

FORUM

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PROCRASTINATION, CONTROL AND PERCEIVED EFFORT IN FOOD WASTE BEHAVIOR

Procrastinação, controle e esforço percebido no comportamento de desperdício de alimentos

Procrastinación, control y esfuerzo percibido en el comportamiento de desperdicio de alimentos

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ABSTRACT

Food waste can be observed in the entire food industry, and it negatively impacts the social, environmental and economic spheres. This study aims to identify the predictive factors for such behavior, specifically those relating the propensity to procrastinate, and the “food control” and “perceived effort” variables as mediators of food waste behavior. To this end, data were collected by way of an online survey, resulting in a consistent final sample of 279 respondents, with the hypotheses being analyzed by structural equation modeling. As the key results of this study, procrastination was not significant for explaining food waste behavior, while food control reduces perceived effort. This study has also clarified that greater, intuitive control is counterproductive. As for its contributions to management, the urgent need to use booklets and training to disseminate food control techniques and access to information on the shelf life of food products stands out.

KEYWORDS | Procrastination, food control, perceived effort, food waste, consumer behavior.

RESUMO

O desperdício de alimentos pode ser observado em toda a indústria alimentícia, refletindo em efeitos negativos nas esferas social, ambiental e econômica. Este estudo objetiva contribuir para a identificação dos fatores preditores desse comportamento, especificamente, relacionando a propensão a procrastinar e as variáveis controle de alimentos e esforço percebido como mediadoras do comportamento em relação ao desperdício de alimentos. Para tanto, foi realizada uma coleta por meio de survey on-line, com uma amostra final de 279 respondentes, e as hipóteses foram analisadas com a modelagem de equações estruturais (MEE). Como principais resultados, destaca-se que a procrastinação não se mostrou significativa para explicar o comportamento de desperdício de alimentos, e o controle desses produtos reduz a percepção de esforço. Além disso, elucida-se que um maior controle realizado de maneira intuitiva é contraproducente. Como uma das principais contribuições gerenciais deste estudo, ressalta-se a urgência por difusão de cartilhas e treinamentos com o objetivo de disseminar técnicas de controle de alimentos e acessibilidade às informações sobre o período de durabilidade dos produtos alimentícios.

PALAVRAS-CHAVE | Procrastinação, controle de alimentos, esforço percebido, desperdício de alimentos, comportamento do consumidor.

RESUMEN

El desperdicio de alimentos se puede observar en toda la industria alimentaria, reflejando efectos negativos en los ámbitos social, ambiental y económico. Este estudio tiene como objetivo contribuir a la identificación de los factores predictivos de esta conducta, en concreto, relacionando la propensión a procrastinar y las variables control alimentario y esfuerzo percibido como mediadoras de la conducta en relación al desperdicio alimentario. Para ello, se realizó una recolección a través de una encuesta online, con una muestra final de 279 encuestados y se analizaron las hipótesis con la modelización de ecuaciones estructurales. Como principales resultados, se destaca que la procrastinación no fue significativa para explicar el comportamiento del desperdicio de alimentos, y que el control de estos productos reduce la percepción de esfuerzo. Además, se aclara que un mayor control realizado de forma intuitiva es contraproducente. Como una de las principales contribuciones gerenciales de este estudio, se enfatiza la necesidad urgente de difusión de folletos y capacitación para difundir técnicas de control de alimentos y acceso a información sobre la durabilidad de los alimentos.

PALABRAS CLAVE | Procrastinación, control de alimentos, esfuerzo percibido, desperdicio alimentario, comportamiento del consumidor.

INTRODUCTION

Food waste causes counterproductive effects in economic, social and environmental spheres (Patra, Leisnham, Tanui, & Pradham, 2020). This phenomenon is intrinsic to the increase in hunger, the emission of greenhouse gases, the degradation of the biosphere, and the scarcity of natural resources — particularly water. It also limits the production of certain foods for future generations (Stancu, Haugaard, & Lähteenmäki, 2016).

The Food and Agriculture Organization of the United Nations – the FAO (2018) - has pointed out that one-third of all food that is produced is wasted at some point in the production and consumption chain. This causes a substantial financial loss of over USD 900 billion per year, and minimizes household food security, thus increasing food market inflation and decreasing consumer purchasing power (FAO, 2018; Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014).

Some researchers have undertaken to understand the causes for such behavior, primarily by creating theoretical models based on the theory of planned behavior (TBP) (e.g., Neubig et al., 2020; Stancu et al., 2016). Despite the theoretical and practical contribution of these studies, however, some questions remain unanswered and require the construction of a theoretical model independent of TBP. Therefore, this study breaks away from this matrix and aims to create an original and predictive theoretical model.

Hitherto the literature has strongly indicated that one of the main causes of waste is the excessive purchase of products (Amirudin & Gin, 2019), especially when combined with a lack of proper food management (Aschemann-Witzel, Giménez, & Ares, 2019). The factors that explain the lack of motivation to engage in proper food control, however, have yet to be fully identified.

Food control is defined as those management activities that individuals carry out in their households to store food adequately and consume it within the established shelf life, and for making them aware of which items are about to expire (Aitken, Watkins, Williams, & Kean, 2020). But such activities are often neglected (Graham-Rowe, Jessop, & Sparks, 2014), as they require consumer awareness, dedication, and effort, thus increasing costs (Aschemann-Witzel et al., 2019). This study, therefore, suggests that one of the causes of this behavior may be associated with consumer procrastination with regard to engaging in such activities.

Procrastination refers to a person's tendency to put off or avoid doing certain activities, especially those that have a less immediate impact (Steel, 2010). In this sense, it tends to be accentuated when it concerns sustainable causes, like those that do not have a clear reward; in fact, this reduces the positive effects of environmental awareness (Lillemo, 2014).

From another perspective, the study by Porpino, Wansink and Parente (2016) points to procrastination as one of the dimensions of waste, and shows how families deal with leftovers, by storing them until they are spoiled so they can be disposed of without remorse. Similarly, Blichfeldt, Mikkelsen and Gram (2015) point to the fact that the longer people put off disposal, the easier it becomes, as the food becomes unsuitable for consumption, hence mitigating the feeling of guilt associated with waste.

Another potentially explanatory variant is perceived effort, especially in terms of the “hard work” undertaken in producing food for human consumption. As Dobernig and Schanes (2019) suggest, the investment of time and resources in this process generates a symbolic value. That said, it is expected that total food management and adequate use is more likely when people prepare their own food.

Given the above, this research seeks to advance the understanding of this phenomenon by analyzing whether there is a relationship between consumer procrastination behavior and food waste. The study also

assesses how the characteristics of individuals regarding food control and perceived effort interfere with and are affected by this relationship. Therefore, this work proposes an explanatory theoretical model and seeks to analyze the significance of this combination.

THEORETICAL FRAMEWORK

Food waste

Food waste can be defined as the practice of discarding food that is suitable for human consumption. It is caused by the negligence of consumers who allow products to exceed their expiry date, or fail to use them in their entirety (FAO, 2018). It is associated with ethical and sustainable factors and the profile of consumers in psychological, demographic, and cultural terms (Radzimska, Jakubowska, & Staniewska, 2016). With this in mind, researchers have diligently sought to develop studies to understand the antecedents that lead individuals to waste food.

The study by Aktas et al. (2018), for instance, found results concerning financial education, routine management, excessive cooking and consumption, and social aspects. It is also known that psychological and sociodemographic aspects influence food waste, although the latter have poor explanatory power (Aschemann-Witzel, De Hooge, Amani, Bech-Larsen, & Oostindjer, 2015).

Adopting the theory of planned behavior, Russell, Young, Unsworth and Robinson (2017) contributed specifically towards identifying psychological factors. The authors point out that subjective norms, control of perceived behavior, and intention, as well as habits and emotions, are causally related to food waste. In turn, and contrary to what Aschemann-Witzel et al. (2015) pointed out, the study by Stancu et al. (2016) revealed that sociodemographic aspects have a significant impact on waste. The authors found that older individuals, members of small families, and those with lower incomes tend to waste less. Developed countries, in contrast, that have higher *per capita* incomes, account for a greater share of the total waste. Along these same lines, Carmo and Barcellos (2018) found that low-income individuals are less likely to engage in such behavior.

Woensel, Donselaar, Broekmeulen and Fransoo (2007) found that less-educated, low-income families tend to waste more due to a need to show off their social status by excess food consumption, and because of the higher number of children living in the household. The findings by Porpino et al. (2016) hint that parents aspire to be seen by their children as good, and they tend to symbolize this by the food they offer them. This, in turn, is materialized in the form of purchasing and storing excess products.

Interestingly, although most consumers know about the effects of waste, they do not feel impacted by it, so their behavior remains reckless (Radzimska et al., 2016). Therefore, in addition to the aforementioned antecedents, other factors also promote this behavior, namely: the moral aspects of individuals (Raats, Shepherd, & Sparks, 1995); their cooking skills (Hartmann, Dohle, & Siegrist, 2013); over-buying and compulsive buying (Porpino et al., 2015); the non-use of leftovers (Stancu et al., 2016); feelings of guilt (Richter, 2017); and materialistic values (Abdelradi, 2018). This study aims to expand on these findings by correlating the procrastination, food control, and perceived effort variables as explanatory factors for waste. These topics will be addressed below.

Procrastination

According to [Parfenova and Romashova \(2019\)](#), procrastination has to do with a delay in carrying out activities, with no compelling reasons for doing so, and experiencing psychological discomfort as a result. It is defined as a tendency to put off the completion of a certain objective ([Zanjani, Milne, & Miller, 2016](#)), and is based on an absence of self-control, which especially affects activities that have an abstract future reward ([Chen, Liu, Zhang, & Feng, 2020](#)).

As [Akerlof \(1991\)](#) noted, one of the explanatory factors for such behavior is the change in the relationship between costs and benefits over time. When a task is established, the costs are interpreted as small, but they become bigger later, and the benefits become more abstract. In this sense, postponing activities entails high cognitive, psychological, and social costs ([Liu et al., 2020](#)).

Procrastination also has an impact on the economic and environmental spheres. [Lillemo \(2014\)](#), for example, points out that individuals who are prone to procrastinate tend to avoid engaging in activities related to sustainable causes, especially when they require psychological and monetary effort. This happens because their associated gains are commonly seen as having less impact on the present and may result in a devaluation of the investment of resources in environmentally friendly initiatives, and a reduction in the positive effects of environmental awareness.

[Zhu, Bagchi and Hock \(2019\)](#) explain the logic of behavior and its relationship with the cost of delayed tasks. The authors point out that the longer the term, the lower the perception of cost and the greater the probability of procrastinating. Furthermore, as productivity is perceived as a value ([Gamst-Klaussen, Steel, & Svartdal, 2019](#)), individuals tend to seek psychological comfort when they start performing tasks, not in any order of priority, but according to their degree of complexity. Therefore, they start with those that require less effort ([Rusou, Amar, & Ayal, 2020](#)).

In this context, the studies by [Blichfeldt et al. \(2015\)](#) and [Porpino et al. \(2016\)](#) introduce discussions concerning procrastination in the context of food waste, as being a way of reducing and mitigating guilt and remorse associated with disposal. Both studies show that individuals who procrastinate tend to keep leftover meals until they spoil, are no longer fit for human consumption and arouse feelings of disgust. This, in turn, makes disposal unavoidable and therefore guilt-free.

Based on the findings by previous exploratory studies, it is clear that procrastination can act as a predictor of food waste behavior. To measure this influence, the following hypothesis is postulated:

H1: The greater the procrastination, the greater the food waste behavior.

Food control

Food control can be defined as the proper management of stored food and meal leftovers ([Masson, Delarue, & Blumenthal, 2017](#)). This process mainly encompasses the adequate storage and constant monitoring of products available in the household to avoid the non-use of food, nutritional losses, and health risks ([Holsteijn & Kemna, 2018](#)). Sensitivity is, therefore, required to identify whether a given food is still suitable for consumption, in addition to checking and correctly interpreting the packaging labels, which display the appropriate handling conditions ([Kavanaugh & Quinlan, 2020](#)).

In the literature on this construct, one strand of thought argues that knowing the techniques that are adequate for storing products can lead to a reduction in food waste (e.g., [Graham-Rowe, Jessop, & Sparks, 2014](#); [Schanes, Dobernig, & Gözet, 2018](#)), and also that the conviction of having the competence to manage them significantly

influences control over them (Dobernig & Schanes, 2019). Not everyone agrees with this, however. Terpstra, Steenbekkers, De Maertelaere and Nijhuis (2005) and Dobernig and Schanes (2019) point out that even though the research subjects in their studies were aware of the storage guidelines and claimed to perform adequate control, they had still stored food for longer than recommended.

That said, the statement that consumers cannot manage food effectively remains valid (Farr-Wharton, Foth, & Choi, 2014). This is mainly due to a lack of systematic control and an organization routine (Costa, Farias, & Angelo, 2018; Romani et al., 2018), because even when such a control is carried out, consumers forget products, resulting in waste (Dobernig & Schanes, 2019). Individuals only seem to remember stored products when an item is needed for preparing a meal, or when the proper time is dedicated to checking and organizing them; it is at this point that people typically realize that these items are unsuitable for consumption (Aschemann-Witzel et al., 2019).

Therefore, despite efforts to understand how food control has an influence on reducing waste, its explanatory potential has yet to become entirely clear. This is especially true because, even though consumers are aware of the recommendations for the correct storage of food, they do not follow the suggested guidelines (Marklinder, Lindblad, Eriksson, Finnson, & Lindqvist, 2004). Based on this, this study seeks to contribute to the literature by measuring the explanatory potential of food control in reducing waste, and therefore the following hypothesis is postulated:

H2: The greater the food control, the less the food waste behavior.

Despite the relevance of correct food management for increasing shelf life, Farr-Wharton et al. (2014) showed that many families fail to manage their food. It is implied that these consumers do not engage in such activities because they perceive the consequences as being in the distant future, they fail to think about such consequences, and they have no knowledge of their direct impacts on their lives. Blichfeldt et al. (2015) also point out that the dimensions of procrastination are involved in food waste, as individuals are inert when using leftovers, and so exceed their recommended storage time. One of the resources used to store food and increase its shelf life is the refrigerator, although the use of this particular technology has been shown to be a co-participant of procrastination (Evans, 2011). Therefore, the following hypothesis is proposed:

H3: The greater the procrastination, the less food control.

Perceived effort

As mentioned above, several variables — either endogenous and/or exogenous — contribute to the performance of everyday human practices (Langan & Kumar, 2019). It is worth highlighting the notion of effort, which Brehm, Wright, Solomon, Silka and Greenberg (1983) conceptualized as an individual's perception of the behaviors to be adopted to achieve certain objectives. Mohr and Bitner (1995) also contribute to the formation of this construct by defining it as the energy exerted to achieve a task, or a set of tasks. For the purposes of this study, we shall adopt the definition of Modig, Dahlén and Colliander (2014), due to its specificity. Effort is here understood as the time, resources, and “hard work” spent in achieving tasks.

When observing individuals as specimens of *homo economicus*, researchers studying economic theories involved in decision-making (e.g., Hesse, Kangur, & Hunt, 2020; Zeelenberg & Van Dijk, 1997) argue that perceived effort decreases or neutralizes the value of the reward, which may cause aversion to the task. As Amirudin and Gin (2019) explain in the context of supermarket purchases, the greater the perceived effort in terms of commuting and time spent, the greater the chances that people will seek ways to avoid shopping. So, as the authors point out,

individuals tend to buy as much food as possible in order to put off the need for new purchases, thus resulting in increased food waste.

However, the effort is a paradoxical construct (Inzlicht, Shenhav, & Olivola, 2018) that, instead of decreasing, may increase the value of an activity (Harmon-Jones, Willoughby, Paul, & Harmon-Jones, 2020), as consumer involvement in the process moderates the perceived effort (Kallmuenzer, Peters, & Buhalis, 2019) and creates value, depending on the resources involved (Benfer, Bardeen, & Clauss, 2018). For instance, time and money represent different levels of effort for individuals, because “donating” time generates a higher level of perceived effort and, consequently, greater value when compared to donating money (Langan & Kumar, 2019). In the context of food waste, Ilyuk (2018) reveals that when consumers exert effort in terms of hard work, there is a greater appreciation of the product and an increase in psychological ownership, thus reducing disposal.

This positive relationship between involvement and value creation can be primarily found in the literature on co-creation (e.g., Ahn, Lee, Back, & Schmitt, 2019; Yen, Teng, & Tzeng, 2020). The joint production process is perceived as a marketing strategy that promotes purchase intentions and establishes a relationship of trust (Jacobsen, Tudoran, & Martinez, 2020). From this angle, it is clear that the byproducts of an individual’s participatory creation tend to be overvalued (Banović, Krystallis, Guerrero, & Reinders, 2016). Therefore, based on the premise that the energy spent in food production assigns a symbolic value to the resources it requires (Dobernic & Schanes, 2019), we seek to contribute to the literature on effort and food waste by verifying the following hypothesis:

H4: The greater the perceived effort, the less the food waste behavior.

When performing a task, the effort is justified when there is a proportional relationship with a clear reward, because when it does not depend exclusively on the effort, it tends to be underestimated, whereas the effort tends to be overestimated (Harmon-Jones et al., 2020). Besides, the quest to avoid losses influences an individual’s willingness to exert effort more significantly than obtaining gains (Massar et al., 2020). We can infer, therefore, that activities that focus on gains tend to be procrastinated more frequently.

This relationship can be further intensified if the gains are viewed as abstract and/or have less impact in the present, as is the case with sustainable activities (Lillemo, 2014). As one of the reasons for avoiding food waste is to achieve environmental gains (Diaz-Ruiz, Costa-Font, & Gil, 2018), it is possible to infer that carrying out related activities tends to result in greater perceived effort, as the focus is on obtaining gains and these entail less immediate benefits. Based on this, it is assumed that the greater the procrastination, the greater the perceived effort to carry out activities aimed at reducing waste. To validate this, the following hypothesis was postulated:

H5: The greater the procrastination, the greater the perceived effort.

In the literature on food control, some studies (e.g., Blichfeldt et al., 2015; Porpino et al., 2016; Romani et al., 2018) have demonstrated how an unplanned shopping routine and the absence of systematic control and organization may lead to an excessive number of products being stored. This results in a lack of effective food control and, consequently, waste (Farr-Wharton et al., 2014).

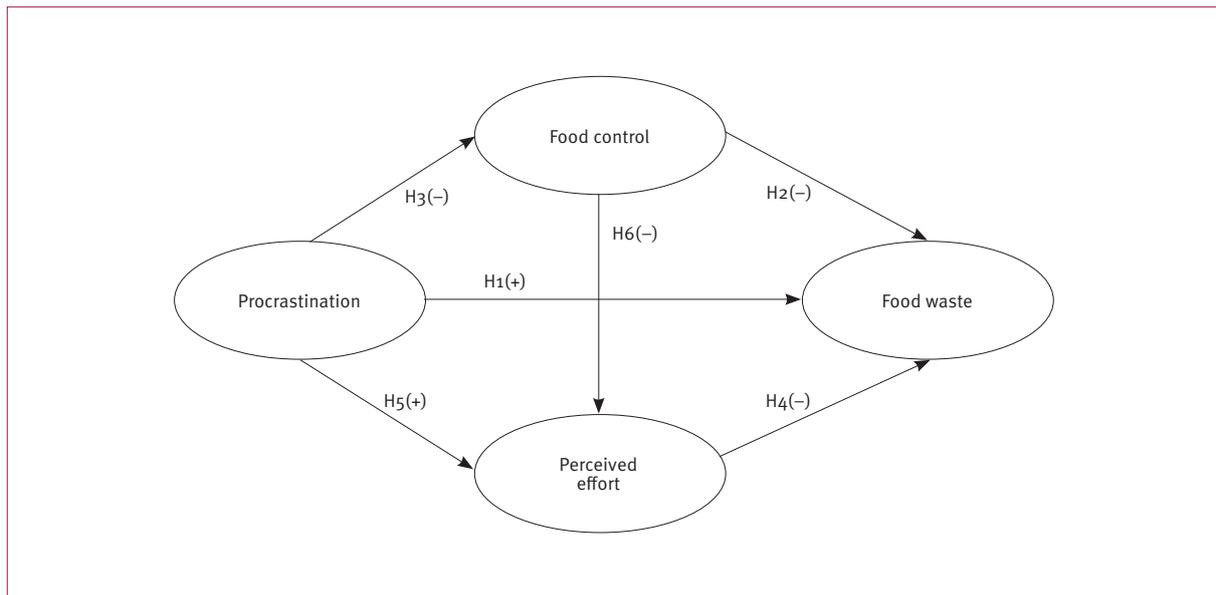
In the light of this situation, a new purchase cycle begins to ensure sufficient food for individuals (Hebrok & Boks, 2017). The access and time required in this process can moderate for the perceived effort and the opportunity cost of not purchasing. In other words, when the acquisition of products is intercepted by mobility problems and requires more time, the process is perceived as costly. A way of compensating for this, therefore, is by acquiring a greater number of products (Lee, 2018).

The study by Amirudin and Gin (2019) illustrates this relationship well by explaining how issues concerning easy access to food permeate the perception of effort and aversion to the activity. Indeed, they point out that the greater the perceived effort, the greater the excessive purchasing. In this sense, ease of access to products, both in terms of available hours and physical distance from the place of purchase, is reflected in lower quantities of food being purchased (Dobernig & Schanes, 2019), which, therefore, favors effective food control. That said, we can infer that greater food control is associated with lower levels of perceived effort. To test this, the following hypothesis was postulated:

H6: The greater the food control, the less the perceived effort.

For a better view of the theoretical model proposed here, see Figure 1, which shows the establishment of the predictive relationship between procrastination and food control, the perceived effort and food waste behavior, and the mediating link between food control and perceived effort with regard to waste behavior.

Figure 1. Theoretical model



METHOD

This study is quantitative and aims to develop an explanatory model for food waste behavior. It is a descriptive survey (Malhotra, 2012) based on the formulation of hypotheses. A literature review was initially carried out in the following databases: ScienceDirect, Scopus, Proquest, and Scielo. Then, as recommended by Churchill (1999), the cross-sectional survey method was used to collect data and establish the relationships between variables using structural equation modeling (SEM) (Kline, 2011).

Sampling

With regard to the sample, we sought to achieve greater heterogeneity for better validation of the results. The sample comprises Brazilian consumers and is characterized as non-probabilistic (Hair, Anderson, Taham, & Black, 2010). To ensure effectiveness in assessing food waste behavior, however, certain criteria were created for the respondents. Therefore, consumers categorized as young (18-40 years old) remained in the sample because older consumers tend to waste less (Stancu et al., 2016). Likewise, those who have the prospect of ascending the social ladder were also kept in the sample, that is, those who have a university degree, or are currently enrolled in higher education, for they are more likely to engage in waste behavior (Aschemann-Witzel et al., 2019).

That said, the sample size was defined on the basis of the guidelines of Hair et al. (2010) who recommend having at least five respondents for each question in the questionnaire, while following the recommendations of Tanaka (1987) for controlling sample size using structural equation modeling (SEM), so as not to exceed the maximum number of 400 respondents. Two samples were accordingly defined: the first had 140 respondents and aimed to refine the questionnaire, whereas the second aimed to test the hypotheses. In fact, the latter initially had 310 respondents, but it was necessary to exclude 31 questionnaires that did not fit the above criteria. Therefore, the final sample to test the hypotheses comprised 279 participants.

Data collection

Data were collected by way of a questionnaire that was based on a structured Likert scale containing 30 questions, in which the respondents indicated their degree of agreement to the statements. The technique used was snowball sampling. Data were collected in February 2020. The questionnaire was applied online using Google Forms and was divided into five sections, namely Procrastination (16 items), Food control (3 items), Perceived effort (4 items), Food waste (7 items), and finally the respondent's profile, consisting of six questions, namely gender, age, marital status, education, average monthly family income, and the total number of people living in the household. It is important to point out that the items on the procrastination scale were inverted for the purposes of this analysis. Exhibit 1 describes the items presented in each construct.

Data analysis

Descriptive statistics (frequency, mean and standard deviation) were used to understand the sample profile and the data collected in the research. The reliability of the scales was assessed using Cronbach's alpha; a reliability value greater than, or equal to 0.7 was accepted (Kline, 2011). SPSS and AMOS software was used for data processing, and structural equation modeling (SEM) was used to test the hypotheses.

To refine the questionnaire and assess the items in each construct to check whether they would load in a single factor, exploratory factor analysis (EFA) was carried out on a first version of the sample with 140 respondents.

Exhibit 1. Scales adopted in the study

Dimensions	Items	Codes
Procrastination Adapted from Tuckman (1990).	Q1. I delay finishing tasks unnecessarily, even when they are important.	P01
	Q2. I put off doing things I don't like to do.	P02
	Q3. I delay making difficult decisions.	P03
	Q4. I continue to put off improving my work habits.	P04
	Q5. I get down to business, even life's unpleasant chores. *	P05
	Q6. I may make excuses for not doing something.	P06
	Q7. I dedicate the necessary time to boring tasks, such as studying. *	P07
	Q8. When something is not worth it, I stop doing it.	P08
	Q9. I'm an incurable time waster.	P09
	Q10. I'm a time-waster and I can't help it.	P10
	Q11. I'd like to find an easy way to start producing.	P11
	Q12. I always finish important tasks ahead of time. *	P12
	Q13. When I finish my job, I check it. *	P13
	Q14. I look for a loophole or shortcut to get through a difficult task.	P14
	Q15. I remain idle despite knowing how important it is to start something.	P15
	Q16. Putting something off until tomorrow is not what I do. *	P16
Food Control Adapted from Russell et al. (2017)	Q17. How much control do you exert over food in your household?	CA1
	Q18. How difficult would it be for you to control food in your household?	CA2
	Q19. Controlling food in my household mainly depends on me.	CA3
Perceived Effort Adapted from Aktas et al. (2018).	Q20. I find it difficult to store food at high temperatures.	EP1
	Q21. I find it difficult to store food according to the required conditions.	EP2
	Q22. I find it difficult to store specific types of food.	EP3
	Q23. I find it difficult to buy food for one.	EP4
Food Waste Adapted from Von Kameke and Fischer (2018) and Aktas et al. (2018)	Q24. I think it's important to avoid wasting food in my household.	DA1
	Q25. I'd like to do more to avoid wasting food in my household.	DA2
	Q26. I'd waste less food if I planned my purchases more carefully.	DA3
	Q27. I waste food when I go out with my friends/family.	DA4
	Q28. I waste food when I have guests coming over.	DA5
	Q29. I waste food at work/school.	DA6
	Q30. I waste food stored at home whenever I travel.	DA7

Note. Items with (*) on the Procrastination scale were considered reversed.

Table 1. Construct items with factorial loads

Code	Factorial Loads				KMO	Bartlett			Cronbach
						df	x ²	Sig	
P15	0.780				0.834	120	725.232	0.000	0.864
Po2	0.763								
Po1	0.756								
P10	0.756								
Po9	0.725								
Po4	0.702								
Po3	0.647								
Po6	0.555								
P14	0.494								
P12	0.465								
P11	0.456								
P16	0.452								
CA1		0.887			0.668	3	125.738	0.000	0.772
CA2		0.820							
CA3		0.801							
EP3			0.812		0.712	6	93.179	0.000	0.710
EP2			0.751						
EP1			0.691						
EP4			0.623						
DA1				0.832	0.746	6	137.494	0.000	0.786
DA2				0.804					
DA3				0.712					
DA4				0.702					

By identifying low factor loads or value loadings in other factors, some items were excluded from the constructs in order to obtain a single factor per construct. Items Po5, Po7, Po8, and P13 were removed from Procrastination, so the construct had only one factor. It is worth noting that in the original scale of Tuckman (1990) the items were considered with factor loads starting from 0.3, and this was maintained in this paper for the EFA. A possible explanation for the need to remove items from the Procrastination scale may have to do with the translation of the statements, as the context and structure of some items may be interpreted differently by

respondents of other nationalities, which leads, in turn, to a certain degree of semantic deviation from the item in the original scale.

Items FW1, FW2, and FW3 were excluded from the Food Waste construct because two different scales were used to measure it, to check whether the items could load into a single dimension (factor). The tests showed that the three statements on the [Kameke and Fischer scale \(2018\)](#) had loads with a second factor, even after the items were inverted. Therefore, only the four items on the scale by [Aktas et al. \(2018\)](#) remained in that construct. As for Food Control and Perceived Effort, no item had to be excluded. The factorial loads that remained in each construct can be seen in Table 1.

ANALYSIS AND DISCUSSION OF RESULTS

Sample Profile

The sample consisted of 279 respondents (53.4% females and 46.6% males). As for schooling, 63.4% of the respondents have some type of college education, 19.4% had completed a graduate course, 12.5% have a bachelor's degree, and 4.3% had finished high school. The predominant marital status was single (82.1%). Married respondents, or those living under common-law accounted for 16.8% of the sample, whereas 1.1% declared they were divorced/separated. The age groups prevailing in the survey were 18 to 25 (69.2%), 26 to 32 (23.3%), and 33 to 40 (7.5%). The average age was 24 years old, and the range was from 18 to 40 (SD = 4.820). With regard to income, two groups stood out: the group with incomes between R\$1 and 3,000.00 (59.9%), and the group with incomes from R\$ 3,001.00 to 6,000.00 (29%). The average family income was R\$ 3,506.41 (SD = 3,403) and the average number of people living in the same household was approximately three (DP = 1,464), with an average *per capita* income of R\$ 1,414.00.

Measurement model

As [Marôco \(2014\)](#) advises, the Mahalanobis distance (D^2) was used to verify the existence and removal of outliers from the sample, but none of the observations had values requiring their exclusion from the analysis. This was followed by factor analysis of the measurement model. The results found in the first rounds of analysis suggested the exclusion of some items from the constructs so the model would achieve better fit rates. Therefore, items Po6, P11, P12, P14, and P16 were excluded from the Procrastination construct, along with PE4, from Perceived effort, and FC4, from Food control. After refining the item composition of the constructs, a new analysis was performed and the indices resulting from the measurement model were $\chi^2/df (104.084/82) = 1.269$ ($p = 0.050$); TLI = 0.978; CFI = 0.983; NFI = 0.925; PCFI = 0.767; RMSEA = 0.030; PCLOSE = 0.985; ECVI = 0.583; MECVI = 0.596. Therefore, these values attest to the model's goodness of fit.

Reliability (Cronbach), composite reliability (CC), and average variance extracted (AVE) were used to investigate the level of adequacy of the scales of each construct. Cronbach's alpha values of 0.7 or higher confirm the internal consistency of the items of each scale. Table 2 shows that all constructs have higher values. Composite reliability is also defined by an index equal to, or higher than 0.7 ([Hair et al., 2010](#)), a value that was reached by all constructs, according to Table 2. The mean and standard deviation of the constructs was calculated for the variables created using the summated scale for this purpose.

Table 2. Descriptive statistics, reliability and validity

Variables	Mean	SD	Cronbach	CR	AVE
Procrastination (P)	4.42	1.37	0.835	0.885	0.529
Food Control (FC)	4.39	1.67	0.751	0.846	0.652
Perceived Effort (PE)	3.69	1.56	0.701	0.794	0.567
Food Waste (FW)	2.44	1.41	0.784	0.853	0.602

Note. SD (Standard deviation); CR (Composite reliability); AVE (Average variance extracted)

Regarding the validity of the construct scales, three validities were performed, namely factorial, convergent, and discriminant (Kline, 2011). The first was performed by observing the standardized coefficients for each item of the constructs, and all showed values of 0.5 or higher, thus attesting to factorial validity. Convergent validity was based on the average variance extracted (AVE) values. As a measure of goodness of fit, this validity adopts values of 0.5 or higher. Table 2 shows that all constructs reached this value.

Table 3. Correlations, shared variance and AVE

Variables	P	FC	PE	FW
P	0.529	0.076	0.025	0.022
FC	0.277	0.652	0.128	0.024
PE	-0.159	-0.358	0.567	0.046
FW	-0.148	-0.156	0.216	0.602

Note. The AVE values are displayed diagonally in the table (in bold), whereas the values below the diagonal show the correlations, and the values above show the shared variances (squared correlations).

To verify discriminant validity, the AVE of each construct was compared with the shared variance. According to Fornell and Larcker (1981), the average variance extracted of a construct must not have a high correlation with other constructs, which are supposedly different. Therefore, the AVE values must be higher than those of the shared variances. Table 3 shows that this requirement has been met.

Structural model

The second stage of the SEM consists of the analysis of the structural model, to which the relations between the latent variables of the measurement model are added. Therefore, new goodness of fit indices were obtained, which can be seen in Table 4. The measures found attest to the goodness of fit of the structural model.

Table 4. Goodness of fit measures

Index	Results	Criteria
χ^2/df (172.759/108)	1.600	[1; 2] Good fit
p-value	0.000	<0.05 Acceptable fit*
GFI	0.933	> 0.90 Good fit
IFI	0.955	> 0.95 Very good fit
TLI	0.942	> 0.95 Good fit
CFI	0.954	> 0.95 Very good fit
NFI	0.887	[0.80; 0.90] Acceptable fit
PCFI	0.757	[0.70; 0.80] Acceptable fit
RMSEA	0.046	< 0.05 Very good fit
PCLOSE	0.664	> 0.05 Very good fit
ECVI	0.945	The lower, the better
MECVI	0.968	The lower, the better

Note. *Large samples are more sensitive to having significant p-values.

The coefficients between the relationships of the latent variables (Table 5) were also analyzed, which allow for an evaluation of the hypotheses postulated. The p-value indicates that only the relationships of Hypotheses H3 (-) and H6 (-) had values less than 0.05. However, only H6 (-) can be considered to have been confirmed or supported, as it also met the negative value of the relationship. This was not true for H3 (-), which showed the positive valence of the relationship coefficient.

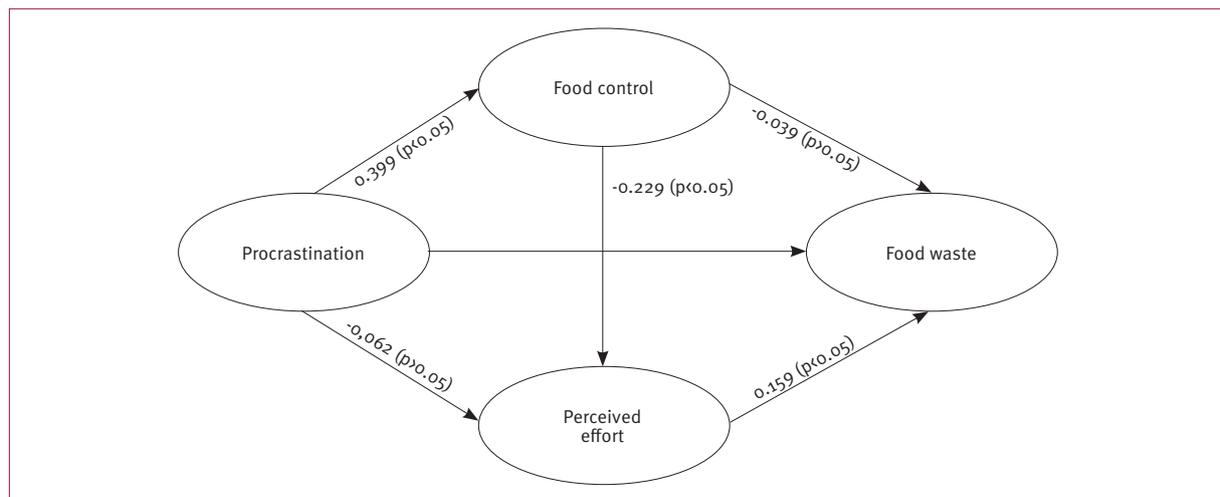
It is also noteworthy that H4 (-) might have been marginally accepted had a p-value of 0.10 been considered, but this study only considered p-values up to 0.05. Therefore, this hypothesis was also disproved.

Table 5. Hypothesis testing

Hypotheses	Standardized coefficient	Unstandardized coefficient	SE	CR	p	Status
H1(+): P → FW	-0.102	-0.089	0.070	-1.273	0.203	Not supported
H2(-): FC → FW	-0.065	-0.039	0.050	-0.782	0.434	Not supported
H3(-): P → FC	0.277	0.399	0.109	3.648	0.000	Not supported
H4(-): PE → FW	0.176	0.159	0.092	1.736	0.083	Not supported
H5(+): P → PE	-0.064	-0.062	0.076	-0.816	0.414	Not supported
H6(-): FC → PE	-0.341	-0.229	0.061	-3.744	0.000	Supported

Note. $p < 0.05$; Marginal significance = $p < 0.10$; SE = Standard error; CR = Critical ratio.

Figure 2. Theoretical model with coefficients



Discussion

The focus on avoiding waste is not guided by an orientation to obtain environmental gains, as suggested by some studies (e.g., Diaz-Ruiz et al., 2018; Lillemo, 2014), but to avoid losses. Although previous studies have pointed to the positive relationship between procrastinating and food waste behaviors, such as those by Blichfeldt et al. (2015) and Porpino et al. (2016), the result of the first hypothesis (H1) is counterintuitive, as it has not been supported. This is possibly explained by the fact that individuals engage more in activities that focus on avoiding negative

results, rather than on obtaining gains (Massar et al., 2020). Therefore, although individuals have a great tendency to procrastinate, they are likely to try and consume all of the food they purchase, and look for ways to prolong its shelf life, as wasting it would require more time being spent on preparing new meals, and buying groceries. Indeed, as Langan and Kumar (2019) point out, the amount of time allocated to a task represents a high cost.

But a greater degree of food control does not lead to less waste. This result concerns Hypothesis H₂, which has been refuted and contributes to the validation of what Terpstra et al. (2005) and Dobernic and Schanes (2019) pointed out, with both studies concluding that even individuals who claimed they exerted a control over their food stored it inadequately. In addition to food management not being regarded as a routine activity (Romani et al., 2018), food is also managed ineffectively (Farr-Wharton et al., 2014); if it were otherwise, there would be less waste (Kavanaugh & Quinlan, 2020). In this sense, the result found here points out that even in a highly controlled scenario, individuals possibly manage their food intuitively, and do not follow the guidelines of the health authorities, which results in waste. This, therefore, is a counterproductive activity.

This study also indicates that if food control is perceived as a component of low complexity, it is more likely to be performed, even by procrastinators. Accordingly, even Hypothesis H₃ – which sought to verify the existence of a negative relationship between procrastination and food control – is statistically significant ($\beta = 0.399, p < 0.05$), although it has not met the valence of the relationship coefficient. Therefore, a directly proportional relationship has been established, a result that disproves previous research (e.g., Blichfeldt et al., 2015; Evan, 2011). It is still feasible, however, due to the tendency of some individuals to seek psychological comfort in performing tasks according to their level of complexity due to procrastination, because they are inclined to prioritize those that require less cognitive effort (Rusou et al., 2020).

The ability to control food can explain the positive relationship between procrastination and food control, for it allows the task to be interpreted as requiring less effort to perform, hence avoiding procrastination (Graham-Rowe et al., 2014). In fact, as economic theories of the decision-making process explain (e.g., Hesse, Kangur, & Hunt, 2020; Zeelenberg & Van Dijk, 1997), when an activity requires less effort, there is an increase in the value of the reward, which, in turns, stimulates execution. The emphasis on avoiding losses can play an important role in achieving control, even by individuals who tend to procrastinate, for it can lead to greater engagement (Massar et al., 2020). Therefore, imminent loss, which is primarily monetary in nature, potentially influences consumers to control their food.

The relationship between perceived effort and food waste is highlighted in this study by Hypothesis H₄. It was postulated that a greater perceived effort would result in less food waste, but this was not confirmed. However, the results ($\beta = 0.159; p = 0.083$) allow for parsimonious reflection on the positive relationship between the constructs. When observing the means of perceived effort ($M = 3.69$) and food waste ($M = 2.44$), it appears that the respondents do not perceive storing products as requiring a lot of effort, and they tend not to engage in waste behavior. Therefore, based on the ratio coefficient found, it can be inferred that less effort results in less food waste. This may occur because less effort may be associated with confidence in the storage process, and thus reduce the individual's fear of becoming ill or poisoned by food when reusing meal leftovers, for instance; this may, in turn, result in less waste (Graham-Rowe et al., 2014).

As the result of H₅ indicates, even though the procrastinatory behavior of individuals is significant, this is not reflected in them not engaging in activities associated with avoiding waste, which would affect perceived effort. This result is supported by previous findings, first because the activities associated with avoiding food waste are carried out with a focus on avoiding losses, in terms of how much time and money are spent, and

as has been pointed out, this focus results in greater engagement (Massar et al., 2020). Second, because it is highly probable that food-management activities will be carried out, because they are perceived as being of low complexity compared to other tasks (particularly those of an intellectual nature) performed by the respondents.

Finally, the last hypothesis (H6) was confirmed. As anticipated, greater food control implies less perceived effort. This result is consistent with that recommended by Dobernic and Schanes (2019), who explained this relationship using the example of the convenience of living close to a supermarket, which allows — and even induces — the purchase of food in smaller quantities, albeit on a more frequent basis. This, in turn, allows for greater control of food without necessarily having the effect of increasing perceived effort (Amirudin & Gin, 2019), while reducing intentions to discard products. All the findings of this investigation are summarized in Table 6 to ensure a better view of the theoretical and managerial contributions.

Table 6. Consolidated Results

Hypothesis	Theoretical implication	Managerial implication
H1(+): P → FW (Not supported)	The focus on avoiding waste is not to obtain gains but to avoid losses.	Awareness-raising campaigns should highlight the losses resulting from waste, particularly the associated waste of time.
H2(-): FC → FW (Not supported)	Greater control is counterproductive when performed intuitively.	Government agencies must devise strategies to disseminate the guidelines for food storage and hygiene, to better inform the population, and, above all, instruct them on the adequate control of each food category.
H3(-): P → FC (Not supported)	The ability to control food and the imminence of monetary loss can lead to engagement in control.	Advertisements must clarify the monetary loss resulting from food waste, and disseminate instructions on control, as this will potentially foster greater consumer engagement in the process.
H4(-): PE → FW (Not supported)	The lesser perceived effort may be associated with confidence in the storage process, consequently reducing food waste.	The instructions on the product labels and packages used for storage must be clear and explicit, as the easiness of procedures may potentially reduce food waste.
H5(+): P → PE (Not supported)	The focus on avoiding exerting future efforts and the perception of food control as not complex allows actions to reduce waste to be prioritized, rather than delayed.	Training the population to control food is effective when its low level of complexity is made clear, thus reducing the perceived effort. This can be done by way of public notices promoting extension projects in public universities, with an emphasis on the field of nutrition.
H6(-): FC → PE (Supported)	Greater food control results in less perceived effort.	The public policy agenda should include promoting greater accessibility to food products, to ensure less perceived effort. Also, consumers need to plan their shopping routines. This allows greater control and may help reduce the perceived effort.

CONCLUSION

Given the emerging need to understand the variables of food waste, this study is an effort for this cause, based on the assumption that psychosocial factors have a significant impact on consumer behavior. Using structural equation modeling (SEM), this study analyzed the relationship between procrastination and food waste, and between food control and the perceived effort exerted on food management.

The main results are state of the art, because they are considered to be theoretically counterintuitive. Procrastination has no positive relationship with food waste behavior, and even when individuals are prone to procrastinate, they make efforts to control food, possibly because they perceive this activity as being not very complex, hence mitigating their perceived efforts. This study also highlights that greater food control and greater perceived effort do not necessarily result in less waste.

We identified that the focus on making efforts to reduce food waste may not be based on obtaining sustainable gains, but on avoiding wasting money and time. Combined with the perceived low complexity of the activity, this encourages consumers not to procrastinate. In this sense, this study corroborates support for economic theories related to the decision-making process that provide for such an emphasis. It is also noteworthy that the perception of less effort being spent on food control, and the imminence of monetary loss caused by waste possibly leads to greater engagement in food management activities. Greater control, however, does not necessarily result in less waste when it is based on common sense.

As to the main practical implications, the study emphasizes the urgent need to disseminate appropriate control practices, and to expand access to information about food storage and conservation. Practically speaking, awareness campaigns and booklet distribution can instruct consumers on how to store and sanitize products. It is also possible to provide training for consolidating the disseminated information and encouraging regular control, as this can mitigate the perceived effort and the probability of wasting food.

The study does have its limitations. Despite the attempt to build a heterogeneous sample, it mainly consisted of respondents with quite similar levels of income, marital status, age, and schooling. Its results are also based on evidence from a cross-section that might have been different had a longitudinal investigation been carried out. Indeed, the latter limitation is a suggestion for future studies. The procrastination scale also has internal inconsistencies and required the exclusion of several items. These problems possibly occurred because of the structure of these items, which may have had a different connotation in other nationalities after they were translated.

Future research can also consider repositioning the variables studied here, as the model presented a statistical structure that proved its validity in the goodness of fit test. Therefore, future studies can relate perceived effort as a variable that negatively affects food control and procrastination, since these relationships stem from food waste behavior. Furthermore, researchers could conduct comparative studies by collecting data from individuals who have a lower level of education, a high income, and who are aged 40 years or more.

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AUTHORS' CONTRIBUTIONS

Marconi Freitas da Costa and Patrícia de Oliveira Campos worked on the conceptualization and theoretical-methodological approach. The theoretical review was conducted by Patrícia de Oliveira Campos and Poliana Nunes de Santana. Data collection was coordinated by Patrícia de Oliveira Campos. Data analysis included Marconi Freitas da Costa, Patrícia de Oliveira Campos and Poliana Nunes de Santana. All the authors worked together in the writing and final revision of the manuscript.