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Planned versus instinctive behaviour: The connection between personality and food waste

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Abstract: Personality may influence food waste through planned as well as instinctive behaviour. Considerable attention has been devoted to planned behaviour because instincts are difficult to measure using attitudes, behaviours, and intentions. Our study intends to include the instinctive side of behaviour. We used a survey of 339 Swiss households regarding the amount of food waste generated to explore the pathways of how personality influences food waste behaviour. A regression analysis showed that agreeableness and conscientiousness are negative predictors of the amount of food waste. However, the different behaviour of conscientious consumers can be explained by an intermediate variable, whereas the different behaviour of agreeable people can't. This lacking link can be due either to missing suitable intermediate variables or to the role of instinctive behaviour.

Keywords: personality; food waste; Switzerland; instincts; behaviour; survey

1. Introduction

The mere waste of food products has been shown to be one of the main sources of inefficiency in the global food system [1]. This insight has provoked a large body of research, as recently summarised by Boulet et al. [2]. Scientists from all continents are engaging in considerable empirical efforts to understand why an increasing share of people's food purchases are landing in the trash.

Few social-psychological frameworks have gained as much attention as Ajzen's [3] theory of planned behaviour. Food waste research is no exception in this respect. Riverson et al. [4], for example, show how food waste habits indirectly affect future intentions through the mediation of attitude and perceived behavioural control. Graham-Rowe et al. [5] claim that an extended model of planned behaviour that includes attitudes, subjective norms, perceived behavioural control, self-identity, and anticipated regret explains 64% of the variation in the intention to reduce food waste. However, the same authors had to concede that the same variables only explain 5% of the actual success in reducing food waste.

This study uses the construct of personality to argue that instinctive behaviour may be as powerful a predictor of unwanted social behaviour like the generation of food waste, as planned behaviour is. Its objective is to demonstrate the different pathways by which our personalities may impact food waste behaviour, going beyond past studies that have shown connections between personality and food waste intentions.

Accordingly, Section 2 presents a draft of the theoretical framework of this study and incorporates this framework into food waste. Section 3 describes the empirical method of a survey among Swiss food consumers. Sections 4 and 5 present the results and discussion, respectively. Finally, Section 6 presents the conclusions.

2. Literature review and theoretical framework

The notion that personality influences behaviour is not new and has been shown, for example, for the case of different styles of supervision [6], for procrastination [7] and for mobility behaviour [8]. Closest to the issue of food waste came a study by Hakulinen and Johela [9] who showed how different personality profiles differed in alcohol consumption and diet preference.

Figures 1 and 2 are simple causal models in which the rounded rectangles represent the factors which are causally connected by arrows [10]. **Figure 1** describes the hypothesised framework that may be new in its entity but not its components. Its basic presumption is that personality influences behaviour, something that has been repeatedly confirmed by social psychologists [11–14].

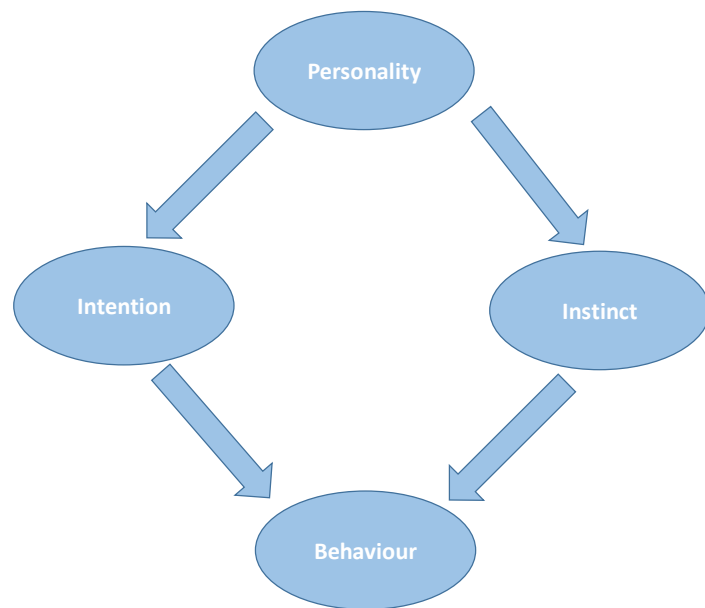


Figure 1. Hypothesising the link between personality and behaviour.

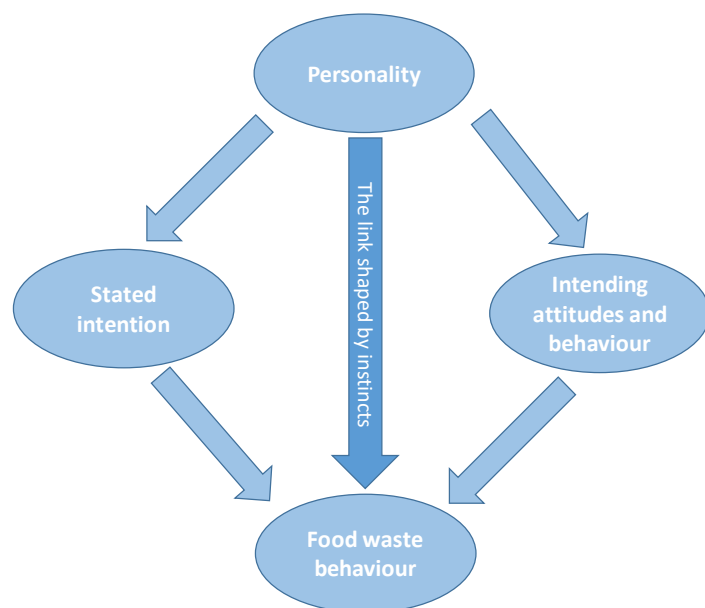


Figure 2. Model of the link between personality and food waste behaviour.

The best-known part of the interactions suggested in **Figure 1** is the link between intentions and behaviour as developed by Ajzen [15] and explored by numerous social scientists (for a review, see Bosnjak et al. [16]). However, while Ajzen considers attitudes and other factors that influence intentions, the model in **Figure 1** suggests a link between personality and intentions.

Whereas Hardison [17] uses a narrative to explore how humans developed their personality through a transformation from instinct-based animals, other authors show the more complex interplay between instincts and the conceptualisation of personality [18–20]. In the context of this research, considering personality as a factor that shapes instincts is certainly oversimplistic. However, **Figure 1** should be understood in the way that personality has become a concept that could be operationalized and from which conclusions about a person's likely instincts can be drawn.

Burt [21] defines instincts as innate, inherited tendencies, Winston [22] defines it as 'that part of our behaviour which is not learned', and Faye [23] as congenital reactions to sensory information. These definitions summarized the difficult connection in humans' behaviour between intentions and immediate learning. They also justify the establishment of this link in the model below. Although the influence of instincts on behaviour is often regarded with scepticism [24], few would deny its existence.

Several authors have mentioned personality as potential contributor to the amount of food waste in households [25–27]. This study builds on a contribution by Jamaludin et al. [28] who used the Big Five concept of personality [29] to show how different personalities impact the intention to reduce food waste. In their study, extraversion and agreeableness had a significant influence on the intention to reduce food waste in the future. However, as illustrated in **Figure 1**, this relationship is one of the four arrows depicted in the theoretical framework, that is, from personality to intention. This part has been demonstrated by Jamaludin et al.'s contribution on food waste using a sample group of young Malaysians, after the strong link between personality and intentions has been verified in numerous other realms [30–31].

However, it is no coincidence that this past study has focused on the link between personality and intentions as both constructs are relatively easy to measure through questionnaires. The model in **Figure 1** requires further investigation to establish the relationship between instincts and actual behaviour, a true research gap to date that this study intends to fill.

This is an ambitious and perhaps even overambitious task as the measurement of human instincts is between difficult and impossible. Based on the work by Winston as cited above, Galily [32] emphasizes the "automatic responses" of bodies driven by patterns that have developed over many generations, a definition that serves well for our purposes. Scholars often decide to use latent variables to estimate the prevalence of instincts [33,34] as instincts are strongly interwoven with the subconscious [35]. Particularly in quantitative settings, it is unrealistic to unveil respondents' instinct in a direct, meaningful way within a survey. However, determining latent forces that drive behaviours and define them as instinctive may be helpful. If behaviours are not explained by attitudes and intentions, then instincts are likely the invisible variable that drives behavioural patterns.

These results are depicted in the mental model in **Figure 2**. It suggests that certain

relationships between personality and food waste behaviour can be explained by intentions and attitudes and that there are others that cannot. Therefore, the intention to reduce food waste is a part of the intermediate variables. However, behavioural patterns that demonstrate this intention may also play a role, such as checking the fridge before shopping. The intending attitudes as depicted in **Figure 2**, for example towards food leftovers, may also be influenced by personality and have an impact on the amount of food waste. And there will always be an interplay between personality and food waste behaviour that does not work via cognitive intermediates, but that is directly steered via instinctive behavioural patterns.

3. Method

A survey for the main shopper in the household was designed to test the theoretical model developed above that includes items on personality, food waste intentions, food waste behaviour and attitudes. After a detailed pre-testing phase, 1600 German, French or Italian-language questionnaires were distributed to all parts of Switzerland into letterboxes in April 2022. The questionnaire was structured in four parts: It started with a record of actual food waste behaviour, then proceeded to attitudinal and behavioural questions around food waste, it applied questions around personality and ended with sociodemographical questions.

A total of 339 responses were returned, resulting in a response rate of 21%. As the questionnaire was distributed on paper only, the age of the average respondent, 53 years, was above the average age of Swiss inhabitants, 42 years. 219 respondents (64%) classified themselves as female, 113 (33%) as male, 2 as other and 5 did not answer the question.

This study also used the Big Five personality concept [29], an influential framework that distinguishes between extroverted, neurotic, agreeable, open and conscientious people, to increase the comparability with Jamaludin et al. [28]. This widely accepted framework allows a broad classification of personalities; in the German language, ten questions allow for a fair classification into the five personality categories [36], as every question depicts either one personality profile or the opposite of it. The ten questions were included in the questionnaire, and the respondents' personality profiles were calculated by subtracting the scores of the two questions for each profile.

Many studies prefer to ask for food waste intentions [37–39] because the actual amount of food thrown away is difficult to measure. This approach was not sufficient for our study. Therefore, consumers were asked about the percentage of their purchases from six groups of food (vegetables, fruit, bread and pastry, dairy, meat/fish and others) that they would often throw away. For 0%, they received a score of 0; 1 for responses between 1% and 10%; and a maximum score of 5 for responses with more than 40% in a category. Therefore, a maximum score of 30 is given if the household throws away more than 40% of each of the six categories.

The responses were analysed in two steps. First, we explored the direct relationship between personality and the food waste index using the control variables displayed in **Table 1**. As control variables, we did not use variables prior found to be of no significance (such as religion according to Qian et al. [40]), but restricted the range of variables to certain variables that had repeatedly shown to be of importance

for the amount of food waste:

Table 1. Descriptive statistics.

Variable	Explanation	Measurement	Mean	Minimum	Maximum
Dependent variable					
Index	Self-declared level of food waste	Rating between 0 (zero food waste) and 5 (>40% food waste) for six food categories	2.73	0	29
Intermediate variables					
Fridge	'I check the fridge before shopping'.	0 = never; 1 = rarely; 2 = sometimes; 3 = often; 4 = always	3.30	0	4
Leftovers	'If stored appropriately, leftovers can still be consumed later'.	From 1 (totally disagree) to 5 (totally agree)	4.73	2	5
Warmup	'I heat leftovers, if available'.	From 1 (totally disagree) to 5 (totally agree)	4.71	1	5
Clearplate	'My parents found it important that I clear my plate'.	From 1 (totally disagree) to 5 (totally agree)	4.12	1	5
Best	'I do my best to prevent food waste'.	From 1 (totally disagree) to 5 (totally agree)	4.71	1	5
Personality variables					
Extraversion	Classifications according to Rammstedt et al. [36]	From -4 to 4	-0.91	-4	4
Agreeableness			0.79	-4	4
Conscientiousness			1.86	-3	4
Neuroticism			-0.69	-4	4
Openness			1.38	-4	4
Control variables					
Age	Respondents' age	Years	52.69	16	92
Income	Respondents' income group	<3000 Fr. = 0; 3000–5000 Fr. = 1; 5000–8000 Fr. = 2; 8000–11,000 Fr. = 3; >11,000 Fr. = 4	2.20	0	4
Education	Respondents' educational level	1 = obligatory school; 2 = basic professional training; 3 = high school; 4 = higher professional training; 5 = university	3.38	1	5

All statistical analyses were carried out with Stata 17, using the reg, oprobit and sem functions.

- Many studies show that young people tend to cause more food waste than elder people [41,42].
- Other studies also suggest a positive link between household income and the amount of food waste [43–45].
- The connection between educational level and the amount of food wasted is less conclusive but often significant [46–48].

The correlations between the variables were checked and found not to be a problem. Between the Big 5, for example, the maximum correlation was -0.22 (between conscientiousness and extraversion). We used two different functional forms for this regression as the dependent variable ranging between 0 and 30 allows ordered probit analysis and ordinary least squares. To check for robustness, both options were applied. It was also calculated with the same explaining variables how personality impacted food waste for the main categories of food recorded (vegetables, fruits, meat, bread and milk), using OLS.

Second, we constructed a structural equation model to identify behavioural and attitudinal variables that link the personality profiles to food waste behaviour. This step intended to show the degree to which the relation between personality and food waste is “planned” through different behavioural patterns. The rich literature on the driving factors of food waste allows using items that significantly influence the amount of food waste:

- The lack of planning and excessive purchases has been identified as the main causes of consumption-based food waste [49]. People that check the fridge before shopping tend to cause less food waste [50,51].
- The handling of leftovers has proven to be crucial to avoiding food waste [52–54]. Therefore, this factor is included by one behavioural and one attitudinal variable.
- Education to clear the plate, i.e. parental influence, also has an impact on food waste behaviour [55,56].
- Finally, the intention to reduce food waste is part of the theoretical model and therefore has to be operationalised.

This attempt to show the “planned” component of food waste behaviour can, of course, suffer from the omission of any aspects that would be the important behavioural aspect for reducing food waste. Any inability to explain the relationship between personality and food waste through behavioural variables can therefore have two reasons: The relation can be of a purely instinctive nature, or the behavioural link has not been identified. And vice versa, if behavioural differences can be found, instincts may still play a role as well.

Three categorical variables were assumed to be metric in the analysis of the data. This concerned income classes, as respondents are more reluctant to provide their exact monthly household income [57] than to group themselves into classes, and it concerned education, where no better options exist. In addition, the behaviour regarding checking the fridge was also put into categories that could be understood as metric. This choice appeared more precise than working with a traditional Likert scale.

4. Results

Table 2 displays the two equations that explain the index derived from the respondents’ statement about the share of food they throw away. Due to some missing values, the results excluded 14 of the 339 responses. Although the significance of “conscientiousness” is slightly lower if you interpret the food waste index as a continuous variable, the match between the two functional forms is considerable. The results reveal that two of the five personality profiles contribute to avoiding food waste. Agreeable and conscientious respondents tend to avoid food loss, with conscientious respondents perhaps having a slightly weaker tendency. The other three personality profiles do not have a significant impact on the amount of food waste.

Table 2. Results of the analyses of the food waste index.

Variable	Ordered probit	OLS
Extraversion	0.04 (1.30)	0.09 (1.33)
Agreeableness	-0.08* (-2.21)	-0.16* (-2.07)
Conscientiousness	-0.08* (-2.10)	-0.14 [°] (-1.80)
Neuroticism	0.01 (0.32)	0.01 (0.17)
Openness	-0.03 (-1.02)	-0.02 (-0.29)
Age	-0.02*** (-5.29)	-0.04*** (-4.71)
Income	0.15*** (2.93)	0.27** (2.56)
Education	0.09 [°] (1.77)	0.20 [°] (1.92)
Constant	-	3.79*** (5.44)
R^2	-	0.20
n	325	325

Note: *, **, *** and [°] denote $p < 0.05$, $p < 0.01$, $p < 0.001$ and $p < 0.1$, respectively. Table displays regression coefficients; z-values and t-values are placed in parentheses.

The three control variables largely play the role they were supposed to play. The results confirm that both higher income and younger age strongly contribute to the generation of food waste. They also show that in Switzerland, consumers with a higher educational level are less reluctant to throw away food than those with a lower education.

Table 3 indicates differences between different food products in a comprehensive way. The better performance of conscientious and agreeable consumers can largely be attributed to bread and milk. It can also be seen that extroverted consumers have an issue with waste when it comes to animal products.

Table 3. Food types thrown away more or less by different personality profiles.

Variable	Vegetables	Fruits	Meat	Bread	Milk
Extraversion			+		+
Agreeableness				(-)	-
Conscientiousness				-	
Neuroticism					
Openness					

+: Significant positive coefficient ($p < 0.05$); -: Significant negative coefficient ($p < 0.05$); (-): Negative coefficient ($p < 0.1$).

Figure 3 displays the second stage of our analysis, that is, the structural equation model that should explain the link between the personality profiles and the amount of food waste. The log likelihood of this model was -6554 , the probability of error 0.000 . As only significant arrows are shown, it can be seen that this task is partly accomplished only. Only three of the five intermediate variables link to a personality profile, and another two to the amount of food waste. Only the habit to heat leftovers can be explained by one of the personality profiles and thus also influences the amount of food waste.

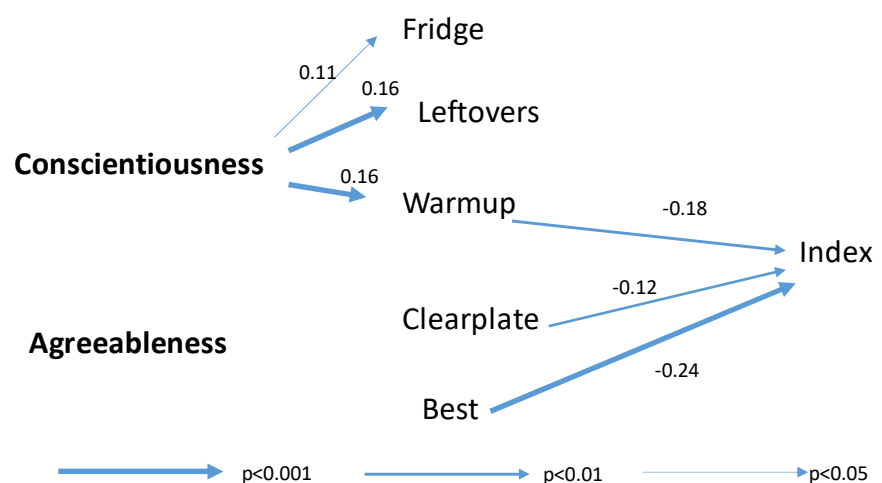


Figure 3. Results of the structural equation modelling (the numbers describe correlation coefficients).

More importantly, no significant relationship between any of the five intermediate variables and agreeableness could be established. **Table 2** indicates that the link between agreeableness and the amount of food waste may even be stronger

than that between conscientiousness and the amount of food waste. However, agreeableness influences food waste not via the intentions and attitudes used in the survey.

5. Discussion

It is worthwhile to take a second look on the results of the regression analysis. As educational levels tend to rise over time, incomes tend to rise as well, and as the older generation dies away, there is little reason to be optimistic about the amount of food thrown away in the future. Young consumers throw much more food away than old consumers, and wealthy ones more than poor ones. And if education, as could be shown, has the effect that more, not less, food is thrown away, it is fair to argue that the traditional educative organizations like schools and universities neglect the significance of food waste in their curricula. Apparently, it needs new approaches to tackle food waste, and these new approaches may include a differentiation between different personality types.

The regression analysis also indicated that two personality types stood out with respect to food waste. When targeting problematic personality types, open, neurotic and, in particular, extroverted individuals have the largest potential to reduce the amount of food thrown away.

In the scientific literature, it is usually not regarded as an achievement if something cannot be explained in a statistically significant way. However, this phenomenon occurred when trying to undermine the statistically significant link between agreeableness and the amount of food waste through intermediary variables. Thus, briefly exploring the literature on agreeableness is helpful to solve the puzzle.

Graziano and Tobin [58] summarized that ‘agreeableness did not initially receive systematic empirical research because of deductive top-down theorizing about its link to biology’. This body of literature includes, for example, lectures by Dambeck [59] who describes agreeableness as an instinctive behaviour towards personal wellbeing as well as a paper by McCormick [60] who also links feelings of agreeableness to human instincts.

A large part of the contemporary literature on agreeableness centres on prosocial motivations [61] and interpersonal relationships [62]. However, Tackett et al. [63] emphasise that agreeableness also intersects with self-regulation and self-discipline.

All this serves well to make the relationship between agreeableness and the avoidance of food waste more palatable. Agreeable individuals will (instinctively) strive to valorise their food, whether to please their partner who has cooked the meal or protect the environment where wasted food presents a challenge to efficient resource use.

The avoidance of food waste by conscientious individuals works in a different way, being more accessible to social scientists. As Roberts et al. [64] describe orderliness and industriousness as the main traits of conscientiousness, these traits help to generate cognitive constructs that contribute to be modest when shopping and well-structured when preparing meals.

The fact that instincts can hardly be investigated by objective, scientific methods should not seduce us to over-rationalize human behaviour. The two possible different routes to avoid food waste which could be distinguished through the construct of

different personality traits are a case in point to acknowledge the importance of not only planned, but also unplanned behaviour.

6. Conclusions

The survey on food waste generated in Switzerland has confirmed several connections that have been observed in other parts of the world thus far. The young lad who does not care about leftovers or the content of his fridge will waste more than the poor pensioner who has been taught by his parents to clear his plate. It also confirms results from Malaysia, where agreeable individuals have been shown to waste less food than others.

However, the study's main contribution is the analysis of the influence of socio-psychological mechanisms of personality on the amount of food waste generated. Planned behaviour is a good predictor of why conscientious individuals waste less food than others. They have the attitude of using leftovers for another meal, as indicated by the variable "leftovers" and act accordingly, as indicated by the variable "warmup". For individuals who are considered agreeable, the connection is different. Their attitudes and intentions toward food waste do not stand out in comparison with their peers, though their behaviour does. Their interaction with the world demonstrates fewer cognitive ways to reduce food waste, a pattern that may be due to intermediate behavioural variables not identified by the authors or that can be best characterised by the term 'instinctive'. This difference should be considered when working on campaigns to reduce food waste. It is likely that communication that dwells on certain behavioural patterns works better for conscientious individuals, whereas more affective campaigns fare better for individuals classified as "agreeable".

The most severe limitation of this study is, of course, that it treats these 'instincts' as a latent variable that is hypothesised if other relationships are not significant. Regarding the important questions of how instincts shape humans' behaviour as well as the habit of throwing away food, improved operationalisations should be used for future research. This should solve the question of whether other intermediate variables can be identified that moderate the link between "agreeableness" and food waste behaviour.

Another imperative for future research is certainly to identify strategies to utilize the results of this study for the reduction of food waste. Campaigns with that purpose may primarily refer to affective states or target specific behavioural patterns. It will be useful to find out which personality profile is targeted in which way to be most effective.

Conflict of interest: The author declares no conflict of interest.

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