



Full length article

Explaining and promoting household food waste-prevention by an environmental psychological based intervention study



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ARTICLE INFO

Article history:

Received 15 February 2016
 Received in revised form 7 April 2016
 Accepted 9 April 2016
 Available online 23 April 2016

Keywords:

Household food waste-prevention
 Behavior change
 Pro-environmental behavior
 Theory-driven intervention
 Environmental psychology

ABSTRACT

Household food waste greatly contributes to global environmental issues, such as climate change or extensive use of restricted natural resources (water, land etc.). Therefore, an intervention study was conducted to promote household food waste-prevention in a sample of German households ($N=217$). By integrating so far identified perceptual, motivational and behavioral predictors, a comprehensive theoretical framework to explain household food waste-prevention was initially developed. Based on this framework, an appropriate intervention strategy was derived consisting of providing action knowledge, using a public commitment- and a goal setting-technique. Thereby, the main objective of the study was to increase the likelihood of household food waste-prevention in the participating households by improving household members' performance of relevant food waste-preventing behaviors (e.g. planning grocery shopping in advance). Based on a 2×2 -control group design, results indicated the effectiveness of the chosen intervention strategy by revealing a stronger improvement of self-reported performances of the recorded food waste-preventing behaviors in the experimental group compared to the control group four weeks following its implementation. Thus, the present intervention study not only provides several entry points for various environmental psychological based intervention strategies to promote household food waste-prevention but also delivers empirical indications for their behavioral effectiveness.

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1. Introduction

1.1. Household food waste-prevention—an appropriate target for environmental psychological interventions

Globally, one third of all food that is produced for human consumption is not eventually consumed by anyone (*food wastage*; Lipinski et al., 2013). Following Gustavsson et al. (2011) this results in a total amount of 1.3 billion tons of food wastage per year. Additionally to relevant economic (e.g. unnecessary expense of \$750 trillion in 2007; Food and Agriculture Organization of the United Nations (FAO, 2013) as well as social consequences (e.g. restricted food security and accesses to food in developing countries; see Buchner et al., 2012 for details), these high amounts of food wastage greatly contribute to the environmental impacts of global food production, causing unnecessary greenhouse gas emissions (e.g. 3.3 Gt worldwide in 2007), water consumption (e.g. 250 km³ blue water¹

worldwide in 2007), land use² (e.g. 1.4 million ha worldwide in 2007) and threats to natural biodiversity³, both on land and in water (FAO, 2013).

Considering main causes for food wastage, we have to differentiate between developing and industrialized countries: Developing countries are especially characterized by high amounts of *food loss*, i.e. food that is not consumed due to spoilage, an excessive reduction in quality (e.g. wilting or crushing) or for other reasons before it can reach human consumers (Lipinski et al., 2013). Consequently, food loss is not or at least hardly related to individual behavior of final consumers. Food loss typically occurs due to inefficient production and transport conditions, insufficient knowledge or adverse natural events (e.g. heavy storms or droughts; Buchner et al., 2012). Thus, structural strategies (see e.g. Abrahamse and

for causing severe environmental problems, such as water depletion, salinization, water-logging or soil degradation [...]" (FAO, 2013, p. 27).

² Land use "[...] describes the surface of land, including cropland and grassland, necessary to produce foodstuff" (FAO, 2013, p. 36).

³ The term "natural biodiversity" "[...] comprises the diversity of life on Earth, across genes, species and ecosystems" (FAO, 2013, p. 47).

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¹ As defined by the Food and Agriculture Organization of the United Nations (FAO): "Blue water in agriculture is the consumptive use of irrigation water taken from ground or surface water" and its "[...] use in irrigated agriculture has the potential

Matthies, 2012) and technical improvements are appropriate intervention techniques to prevent food loss.

In contrast, industrialized countries are characterized by high amounts of *food waste*, i.e. food that is discarded being suitable for human consumption (see e.g. Buchner and Fischler, 2012; FAO, 2013; Gustavsson et al., 2011; Lipinski et al., 2013; Parfitt et al., 2010; Stuart, 2009; Thyberg and Tonjes, 2016). In consequence of inadvertence or conscious decisions for discarding, food waste – especially *household food waste* – is closely related to individual behavior of final consumers (FAO, 2013; Gustavsson et al., 2011; Lipinski and Hanson, 2013; Parfitt and Barthel, 2010; Stuart, 2009). Thereby, several studies conducted in Germany, Great Britain, Italy, France, Austria, Switzerland and the USA unanimously indicated private households as the main contributors of food waste or food wastage in general (e.g. Buchner et al., 2012; Lipinski et al., 2013; Monier et al., 2011; WWF Schweiz [Switzerland], 2012). Thereby, German households are assumed to cause 61% of all food wastage in their whole country, resulting in nearly 6.7 million tons per year and an average amount of 82 kg per person.⁴ Out of these 82 kg, nearly 47% (i.e. 38 kg) can be seen as *avoidable*. So, these 47% represent food that was completely edible to that time when it was discarded or it would have been edible by consumption in time (Kranert et al., 2012).

To summarize, household food waste-prevention is highly relevant not only, but especially from an ecological point of view (Klößner, 2015). Due to the close relation between household food waste-prevention and individual behavior of household members, investigating appropriate intervention strategies can be seen as a relevant research task especially for social sciences such as psychology. Thus, the present paper contributes to previous research by starting with an integration of so far identified perceptual, motivational and behavioral predictors of household food waste-prevention into a comprehensive – environmental psychological based – theoretical framework to explain household food waste-prevention. Considering this framework, as well as empirical indications on effective intervention techniques commonly used in environmental psychology, an intervention study was further implemented and evaluated in a sample of German households.

1.2. Explaining household food waste-prevention by applying the integrative influence model of pro-environmental behavior

In order to apply an appropriate theoretical basis for the following intervention study, the author initially compared several *decision/change models* commonly used environmental psychology for explaining various types of pro-environmental behavior (e.g. energy saving, recycling, water conservation, promotion of organic food consumption etc.; see e.g. Klößner, 2015; Steg and Norlund, 2012; Steg et al., 2012). Thereby, model's suitability to integrate nearly all so far identified perceptual, motivational and behavioral predictors of household food waste-prevention into one comprehensive theoretical framework was evaluated as one of the most important decision criteria. Thus, the *integrative influence model of pro-environmental behavior* proposed by Matthies (2005) was finally chosen as such an appropriate theoretical framework for the following intervention study. Fig. 1 shows the adapted version of the initial model in order to explain household food waste-prevention. Within the adaptation process, so far identified perceptual, motivational and behavioral predictors of household food waste-prevention were arranged in four sequential stages,

representing the whole process of a conscious behavioral performance (i.e. household food waste-prevention).

By explaining household food waste-prevention, the model starts with relevant perceptual predictors in the *norm activation* stage. Focusing on environmental aspects, these predictors represent the *perceived environmental consequences of household food waste* (see Section 1.1 for examples), the *perceived ascription of responsibility for these consequences* (Quested et al., 2013) and the *perceived ability to prevent household food waste* (or self-efficacy; Farr-Wharton et al., 2014; Quested et al., 2013). Thereby, degrees of one's own perceived ability to prevent household waste depend on available *action knowledge* (e.g. Abrahamse and Matthies, 2012; Homburg and Matthies, 1998; Mack, 2007), respectively processed information about relevant food waste-preventing behaviors (e.g. avoiding impulse purchases/buying more food than currently necessary; see below for details on food waste-preventing behaviors).

Based on the effect of these perceptual predictors, a *personal ecological norm* (see e.g. Klößner, 2015; Steg and Norlund, 2012; Steg and Vlek, 2009 for an overview) or *moral norm* (as labeled by other authors) to prevent household food waste can further be activated as an important motivational predictor during the *motivation stage* (e.g. Graham-Rowe et al., 2014; Parizeau et al., 2015; Visschers et al., 2016; Watson and Meah, 2013). Additionally, *social norms* (i.e. expectations of important other persons, like family and friends; see e.g. Bamberg and Möser, 2007 for details) to prevent household food waste are assumed as another motivational predictor taking effects in the motivation stage (Quested et al., 2013; Stancu et al., 2016). Finally, other possible motives to prevent household food waste, especially strong motives to save money (economy; see also Neff et al., 2015; Quested et al., 2013; Watson and Meah, 2013) and to *minimize behavioral costs* (associated with specific food waste-preventing behaviors such as planning grocery shopping in advance) can have an effect in the motivational process.⁵

During the following *evaluation stage*, the effects of all previous perceptual and motivational predictors are balanced and a behavioral decision (concerning the performance of a specific food waste-preventing behavior) is taken. As household food waste-prevention cannot be seen as the result of a single behavior, a combination of multiple behaviors can influence its likelihood (Quested et al., 2013; Thyberg and Tonjes, 2016). Because such food waste-related behaviors consequently determine household food waste-prevention, the label *food waste-preventing behaviors* is used in the current paper. Food waste-preventing behaviors, however, represent an extensive category of different behaviors reaching from preparation of grocery shopping, grocery shopping itself, storing and preparation of food at home to its final discarding. Based on previous indications (see e.g. Kranert et al., 2012 for an overview), in the present study, eleven relevant food waste-preventing behaviors are differentiated, presented and arranged in superior behavioral factors in Table 1.

Concerning these relevant food waste-preventing behaviors, there are specific behavioral predictors for household food waste-prevention, which can also affect the resulting behavioral decision taken in the evaluation stage. Thereby, conscious decisions to perform specific food waste-preventing behaviors can be suppressed by strong *habits* associated with the specific behaviors (see e.g. Verplanken and Orbell, 2003 for details). For example, a strong habit to avoid impulsive purchases/buying more food than cur-

⁴ Food wastage/food waste caused by private consumers in the food service sector/catering industry is not included in the 61% food waste caused by German households. Following Kranert et al. (2012), large-scale consumers (e.g. catering industry, hotels, hospitals etc.) are causing only 5% of all food wastage in Germany.

⁵ Unfortunately, because most food waste-preventing behaviors are characterized by behavioral costs (see Graham-Rowe et al., 2014 for further examples), strong motives to minimize behavioral cost rather increase likelihood of household food waste, instead of its prevention. For example, perceived inconvenience because of high planning efforts can be assumed as such behavioral costs associated with planning grocery shopping in advance.

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