavior*, 31, 178-202.
- Kaplan, S. (1995). The restorative benefits of nature: toward an integrative framework. *Journal of Environmental Psychology*, 15, 169-182.
- Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment & Behavior*, 33, 480-506.
- Lehman, P.H. & Geller, S. (2004). Behavior analysis and environmental protection: accomplishments and potential for more. *Behavior and Social Issues*, 13, 13-32.
- Lindenberg, S. & Steg, L. (2007). Normative, gain and hedonic goal frames guiding environmental behavior. *Journal of Social issues*, 63, 117-137.
- List, J. (2004). Young, selfish, and male: field evidence of social preferences. *The Economic Journal*, 114, 121-149.
- Norling, J., Sibthorp, J., & Ruddell, E. (2008). Perceived Restorativeness for Activities Scale (PRAS): Development and Validation. *Journal of Physical Activity and Health*, 5, 184-195.
- Pelletier, L. C., Tuson, K. M., Green-Demers, I., Noels, K. & Beaton, A. (1998). Why are you doing things for the environment? The motivation toward the

- environment scale (MTES). *Journal of Applied Social Psychology*, 28 (5) 437–468.
- Post, S., Underwood, J. & Hurbut, W. (2002). General introduction. In S. Post, J. Underwood, J. Schloss, & W. Hurbut (Eds.), *Altruism and altruistic love*. New York: Oxford University Press.
- Schroeder, D. A., Penner, L. A., Dovidio, J. F., & Piliavin, J. A. (1995). *The psychology of helping and altruism: Problems and puzzles*. New York: McGraw-Hill.
- Schultz, P. W. (2001). The structure of environmental concern. Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, 21, 327-339.
- Thøgersen, J. (2005). How may consumer policy empower consumers for sustainable lifestyles? *Journal of Consumer Policy*, 28, 143-177.
- Ulrich, R. S. (1993). Biophilia, biophobia and natural landscapes. In S. R. Kellert, & E. O. Wilson (Eds.), *The biophilia hypothesis*. Washington, DC: Island Press.
- Van den Berg, A., Hartig, T. & Staats, H. (2007). Preference for nature in urbanized societies: stress, restoration, and the pursuit of sustainability. *Journal of Social Issues*, 63, 79-96.
- Van de Vliert, E., Huang, X. & Parker, P. (2007). Do colder and hotter climates make richer societies more, but poorer societies less, happier and altruistic? *Journal of Environmental Psychology*, 24, 17-30.
- Van Lange, P. A. M. (2000). Cooperation and competition. In A. E. Kazdin (Ed.), *Encyclopedia of Psychology*, Vol. 2. (pp. 296–300). Washington, DC, New York: American Psychological Association & Oxford University Press.
- Vining, J. & Ebreo, A. (2002). Emerging theoretical and methodological perspectives on conservation behavior. In R.B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology* (pp. 541-558). New York: Wiley.
- Winter, D. (2002). (En)Gendering sustainable development. En P. Schmuck & P. W. Schultz (Eds.), *Psychology of Sustainable Development*. Norwell, Massachusetts: Kluwer.