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This apple is too ugly for me! Consumer preferences for suboptimal food products in the supermarket and at home

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ABSTRACT

Food waste has received increasing scientific and societal attention during the last decade. One important cause of food waste is thought to be the un-willingness of supply chains and consumers to sell, purchase, and consume suboptimal or imperfect foods. Yet, empirical research on this issue is scarce and contradictory. The current research investigates under which conditions consumers purchase or consume foods that deviate from regular products in terms of appearance standards, date labelling, or damaged packaging, without deviation on the intrinsic quality or safety. An online choice experiment among 4214 consumers from five Northern European countries reveals that consumer preferences for suboptimal products differ depending on whether the consumer is in a supermarket or at home, and depending on the type of sub-optimality. Moreover, consumer choices, discount preferences, and waste behaviors of suboptimal products are influenced by demographics (nationality, age), by personality characteristics (value orientation, commitment to environmental sustainability, and perceived consumer effectiveness in saving the environment), and by individual-waste aspects (perceived food waste of the household, perceived importance of food waste, engaging in shopping/cooking). These findings provide important insights into consumer preferences for suboptimal products, and useful suggestions for supply-chain regulations on suboptimal products.

1. Introduction

The last couple of years, more and more attention has been given to the issue of food waste. Numerous articles have provided numbers on the amount of food that is being wasted along the food supply chain and in consumer households (Brautigam, Jorissen, & Priefer, 2014; Buzby & Hyman, 2012; Quested, Parry, Easteal, & Swannell, 2011), indicating that about one third to one half of all produced food is wasted (Parfitt, Marthel, & MacNaughton, 2010). As the production of food is assessed to cause approximately a third of all greenhouse gas emissions (Garnett, 2011), and requires extensive use of water, energy, land, and other natural resources (FAO, 2013; Godfray et al., 2010), it is inefficient to waste foods. Unfortunately, there are even some indications that household food waste is increasing over time (Kretschmer et al., 2013). Policy makers, supply chain actors, and consumers have set up non-governmental organizations, developed campaigns, and changed laws trying to reduce the amount of food waste (Aschemann-Witzel, De Hooge, & Normann, 2016a; Fuchs & Glaab, 2011; FUSIONS., 2013; Halloran, Clement, Kornum, Bucatariu, & Magid, 2014; Quested, Marsh, Stunell, & Parry, 2013; Sieber & Dominguez, 2011). In addition, scholars from different disciplines have tried to unravel which factors cause supply chain actors and especially consumers to waste food (Aschemann-Witzel, De Hooge, Amani, Bech-Larsen, & Oostindjer, 2015; Evans, 2012; FUSIONS, 2013; Quested et al., 2013).

One significant source of food waste at retailers and in households seems to be the un-willingness to sell, purchase, or consume

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suboptimal or imperfect foods (Aschemann-Witzel et al., 2015; Buzby & Hyman, 2012; Buzby, Hyman, Stewart, & Wells, 2011). There are multiple indications that consumers waste foods at home because the food has passed the best-before date (Newsome et al., 2014; WRAP, 2014a, 2014b). Also, international trade regulations and retailers have developed product specifications (i.e., rules concerning the appearance, weight, shape, and size of products) (Gobel, Langen, Blumenthal, Teitscheid, & Ritter, 2015; Halloran et al., 2014), on the basis of which supply chains waste foods that do not fulfil these product specifications, because it is assumed that consumers do not wish to buy and consume such suboptimal products (Buzby et al., 2011; Gobel et al., 2015; Gustavsson & Stage, 2011; Lebersorger & Schneider, 2014; Loebnitz, Schuitema, & Grunert, 2014).

Yet, it is currently unclear which factors explain consumers' (non-)preference for suboptimal products. The current research addresses this question by studying consumer preferences for different types of suboptimal food products in the supermarket and at home. With an online choice experiment among 4214 consumers from five Northern European countries, we reveal consumer choices for suboptimal food products in terms of appearance, best-before date, and packaging damage in supermarkets and at homes. Moreover, we study consumers' demand for discounts to buy suboptimal food products at supermarkets, and consumers' likelihood of wasting suboptimal food products at home. Finally, we demonstrate the importance of demographics (e.g., nationality, age, gender, household composition, education, income), of personality characteristics (value orientation, commitment to environmental sustainability, and perceived consumer effectiveness in saving the environment), and of individual-waste aspects (food-waste awareness, perceived household food waste, perceived food waste importance) in consumer preferences for suboptimal food products. Collectively, these findings provide some new and essential insights into consumer preferences for the purchase and consumption of suboptimal products, and can aid supply chains and policy makers to reduce waste of suboptimal foods, therewith reducing inefficient use of resources.

1.1. Suboptimal products at supermarkets and in homes

Suboptimal or imperfect foods are products that deviate from normal or optimal products 1) on the basis of appearance standards (in terms of e.g. weight, shape, or size) (Bunn, Feenstra, Lynch, & Sommer, 1990), 2) on the basis of their date labelling (e.g., close to or beyond the best-before date), or 3) on the basis of their packaging (e.g., a torn wrapper, a dented can) (White, Lin, Dahl, & Ritchie, 2016), without deviation on the intrinsic quality or safety (Aschemann-Witzel et al., 2015; Gobel et al., 2015; Halloran et al., 2014). Empirical research on consumer preferences for suboptimal products is scarce, and only a handful of existing studies provide some insights into whether consumers are willing to purchase suboptimal products in supermarkets, and whether they are willing to consume suboptimal products at home.

Concerning the purchase of suboptimal products in supermarkets, three studies found that consumers were only willing to purchase fruits that were suboptimal in terms of appearance when the optimal fruits were sprayed with pesticides (Bunn et al., 1990), or when the deviation from the product specifications was only moderate (compared to extreme) (Loebnitz & Grunert, 2015; Loebnitz et al., 2014). Research on damaged packaging extends this work by demonstrating that consumers under high cognitive load (i.e., consumers who were mentally preoccupied with other tasks) perceived superficial packaging damages (e.g., a torn wrapper, a dented can) as a source of potential contamination and of health and safety risks (White et al., 2016). Consequently, consumers under high cognitive load showed a less positive attitude towards and a lower intention to purchase foods with superficial packaging damage. Also, in one study, the majority of consumers (62%) indicated to buy foods with the longest remaining shelf lives (Newsome et al., 2014), suggesting that consumers avoid the purchase of foods that are suboptimal in terms of being close to the best-before date. Further indirect support for the idea that consumers are less positive about foods with superficial packaging damage or foods close to the best-before date, comes from food loss research at supermarkets. Non-perishable food products such as pasta, canned vegetables, or cereals, have been found to mostly get discarded because of "crushed, dented, or otherwise damaged packaging, and expired shelf dates" (Kantor, Lipton, Manchester, & Oliveira, 1997, p. 5). There are some suggestions that consumers would need price discounts before they would be willing to buy such suboptimal products (Verghese, Lewis, Lockrey, & Williams, 2013), where willingness-to-pay decreases with the extent of the remaining shelf-life (Tsiros & Heilman, 2005). Literature also suggests that there can be an interaction between price discounts and perception of quality of the product (Theotokis, Pramatari, & Tsiros, 2012). Together, these findings seem to suggest that consumers will not be motivated to buy suboptimal foods (in terms of appearance, date labelling, or damaged packaging) in supermarkets.

Yet, there are also some indirect suggestions that consumers would be willing to purchase suboptimal foods in supermarkets. Marketing campaigns of supermarkets that provided a limited supply (in terms of days of the campaign, supply, or ways to buy) of suboptimal fruits and vegetables (e.g., the "Inglorious fruits and vegetables" from the French retailer Intermarché, the "Buitenbeentjes" from the Dutch retailer Albert Heijn) appeared to be successful (Aschemann-Witzel, De Hooge, Almli & Oostindjer, 2016b). Similarly, multiple European retailers offer products that are close to the best-before date at a lower price, and such actions attract consumers (Aschemann-Witzel et al., 2015). Consumers might thus be more motivated to purchase suboptimal products than existing research suggests. We propose that this discrepancy may depend on the type of product sub-optimality. That is, consumers may have different preferences for products that are suboptimal on the basis of appearance (e.g. a bent cucumber, an apple with a spot), date labelling (e.g. dairy close to the best-before date), or on the basis of packaging damage (e.g., a dented carton).

Concerning the consumption of suboptimal foods at home, consumers have been shown to dislike not using products up to their full utility, and therefore are motivated to avoid wasting products that they possess (Bolton & Alba, 2012). This implies that, once consumers own a suboptimal product, they would prefer consuming the product (independent of the type of sub-optimality) to wasting it. On the contrary, the research on superficial damaged packaging in supermarkets demonstrates that damaged packaging can function as a source of perceived potential contamination and of perceived health and safety risks (White et al., 2016). As such perceptions would also play a role in the consumption of foods at home, this research would suggest that consumers are less likely to consume foods with suboptimal packaging at home.

In sum, there are few, and contradictory, empirical findings on the question whether consumers are motivated to buy and consume suboptimal products. It seems likely that consumers will act differently towards suboptimal products when they need to make a purchase decision in a supermarket compared to when they need to make a consumption decision at home (also suggested in previous focus group interviews, see Almli et al., 2016). Indeed, there are multiple differences in consumer decisions concerning suboptimal foods in supermarkets compared to at homes: in supermarkets, consumers still can select the products, whereas at home the food is already bought. Moreover, consumers might experience different degrees of personal responsibility for the sub-optimality

and different degrees of familiarity with the products' history depending on the setting (Campbell, Smith, Jaeger, & Harker, 2008; Watson & Meah, 2013). Therefore, the current research examined consumer preferences for suboptimal products in supermarkets and at homes separately. Moreover, it seems that different types of sub-optimality (appearance, date labelling, or damaged packaging) can affect consumer choices differently. To test this assumption, the present research measured consumer preferences for products that are suboptimal in terms of appearance (an apple with a spot, a bent cucumber), date labelling (milk and yoghurt close to the best-before date), and damaged packaging (dented carton of juice, broken biscuits).

1.2. The importance of demographics, personality characteristics, and individual-waste aspects in suboptimal product preferences

Consumer preferences for suboptimal products may not only depend on situational factors such as the setting (at supermarkets or in homes) and the type of sub-optimality (appearance, date labelling, or damaged packaging), but also on personal factors. Consumers' general food waste behavior has been shown to depend on 1) gender (Buzby & Hyman, 2012; Gutierrez-Barba & Ortega-Rubio, 2013; Katajajuuri, Silvennoinen, Hartikainen, Heikkila, & Reinikainen, 2014; Koivupuro et al., 2012), 2) age (Buzby & Hyman, 2012; Canali et al., 2013; Quested et al., 2013; Stefan, Van Herpen, Tudoran, & Lahteenmaki, 2013), 3) household composition (Aschemann-Witzel et al., 2015; Koivupuro et al., 2012; Porpino, Parente, & Wansink, 2015), 4) education (Quested et al., 2013), and 5) household income (Buzby & Hyman, 2012; Koivupuro et al., 2012; Porpino et al., 2015; Stefan et al., 2013). Overall, research seems to suggest that women, younger consumers, consumers with children, lower educated consumers, and consumers with a higher household income, tend to waste more food. These demographics might also influence consumers' preferences to buy and consume suboptimal products (although Bunn et al., 1990 found no effect of demographics on consumer preferences for suboptimal products when the optimal product was sprayed with pesticides).

Moreover, personality aspects might play a role in consumer preferences for suboptimal products. For example, consumers have been found to demonstrate a higher likelihood to act environmentally friendly when they are personally committed to environmental sustainability (Alcock, 2012), when they value biospheric aspects such as natural resources and other species as relatively more important than egoistic aspects such as power or wealth (De Groot & Steg, 2008), or when they have confidence in their ability to improve the environment (named perceived consumer effectiveness) (Berger & Corbin, 1992; Jones, Comfort, & Hillier, 2009). As choosing the suboptimal product might be perceived as a way to act environmentally friendly, commitment to environmental sustainability, biospheric values, and perceived consumer effectiveness might exert a positive influence on consumers' preferences for suboptimal foods.

Finally, it is possible that consumers' current food waste-related behaviors exert an influence on their purchase and consumption of suboptimal products. Consumers might differ in their knowledge or awareness of the food-waste issue (Porpino et al., 2015; Quested et al., 2011). It is possible that such knowledge or awareness can influence consumer preferences for suboptimal products, such that consumers who are more aware of the food-waste issue would be more inclined to prefer suboptimal foods. Moreover, consumers might differ in their perceptions of their household food waste, and of the importance of the food-waste issue set against other societal issues (Aschemann-Witzel et al., 2015). We have included these personal factors in our study to test for their relationship with preferences for suboptimal products.

To study the propositions that consumer preferences for suboptimal products depend on the setting (in a supermarket or at home) and on the type of sub-optimality, a cross-national online choice experiment was conducted. In our experiment, consumers indicated their choices for six (sub)optimal products either in a supermarket or a home setting. We also measured necessary discounts for suboptimal products in the supermarket setting, and likelihood of wastage in the home setting. Demographics, personality characteristics, and individual-waste aspects were included to study their effects on consumer preferences for suboptimal products.

2. Method

2.1. Respondents and design

Four thousand two hundred and fourteen Northern European citizens (48.89% males, 18–70 years old, M_{age} = 44.60, SD_{age} = 14.44) participated in the online study (for Descriptive statistics see Table 1). The respondents were recruited by an international agency that maintains representative panels in Denmark, Germany, Norway, Sweden, and The Netherlands. These five North-Western European countries are comparable in terms of urbanization, literacy rates, ecological footprint, and world system position (Jorgenson, 2003), and therefore we expected the outcomes and recommendations to have high generalizability and utility for North-West Europe. Yet, consumer acceptance of organic foods (Thøgersen, 2010) and the exposure of consumers to sustainable initiatives vary between the countries (e.g. NGO's pushing the issue of food waste onto the societal agenda), which may generate slight differences between countries in our study. In each of the countries, the agency recruited 850 respondents who, based on their age, gender, income, ethnicity, and occupation, formed a representative sample of the respective country.

The respondents received an invitation to partake in a 20-minute survey, with which they would earn points that they could spend in the agency's point shop. The survey was originally developed in English, and translated to the native languages of the five participating countries by the authors. The translated surveys were tested by minimum five local persons with regards to language appropriateness. Eighty-six respondents took less than 300 s to answer the survey and were therefore left out of the analyses (inclusion of these respondents in the data analyses did not change the results). Respondents were randomly assigned to either the Supermarket (N = 2109) or the Home condition (N = 2105).

2.2. Experimental design

To measure the respondents' preferences when confronted with optimal versus suboptimal foods, a choice design including six pairs of food items was constructed (within-subjects factor). Because the sub-optimality can be specific to a product, we included two products for every type of sub-optimality. The selected suboptimal food items included an apple and a cucumber with a suboptimal appearance, milk and yoghurt with a suboptimal date labelling, and fruit juice and biscuits with small damages on the packaging (see Appendix A). For each type of food item, two images were created: an optimal version with standard appearance or with long remaining best-before date, and a suboptimal version showing visual defects (odd shape, brown spot, past best-before date, or dented packaging). We preferred to use pictures of actual products, and for the apple, cucumber, fruit juice, and biscuits this was possible. However, for the sub-optimality in terms of date labelling, this was hardly possible. The countries differed in their

Table 1
Descriptive statistics.

	Overall $n = 4214$	Supermarket condition $n = 2109$	Home condition $n = 2105$
Age in years *M* (SD)	44.60 (14.44)	44.64 (14.35)	44.55 (14.53)
Gender N (%)			
Female	51.1	50.2	52
Male	48.9	49.8	48
Household composition N (%)			
No children under 18	69	69.3	68.7
Children under 18	31	30.7	31.3
Education N (%)			
Primary education	7.8	7.7	8
Secondary education	22.7	22.8	22.6
Vocational school	27.1	27.5	26.8
Bachelor degree	22.5	23	22.1
Master degree	17.9	16.8	19
PhD	1.9	2.2	1.5
Occupation N (%)			
Fulltime employed	48.2	48.6	47.8
Parttime employed	12.9	13.1	12.7
nemployed	5.6	5.2	5.9
Student	9.9	10.2	9.6
Volunteer	0.9	0.7	1.1
Retired	14.9	14.6	15.2
Not specified	7.6	7.5	7.6
Household income N (%)			
Less than half of average	20.2	20	20.4
Between half of average and average	25.1	25.4	24.8
Average in home country before tax	15.4	14.6	16.2
Between average and 1.5 average	16.7	17.2	16.2
Above 1.5 average	10.8	11.3	10.3
Not specified	11.8	11.6	12.1
Active in environmental organization N (%)			
No	97.5	97.2	97.8
Yes	2.5	2.8	2.2
Value Orientation *M* (±SD)			
Egoistic	2.14 (1.57)	2.15 (1.56)	2.14 (1.58)
Altruistic	5.32 (1.41)	5.32 (1.39)	5.32 (1.43)
Biospheric	5.32 (1.52)	5.32 (1.51)	5.32 (1.53)
Commitment to Environmental Sustainability *M* (SD)	4.71 (1.42)	4.71 (1.43)	4.72 (1.42)
Perceived Consumer Effectiveness *M* (SD)	4.09 (1.37)	4.09 (1.34)	4.08 (1.41)
Food waste Awareness *M* (SD)	101.30 (23.02)	101.52 (22.96)	101.09 (23.08)
Perceived household waste *M* (SD)	12.54 (14.95)	12.44 (14.82)	12.64 (15.07)
Perceived waste importance *M* (SD)	4.56 (1.32)	4.56 (1.31)	4.56 (1.33)
Do shopping/cooking *M* (SD)	4.16 (0.83)	4.16 (0.82)	4.16 (0.84)

dairy brands, and the interpretation of the dates as being optimal or suboptimal depend on the day that participants answered the survey. Because products over the best-before data cannot be sold legally in many countries, and to avoid confounds, we developed neutrally-designed packages on which the particular best-before dates differed both by product and by condition. In the Home condition, the suboptimal best-before date stated "yesterday" (for milk) and "one week ago" (for yoghurt). In the Supermarket condition "today" was used for both products for the suboptimal product. With this distinction we avoided that the options "yesterday" and "one week ago" were unrealistically encountered in the Supermarket condition. Half of the participants made the six choices in a Supermarket condition, while the other half made the six choices in the Home condition (between-subjects design). The Supermarket and Home conditions shared the same images, except (as mentioned above) in the case of suboptimal best-before dates. All food items and choice items within each pair (optimal versus suboptimal) were presented in a randomized balanced order across participants.

2.3. Choice task

During the choice task, the respondents were asked to "imagine that you're in your home [in a supermarket], ready to select a [food item; see Appendix A]". In both conditions, respondents saw two images: one of a suboptimal product and one of the corresponding optimal product, in randomized positions. As the dependent variable *Suboptimal choice*, the respondents indicated which one they chose to buy (given an identical price, in the Supermarket condition) or to consume (in the Home condition). They also had an option to choose "I don't know/none of these". In the Supermarket condition, the respondents subsequently indicated what the lowest acceptable discount would be for them to purchase the suboptimal product using a slider scale (with 1% precision), ranging from 0% (no discount at all) to 100% (product for free) (Drozdenko & Jensen, 2005; Jensen & Drozdenko, 2008). This question is similar to a standard measure of willingness-to-pay (asking how much more in percentage consumers are willing to pay, see Aschemann-Witzel & Zielke, 2015), but converted to the needed

discount for the willingness-to-accept the food item. This formed our dependent measure *Suboptimal discount*. In the Home condition, the respondents indicated how probable it was that the suboptimal product would be discarded in the garbage using a slider scale (with 1% precision), ranging from 0% (Would definitely be consumed) to 100% (Would definitely be discarded). This formed our dependent measure *Suboptimal disposal*. Please note that both Suboptimal discount and Suboptimal disposal measures were solely intended to make quantitative comparisons between products and not to use them as absolute numbers.

In both conditions, the respondents then saw once again the picture of the suboptimal product and a list of associations presented as a Check-All-That-Apply (CATA) task (see Table 4 for the list of associations). The respondents checked all associations that they thought applied to the displayed suboptimal product. The data were analyzed by Correspondence Analysis in XLSTAT version 2015.1.03.15473 (Addinsoft) to obtain multivariate maps of the suboptimal products' associations. After these *Product associations*, the respondents continued with answering the Suboptimal choice, Suboptimal discount (Supermarket condition), Suboptimal disposal (Home condition), and the Product associations for another product. The six food products were displayed in random order. The *Overall suboptimal choice* was calculated as the number of times respondents selected the suboptimal product (with a maximum of six when all six suboptimal products were selected) and treated in all analyses as a ratio scale. *Overall suboptimal discount* formed the average of the Suboptimal discount answers across products (in the Supermarket condition), and *Overall suboptimal disposal* formed the average of the Suboptimal disposal answers across products (in the Home condition).

2.4. Procedure and measures for demographics, personality, and individual-waste aspects

The respondents started the survey by answering 55 questions regarding their food-related lifestyles and habits (see Aschemann-Witzel et al., 2016b for details, analysis and results). Then, the respondents answered the *Value Orientation Scale* (De Groot & Steg, 2008), indicating for 12 mentioned values to what degree it is a guiding principle in their personal lives (see Appendix B, ranging from −1 (opposed to my values), 0 (not at all important), to 7 (extremely important)). The scale resulted in three value orientation types: egoistic, altruistic, and biospheric.

The respondents continued with a shortened version of the *Commitment to Environmental Sustainability Scale* (Alcock, 2012), which measures personal commitment to environmental sustainability by putting sustainability in the context of personal costs and forgoing other things in life (1 = completely disagree, 7 = completely agree). We used the items "(1) It takes too much time and effort to do things that are environmentally friendly" (recoded by reversing the scale), "(2) The environment is a low priority for me compared with a lot of other things in my life" (recoded), and "(3) I am environmentally friendly in most things that I do". A Factor analysis on the three items showed a clear one-factor solution (Eigenvalue = 1.58, R^2 = 53%), but did not show a satisfactorily reliable scale (Cronbach's α = 0.54). Deletion of item 3 increased reliability to an acceptable level (Cronbach's α = 0.63).

The respondents also answered three items on *Perceived Consumer Effectiveness* (Berger & Corbin, 1992; Lord & Putrevu, 1998). This scale reflects consumers' confidence in their ability to improve the environment. A Factor analysis on "(1) I feel personally helpless to have much of an impact on a problem as large as the environment" (recoded), "(2) I do not feel I have enough knowledge to make well-informed decisions on environmental issues" (recoded), and "(3) I expect the environment to continue to deteriorate until it is almost unliveable before enough attention is paid to improve it" (recoded) (1 = completely disagree, 7 = completely agree) showed a clear one-factor solution (Eigenvalue = 1.58, R^2 = 53%), but an unreliable scale (α = 0.54). Deletion of item 3 increased reliability substantially (Cronbach's α = 0.62).

Next, the respondents performed the choice task that is described above. Including the choice task in the middle of the various questionnaires allowed preserving respondents' attention and motivation to fulfil the survey. Following the choice task, respondents' *Food-waste awareness* was measured with "According to what you have heard or would guess: how much of the world's food do you think is wasted (in% across the global food supply chain)?" and "According to what you have heard or would guess: how much of the food in households is wasted (in% of the food bought)?" The correct answers we used were 35% and 33%, respectively (FAO, 2013). The average Food-waste awareness score consisted of summed up deviations from the correct answers and reversing the score, such that a higher score would reflect less errors (more food-waste awareness; ranging from 0, maximum possible errors made, to 132, exactly correct answers).

As a measure of *Perceived household food waste*, the respondents indicated for five product categories (fresh fruit and vegetables, milk and dairy products, bread and other bakery products, meat and fish, and prepared meals/dishes (leftovers)) how much (in%) of what they buy or cook usually ends up being thrown away at home. Respondents assessed their food waste in the different categories in a similar pattern. The categories therefore formed one scale (Eigenvalue = 3.79, R^2 = 75%, α = 0.92) named *Perceived household food waste*. Further, the respondents specified the relative importance of reducing food waste in comparison to reducing obesity, reducing environmental pollution, and stabilizing the global economy (1 = much less important, 7 = much more important). These items formed *Perceived food waste importance* (Eigenvalue = 2.07, R^2 = 69%, α = 0.77).

Finally, to measure demographics, respondents indicated how often they did the grocery shopping and the cooking for their households (both items 1 = never, 5 = always, averaged into one shopping/cooking variable), their gender and age, the age groups in their households (0–6 years, 7–18 years, 19–65 years, or 66 years and older, recoded into no children under 18 or children under 18), their nationality, their education, their main occupation, their household income, and whether they were active in an environmental or food waste organization.

3. Results

3.1. Overall suboptimal choices

On average, respondents selected only one or two suboptimal products out of the six choices (M = 1.24, SD = 1.68; see Table 2). This preference depended on the condition: the respondents in the Supermarket condition chose the suboptimal product less often (M = 0.50, SD = 0.95) compared to the respondents in the Home condition (M = 1.99, SD = 1.91, $t(4212) = 32.00$, $p < 0.01$). Also, the preference for the suboptimal product depended on the type of product (χ^2 (5) = 558.54, $p < 0.01$, $\Phi > 0.15$). Across conditions, the respondents more often selected the suboptimal cucumber or yoghurt compared to the other suboptimal products.

A Binary logistic regression with Condition (Supermarket vs. Home condition) and Product as independent variables and with Suboptimal choice as dependent variable indeed showed that both the Condition (B = −2.29, *Wald* (1) = 239.13, $p < 0.01$) and the Product (*Bs* > 0.71, *Walds* > 92.84, *ps* < 0.01) influenced respondents'

Table 2
Suboptimal choices, suboptimal discount, and suboptimal disposal means (and *SD*) separated by condition and product.

	Suboptimal choice Condition		Suboptimal discount (Supermarket condition)	Suboptimal disposal (Home condition)
Product	Supermarket	Home	Scale 0–100% Mean (SD)	Scale 0–100% Mean (SD)
Apple	2.6%	21.0%	67.1 (30.3)[a]	36.3 (29.9)[a]
Cucumber	25.0%	36.9%	23.7 (26.1)[b]	13.7 (20.4)[b]
Milk	6.5%	42.2%	58.1 (24.5)[c]	33.4 (32.6)[c]
Yoghurt	10.2%	46.9%	54.7 (23.6)[d]	29.5 (31.9)[d]
Juice	6.2%	35.5%	39.2 (28.3)[e]	16.6 (22.3)[e]
Biscuits	3.3%	35.0%	51.2 (25.5)[f]	15.9 (22.5)[e]
Φ/R^2	0.26	0.17		
χ^2/F	828.2**	335.2**	714.2**	285.3**
Total Mean (*SD*)	8.9%	36.2%	49.0 (30.0)	24.2 (28.5)

$^{\dagger}p < 0.10$. $*p < 0.05$. $**p < 0.01$.
Note. Suboptimal choice reflects the% of respondents selecting the suboptimal product. Suboptimal discount reflects the % discount that the respondent needs before (s)he would buy the suboptimal product (0%, no discount – 100%, for free), and suboptimal disposal the probability of the suboptimal product being wasted (0–100%). Means with different superscript differ significantly with *t*s > 4.21, *p*s < 0.01.

Table 3
Linear regression analyses for predicting overall suboptimal choice (in total, in Supermarket condition, and in Home condition). Significant relationships are indicated in **bold**.

	Overall suboptimal choice								
	Total			Supermarket condition			Home condition		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Condition (0 Supermarket, 1 Home)	**1.51**	**0.05**	**0.45****		NA			NA	
Condition (0 Supermarket, 1 Home)	−0.07	0.08	−0.02	<−0.01	0.07	<−0.01	−0.12	0.14	−0.02
Country 2 (Germany)	**−0.27**	**0.08**	**−0.06****	**0.20**	**0.07**	**0.09****	**−0.70**	**0.14**	**−0.15****
Country 3 (Netherlands)	**0.33**	**0.08**	**0.08****	−0.01	0.07	<−0.01	**0.68**	**0.14**	**0.14****
Country 4 (Norway)	**0.35**	**0.08**	**0.08****	0.03	0.07	0.01	**0.65**	**0.13**	**0.14****
Gender (0 male, 1 female)	−0.01	0.05	<−0.01	−0.03	0.05	−0.02	0.02	0.09	<0.01
Age (18–70 y.o.)	**−0.01**	**<−0.01**	**−0.10****	**<−0.01**	**<0.01**	**−0.09****	**−0.02**	**<0.01**	**−0.12****
Household composition (0 no children, 1 children)	−0.01	0.06	<−0.01	−0.04	0.05	−0.02	0.02	0.10	<0.01
Education	0.04	0.02	0.03[†]	0.02	0.02	0.03	0.06	0.04	0.04[†]
Household income	−0.03	0.02	−0.02	−0.02	0.02	−0.03	−0.04	0.04	−0.03
Egoistic orientation[1]	−0.02	0.02	−0.02	**−0.04**	**0.02**	**−0.07****	<−0.01	0.03	<−0.01
Altruistic Orientation[1]	0.02	0.02	0.02	<−0.01	0.02	<−0.01	0.04	0.04	0.03
Biospheric orientation[1]	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.04	0.03
Commitment to environmental sustainability	**0.10**	**0.02**	**0.04****	0.03	0.02	0.05[†]	**0.18**	**0.04**	**0.13****
Perceived consumer effectiveness	0.025	0.02	0.04	**0.06**	**0.02**	**0.08****	0.03	0.03	0.02
Food-waste awareness	<−0.01	<0.01	−0.01	<−0.01	<0.01	−0.04	<−0.01	<0.01	−0.02
Perceived household waste	**<−0.01**	**<01**	**−0.08****	<0.01	<0.01	0.02	**−0.02**	**<0.01**	**−0.15****
Perceived waste importance	**0.08**	**0.02**	**0.06****	**0.10**	**0.02**	**0.13****	0.06	0.04	0.04
Do shopping/cooking	**0.10**	**0.03**	**0.05****	0.02	0.03	0.02	**0.13**	**0.05**	**0.06***
R^2	26%			6%			16%		
F	69.69**			6.55**			18.80**		
Mean (*SD*)	1.24 (1.68)			0.50 (0.95)			1.99 (1.91)		

† $p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.
[1] See Appendix A.

choice for the suboptimal product[1] (see Table 2). For every product, the suboptimal one was chosen less often when the respondents were in a supermarket compared to when they were at home (all χ^2s > 63.18, *p*s < 0.01, Φs > 0.13). Most notably, in supermarkets, 25% of the respondents would buy a bent cucumber, but hardly any respondent would purchase an apple with a spot (2.6%) or broken biscuits (3.3%). At home, more than 40% of respondents were fine with consuming milk (42.4%) or yoghurt (46.9%) past the best-before date, but only 21% of consumers would consume the apple with a spot.

3.2. Influences of demographics, personality characteristics, and individual-waste aspects

A Linear regression analysis with overall suboptimal choice as the dependent variable and condition, demographics (country, gender, age, household composition, education, household income), personality measures (the three value orientations, commitment to sustainability, perceived consumer effectiveness), and individual-waste aspects (food-waste awareness, perceived household food waste, perceived food waste importance, frequency of shopping and cooking) as independent variables revealed a significant model ($F(19, 3715) = 69.69$, $p < 0.01$, $R^2 = 0.26$, $R^2_{adjusted} = 0.26$) (see Table 3).

[1] When analysing the choices between suboptimal and optimal products, we did not analyse the participants that chose the "I don't know" option. These participants only formed 7% of the sample. When including these participants in our analysis, a Multinomial regression analysis confirmed the findings from the Binary logistic regression: both the home-Supermarket condition (*B*s > 1.03, *Wald*s > 303.02, *p*s < 0.01) and product had a significant influence on the choice of suboptimal products (*B*s > 0.13, *Wald*s > 4.44, *p*s < 0.04).

Respondents' preference for suboptimal products depended on the condition they were in (Supermarket or Home condition), on their demographics, on some personality aspects, and on some individual-waste aspects (see column 'Total' in Table 3). More specifically, in terms of demographics, respondents demonstrated a higher tendency to choose suboptimal products when they were from The Netherlands or Norway, or when they were younger. In terms of personality, respondents who had a higher commitment to environmental sustainability showed a higher preference for suboptimal products. Value orientations and perceived consumer effectiveness did not have an influence on choices. Finally, in terms of individual-waste aspects, respondents showed a higher tendency to choose suboptimal products when they had a lower perceived own household food waste, when they found the issue of food waste more important, or when they did the shopping and cooking more often. Food-waste awareness did not influence choices.

3.3. Suboptimal choices in supermarkets and at homes

We predicted that preferences for suboptimal products would differ depending on whether consumers are in supermarkets or at home. Indeed, analyses revealed that different factors influenced suboptimal preferences in the Supermarket condition compared to the Home condition (see Table 3). In the Supermarket condition, the Linear regression analysis revealed that respondents' preferences for suboptimal products in supermarkets depended on multiple independent variables ($F(18, 1864) = 6.55$, $p < 0.01$, $R^2 = 0.06$, $R^2_{adjusted} = 0.05$). Supermarket respondents were more likely to choose suboptimal products when they were from Germany, when they had a lower egoistic value orientation, or when they had a higher perceived consumer effectiveness. For individual-waste aspects only perceived food waste importance exerted a positive influence on choices for suboptimal products in this condition.

In the Home condition, the Linear regression analysis ($F(18, 1850) = 18.80$, $p < 0.01$, $R^2 = 0.16$, $R^2_{adjusted} = 0.15$) showed that respondents were more likely to choose suboptimal products when they were *not* from Germany, when they were from The Netherlands or Norway, or when they had a higher commitment to environmental sustainability. They also had a higher tendency to consume suboptimal products when they had a lower perceived own household food waste, or did more shopping/cooking. Thus, it seems that different aspects of consumers' personality (egoistic value orientations, commitment to environmental sustainability vs. perceived consumer effectiveness) and of consumers' individual-waste aspects (own household food waste and shopping/cooking habits) explain preferences for suboptimal products when consumers are in the supermarket compared to when they are at home. Both models, however, showed a low R^2 and thus can only predict little. This may not surprising considering the multiplicity of factors affecting product choices in homes and especially in supermarkets.

3.4. Product associations and their influences on suboptimal choices

The differences in preferences for suboptimal products might depend on how these products were perceived, or on how the product associations played a role in the decision to choose a suboptimal product. We first tested whether products were perceived differently. Cochran's Q tests showed that, across conditions, product associations differed for all products (all $ps < 0.01$). These differences between products were found both in the Supermarket (all χ^2s > 542.02, $ps < 0.01$) and the Home condition (all χ^2s > 258.52, $ps < 0.01$). When comparing the product associations between the Supermarket and the Home condition, the only differences in product associations were the dairy products. In the Home condition, the dairy products were associated by consumers with being unsafe to eat, to be discarded or to be consumed as soon as possible, being unattractive and having a bad taste, whereas in the Supermarket condition these products were simply associated with having to be consumed as soon as possible (Fig. 1). This difference might relate to the divergence in date labelling: whereas milk and yoghurt were close to the best-before date in the Supermarket condition, they were one day (milk) and one week (yoghurt) passed the best-before date in the Home condition. In addition, the apple with a spot was more frequently associated with "to be discarded" in the supermarket condition than in the home condition. The remaining suboptimal products were perceived similarly across conditions, with characteristics of good taste, safe to eat, to be eaten as it is, and suitable for adults, children and (except for the broken biscuits) for guests.

Another possibility for the divergence in suboptimal choices for the products is that the product associations might have exerted different influences on respondents' suboptimal choices depending on the product. To test whether the product associations influenced the decision to choose the suboptimal product differently for every product, we conducted Binary logistic regressions with the product associations of the suboptimal product as independent variables and the suboptimal choices for every product separately as dependent variables (see Table 4). The results reveal that, for all products, attractiveness of the product and the safety of consuming the product (except for cucumber) played a role in the decision to choose the suboptimal product. On the other hand, whether a product was perceived to be suitable for children did not play a role in the decision for any of the products. This may be because all products tended to be equivalently suitable for adults and children. There were differences between products in the role of product associations in suboptimal choices. The product's perceived taste correlated with the decision to choose the suboptimal product only for apples, cucumbers, and milk. Whether the product was perceived to be suitable for serving to guests was related to the choice decision only for cucumbers, juice, and biscuits. Finally, the decision to choose the suboptimal product could be influenced by whether the product could be used in cooking (for apples, yoghurt) or could be consumed as it was (for apples, milk, yoghurt, biscuits).

3.5. Suboptimal discounts in supermarkets

Respondents in the Supermarket condition also indicated how much discount they needed on the suboptimal product before they were willing to purchase the suboptimal product (*Suboptimal discount*). Respondents' discount preferences depended on the type of product ($F(5) = 714.21$, $p < 0.01$; see Table 2). They needed a higher discount before they were willing to buy the milk or yoghurt one day before the best-before date or the broken biscuits, compared to the bent cucumber or to the indented carton of juice. Respondents needed the highest discount for the apple with a spot before they were willing to buy it ($M = 67.1\%$, $SD = 30.3$). This finding is in line with the more frequent "to be discarded" association for the apple that was reported above.

A Linear regression analysis with Overall suboptimal discount as the dependent variable and the demographics, personality measures, and individual-waste aspects as independent variables showed that respondents' preferred discount on suboptimal products in supermarkets depended mainly on their demographics and individual-waste aspects ($F(18, 1864) = 13.40$, $p < 0.01$, $R^2 = 0.12$, $R^2_{adjusted} = 0.11$). Respondents needed a higher discount before they would purchase suboptimal products when they were from

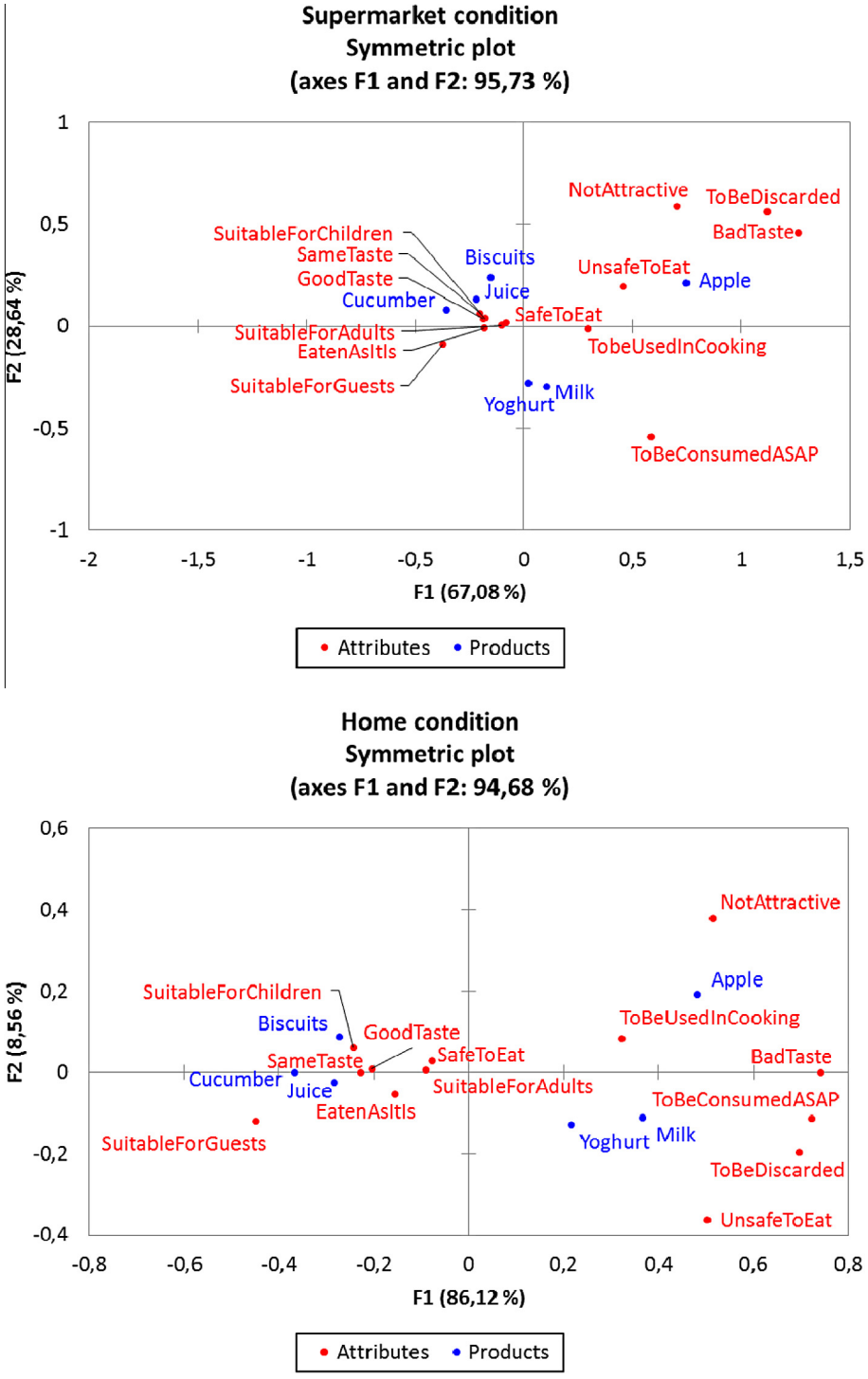

Fig. 1. Suboptimal product associations in Supermarket and Home conditions.

Denmark (β = 0.06, $p = 0.05$) or The Netherlands (β = 0.06, $p = 0.04$), when they were female (β = 0.05, $p = 0.03$), when they were older (β = 0.25, $p < 0.01$), when they had children (β = 0.05, $p = 0.04$), or when they had a lower education (β = −0.06, $p = 0.01$). In terms of personality, respondents needed a higher discount when they had a lower commitment to environmental sustainability (β = −0.13, $p < 0.01$). Finally, respondents needed a higher discount when they had a higher perceived own household food waste (β = 0.12, $p < 0.01$), or when they were less aware of the food-waste issue (β = −0.10, $p < 0.01$).

3.6. Suboptimal disposal in households

Respondents in the Home condition not only indicated whether they would choose the suboptimal or the optimal product, they also indicated the probability of disposing the suboptimal product. Respondents' disposal estimations depended on the type of product ($F(5) = 285.29$, $p < 0.01$; see Table 2). They showed a higher probability to throw away the apple with a spot, the milk, and the yoghurt one day/week past the best-before date compared to the bent cucumber, the indented carton of juice, or the broken biscuits.

Table 4
Binary regression analyses for predicting Suboptimal choice on product associations (across conditions). Significant relationships are indicated in **bold**.

Variable	Suboptimal choice per product					
	Apple (*B*)	Cucumber (*B*)	Milk (*B*)	Yoghurt (*B*)	Juice (*B*)	Biscuits (*B*)
Condition (0 supermarket, 1 home)	2.21**	0.65**	2.86**	2.48**	2.15**	2.74**
Good taste	0.04	**0.43****	0.11	0.16	0.21†	−0.02
Bad taste	**−1.33***	−0.43	−0.35	−0.53	−0.33	0.40
Same taste as the other product	0.15	**−0.23***	**0.31****	0.15	0.17	0.06
Safe to eat/drink	**0.38****	0.08	0.11	**0.32****	**0.24***	**0.32***
Unsafe to eat/drink	−0.46	−0.43	**−1.21****	**−1.25****	−0.67†	−0.54
Not attractive/tempting to eat/drink	**−1.19****	**−1.78****	**−1.11****	**−1.01****	**−1.47****	**−1.00****
Suitable for adults	**0.52****	−0.12	0.23	0.10	0.28†	0.20
Suitable for children	0.13	0.06	0.07	0.14	−0.18	0.19
Suitable for serving to guests	0.34	**0.76****	0.09	0.14	**0.40****	**0.52****
To be discarded	**−2.06****	−0.22	**−2.46****	**−1.89****	−0.13	−1.09†
To be consumed as soon as possible	**0.35****	−0.16	0.04	0.01	0.02	0.16
To be used in cooking	**−0.58****	−0.07	<0.01	**−0.21***	0.02	−0.09
Can be eaten/drunk as it is	**0.32***	0.03	**0.33****	**0.35****	0.18	**0.27***
Nagelkerke R^2	32%	13%	40%	36%	28%	34%
χ^2	743.74**	357.04**	1248.92**	1167.60**	710.15**	885.19**
% of Participants selecting suboptimal choice (home/supermarket)	12% (21%/3%)	31% (37%/25%)	24% (42%/7%)	29% (47%/10%)	20% (36%/6%)	19% (35%/3%)

† $p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.

A Linear regression analysis with overall suboptimal disposal as the dependent variable and the demographics, personality measures, and individual-waste aspects as independent variables showed that respondents' probability of suboptimal product disposal depended on their demographics, personality, and individual-waste aspects ($F(18, 1850) = 24.42$, $p < 0.01$, $R^2 = 0.19$, $R^2_{adjusted} = 0.19$). Respondents showed a higher probability to dispose suboptimal products when they were from Denmark, Germany, or the Netherlands (βs > 0.12, *p*s < 0.01), when they were older (β = 0.08, $p < 0.01$), or when they had a lower education (β = −0.08, $p < 0.01$). In terms of personality aspects, respondents had a higher probability to dispose suboptimal products when they had lower biospheric value orientations (β = −0.07, $p = 0.03$), or when they had a lower commitment to environmental sustainability (β = −0.11, $p < 0.01$). Also, they had a higher probability to dispose suboptimal products when they had a higher perceived own household food waste (β = 0.27, $p < 0.01$), or when they had a lower food-waste awareness (β = −0.06, $p < 0.01$).

4. General discussion

Consumer preferences for suboptimal food products are suggested to play a large role in the retailer and consumer food-waste issue (Aschemann-Witzel et al., 2015; Buzby et al., 2011). The present research contributes to this assumption by demonstrating what factors play a role in consumer preferences for suboptimal products. It appears that consumer preferences for suboptimal products differ when they focus on buying a product in a supermarket from when they focus on consuming a product at home. Moreover, the type of sub-optimality plays a role in the choice process: consumers show different preferences for products that deviate in terms of appearance, date labelling, or damaged packaging. Consumer choices, discount preferences, and waste behaviors of suboptimal products appear to be influenced by consumers' demographics (nationality, age), by their personality characteristics (value orientation, commitment to environmental sustainability, and perceived consumer effectiveness in saving the environment), and by individual-waste aspects (perceived food waste of the household, perceived importance of food waste, and engaging in shopping/cooking).

4.1. Theoretical contributions and future research

The present findings provide a useful addition to the study of food waste. Until now, most research on food waste has indicated that sub-optimality in terms of appearance, date labelling, or damaged packaging plays an important role in both supply chain and household food waste. Supply chains, for example, are found to waste foods because consumers are perceived as unwilling to purchase products that are deviant in terms of shape or color, that are close to the best-before date, or that have a slightly damaged packaging (Gobel et al., 2015; Lebersorger & Schneider, 2014). Our findings suggest that consumers can demonstrate a tendency to purchase suboptimal products, but that these purchasing tendencies and subsequent consumption tendencies at home depend on the type of sub-optimality. Moreover, consumer preferences differ when consumers decide about which product to buy compared to when they decide about which (already purchased) product to consume. Therefore, making distinctions between types of sub-optimality and the settings in which consumer preferences are studied would aid the understanding of consumer food waste.

The current findings not only suggest that consumer preferences may depend on the type of sub-optimality, they also indicate that different deviations in appearance may play a role. In our study, consumers appeared willing to purchase and consume a product that deviated on the basis of shape (the cucumber), and they indicated lower necessities for discounts and lower tendencies of wastage for this product compared to the other suboptimal products. This implies that retailers could easily offer suboptimal products in terms of appearance to consumers. However, an appearance deviation in terms of color (the apple with a spot) was only very limitedly accepted. The product associations indicated that the product with a color deviation was perceived as unattractive, unsafe to eat, and bad-tasting. Because these aspects determine consumers' tendencies to purchase suboptimal products in supermarkets, consumers were not willing to buy the apple with a spot. In sum, it is important for both future research and retailers to make a distinction between appearance deviations in terms of shape, color, and size.

The present findings demonstrate that consumers are differently sensitive to different types of sub-optimality.

Consumer preferences for discounts, and consumer probabilities to dispose, differed across suboptimal products in terms of appearance, best-before date, and packaging damage. Yet, the current set of studied products is not all-encompassing, and consumers may demonstrate different levels of sensitivity for different products of one type of sub-optimality. For example, future research is needed to study whether consumers respond similarly to dairy, canned vegetables, and pasta past the best-before date, or to neutrally-designed (in the present research: milk and yoghurt) versus branded packaging (in the present research: juice). Similarly, our study did not test all possible aspects of sub-optimality in terms of appearance and packaging damage. Future research is poised to examine whether consumer responses to, for example, deviant sizes, cracks in, or print errors on packaging, differ from the current findings. Finally, future research may investigate consumers' emotional responses and inferences on intrinsic quality triggered by such external suboptimal characteristics.

Interestingly, our results do not converge with existing findings on the role of demographics in food wasting behavior. Whereas gender, age, household composition, education, and household income have been found to influence food-waste behaviors (e.g., Koivupuro et al., 2012; Quested et al., 2013), the current study suggests that only age plays a role in consumer preferences for suboptimal products. Moreover, our results do not confirm that age has a negative effect on food waste (Buzby & Hyman, 2012; Canali et al., 2013; Stefan et al., 2013). Instead, it appears that younger consumers are more open to purchasing and consuming suboptimal products, and have a lower tendency to waste suboptimal products. It is possible that our findings do not replicate existing research on demographics because the inclusion of personality aspects and individual-waste aspects explain at least some of the effects that have been found for demographics on food-waste behaviors in other studies. Another possibility is that findings from food-waste behaviors do not translate to preferences for suboptimal products. Future research is needed to provide clarification on this issue, and to develop a more thorough understanding of the role of demographics and personality factors in consumer food waste.

It is important to mention that our research is based on consumers' self-reported intentions to buy and consume suboptimal products in a web survey with on-screen images. One may wonder whether consumers will behave differently in front of the actual products in a supermarket or at home. The technique of evoked contexts has been reported to be an efficient manner to mentally and emotionally condition respondents to the target situation (Aschemann-Witzel et al., 2015; Almli et al., 2016), suggesting that our findings are based on validated and reliable measures.

When exploring the Supermarket and the Home condition separately, the predictive ability of the respective models appeared to be poor. This result underlines that a consumer's food choice is influenced by a complex set of factors, of which only a fraction was currently captured. It suggests that further research might rather focus on specific choices, food categories and types of sub-optimality, to be able to arrive at a greater level of explained variation. Other possible approaches to potentially improve these models would be to conduct a non-hypothetical, incentive-compatible procedure such as experimental auctions (see e.g. Olesen, Alfnes, Rora, & Kolstad, 2010), or to conduct actual product choices in supermarkets and at homes, as these methods may be more engaging for the consumer. Yet, both approaches may not be realistic to conduct on such a large sample of consumers.

4.2. Practical contributions

The current study provides useful recommendations for both supply chains (retailers) and policy makers. First, the results indicate that consumers seem to be sensitive to discounts on suboptimal products, and that the majority of consumers is willing to purchase any type of suboptimal product when a discount is given. This suggests that product discounts can be a practice that is worth expanding, as it can generate a favorable consumer response. Yet, to be efficient, discounts should be in line with the product and its flaw. Based on the present data, it seems that efficient price discounts may be low for a fresh, odd-shape produce or too high for an apple with a spot (see Table 3).

Second, the observed differences between the supermarket setting and the home setting imply that policy makers should make a clear distinction between whether they are focusing on purchasing behaviors at supermarkets, or on consumption behaviors at home. Not only do consumer preferences for different types of sub-optimality differ across settings, the factors that influence these preferences also differ. For example, our findings imply that food waste reduction campaigns may become more successful when such campaigns focus on egoistic value orientations, perceived consumer effectiveness, or the importance of the food-waste issue in cases where they address consumer purchasing behaviors of suboptimal foods. When campaigns aim to reduce food waste of suboptimal foods in households, they may be more successful by focusing on consumers' commitment to environmental sustainability or on shopping and cooking habits.

Third, the finding that consumers who regularly engage in shopping and cooking are more inclined to purchase suboptimal products, provides some interesting suggestions for retailer actions and policy makers. For example, it might be possible that consumers who are more often exposed to suboptimal products, are more open to suboptimal products. Thus, including suboptimal products in the retailer's standard assortment might generate increased purchase likelihoods of such products over time. Moreover, consumers who have more experience with suboptimal products, might be more open to buy and consume products that are close to or at the best-before date, because they have knowledge on how to interpret best-before dates or on how to use other senses to evaluate these products. Indeed, currently multiple retailers across Europe offer a discount on products that are close to or at the best-before date. Finally, the present data suggest that there is a marketing potential for suboptimal foods, especially towards people interested in cooking.

4.3. Conclusion

In sum, suboptimal products are not necessarily a cause of food waste. Consumers are open to purchase especially products that deviate on the basis of their shape, and to consume especially products that deviate on the basis of their shape, best-before date, or damaged packaging. Almost every type of suboptimal product can be sold when consumers receive a discount that fits the sub-optimality. Yet, the sub-optimality may influence consumer perceptions of taste, attractiveness, and safety, even though the objective quality has not changed. Future research questions such as: how can we re-train consumers to rely on taste and usage properties of the food before their looks? How can we teach consumers to separate quality, taste, and safety evaluations from product appearance? And how can we adjust consumers' internal norms for optimal product to include suboptimal products? are interesting lines for future research that still need to be addressed. But on the basis of our research, we can at least conclude one thing: product sub-optimality is key in consumer decision making.

Appendix A
Used pictures of Suboptimal and Optimal Foods.

	Foods	
	Suboptimal	Optimal
Product Type		
Apple		
Cucumber		
(Neutrally-designed) Milk (“today” (Supermarket)/“yesterday” (Home) vs. “1 week left”)		
(Neutrally-designed) Yoghurt (“today” (supermarket)/“yesterday” (Home) vs. “1 week left”)		
Juice		
Biscuits		

Note. For milk and yoghurt, text was displayed in the national language of data collection (Norwegian products shown here). Products and product types were displayed in a randomised balanced order.

Appendix B

Items and factor loadings of the value orientation measure (De Groot & Steg, 2008).

Item	Egoistic	Altruistic	Biospheric
1. Control over others, dominance	**0.73**	−0.12	0.01
2. Material possessions, money	**0.56**	−0.01	−0.04
3. The right to lead or command	**0.88**	−0.09	0.04
4. Having an impact on people and events	**0.67**	0.15	0.01
5. Equal opportunity for all	−0.02	**0.71**	0.01
6. A world free of war and conflict	−0.05	**0.66**	0.13
7. Correcting injustice, care for the weak	−0.02	**0.94**	−0.05
8. Working for the welfare of others	0.04	**0.62**	0.05
9. Protecting natural resources	0.01	0.18	**0.73**
10. Harmony with other species	−0.01	0.04	**0.82**
11. Fitting into nature	−0.01	−0.11	**0.93**
12. Preserving nature	−0.02	0.07	**0.81**
Reliability (α)	0.80	0.84	0.91

Note. Items answered using 8-point scales, labeled from −1 (opposed to my values), 0 (not at all important), to 7 (extremely important).

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