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Relation between psychological, psycho-cultural factors and attitudes towards the construction of a composting/ vermicomposting plant: a case study

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Abstract

Waste management is one of the challenges to address to promote environmental sustainability. The methods of composting and vermicomposting seem to be a possible ecological solution. A number of 90 participants answered a questionnaire aimed at detecting the relationship between risk perception about climate change, biospheric values, symbolic universes and attitudes towards the construction of a composting and vermicomposting plant near the respondent's living place. Participants answered an open-ended question aimed to obtain a deeper understanding of the perceived disadvantages in relation to the construction of the plant. Results highlight that positive attitudes towards the plant are related and predicted by both risk perception and biospheric values. Moreover, different levels of biospheric values were found between symbolic universes, consistently with a different world's representation. The qualitative analysis produced 7 categories related to different kinds of disadvantages about the plant. Findings offer suggestions for future research.

Keywords: composting, risk perception, values, meaning-making

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Introduction

The transition to renewable energy (RE) sources is increasingly needed to promote the sustainability of energy systems (EEA, 2020). Landfills are a major source of methane emissions which contribute to global warming with 12% of total global emissions (Hawken, 2017). Although not without any environmental consequences, composting/vermicomposting plants (henceforth: CVP), seem to be a good compromise for environmental sustainability in terms of waste management (Yasmin et al., 2022). Every technological transition to RE raises important issues of social acceptance of technologies by the resident population (Bauwens, & Devine-Wright, 2018) because they are perceived as dangerous to their health or to the area where they live (e.g. loss of property value; Piat, 2000). Attitude plays a critical role in the ecological transition (Abhold et al., 2011) so the present case study focused on attitudes towards the construction of a CVP which represents a novelty in the literature on waste disposal (Kraft, M. E., & Clary, B. B.,1991) that has hitherto focused mainly on landfill or on assessing the determinants of residents' domestic/composting behavior (Sewak et al., 2021). Research shows that opponents to such projects aren't against RE, but engage in actions to protect the place, so as not to allow changes to damage the emotional and symbolic relationships between communities and the place where they live (Batel et al., 2020; Devine-Wright & Howes, 2010). Some scholars (Devine-Wright, 2013; He et al., 2021) trace these dynamics back to the NIMBY (Not In My Backyard) phenomenon. So, the presence of a CVP could represent a significant change and a threat to the population. In accordance with the Protection Motivation Theory (PMT; Rogers, 1983), recognizing the severity of a threat (climate change) and one's vulnerability in relation to this danger and subsequently evaluating one's response efficacy, self-efficacy, and response cost of the suggested action (the creation of a CVP in one's neighborhood) could generate positive attitudes towards the recommended action (Rogers, 1983). PMT has been applied in other sustainability studies (e.g. Shafiei & Maleksaeidi, 2020). In line with this, the present case study investigates the role of risk perceptions (henceforth: RP) not related to the object of attitude as traditionally happens in similar research (e.g. Bohner & Wänke, 2002), but in relation to climate change. As reported by Han et al. (2015) values serve as a guide for increased environmental concern. Biospheric values (henceforth: BV, Stern et al., 1993) relate to the recognition of the benefits that the environment brings to human beings (Steg & De Groot, 2012). Previous studies have shown that some sustainable attitudes are strictly linked to the presence of BV in the population (Steg & De Groot, 2012). However, no one has explored the links between BV and specific attitudes through CVP.

Furthermore, from a cultural perspective, there is the need to investigate the psychological processes and the psycho-cultural factors that shape them; in other words, how people make sense of new social objects (Batel, Devine-Wright, 2015). The Semiotic Cultural Psychology theory (SCPT; Cremaschi et al., 2021) assumes that individual cognition is mediated by semiotic resources (e.g. beliefs, values, worldviews) based on embodied patterns of meaning embedded in the cultural milieu of the social group (Cole, 1996). Such semiotic resources are in turn shaped by hyper-generalized, a-semantic and affect-laden meanings declined in terms of symbolic universes (henceforth: SUs) (Salvatore et al., 2019). A SU does not concern a specific object but provides a global representation of the experience. Other research investigated the role played by SUs in relation to various social phenomena (e.g. see Cordella et al., 2023).

This case study, in an exploratory and in-depth way, aimed to investigate attitudes towards building a CVP near people's place of residence, considering risk perceptions related to climate change and BV. According to the most recent community acceptance research we opted for a case study and blended methodology, to gain a deep understanding of the perceived disadvantages in relation to building a CVP (Devine-Wright & Howes, 2010, Hall et al., 2013). Furthermore, the use of a mixed methodology is consistent with the exploratory nature of the study as, thanks to the multiple data sources, it allows to address the research topics from different angles in order to explore the phenomena in a multifaceted way (Mason, 2006). The differences of BV among different SUs were investigated because, to date, research that considers the role played by the context in influencing people's attitudes about the construction of renewable energy plants is lacking.

Method

Participants

A total of 90 responses were gathered: 32.2% male; 66.7% female; and 1,1% preferred not to answer. The average age was 31.23 (*SD* = 10.46). Moreover, 31.1% of the participants had a secondary school diploma or a lower qualification, whereas 68.9% obtained a university degree or higher. Finally, 28.9% of the participants resided in northern Italy, 31.9% in center, 32.2% in southern Italy, and 7.8% in the islands.

Measures

Quantitative Instruments

The translation accuracy was verified through back translation for all the scales.

Attitudes towards the plant (α = .76). Attitudes toward the plant were measured by adapting 2 items used by Sundstrom et al. (1977) to evaluate attitudes towards nuclear power plants. Participants answered on a six-point Likert scale (1=absolutely not; 6=absolutely yes).

Risk Perception Index (α = .91). Risk Perception about climate change was measured through the Risk Perception Index (Linden, 2015). This scale includes eight items scored on a seven-point Likert scale (1=Not at all; 7=completely).

Biospheric values (α = .94). Biospheric values were measured by using the instrument of De Groot & Steg (2008). Participants answered rating the importance of each item as a guiding principle in their life on a nine-point Likert scale (-1=opposed to my values; 7=extremely important).

View of context. The short version of the VOC questionnaire (Ciavolino et al., 2017) was used. The instrument consists of 29 items - scored on a seven-point Likert scale (1=Totally disagree; 7=Totally agree) - and is designed to identify SUs that are active within the sample, based on how people represent the meaningful and affect-laden aspects of their life contexts (Kerušauskaitė et al., 2023). The VOC has been shown to have satisfactory construct validity and internal consistency (α = .70).

Qualitative Instrument

To gain an initial understanding of perceptions regarding the possible disadvantages of building a CVP, a brief description along with 3 pc-processed images (see Supplementary Material) of it was presented followed by an open-ended question to the participants ("*What could be, in your opinion, the drawbacks of building a composting/vermicomposting plant like the one described?*"). All responses were analyzed using the content analysis procedure (Hsieh & Shannon, 2005).

Procedure and data analysis

An anonymous questionnaire was administered online. Participants signed informed consent before the questionnaire administration. Statistical analyses were conducted by using SPSS 25.

In order to detect the SUs active in the sample, the responses to the VOC were subjected to a combination of Multiple Correspondence Analysis (MCA) and Cluster Analysis (CA) (see Salvatore et al., 2019).

Pearson's correlation coefficients were calculated. A multiple regression was conducted with attitude towards the plant as the dependent variable. Finally, ANOVA was used to compare BV in relation to the different SUs performing post-hoc analyses.

Conventional content analysis (Hsieh & Shannon, 2005) was used to classify textual data by coding and identifying themes, without having pre-established categories. The responses to the open-ended question were examined and classified by the research group. Subsequently, two other researchers checked the classification of the data (Braun & Clarke, 2012) and provided feedback. Differences among the researchers were resolved in order to obtain unanimous consensus.

Results

Quantitative analysis

The MCA extracted 6 main factors, which explain 96.07% of the total inertia (see supplementary material). The factors were used as classificatory criteria in the subsequent CA, which identified three clusters interpreted as follows:

SU1: *Disheartened Affiliates*: the world is an object to be passively adhered to and a rejecting and persecuting reality.

SU2: *Confident Engaged:* the world is an object to engage with.

SU3: *Idealizing Optimists:* the world is an object to idealize, rather than a reality to analyze critically.

Means, standard deviations were performed for BV (M = 5.28; SD = 1.04), RP (M = 5.95; SD = .94) and Attitudes Towards the Plant (M = 6.02; SD = 1.36). Pearson's correlations showed that attitudes toward the plant were significantly and positively correlated with BV (r = .366, p < .001) and with RP (r = .375, p < .001). Linear multiple regression was conducted by inserting BV and RP as predictors of Attitude Towards the Plant (see Table 1). The Model was significant: $F\ (2, 87)$ = 9.66, $\eta 2$ = 0.18, p < .001. BV and RP were significantly related to Attitude Towards the Plant (β = .236, p < .05 and β = .254, p < .05 respectively).

Tab. 1. Results of Multiple Regression Analysis predicting Attitude Towards the Plant

Predictors	β	p	R2	R2Adj.
1.Biospheric values	.236	.040	.182	.163
2.Risk Perception	.254	.027		

Finally, ANOVA was used to compare the differences between the SUs in relation to BV. Significant differences were found on the mean scores of the three SUs ($F(2, 87)$ = 3.49, $\eta 2$ = 0.07, p < .05). According to post-hoc analyses (see Table 2), "Idealizing optimists" showed higher scores than "Confident engaged" (*Mean Difference* =.767; p < .05) and "Disheartened affiliates" (*Mean Difference* =.858; p < .05).

Tab. 2. Multiple comparisons of SUs and BV

(I) SU	(J) SU	Mean Difference (I-J)	p
Disheartened affiliates	Confident engaged	-.091	.802
	Idealizing optimists	-.858*	.030
Confident engaged	Disheartened affiliates	.091	.802
	Idealizing optimists	-.767*	.020
Idealizing optimists	Disheartened affiliates	.858*	.030
	Confident engaged	.767*	.020

Qualitative analysis

Thanks to the conventional content analysis procedure applied to the open-ended question it was possible to create 7 categories. More than half of the participants (75%) indicated that they perceive disadvantages from the possible construction of the CVP.

The largest category was "unpleasant smell" (18%). The smell is considered a major disadvantage (*"Smell related to the presence of garbage and organic waste"*).

The second category was "reduction of green spaces" (15.5%). The reduction of green and uncontaminated space is also a disadvantage for the participants (*"The disadvantage is that its construction takes away green space accessible to all people"*).

The third category was "Collateral pollution" (12%) which includes all forms of pollution that the CVP could cause, such as the transport of rubbish, pollution related to the construction of the plant, etc (*"Waste transportation"*).

The fourth category was "Construction's costs" (11%). The participants were concerned about the possible costs required

of the population for the construction and maintenance of the plant *"You need to spend a lot of money to make it and a lot of resources"*).

The fifth category was "Visual impact" (7%). People have identified the possible disfigurement of the territory as a disadvantage *"I think there may be problems from a landscape point of view"*).

The sixth category was "Composting times" (6%). People have identified the long composting times as a disadvantage (*"The timing of transformation of waste into fertilizer"*).

The last category was "Proximity to waste" (5.5%). People perceive it as a disadvantage to live in close proximity to a building that contains large amounts of garbage (*"no one will want waste close to home"*).

Discussion

Our main findings were that high levels of BV and high perceptions of climate change-related risk play a role in predicting positive protective attitudes towards building a CVP. This is consistent with previous research that showed how BV and understanding of climate change risks generate a positive attitude within the population towards RE sources (Bentz et al., 2022).

Multiple comparisons of SUs and BV found significant differences between groups. In particular "Idealizing Optimist" seems to have higher levels of BV than "Disheartened affiliates" and "Confident Engaged". This can be explained because of their idealized representation of the world, which contemplates a harmonious coexistence between humans and the environment.

Qualitative analysis produced 7 categories: Unpleasant smell, Reduction of green spaces, Collateral pollution, Construction costs, Visual impact, Composting times and Proximity to waste were the perceived disadvantages. Consistently with PMT (Rogers, 1983), people recognize the presence of disadvantages arising from the implementation of the proposed plant but the fear derived from high RP of climate change and the concern derived from high levels of BV is declined through a protective attitude. This analysis is consistent with that of Woźniak et al. (2022) who see concern about climate change as fuel to a positive attitude toward the acceleration of the ecological transition.

The objective of this study was to explore the psychological and psycho-cultural factors of social actors and their direct impact on attitudes towards the development of a CVP through a mixed methodology. Although this case study enriched an ongoing debate in the literature using a qualitative-quantitative methodology is not exempt from having limitations.

The small sample analyzed is unrepresentative of the Italian population due to the use of the snowball methodology and the online administration of self-report questionnaires.

Concerns on climate change and the need for an ecological transition towards RE sources are topics where psychology cannot claim exemption. Studying the relationships with other variables that could influence the attitudes related to the construction of a CVP (e.g. place attachment) is increasingly needed. The research presented here can be seen as a cue towards further studies that can offer psychology the opportunity to give answers to the questions of the actors involved in this process of change.

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Author Contributions
The authors contributed equally to this manuscript

Conflict of interest
The authors declare that they have no competing interests.

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Ethical approval
The study was approved by the Ethics Committee of the Department of Dynamic, Clinical Psychology and Health Studies of "Sapienza" University of Rome (No. 0000455/2022).

Supplementary Material
Supplementary Material may be retrieved at the following link:
https://osf.io/xnb4j/files/osfstorage/63f37c6c4bdf0301ef56c158

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