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Emotions toward water consumption: Conservation and wastage



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Abstract Water is a key element for the human survival but unsustainable patterns of water consumption are still evident. Many factors influence water conservation but the existing literature investigating psychological determinants of water conservation have so far focused on cognitive or motivational factors. However, there is growing evidence for the important role of emotions as predictors of environmental engagement in general and water conservation in particular. The present article contributes to this recognition of the role of emotions by reporting two studies on the development and validation of a measure to access negative emotions regarding water wastage, the Rating Scale of Emotions towards Water Wastage (RSEWW). Results confirmed that this 12-item scale form a unidimensional measure that reliably predict participants' behavioral intention to participate in activities for the water conservation. Theoretical and practical implications from the findings are discussed in relation to the extant literature.

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PALABRAS CLAVE

Agua;
Emocione;
Desperdicio;
Conservación

Emociones hacia el consumo de agua: desperdicio y sostenibilidad

Resumen El agua es un elemento clave para la supervivencia humana, pero los patrones no sostenibles de consumo de agua siguen siendo evidentes. Muchos factores influyen en la conservación del agua, pero la literatura existente que investiga los determinantes psicológicos de la conservación del agua, hasta el momento, se han centrado en los factores cognitivos o motivacionales. Sin embargo, existe una creciente evidencia de la importancia del papel de

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las emociones como predictores de la participación en la conservación del medio ambiente en general y del agua en particular. El presente artículo contribuye a este reconocimiento del papel de las emociones en la exposición de 2 estudios sobre el desarrollo y validación de una medida para acceder a las emociones negativas con respecto a desperdicio de agua, la Escala de Evaluación de las Emociones hacia el Desperdicio de Agua (Rating Scale of Emotions towards Water Wastage [RSEWW]). Los resultados confirmaron que esta escala de 12 ítems forma una medida unidimensional que prevé de manera fiable la intención de conducta de los participantes para intervenir en las actividades para la conservación de agua. Implicaciones teóricas y prácticas de los hallazgos se discuten en relación con la literatura existente.

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Water is a key element for the human survival. However, freshwater is becoming a scarce resource. Many freshwater sources are threatened by waste, dumping of industrial pollutants and fertilizer runoff. Currently, around 1.2 billion people in the world have limited access to drinking water, which means that one in six people do not have drinking water for your needs, because the demand for water exceeds the supply, and this situation does not show signs of change (Rogers, 2008). From this, the society has a key role to the sustainable development and promotion of pro-environmental behavior, demanding from the governments some urgently and needed changes (de Oliveira Tassara, Ardans-Bonifacino, & Oliveira, 2013; Mankad & Tapsuwn, 2011).

Water wastage, like many other environmental problems, is caused by maladaptive human behaviors and thus, the psychology has an important role in its mitigation (e.g., Corral-Verdugo, 2001; Corral-Verdugo, Tapia-Fonllem, Ortiz-Valdez, & Fraijo-Sing, 2013; Oskamp, 2000; Stern, 2000). Therefore, the psychology in this context needs to take an active role, first knowing the antecedents of the behaviors that promote environmental quality for current and future generation, and then tracing intervention programs to ensure this goal (Schultz, 2002).

For Vining and Ebreo (2002, p. 545), "many studies of the relations between environmental attitudes and pro-environmental behavior have focused on the prediction of behavior from general attitudes about the environment, that is, from environmental concern". The term "environmental concern" is typically used in empirical literature to refer to "environmental attitudes", as a synonymous (Dunlap & Jones, 2002; Fransson & Gärling, 1999), whereas others tend to differentiated them (Schultz, Shriver, Tabanico, & Khazian, 2004; Stern & Dietz, 1994).

However, the measures of environmental concern have generally been found to be only weakly related to the performance of pro-environmental behaviors (Vining & Ebreo, 2002). For example, the New Environmental Paradigm instrument (Dunlap & Van Liere, 1978; Dunlap, Van Liere, Mertig, & Jones, 2000). Specifically, Corral-Verdugo and Armendáriz (2000) found a correlation of 0.21 between the NEP and a measure of reuse behavior. Vining and Ebreo (2002) endorse the items on this measure; their overall

score on the instrument has small correlations with their behavior. Often, this measure is interesting in cognitive variables as behavioral determinants, with particular focus in two main theoretical frameworks: values and attitudes (Bamberg & Möser, 2007; Grob, 1995; Groot & Steg, 2008; Heyl, Díaz, & Cifuentes, 2013; Milfont, Duckitt, & Cameron, 2006; Wray-Lake, Flanagan, & Osgood, 2010).

For this article, in particular, aiming to provide a convergent validity to the second study (Study 2), was adopted the concept proposed by Schultz et al. (2004, p. 31): Environment Attitudes (EA) are "the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues", and have been traditionally viewed as unidimensional (Poortinga, Steg, & Vlek, 2002). However, EA has also been seen as a multidimensional construct related to value-based orientations, having either two (Kortenkamp & Moore, 2000; Thompson & Barton, 1994) or three dimensions (Schultz et al., 2004; Stern & Dietz, 1994). In the present study, EAs will be considered in line with the two-dimensional value-based tradition. Specifically, Wiseman and Bogner's (2003) Model of Ecological Values was considered; they argued that ecological values are established by "one's position on two orthogonal dimensions, a biocentric dimension that reflects conservation and protection of the environment (Preservation); and an anthropocentric dimension that reflects the utilization of natural resources (Utilization)" (p. 787).

Thus, for this study make use the measure called Environmental Attitudes Inventory (EAI) are considered through their two second-order factors, namely environmental preservation and environmental utilization. This measure presents adequate psychometric parameters, and also to be largely free from social desirability (Milfont & Duckitt, 2010).

On the other hand, in the value orientation approach, Stern and Dietz (1994) proposed a theory of the value basis of environmental concern. Expanding the Schwartz's (1977) norm-activation model of altruism, they argued that environmental moral norms could be activated by social-altruistic values as well as by egoistic or by biospheric values, leading to a tripartite classification of value orientations toward environmental concern.

Altruistic values predispose people to judge environmental issues on the basis of costs or benefits for a human group (e.g. community, ethnic group or all humanity). In contrast, people who apply *egoistic* values judge environmental issues on a personal basis. In the *biospheric* value orientation, people judge environmental issues on the basis of costs or benefits to ecosystems. These three distinct value orientations, toward self, showed that can be distinguished and each can independently influence the intentions to act for the preservation of the environment (Stern, Dietz, Kalof, & Guagnano 1995).

Although these variables have been shown to influence environmental engagement, is important to note that emotions also have a fundamental role as behavioral predictors. Exemplifying, the "compassion for animals" seems to be linked to the emergent food market of millions of new vegetarians (Soromenho-Marques, 2005). Emotion has largely been ignored regarding to cognitive structures that predict conservation behavior. Meanwhile, there is a high potential for both positive and negative emotions be predictors of conservation behavior and mediators of predictor variables (Vining & Ebrero, 2002).

In this context, the aim of the current paper was to develop a scale to assess individuals' emotions toward water wastage. In the **Study 1** aimed to check preliminary evidence of construct validity (factorial structure and reliability) of this measure, and in the **Study 2** provides complementary evidence of the construct validity of the scale by focusing on convergent and concurrent validities. Both described later.

Emotions as determinants of environmental engagement

Emotion is a broad concept: (1) it implies physiological activation, (2) emotions are linked to expressive behaviors and (3) are linked to conscious experience, and (4) have a central role in many human activities (Myers, 2009). Reeve (2005) argued that emotions are subjective feelings, make individual feel a particular way, such as angry or joyful. Nevertheless, feelings are only part of emotion. The feeling component has both meaning and personal significance; in turn, the emotion is felt and experienced at the subjective level.

"Emotions are also biological reactions, energy-mobilizing responses that prepare the body for adapting to whatever situation one faces" (Reeve, 2005, p. 299). On the other words, Emotions are agents of purpose. This component gives to the Emotion its goals-directed character to take the action necessary to cope with any circumstances. Emotions are social phenomena established through postures, gestures, vocalizations, and facial expressions. In sum, emotion engages feelings, bodily arousal (activation), sense of purpose, and nonverbal communications (expressions), "in order to prepare the individual to adapt successfully to the life circumstances" (Reeve, 2006, p. 191).

In this perspective, and taking into consideration the arguments of functionalist aspects reported by Ekman (2011), emotions are the fundamental motives that boost the individual instincts of hunger and survival. For example, people will not eat if they deem that the available

food is disgusting, because the hunger impulse is overcome by emotion. Not coincidentally, this author argues that the desperation can subdue the will to live, leading to suicide. Therefore, Emotions take a functional aspect (sense of purpose) and become a motivational state directed toward a goal. Emotion emerges from significant life situations and from appraisals of their significance to individual well-being, also mostly influences behaviors and direct specific actions. Furthermore, Ekman (2011) argued that "emotion is a process, a particular kind of automatic appraisal influenced by our evolutionary and personal past" (p. 31), also can occur automatically/involuntary, and can be induced by non-cognitive procedures.

In the environmental psychology literature, theorists have begun to conceive of emotion as an integral and adaptive part of cognition, and also emotion a fundamental part of motivation. For example, when a person has attitudes pro-environmental but do not perform conservation actions, a dissonant state is created accompanied by negative emotions. For resolve this dissonance and relieve the negative emotion is need find a way to act in accordance with attitudes of conservation (Vining & Ebrero, 2002).

Kals, Schumacher, and Montada (1999) suggested that positive and negative emotions serve as predictors of attempts to conserve resources. Specifically, this emotional affinity for nature is positively related to self-reported conservation behavior, and is a significant motivational force for activities that protect nature.

The self-evaluated (self-conscious) emotions, such as pride, shame and guilt, are fundamentals to conservation motivations (Bamberg & Möser, 2007; Kaiser, Schultz, Berenguer, Corral-Verdugo, & Tankha, 2008; Perrin & Benassi, 2009). Nevertheless, environmental psychologists rarely studied these emotions, except related indirectly to cognitive constructs (Vining & Ebrero, 2002). For example: Larson, Ibes, and White (2011) examined attitudinal judgments about water scarcity. Those distinguish from the affectivity, because do not inherently imply to personal worry or emotional attachment. That is, if an individual conserves water out of fear of drought, information regarding water conservation and drought would be stored along with the associated negative emotion.

Past studies have shown consistent findings regarding the importance of emotions in predicting pro-environmental behaviors, and have shown the importance of theoretical models based on emotions (e.g., Durán, Alzate, López, & Sabucedo, 2007; Grob, 1995; Kals et al., 1999; Lazarus, 1991a; Müller, Kals, & Pansa, 2009; Pooley & O'Connor, 2000; Vining, 2003; Vining & Ebrero, 2002). Specifically, Grob (1995) points out that the negative emotional reactions by environmental degradations facilitate the implementation of pro-environmental behaviors.

In addition, Pooley and O'Connor (2000) and Vining (2003) maintained that emotions are essential for the prediction and promotion of pro-environmental attitudes, and in the understanding of relationships between individuals, animals and the environment. Below are expanded three relevant concepts that explain the links between emotions and environmental engagement.

Moral emotions. Emotions related to moral issues are one way to understand the associations between

emotions and environmental engagement. Particularly, three moral emotions can be considered (Kals & Maes, 2002): (1) outrage at the failure to control pollution and lack of pro-environment policy, (2) annoyance due to excessive control of pollution and its effects for the competing goals and individual interests (negative predictive effect), and (3) sense of guilt with respect to insufficient personal sustainable behaviors. These emotions imply the acceptance or rejection of ecological norms and responsibilities, and suggest the importance of emotional indicators of responsibility and justice to explain why some people show sustainable behavior while others do not. In fact, moral emotions have been shown to account for close to 50% of variance in sustainable behavior, such as decisions to reduce air pollution (Kals & Maes, 2002).

Emotional affinity toward nature. Affinity toward nature is another way to understand the associations between emotions and environmental engagement, and is arguably the most powerful emotion linked to an environmental identity, associating emotional affinity with pro-environmental behavior (Kals et al., 1999), i.e. when one feels good, free and secure in nature and has a feeling of oneness with nature. This emotional affiliation with nature is related to the idea of "inclusion of nature in self" (Schultz, 2002), "environmental identity" (Clayton, 2003), and "connectedness to nature" (Mayer & Frantz, 2004).

Ecological fear. The fear of being personally affected by environmental risks and ecological damage, alongside the related experience of emotional anxiety, seem to represent a compelling motivation to act sustainably and to reduce environmental risks, predicting pro-environmental intentions (Brody, Zahran, Vedlitz, & Grover, 2008; Milfont, Duckitt, & Wagner, 2010; Spence, Poortinga, Butler, & Pidgeon, 2011). Fear and anxiety have less overall predictive power compared to the moral emotions and emotional affinity toward nature; one explanation for this is that experience of ecological fear is confounded with a denial of environmental problems, whereas fear evokes the psychological mechanisms of rejection to avoid panic (Kals & Maes, 2002).

Thus, the process of decision-making or the intention to behave in a sustainable way is not only based on cognitions related to responsibility and justice, but also based on moral emotions, emotional affiliation/personal identification with nature and fear/anxiety related to environmental risk perception.

Basically, positive and negative emotions enhance or attenuate pro-environmental behaviors under normative criteria that guide its driving. For example, negative emotions associated with fear (particularly found in risk situations, such as floods or lack of water) results in reactive actions (e.g., store water to meet possible rationing or emergencies; adapt the course of house construction to face floods; or change address). In contrast, negative emotions without fear association (specifically the emphasis on guilt) imply proactive actions (e.g., participate in water reuse programs – for household adaptations, such as the washing machine or toilet flushing). On the other hand, positive emotions (feelings of contentment and satisfaction) are associated with pro-environmental actions (e.g., feel

proud to be part of pro-environmental programs). However, emotion is a regulator of pro-environmental actions in both contexts (positive or negative).

These mechanisms might explain the associations between emotions and environmental engagement. These issues are analyzed in this study by focusing on the development of a psychometrically sound instrument that centers on emotions related to water wastage.

Water conservation and the present study

Corral-Verdugo, Frías-Armenta, Pérez-Urias, Orduña-Cabrera, and Espinoza-Gallego (2002) demonstrated that perception of externalities is an inhibitor of the motivation for acting in a pro-environmental manner. An example of externalities is the environmental social dilemma, which refers to situations where the individual and collective interest are at odds. For example, resource depletion can occur when each individual acts in his or her own interests by taking a little more from the common pool of resources than his or her "share", negatively resulting for the society through the resource destruction. The author found that highly perceived externalities lead to increase of water consumption as response to the perception of the social dilemma that other people would consume more water. In other words, the perception of externalities regarding water consumption inhibits motivation for conserving water: an individual perceives that others are wasting water, less he will be willing to conserve this resource.

In another study, Corral-Verdugo (2003, p. 248) showed significant direct and indirect effects of psychological and social components on the water consumption. Psychological components are, for example: "motives – some persons engage in water conservation practices for saving that resource, for cooperating with a conservation campaign". Social components are, for example, "such as having money, big houses and gardens and a big family promote water waste, while using water-saving devices, facing norms demanding a decreased consumption, and living in a place where water is scarce lead to water conservation".

Corral-Verdugo, Bechetel, and Fraijo-Sing (2003) also showed a significant link between general environmental beliefs, specific water beliefs and water consumption. Overall, the findings indicate environmental beliefs predict the willingness to reduce water consumption, and that specific measures of water beliefs are important in predicting water conservation. The influence of environmental beliefs on water conservation was confirmed in a cross-cultural study in France, Italy, Mexico and India (see, Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha, 2008).

Considering the importance of water for human survival and the emotions as predictors of environmental engagement, and this specific measures related to water issues are important in predicting water conservation; the present research aimed to develop a self-report measure of individuals' emotions toward water waste. The measure focuses on emotions that water wastage might elicit in individuals. Two studies were carried out to develop and validate this new measure.

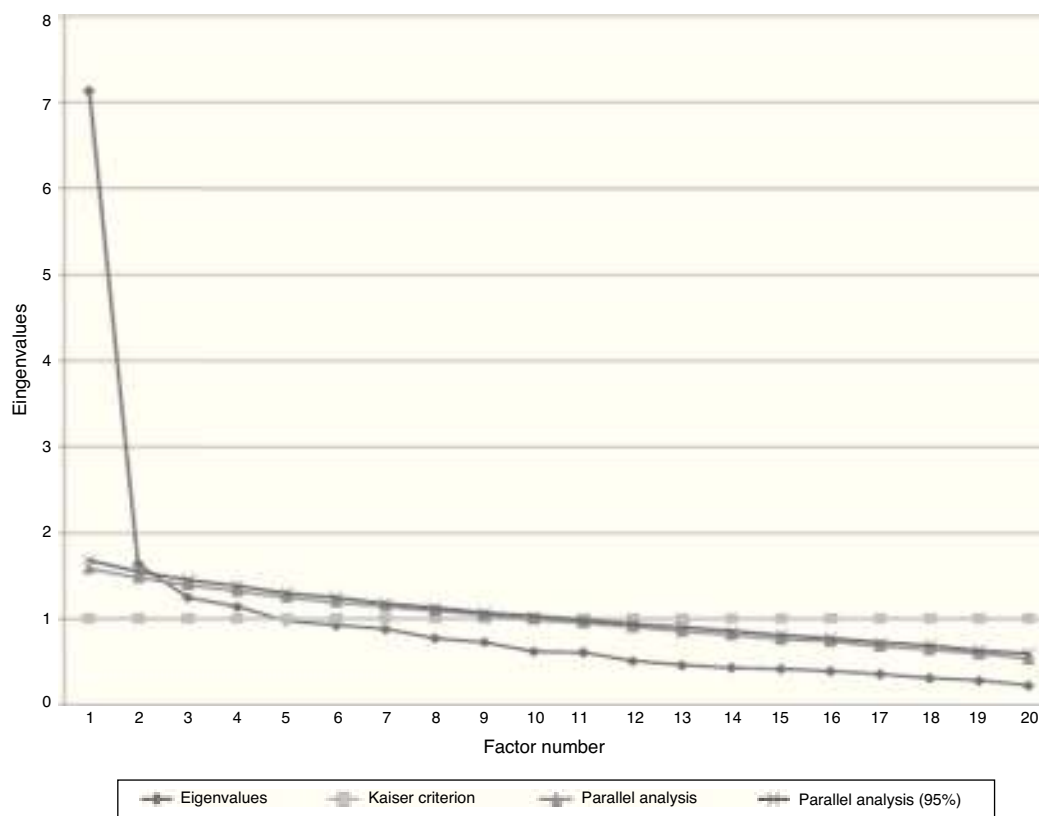


Figure 1 Scree plot of eigenvalues and methods of factor extraction (Study 1).

Study 1

The goal of Study 1 was to develop items for the Rating Scale of Emotions towards Water Wastage (RSEWW), considering the study of [Kals and Maes \(2002\)](#) regarding respect to emotion underlying to the nature protection, and perform the initial test of its construct validity (factorial structure and reliability). Based on an open-ended survey conducted with 121 students from the State of Paraíba, Brazil (71.7% undergraduate students and 55.4% female with mean age of 19 years, $SD = 5.31$); 20 items were defined to form the initial version of the RSEWW.

Based on these sources, 20 items were derived to form the initial version of the RSEWW. When developing the item pool from the interviews, the aim was to create items that express emotion at a general level but relating to a specific object (water wastage), and expressing natural bipolar pairs, such as happy-sad and annoyed-pleased (cf. [Russell & Lemay, 2000](#)). This study aimed to verify preliminary evidence of construct validity (factorial structure and reliability) of this measure.

Method

Participants

Participants were 213 undergraduate students from the State of Paraíba, Brazil. They were mostly female (73%),

with mean age of 25 years (ranging from 17 to 60 years, $SD = 9.22$).

Instruments and Procedure

All participants received a booklet consisting of demographic questions (age, sex, marital status) and the RSEWW. This 20-item scale asks participants to indicate the extent to which the statements describe them or not, in a 5-point scale ranging from 1 (*Does not describe me at all*) to 5 (*Describes me completely*). Participants completed the instruments individually but in-group, and took 15 minutes on average to complete. All participants were informed about the anonymity and confidentiality of the survey.

Results and discussion

Construct validity was assessed by factor structure of the RSEWW. A principal axis factoring (PAF) was carried out, without specifying the rotation method and the number of factors to extract ($KMO = 0.88$ and Bartlett's sphericity test, $\chi^2(190) = 1561.93$, $p < .000$). Multiple criteria were used to define the number of factors to extract ([Fabrigar, MacCallum, Wegener, & Strahan, 1999](#)). Four eigenvalues greater than one emerged (7.13, 1.63, 1.24 and 1.13), but the scree plot from eigenvalues suggested a single factor ([Fig. 1](#)).

Table 1 Results of principal axis factoring of the RSEWW.

Items	Study 1		Study 2
	Factor		Factor
	1	2	1
17. I get upset when I see someone using water to wash the footpath/sidewalk or driveway.	0.76	-0.18	0.64
15. It bothers me when someone stays in the shower for too long.	0.75	0.01	0.64
16. Sometimes, I stop what I am doing to turn off a dripping tap.	0.72	0.14	0.72
11. It troubles me to see someone wasting water by washing his/her car with a hose.	0.68	-0.16	0.56
13. When I see someone wasting water, I feel like complaining.	0.66	0.23	0.77
04. I feel frustrated when I see a toilet running without anyone doing anything about it.	0.63	0.24	0.66
12. I feel indignant at the lack of awareness of some people regarding water conservation.	0.61	0.17	0.76
14. I get annoyed to see a tap running without anyone using the water.	0.61	0.24	0.76
19. I feel upset when I see water wasted from a running tap.	0.60	0.24	0.80
18. I feel good when I can save water.	0.59	0.20	0.76
09. I feel sad when I see rain water wasted, without being stored and used.	0.54	-0.22	0.46
02. I feel bad when I see water being wasted from a water leak in the street.	0.54	0.10	0.66
20. It bothers me to see someone putting more drinking water than necessary in a glass, and then throwing away the rest.	0.53	0.04	0.57
03. It annoys me when I forget to turn off a tap.	0.52	0.18	0.65
08. I feel bad to see someone washing the footpath/sidewalk with a hose.	0.50	-0.17	0.70
01. When I see a water leak in the street, I try to call the responsible organization to fix the problem.	0.49	0.02	0.48
10. It makes me happy to see someone who is trying to save water.	0.40	0.22	0.62
06. I feel disturbed by the waste of water in public places.	0.40	0.10	0.79
07. I don't feel guilty when I leave a tap running. (reversed)	-0.01	-0.62	-
05. It doesn't worry me to know that some people waste water (reversed).	-0.05	-0.39	-

Note: The items were administered to participants in Portuguese, and were translated into English by bilinguals using a committee approach.

From a parallel analysis performed (20 items, 213 participants and 1000 replications), the first two eigenvalues expected for random data (1.59 and 1.48) fall below the observed eigenvalues, which suggests the extraction of two factors. Given that parallel analysis is the most recommended method for deciding the number of factors to extract, a new PAF analysis was carried, extracting a two-factor solution with *varimax* rotation. The results are shown in Table 1.

When combined the two factors accounted for 37.75% of total variance, and their items had factorial loadings ranging from -0.39 to 0.76. They were named as following:

Factor 1 encompassed 18 items, with factorial loadings ranging from 0.40 ('I feel disturbed by the waste of water in public places') to 0.76 ('I get upset when I see someone using water to wash the footpath/sidewalk or driveway'). Its eigenvalue was 7.13, explained 32.18% of total variance and had a Cronbach's alpha of 0.90. The main items of this

component indicate negative experiences associated with water wastage (e.g., anger). This component was labeled *water wastage distress*.

Factor 2 encompassed 2 items (both reversed-worded items), with factorial loadings of -0.39 ('It doesn't worry me to know that some people waste water'), and -0.63 ('I don't feel guilty when I leave a tap running'). Its eigenvalue was 1.63, accounted for 5.58% of the total variance, and had alpha of 0.64. This factor was labeled *water wastage indifference*.

In sum, two factors of emotions toward water wastage were identified. The first component was clear, showing an evident factorial structure and reliability in line with recommended values ($\alpha > 0.70$) (Nunnally, 1991). The second component had only two items, which is not recommended to represent a factor (Costello & Osborne, 2005) because it leads to negative influence on scale reliability and unavoidable measurement error.

Based on the eigenvalues-greater-than-one rule, scree plot and resulting factors, only items from the first factor are considered.

Results from this initial study show that 18 items expressing moral emotions regarding to water wastage can be used to form an unidimensional measure, labeled as RSEWW. The content and external validity of the scale items is also enhanced by the fact that the items were created based on data from an independent sample. The factorial structure of the RSEWW is replicated in Study 2.

Study 2

The goal of Study 2 was test the unifactorial structure of the RSEWW in an independent sample. This study provides complementary evidence of construct validity of the scale, focusing on convergent and concurrent validities.

Method

Participants

Participants were 338 undergraduate students from the State of Paraíba, Brazil, mostly male (68%), with mean age of 23 years (ranging from 16 to 55, $SD = 5.63$).

Instruments and procedure

Participants answered the 18-item version of the RSEWW derived from Study 1. The instructions and format were maintained. Aside from this instrument, participants also completed the following measures:

Environmental attitudes inventory (EAI)

This self-reported scale was developed to measure the first- and second-order structure of environmental attitudes (Milfont & Duckitt, 2010). The original version has 120 balanced items, with ten items distributed across 12 subscales. In following study, a brief version was used, comprising 48 balanced items equally distributed across its 12 subscales. The subscales represent two second-order factors. Preservation expresses the general belief that priority should be given to preserving nature and the diversity of natural species in its original state (e.g., "Whenever possible, I try to save natural resources"; "I am NOT the kind of person who makes efforts to conserve natural resources" – reverse). Utilization, in contrast, expresses the general belief that it is right, appropriate and necessary for nature and all natural phenomena and species to be used and altered for human objectives (e.g., "Nature is important because of what it can contribute to the pleasure and welfare of humans"; "Conservation is important even if it lowers peoples' standard of living" – reversed), which refers to conviction of using the nature, which may be changed for attending the human needs and goals. All items are answered in a 7-point scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*).

Water conservation scale

A 12-item scale measures self-reported behaviors relating to water conservation (e.g., "Take a bath in less than five minutes"; "Brush your teeth with the tap closed"). Participants indicate the frequency of perform each of the behaviors in a 5-point scale, ranging from 1 (*Never*) to 5 (*Always*), as determined by Corral-Verdugo (2003).

Behavioral question

The last section of the questionnaire (socio-demographic questions) also included a single-item to assess participants' intention to behave in environmentally-oriented way: "As you may have noticed, this questionnaire dealt mainly of environmental issues. We are organizing a committee to carry activities that are necessary for water conservation. Therein, we rely on voluntary participation of people. If you are interested to help us, please leave your e-mail address and your nickname for contact and we will contact you shortly. Your data will be kept in confidentiality".

Results and discussion

Replicating Study 1, a PAF analysis was carried ($KMO = 0.94$; *Bartlett's Sphericity Test*, $\chi^2(153) = 3531.38$, $p < .001$) and the single component accounted for 45.83% of total variance (eigenvalue = 8.76). As shown in Table 1, the factor loadings ranged from 0.46 ("I feel sad when I see rain water wasted, without being stored and used") to 0.80 ("I feel upset when I see water wasted from a running tap"), with an excellent internal consistency of 0.93.

To understand how congruent are the two sets of factor loadings from Study 1 and Study 2, it was performed a factorial congruence/similarity analysis which provides a congruency coefficient of the factor loadings across samples (Gorsuch, 1983). The coefficient of factorial congruence was calculated with the following formula: $r_{congruence} = (\sum ab) / [(\sum a^2) \cdot (\sum b^2)]^{1/2}$, in which 'a' and 'b' correspond to the factor loadings to be compared. A factorial congruence coefficient of 0.90 or higher indicates between-sample factorial similarities (Reynolds & Ramsey, 2003). When compared with factorial solution described in Study 1, the results from Study 2 yield a factorial congruence coefficient of 0.98. This provides evidences that the RSEWW measures one predominant factor of emotion regarding water wastage that is independent of sample.

To access convergent validity, the RSEWW was correlated with the other two measures. As can be seen in Table 2, the RSEWW (negative emotions) was positively correlated with environmental preservation attitudes and water conservation behaviors. This shows that greater negative emotions toward water wastage are associated with higher environmental preservation and conservation behaviors. In contrast, the RSEWW was negatively correlated with environmental utilization attitudes, indicating that greater negative emotions toward water wastage are associated with higher environmental utilization. Overall, these findings suggest that people scoring high on negative emotions toward water wastage are more likely to conserve water.

Table 2 Reliability and correlation of environmental attitudes and emotions (Study 2).

	1	2	3	4
1. Emotions toward water wastage	(0.93)			
2. Preservation	0.54*	(0.69)		
3. Utilization	-0.32*	-0.56*	(0.54)	
4. Water conservation	0.54*	0.40*	-0.23*	(0.74)

Note: Two-tailed test; diagonal coefficients correspond to Cronbach's Alpha.

* $p < .001$.

It is also worth noting that although the correlation between the RSEWW and the Water Conversation Scale was high ($r = .54$), which is expected considering content of the measures, the correlation between the RSEWW and preservation attitudes ($r = .54$) was significantly higher ($p < .05$) than the correlation between preservation attitudes and the Water Conversation Scale ($r = .40$). This provides further evidence for the construct validity of the RSEWW and for role importance of emotions.

Finally, to assess concurrent validity, it was assessed that the extent with higher scores on negative emotions regarding water wastage would explain participants' behavioral intention to participate of water conservation activities. Participants who gave their name/e-mail to be contact to participate were deemed interested in taking action to conserve water. The answers were classified into uninterested (0; name/e-mail was not provided) or interested (1; name/e-mail was provided). Supporting predictions, participants interested in taking action to conserve water had significantly higher scores ($M = 4.0$, $SD = 0.67$, $n = 191$) on the RSEWW than those interested in taking actions ($M = 3.7$, $SD = 0.72$, $n = 147$), $t(336) = 3.93$, $p < .001$, Cohen's $d = 0.43$. Further, supporting the RSEWW's validity, participants interested or uninterested in taking action to conserve water did not significantly differ in their scores on the Water Conversation Scale ($p > .35$). These results indicate that participants scoring higher in the RSEWW, and thus expressing higher negative emotions regarding water wastage, are more likely to engage in water conservation activities.

Final remarks

Despite the most environmentally-related studies have focused on a cognitive rational approach in explaining pro-environmental behavior, there is a growing recognition of the role of emotions as predictors of environmental engagement. The present article contributes to this important trend by reporting two studies about the development of a measure to access negative emotions regarding water wastage, the Rating Scale of Emotions towards Water Wastage (RSEWW).

In order to foster water conservation, it is important to understand the psychological determinants of individuals' intentions to not waste this essential resource. Results from the empirical studies showed that the RSEWW is a unidimensional 18-item scale that has strong psychometric properties and demonstrated construct validity. Empirical evidences show that the use of the RSEWW in researches is fruitful to measure emotional reactions to water wastage.

Besides describing a new measure that could be used in future research, the present findings have significant theoretical and practical implications. Firstly, the present research focuses on emotional reactions linked to water wastage. Secondly, by both cognitive and emotional approaches, future studies can develop and test models predicting water conservation.

Such psychological inclusive models prove to be more useful in explaining individuals' decision to conserve water. These models can be effectively used to access the best psychological predictors of water conservation, and then use this information to guide the development of intervention programs aimed at reducing water wastage.

In addition, the present research supports existing literature that highlights the important role of emotions in predicting environmental engagement (Bamberg & Möser, 2007; Kaiser et al., 2008; Kals & Maes, 2002). Most of the psychological research have used cognitive-based models to explain pro-environmental intentions, such as the theories of reasoned action and planned behavior (Ajzen & Fishbein, 2005). However, there is growing evidences that the inclusion of emotion in such models improves the explanatory power of pro-environmental intention and behaviors (e.g., Bamberg & Möser, 2007; Kaiser et al., 2008). Future studies examining environmental engagement and water conservation in particular, would benefit incorporating emotional variables in predictive models.

Another relevant implication refers to specific emotions examined in this paper. The main focus of the present research was on moral emotion which is only one of emotional domains that have been linked to environmental issues (Kals et al., 1999; Kals & Maes, 2002). The RSEWW and the present study not address emotional affiliation with nature, nor fear/anxiety related to environmental risk perception. The decision to focus on moral emotion was based on the fact that morality underlies environmental issues (Bamberg & Möser, 2007), and that moral emotions explained more variance of environmentally-related constructs than the other two emotional domains (Kals & Maes, 2002). Even so, future studies could examine the extent to which the RSEWW is associated with these other emotional domains, and whether it is feasible incorporate new items in the scale that cover emotional affiliation with water and fear/anxiety with the water scarcity perception.

A contribution of this study is the clear operational definition of the emotional domain to guide the scale developed. Emotion was used in the RSEWW at a general level related to a specific object (water wastage) and expressing emotional bipolar pairs. From the outset, the goal was develop a new instrument that measures emotion toward water wastage,

and the findings reported here indicate that the resulting scale achieved this goal.

Beyond these implications and contributions, it is important to acknowledge some limitations of this research. The first limitation refers to the reliance on only undergraduate students from a particular cultural milieu. Further validity studies should administer the RSEWW to culturally diverse and distinct populations. Another limitation was the use of only self-reported measures. It is important to examine the extent in which the RSEWW can predict the water conservation behavior (e.g., using un-obstructive observation of water metering in households), given the evidence that self-reports are not completely reliable measures of pro-environmental behavior (e.g., Corral-Verdugo, 1997).

Finally, this study focused only on a specific psychological determinant (emotion) and emphasized the importance of psychological variables in explaining environmental engagement, but has neglected the role of contextual factors in explaining water conservation. There is evidence suggesting that situational variables influence the water consumption (Corral-Verdugo, 2003; Van Vugt & Samuelson, 1999). For example, Van Vugt and Samuelson (1999) found that the water consumption decreased when participants experienced a fictional or real water shortage. Contextual factors should thus be taken into consideration in future studies using the RSEWW.

In conclusion, by contributing to the studies that have incorporated emotion in their predictive models of environmental engagement, this study advances on water conservation with the development of a measure that assesses individual reactions to water wastage. It is hoped that the Rating Scale of Emotions towards Water Wastage (RSEWW) can be used in future research to further its development and its nomological network. The RSEWW is an instrument psychometrically and theoretically relevant that can contribute with researchers that aimed to foster water conservation.

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