

Awareness, Intention, and Behavior: Three Empirical Perspectives on Predicting the Purchase
of Abnormally Shaped Fruits and Vegetables

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2017). In addition, messages that emphasize the authenticity of abnormally shaped fruits and vegetables and the sustainability of consuming such food motivate people to purchase them (van Giesen & de Hooze, 2019). This research gap regarding the psychological factors that motivate the purchasing of abnormally shaped fruits and vegetables is particularly pivotal when considering that in the last years, practitioners have launched various initiatives and business models to promote abnormally shaped fruits and vegetables (see, e.g., Louis & Lombart, 2018). In addition to the existing supermarkets increasingly promoting abnormally shaped fruits and vegetables and further processed foods such as smoothies or soups, an increasing number of sales outlets exclusively selling abnormally shaped fruits and vegetables are entering the market.

The aim of this research is to better understand the psychological determinants of purchasing abnormally shaped fruits and vegetables and the psychological factors that motivate people to purchase such foods. We first identify the psychological determinants of the awareness, intention, and purchase behavior of consumers regarding abnormally shaped fruits and vegetables. Second, we conduct a detailed analysis on differences between people that purchase abnormally shaped fruits and vegetables—i.e., *Doers*—and people that do *not* purchase such fruits and vegetables—i.e., *Non-Doers*. Finally, we discuss the theoretical and practical contributions of our research. These include, in particular, the need (1) to consider situational aspects as drivers of (not) purchasing abnormally shaped fruits and vegetables, (2) to design interventions that foster environmental awareness and personal norms, and (3) to design targeted interventions for *Non-Doers*.

63

64 **Why people do not purchase abnormally shaped fruits and vegetables**

65 Research has identified many reasons why people waste food in general (Delley & Brunner, 2017; Schanes et al., 2018; Stancu et al., 2016; Stefan et al., 2013). One of these 66 reasons is people's reluctance to purchase abnormally shaped fruits and vegetables. Note that 67

68 abnormally shaped food refers to food that deviates from conventional norms that dictate
69 certain characteristics. Typically, abnormally shaped food is defined as food whose
70 appearance (e.g., shape), date labelling (e.g., best-before date) or packaging (e.g., tear-open
71 wrapper) are not perceived as optimal, but still meet all intrinsic quality and safety
72 characteristics (Aschemann-Witzel et al., 2016; de Hooge et al., 2017). Based on this
73 definition, we refer to “abnormally shaped fruits and vegetables” as fruits and vegetables with
74 appearances that—according to conventional norms—have deficiencies, such as an odd shape
75 or scabs, but still meet all intrinsic quality and safety characteristics. Note that various terms
76 are used to refer to abnormally shaped fruits and vegetables in the literature. The most
77 common ones are “suboptimal,” “imperfect,” “misshapen,” “oddly shaped,” and
78 “superficially damaged.”

79 Why people are reluctant to purchase abnormally shaped fruits and vegetables,
80 however, has received only little attention (see e.g., Aschemann-Witzel et al., 2019; de Hooge
81 et al., 2017; Jaeger et al., 2018; Loebnitz et al., 2015). What is so far known on why people
82 are reluctant to consume abnormally shaped foods is related to their subjective perception of
83 the appearance deficiencies and their judgment and decision making regarding these fruits and
84 vegetables. People’s subjective perception of external appearance deficiencies (e.g., odd
85 shape) with or without internal appearance deficiencies (e.g., internal browning) influence
86 their judgment of food quality, which, in turn, determines purchase decisions (Eldesouky et
87 al., 2015; Jaeger et al., 2018). Fruits and vegetables with (vs. without) external appearance
88 deficiencies typically attract visual attention. If there are fruits and vegetables without
89 appearance deficiencies in people’s visual field as well, people typically switch their attention
90 from the abnormally shaped to the norm-congruent fruits and vegetables (Hochstein &
91 Ahissar, 2002). Fruits and vegetables with appearance deficiencies are perceived as
92 unappealing as well as unable to meet one’s sensory expectations (de Hooge et al., 2017;
93 Jaeger et al., 2018) and are associated with potential contamination and health risks (Loebnitz

94 & Grunert, 2018; White et al., 2016). Consequently, people are less willing to pay, purchase
95 and consume abnormally shaped compared to norm-congruent fruits and vegetables (de
96 Hooge et al., 2017; Helmert et al., 2017; Jaeger et al., 2018). This seems to be in line with the
97 general observation that people tend to opt for those food alternatives that are perceived as
98 “optimal” (Newsome et al., 2014)—be it in terms of appearance, date labelling or packaging.

99 People’s judgment and decision making regarding the purchase and consumption of
100 abnormally shaped fruits and vegetables depend on the extent to which the fruits and
101 vegetables deviate from the conventional norms. The more pronounced people perceive the
102 “appearance deficiencies” to be, the lower their willingness to pay, purchase and consume
103 becomes (Ares et al., 2008; de Hooge et al., 2017; Loebnitz et al., 2015). In addition to this,
104 there are individual differences in people’s judgment and decision making regarding the
105 purchase and consumption of abnormally shaped fruits and vegetables. For instance, people
106 are more likely to waste abnormally shaped fruits and vegetables when they are old (vs.
107 young), when they perceive the food item as a worse alternative in terms of quality, or when
108 they have a relatively low commitment to environmental sustainability (de Hooge et al.,
109 2017).

110 Although there is evidence on how the aesthetical perception of food determines the
111 willingness to pay, purchase and consume abnormally shaped *food*, less is known so far about
112 what motivates people to purchase abnormally shaped *fruits and vegetables*. In other words,
113 research needs to identify psychological factors that explain the purchasing of such fruits and
114 vegetables. Knowing such psychological factors is essential to design effective interventions
115 to promote the consumption of abnormally shaped fruits and vegetables. So far, only few
116 studies have systematically examined such psychological factors.

117

118 **Interventions to promote abnormally shaped fruits and vegetables**

119 To date, considerable amount of research has been conducted on the interventions that
120 address food waste *in general* (for reviews, see Reynolds et al., 2019; Stöckli et al., 2018). In
121 contrast, research examining the interventions that target the promotion of abnormally shaped
122 fruits and vegetables *in particular* is limited (for exceptions, see e.g., Aschemann-Witzel,
123 2018b; Louis & Lombart, 2018; van Giesen & de Hooze, 2019). Previous research on
124 interventions to promote abnormally shaped fruits and vegetables has focused on two
125 intervention types: (1) price reductions and (2) promoting messages. These are also the
126 intervention types most frequently implemented by practitioners at the point of sale.

127 Interventions in the form of a price reduction are thought to compensate for the
128 appearance of abnormally shaped fruits and vegetables. Price reductions have repeatedly been
129 shown to effectively foster the purchase of abnormally shaped fruits and vegetables. In fact,
130 people are more likely to buy abnormally shaped fruits and vegetables when they are
131 discounted (de Hooze et al., 2017). The effectiveness of price reductions can be explained by
132 the monetary motive of “saving money.” Note that the consumption of price-reduced,
133 abnormally shaped fruits and vegetables can also depend on demographics such as gender,
134 income, education, age, or type of household. For example, people with a relatively high
135 income as well as people that live in a single household are less willing to purchase
136 abnormally shaped fruits and vegetables (Aschemann-Witzel et al., 2017; van Giesen & de
137 Hooze, 2019). Further, price reductions are often signaled with price badges, which have
138 shown to draw people’s attention to the reduced food item (Helmert et al., 2017).

139 Interventions in the form of messages that emphasize the authenticity of abnormally
140 shaped fruits and vegetables and the sustainability of consuming such food motivate to purchase
141 abnormally shaped fruits and vegetables. In fact, an authenticity and sustainability positioning
142 of abnormally shaped fruits and vegetables increases people’s quality perception and purchase
143 intention. Similarly, interventions focusing on food taste motivate people to purchase
144 abnormally shaped fruits and vegetables (Louis & Lombart, 2018). Note that such positioning

145 interventions seem to work best when they are combined with price reductions (van Giesen &
146 de Hooge, 2019). For the managerial perspective—that is, for the perspective of sales outlets—
147 it is important to point out that promoting the consumption of abnormally shaped fruits and
148 vegetables can contribute to developing a favorable image of such foods (Louis & Lombart,
149 2018). Overall, it seems that targeting the price, authenticity, and taste of abnormally shaped
150 fruits and vegetables is a promising strategy to motivate people to purchase them.

151 Interestingly, it seems that while research has only just begun to examine interventions
152 that promote the consumption of abnormally shaped fruits and vegetables, practitioners have
153 launched various initiatives and business models aiming to do so. Table 1 provides a non-
154 exhaustive list of these initiatives and business models (see also Aschemann-Witzel et al.
155 2017 for a detailed overview of such initiatives and their key characteristics and success
156 factors). Overall, we observe that existing supermarkets increasingly promote abnormally
157 shaped fruits and vegetables as well as products produced from such fruits and vegetables, for
158 example, smoothies. In addition to the effort of existing supermarkets to promote abnormally
159 shaped fruits and vegetables, there is also an increasing number of emerging sales outlets and
160 initiatives that exclusively sell abnormally shaped fruits and vegetables, various food products
161 produced on the basis of abnormally shaped fruits and vegetables such as smoothies, soups
162 and dried fruits, as well as other food items that would be wasted otherwise. To date, there are
163 many reports from practitioners that these initiatives and business models are successful in
164 rising awareness for food waste and in strengthening the intention to purchase and increase
165 the actual purchase of abnormally shaped fruits and vegetables (Aschemann-Witzel,
166 Otterbring, et al., 2019; Louis & Lombart, 2018). From a scientific perspective these claims
167 are problematic for two reasons: First, to our knowledge there is no evaluation on the success
168 of these initiatives with regard to the outcomes. Second, there is generally little knowledge
169 about what drives awareness, intention, and purchase behavior of consumers regarding
170 abnormally shaped fruits and vegetables. Thus, again, research is needed to identify the

171 psychological determinants of awareness, intention, and purchase behavior of consumers
172 regarding abnormally shaped fruits and vegetables.

173 In order to advance the understanding of psychological factors that motivate people to
174 purchase abnormally shaped fruits and vegetables and to hypothesize on the psychological
175 processes for purchasing abnormally shaped fruits and vegetables, we suggest referring to
176 research on interventions against food waste *in general*. Particularly insightful is research that
177 uses behavioral change theories to explain the underlying psychological mechanisms (see e.g.,
178 (Stöckli et al., 2018).

179 **Table 1**180 **Overview of initiatives and business models selling abnormally shaped fruits and vegetables**

181

Country (year)	Supermarket / initiative	Description	Offer(s)
Austria (unk)	Billa	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Australia (2014)	Harris Farm Markets	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Australia (2014)	Woolworths	Retail chain	The product line “the odd bunch”: sale of fruits and vegetables with appearance deficiencies (lower price)
Belgium (2018)	Colruyt	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Belgium (2015)	Delhaize	Retail chain	The product line “ugly Veggies”: sale of fruits and vegetables with appearance deficiencies (lower price)
Belgium (2016)	Wonky (supplies Colruyt and Meny)	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Canada (2015)	Loblaws	Retail chain	Product line “No name: Naturally imperfect”: sale of fruits and vegetables with appearance deficiencies (lower price)
Canada (2014)	Second Life	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
Switzerland (2013)	Coop	Retail chain	Product line “unique”: sale of fruits and vegetables with appearance deficiencies (lower price)
Switzerland (2017)	Erntennetzwerk OGG Bern	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Switzerland (unk)	Food Save Emmental	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Switzerland (unk)	Food Save Luzern	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price; free)
Switzerland (2015)	FRÜTILE	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)

Switzerland (unk)	Gebana	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
Switzerland (2017)	Gmüesgarte	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Switzerland (unk)	MUDA rejuice	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Switzerland (2017)	Pure Taste	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Switzerland (unk)	Rohnatur	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Switzerland (2013)	Ugly Fruits	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies (lower price)
Switzerland (2017)	Vivavonterra	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Switzerland (2015)	Zum guten Heinrich	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Czech Republic (2018)	Tesco	Retail chain	Product line “Perfectly Imperfect”: sale of fruits and vegetables with appearance deficiencies (lower price)
Germany (2014)	Aldi Süd	Retail chain	The product line “krumme Dinger”: sale of fruits and vegetables with appearance deficiencies (lower price)
Germany (2014)	Etepetete	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
Germany (2014)	Dörrwerk	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Germany (2014)	FoPo	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
Germany (2019)	Kaufland	Retail chain	Product line “Die etwas Anderen”: sale of fruits and vegetables with appearance deficiencies (lower price)
Germany (2016)	Penny	Retail chain	Product line “Bio-Helden”: sale of fruits and vegetables with appearance deficiencies (lower price)
Germany (2016)	Querfeld	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Germany (unk)	Rübenretter	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies

Germany (2016)	The Good Food	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Denmark (unk)	Meny	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Denmark (unk)	Rema 1000	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
Denmark (2016)	WeFood	Retail outlet for abnormally shaped fruits and vegetables	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Spain (2016)	Eroski	Retail chain	Product line “Tan Feas Como Buenas”: sale of fruits and vegetables with appearance deficiencies (lower price)
France (2014)	Intermarché	Retail chain	Product line “Inglorious Fruits and Vegetables”: sale of fruits and vegetables with appearance deficiencies (lower price)
England (2016)	ASDA	Subscription box	Product line “Wonky Veg box”: sale of fruits and vegetables with appearance deficiencies
England (2015)	ChicP	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (2016)	Co-op	Retail chain	Sale of local fruits and vegetables with appearance deficiencies and further processed products (lower price)
England (2016)	Dash Water	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (unk)	Flawsome	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (unk)	Graig Farm	Retail chain	Product line “Wonky Veg”: sale of fruits and vegetables with appearance deficiencies (lower price)
England (2017)	Morrisons	Retail chain	Product line “Wonky Veg”: sale of fruits and vegetables with appearance deficiencies (lower price)
England (2016)	Oddbox	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
England (2012)	Rubies in the Rubble	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (2013)	SNACT	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (2018)	Tesco	Retail chain	Product line “Perfectly Imperfect”: sale of fruits and vegetables with appearance deficiencies (lower price)

England (2006)	Waitrose	Retail chain	Product line “A little less than perfect”: sale of fruits and vegetables with appearance deficiencies (lower price)
England (2017)	Wonky Food Co	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
England (unk)	Wonky Veg Boxes	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies (lower price)
Hungary (2018)	Tesco	Retail chain	Product line “Perfectly Imperfect”: sale of fruits and vegetables with appearance deficiencies (lower price)
Ireland (2014)	Tesco	Retail chain	Product line “Wonky Veg”: sale of fruits and vegetables with appearance deficiencies (lower price)
Netherlands (2016)	Albert Heijn	Retail chain	Product line “Buitenbeentjes”: sale of fruits and vegetables with appearance deficiencies and delivery box with fruits and vegetables with appearance deficiencies (lower price)
Netherlands (unk)	EkoPlaza	Retail chain	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Netherlands (unk)	Jumbo	Retail chain	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
Netherlands (2012)	KromKommer	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products
New Zealand (2017)	Countdown	Retail chain	Product line “The Odd Bunch” sale of fruits and vegetables with appearance deficiencies (lower price)
Poland (2018)	Tesco	Retail chain	Product line “Perfectly Imperfect”: sale of fruits and vegetables with appearance deficiencies (lower price)
Sweden (2015)	Coop	Retail chain	Product line “unknown”: sale of fruits and vegetables with appearance deficiencies (lower price)
USA (2016)	Giant Eagle	Retail chain	Product line “Produce with Personality”: sale of fruits and vegetables with appearance deficiencies (lower price)
USA (2014)	Hungry Harvest	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
USA (2015)	Imperfect Food	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
USA (2014)	Misfits Market	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
USA (2016)	Perfectly Imperfect Produce	Subscription box	Delivery box with fruits and vegetables with appearance deficiencies
USA (2017)	Wonky Food Company	Retail outlet for abnormally shaped fruits and vegetables	Sale of local fruits and vegetables with appearance deficiencies and further processed products

183 Drivers of (not) purchasing abnormally shaped fruits and vegetables

184 When speaking of behavioral change (interventions), it is important to define what
185 kind of change is addressed. Interventions to tackle food waste at the level of consumers often
186 focus on problem awareness and behavioral intentions. Accordingly, the effect of these
187 interventions is often quantified in terms of changes in awareness and intention (Stöckli et al.,
188 2018). The focus on awareness and intention is problematic: neither awareness nor intention
189 is a good predictor for a change in behavior (Wong & Sheth, 1985).

190 Although awareness and intention seem to have a limited power to predict if people
191 purchase abnormally shaped fruits and vegetables to reduce food waste or not, we do not
192 suggest ignoring awareness and intention. It is important to consider awareness and intention
193 as this helps to understand to what extent the intention-behavior gap occurs for the purchase
194 of abnormally shaped fruits and vegetables. The intention-behavior gap for consumer food
195 waste in general is well established (Stancu et al., 2016; Stefan et al., 2013). Yet, it is not
196 evident to what extent the intention-behavior gap also occurs for the consumption of
197 abnormally shaped fruits and vegetables in specific.

198 The lack of examination of psychological determinants for purchasing abnormally
199 shaped fruits and vegetables highlights the need to conceptualize about psychological
200 determinants to explain why people do (not) purchase abnormally shaped fruits and
201 vegetables. In line with previous research on interventions against food waste, we suggest to
202 build the examination of psychological determinants for purchasing abnormally shaped fruits
203 and vegetables on a combination of theoretical behavioral change models (Stöckli et al., 2018;
204 Visschers et al., 2020). So far, the behavioral change theory that has been predominantly used
205 in research on general food waste interventions is the *theory of planned behavior* (Ajzen,
206 1991). Yet, this theory has been criticized due to its strong focus on cognition (Sniehotta et
207 al., 2014) and the limited predictive power of intention for behavior (Armitage & Conner,
208 2001; Bamberg & Möser, 2007; Wong & Sheth, 1985). To overcome this drawback, the use

209 of more comprehensive, integrative theoretical frameworks, such as the *integrative influence*
210 *model of pro-environmental behavior*, has been suggested (Matthies, 2005; Schmidt, 2016).
211 In accordance with these integrative conceptualizations of pro-environmental behavior of
212 daily life, we aimed for a broader set of psychological determinants from multiple behavioral
213 change theories. In particular, we selected determinants that go beyond what is suggested by
214 the *theory of planned behavior* (Ajzen, 1991); hence, more than attitudes, subjective norm,
215 perceived behavioral control and intention are considered. Therefore, the set of psychological
216 determinants that we aim to test for their relevance in predicting the awareness of sales outlets
217 of abnormally shaped fruits and vegetables, the intention to purchase these, and the reported
218 actual purchase includes personal norm, descriptive norm, injunctive norm, behavioral
219 control, self-efficacy, environmental awareness, and perceived environmental effectiveness.

220 We do not yet specify exactly how these psychological determinants are related to
221 each other and define intention as well as behavior in terms of purchasing abnormally shaped
222 fruits and vegetables. This first step of identifying which psychological determinants are
223 particularly decisive will allow future research to specify a specific theoretical model for
224 fostering the purchase of abnormally shaped fruits and vegetables. Note that to be realistic,
225 such a theorization will need to consider that the significance of and relationship between
226 identified psychological determinants changes over time—as suggested by the *stage models*
227 *of behavioral change* (Bamberg, 2013).

228

229 ***Personal norms***

230 In general, personal norms refer to one's individual expectation of how to behave in a
231 certain situation, which the individual experiences as a feeling of moral obligation (Schwartz,
232 1973, 1977). Thus, personal norms are determined by one's tendency to comply with what is
233 internalized as good or bad (Thøgersen, 2006). A personal norm in the present context, for
234 example, is one's personal principle to either purchase abnormally shaped fruits and

235 vegetables or not. The personal principle to purchase abnormally shaped fruits and vegetables,
236 for instance, is likely to be driven by the motivation to reduce the negative feelings of being
237 responsible for the environmental consequences of throwing away such foods. For the
238 specific case of purchasing abnormally shaped fruits and vegetables, personal norms have
239 been shown to predict food-waste–related behaviors such as reducing plate waste (Visschers
240 et al., 2020).

241

242 *Descriptive norms*

243 Descriptive norms refer to one’s perception of how frequent others show a certain
244 behavior (Cialdini et al., 1990). Descriptive norms are determined by one’s observation of the
245 prevalence of a certain behavior among relevant others. People use descriptive norms as
246 information to reduce uncertainty in decision making. Further, they comply to descriptive
247 norms to obtain approval from others (Cialdini et al., 1991; Deutsch & Gerard, 1955). A
248 descriptive norm in the present context, for example, is that one’s peers purchase their fruits
249 and vegetables from sales outlets that exclusively sell abnormally shaped fruits and
250 vegetables. In general, descriptive norms are a good predictor for sustainable consumption
251 (Niemic et al., 2020). Importantly, recent research shows that descriptive norms can alter
252 people’s intentions to purchase certain types of abnormally shaped foods (do Carmo
253 Stangherlin et al., 2020).

254

255 *Injunctive norms*

256 Injunctive norms refer to one’s perception of what others think people should do
257 (Cialdini et al., 1990). Injunctive norms are determined by one’s beliefs about which specific
258 behavior others expect one to do or which specific behavior others approve of (Ajzen, 1991;
259 Cialdini et al., 1991). Injunctive norms are comparable to subjective norms, in fact, they are
260 often used interchangeably (Niemic et al., 2020). People use injunctive norms as information

261 in their decision making, they comply to them for others' approval and to avoid social
262 sanctions (Cialdini et al., 1991; Rimal & Real, 2005). An injunctive norm in the present
263 context, for example, is that one's peers find it right to purchase fruits and vegetables from
264 sales outlets that exclusively sell abnormally shaped fruits and vegetables. Note that
265 injunctive norms have been shown to predict general food waste intentions (Stancu et al.,
266 2016).

267 Overall, there is a clear conceptual difference between descriptive and injunctive
268 norms. Descriptive norms capture what most people do, whereas injunctive norms capture
269 what most people approve or disapprove of. This differentiation is important because
270 descriptive and injunctive norms may differ. In the case of the purchase of abnormally shaped
271 fruits and vegetables, the injunctive norm may be that one should purchase abnormally shaped
272 fruits and vegetables, whereas the descriptive norm may be that most people purchase fruits
273 and vegetables that comply with conventional norms. The difference between descriptive and
274 injunctive norms might lead to different responses (see Cialdini & Trost, 1998).

275

276 *Behavioral control*

277 Behavioral control refers to one's perception of the ease or difficulty of doing a certain
278 behavior (Ajzen, 1991). Perceived behavioral control in the present context, for example, is
279 how difficult one expects it to be to purchase abnormally shaped fruits and vegetables. In line
280 with this, perceived behavioral control has been shown to predict food-waste-related
281 behaviors (Stancu et al., 2016).

282

283 *Self-efficacy*

284 Self-efficacy refers to one's perception of the own ability to do a certain behavior.
285 Self-efficacy is determined by one's experience and performance accomplishments (Bandura,
286 1977, 1986). Self-efficacy in the present context, for example, is that one expects to be

287 capable to go to a sales outlet that sells abnormally shaped fruits and vegetables for one's
288 weekly grocery shopping. In line with this, self-efficacy has been shown to explain food-
289 waste-related behaviors (Aschemann-Witzel, Giménez, et al., 2019).

290

291 *Environmental awareness*

292 Environmental awareness refers to one's awareness of the environment and how
293 human behavior affects it. Environmental awareness is determined by the knowledge about
294 ecological consequences of one's behavior (Bamberg & Möser, 2007; Everett, 1989).

295 Environmental awareness in the present context, for example, is that one is aware of the fact
296 that food waste contributes to environmental problems such as soil pollution and greenhouse
297 effect (see Haws et al., 2014). Past research indicates that environmental awareness predicts
298 whether someone has the intention to buy abnormally shaped fruits and vegetables
299 (Aschemann-Witzel et al., 2020; Loebnitz et al., 2015).

300

301 *Perceived environmental effectiveness*

302 Perceived environmental effectiveness refers to one's perception of the (relative)
303 benefit of a certain behavior at addressing environmental problems. This is determined by the
304 perception of the impact of a certain behavior to successfully protect the environment (Dietz
305 et al., 2002; Frick et al., 2004). Perceived environmental effectiveness in the present context,
306 for example, is the perception of the relative benefit of purchasing abnormally shaped fruits
307 and vegetables (in order) to reduce environmental problems such as soil pollution and
308 greenhouse effect. To date, it is not clear to what extent perceived environmental
309 effectiveness explains if people purchase abnormally shaped fruits and vegetables to reduce
310 environmental problems.

311

312

The present research

313 The overarching goal of this research is to better understand the psychological
314 determinants of the purchase of abnormally shaped fruits and vegetables. For this purpose, we
315 conducted an online survey with both people that *do* purchase abnormally shaped fruits and
316 vegetables—i.e., *Doers*—and people that *do not* purchase abnormally shaped fruits and
317 vegetables—i.e., *Non-Doers*. With this approach, we pursue two goals. First, we identify the
318 psychological determinants of the awareness of sales outlets that sell abnormally shaped fruits
319 and vegetables as well as the intention and (self-reported) purchase behavior of consumers
320 regarding abnormally shaped fruits and vegetables. Here, we expect that personal norm,
321 descriptive norm, injunctive norm, behavioral control, self-efficacy, environmental
322 awareness, and perceived environmental effectiveness are psychological determinants.
323 Second, to provide a fine-grained picture of the differences between *Doers* and *Non-Doers*
324 regarding their various situational preferences for fruits and vegetables, such as large variety,
325 low price, and freshness, we perform a detailed explorative analysis of these differences.

326

327

328

Methods

329 Participants

330 We recruited 472 citizens living in or close to the city of Bern (Switzerland; 365
331 female, 105 male, 2 non-binary; $M_{Age}=34.68$, $SD_{Age}= 12.80$). The citizens were recruited at
332 two different types of sales outlets: On one hand, we recruited at sales outlets that focus on
333 selling fruits and vegetables that conform to the current conventional norms. On the other
334 hand, we recruited at sales outlets that focus on selling abnormally shaped fruits and
335 vegetables. To recruit participants, we distributed flyers in front of or close to the sales
336 outlets. Some of these sales outlets allowed us to post the flyer on their social media channels.
337 Hence, we recruited offline as well as online. As an incentive, participants were given the
338 opportunity to participate in a prize drawing (10x ~\$50 vouchers).

339

340 Design and Procedure

341 In the first part of the correlational online survey, participants were asked for informed
342 consent and answered specific questions about their personal fruit and vegetable purchases,
343 namely their awareness of the existence of sales outlets that offer abnormally shaped fruits
344 and vegetables, their intention to purchase their food from such outlets, and the extent to
345 which participants purchase their food from such sales outlets. In the second part, participants
346 responded to questions concerning the perception of their own consumption of abnormally
347 shaped fruits and vegetables as well as the perception of others' consumption of abnormally
348 shaped fruits and vegetables. That is, participants answered specific questions capturing
349 personal, descriptive, and injunctive norms, behavioral control, self-efficacy, and perceived
350 environmental effectiveness regarding the purchase of abnormally shaped fruits and
351 vegetables. Finally, participants answered some general questions about their environmental
352 awareness and sociodemographic status.

353

354 Material**355 *Sales outlet awareness***

356 To measure *sales outlet awareness*—that is, the awareness of sales outlets that sell
357 abnormally shaped fruits and vegetables—participants were required to indicate how many
358 local sales outlets that offer abnormally shaped fruits and vegetables they knew about.
359 Participants were given a list of seven local sales outlets that offer abnormally shaped fruits
360 and vegetables and then indicated for each one if they knew it or not (0=*no*, 1=*yes*). Based on
361 this, we computed a variable containing the number of known sales outlets for every
362 participant. A higher number indicates a higher awareness of sales outlets that offer
363 abnormally shaped fruits and vegetables.

364

365 ***Intention***

366 To measure *intention*—that is, the intention to purchase abnormally shaped fruits and
367 vegetables—participants indicated how strongly they intended to buy abnormally shaped
368 fruits and vegetables in the upcoming four weeks. Participants indicated their intention on a 7-
369 point scale (1=*not at all strongly*, 7=*very strongly*).

370

371 ***Purchase behavior and Doers versus Non-Doers***

372 To measure *purchase behavior*—that is, the extent to which participants report to
373 actually purchase abnormally shaped fruits and vegetables—participants were presented with
374 a list of 13 sales outlets that are located in the city and that either sell fruits and vegetables
375 that conform to the current conventional norms (6 sales outlets) or sell abnormally shaped
376 fruits and vegetables (7 sales outlets). The participants indicated for every sales outlet whether
377 they purchase food from this outlet (0=*no*, 1=*yes*). Based on participants' answers, we
378 computed the *purchase behavior* variable. In particular, this variable contained the number of
379 known sales outlets for every participant.

380 Based on the *purchase behavior* variable, we computed a *Doer* versus *Non-Doer*
381 variable—that is, a binary variable to differentiate between people that do and people that do
382 not purchase abnormally shaped fruits and vegetables. Participants who indicated that they
383 purchased from any platform that sells abnormally shaped fruits and vegetables were coded as
384 *Doers*. On the contrary, participants who indicated that they did not purchase from any
385 platform that sells abnormally shaped fruits and vegetables were coded as *Non-Doers*
386 (0=*Non-Doers*, 1=*Doers*).

387 Note that we only measured whether participants purchase from any of these sales
388 outlets and not the frequency with which they visit these. Consequently, we coded their self-
389 reports into a dichotomous variable, *not* a continuous form, that reflects the degree to which
390 participants are (*Non-*)*Doers*.

391

392 ***Personal norm***

393 To measure *personal norm*—that is, one’s individual expectation of how to behave in
394 a certain situation, which the individual experiences as a feeling of moral obligation—
395 participants were required to estimate how well purchasing abnormally shaped fruits and
396 vegetables complied with their personal principles (see Visschers et al., 2016). Participants
397 indicated their personal norm on a 7-point scale (1=*not at all*, 7=*very much*).

398 Note that it was important to measure our constructs of interest—namely, personal
399 norm, descriptive norm, injunctive norm, behavioral control, self-efficacy, and perceived
400 environmental effectiveness—specific to the purchase of abnormally shaped fruits and
401 vegetables. Therefore, we have formulated the items to capture the constructs of interest with
402 focus on purchasing abnormally shaped fruits and vegetables. To prevent respondent fatigue,
403 we used single (vs. multiple) items for the constructs of interest.

404

405 ***Descriptive norm***

406 To measure *descriptive norm*—that is, one’s perception of how frequently others show
407 a certain behavior—participants were required to indicate how many of their close others
408 (e.g., friends) purchased abnormally shaped fruits and vegetables. Participants indicated the
409 descriptive norm on a 7-point scale (1=*nobody*, 7=*everybody*).

410

411 ***Injunctive norm***

412 To measure *injunctive norm*—that is, one’s perception of what others think people
413 should do—participants were required to indicate how their close friends thought about their
414 purchasing abnormally shaped fruits and vegetables. Participants indicated the injunctive
415 norm on a 7-point scale (1=*very bad*, 7=*very good*).

416

417 Behavioral control

418 To measure *behavioral control*—that is, one’s perception of the ease or difficulty of
419 doing a certain behavior—participants were asked to indicate how much control they had over
420 purchasing abnormally shaped fruits and vegetables given their situation (e.g., family, job).
421 Participants indicated their behavioral control on a 7-point scale (1=*no control at all*, 7=*a lot*
422 *of control*).

423

424 Self-efficacy

425 To measure *self-efficacy*—that is, one’s perception of their own ability to do a certain
426 behavior—participants were asked to indicate how difficult or easy they found it to purchase
427 abnormally shaped fruits and vegetables. Participants indicated self-efficacy on a 7-point
428 scale (1=*very difficult*, 7=*very easy*).

429

430 Environmental awareness

431 To measure *environmental awareness*—that is, one’s awareness of the environment and
432 how human behavior affects it—participants filled in a six-item scale (e.g., “I would describe
433 myself as environmentally responsible”). Participants indicated their environmental awareness
434 on a 7-point scale (1=*do not at all agree*, 7=*fully agree*; $\alpha=.87$). For the analysis, we computed
435 the mean score of the six items for every participant (Haws et al., 2014).

436

437 Perceived environmental effectiveness

438 To measure *perceived environmental effectiveness*—that is, one’s perception of the
439 (relative) benefit of a certain behavior at addressing environmental problems—participants
440 indicated how effective they perceived buying abnormally shaped fruits and vegetables to be
441 in tackling food waste consequences. Participants indicated perceived environmental
442 effectiveness on a 7-point scale (1=*not at all effective*, 7=*very effective*).

443

444 **Purchase preferences of *Doers* and *Non-Doers***

445 To examine how *Doers* and *Non-Doers* differ in their purchase preferences of fruits
446 and vegetables, participants filled in 14 items. We constructed these items to capture the
447 variety of preferences that typically occur during the process of purchasing fruits and
448 vegetables, e.g. concerning the properties of the products themselves, as well as their outlets.
449 Specifically, we asked them to rate how important the following aspects are to them, on a 7-
450 point scale (1=*not important at all*, 7=*very important*): (1) appearance of the fruits and
451 vegetables, (2) large variety, (3) freshness, (4) full shelves at all times, (5) in sales, (6) longest
452 possible shelf life, (7) low price, (8) organic production, (9) practical for processing, (10)
453 quality, (11) regionality, (12) seasonality, (13) social/ecological sustainability, and (14) taste.

454

455

Results

456 To test whether and to what extent the suggested psychological determinants predict
457 *sales outlet awareness, intention, and purchase behavior*, we performed three regression
458 analyses. Namely, we computed multiple regressions with *sales outlet awareness, intention,*
459 *or purchase behavior* as our response variable. As predictors we used *personal norm,*
460 *descriptive norm, injunctive norm, behavioral control, self-efficacy, environmental*
461 *awareness, and perceived environmental effectiveness* (see Table 2 for an overview). Note
462 that after acceptance of this manuscript all our data and code will be publicly available on the
463 open access repository [figshare](#).

464

465 **Environmental awareness, personal norms, and age predict sales outlet awareness**

466 The results show that participants were more likely to know sales outlets that offer
467 abnormally shaped fruits and vegetables (*sales outlet awareness*) if they were concerned
468 about the environment (*environmental awareness, B=0.38*), had a personal principle to

469 purchase abnormally shaped fruits and vegetables (*personal norm*, $B=0.18$), and were young
470 (*age*, $B=-0.02$).

471

472 **Personal and descriptive norms, behavioral control, self-efficacy, environmental**
473 **awareness, perceived environmental effectiveness, and gender predict intention**

474 Participants were more likely to intend to purchase abnormally shaped fruits and
475 vegetables (*intention*) if they had a personal principle to purchase them (*personal norm*,
476 $B=0.40$), were female (*sex*, $B=0.36$), were concerned about the environment (*environmental*
477 *awareness*, $B=0.22$), found it easy to purchase abnormally shaped fruits and vegetables (*self-*
478 *efficacy*, $B=0.14$), had friends that purchased them (*descriptive norms*, $B=0.13$), perceived
479 purchasing them as a measure against food waste (*perceived environmental effectiveness*,
480 $B=0.10$), and had control over the purchase of abnormally shaped fruits and vegetables
481 (*behavioral control*, $B=0.09$).

482

483 **Personal norm, behavioral control, environmental awareness, age, and gender predict**
484 **self-reported purchase behavior**

485 Participants were more likely to purchase abnormally shaped fruits and vegetables
486 (*behavior*) if they were female (*gender*, $B=0.91$), concerned about the environment
487 (*environmental awareness*, $B=0.59$), had a personal principle to purchase abnormally shaped
488 fruits and vegetables (*personal norm*, $B=0.44$), had control over purchasing them (*behavioral*
489 *control*, $B=0.33$), and were young (*age*, $B=-0.02$).

490 **Table 2**491 **Overview of the multiple regressions for *Sales Outlet Awareness, Intention and Behavior***

	Sales Outlet Awareness ^a						Intention ^b						Behavior ^c					
	<i>B</i>	zero-order	<i>SE</i>	<i>T</i>	95% CI [LL, UL]	<i>p</i>	<i>B</i>	zero-order	<i>SE</i>	<i>t</i>	95% CI [LL, UL]	<i>p</i>	<i>B</i>	zero-order	<i>SE</i>	<i>z</i>	95% CI [LL, UL]	<i>p</i>
(Intercept)	-1.41		0.56	-2.53	[-2.59, -0.18]	<.05	-1.37		0.43	3.16	[-2.17, -0.48]	<.01	-9.16		1.33	-6.91	[-11.86, -6.65]	<.001
Personal norm	0.18	0.29	0.08	2.35	[0.05, 0.32]	<.05	0.40	0.51	0.06	6.84	[0.27, 0.53]	<.001	0.44	0.27	0.17	2.63	[0.12, 0.77]	<.01
Descriptive norm	-0.00	0.10	0.04	-0.11	[-0.09, 0.08]	0.916	0.13	0.35	0.03	3.99	[0.06, 0.19]	<.001	-0.05	0.08	0.08	-0.61	[-0.21, 0.11]	0.541
Injunctive norm	-0.00	0.12	0.05	-0.01	[-0.12, 0.11]	0.992	0.02	0.28	0.04	0.58	[-0.06, 0.10]	0.562	-0.01	0.11	0.10	-0.11	[-0.21, 0.19]	0.916
Behavioral control	0.06	0.17	0.04	1.52	[-0.01, 0.14]	0.129	0.09	0.31	0.03	2.91	[0.02, 0.17]	<.01	0.33	0.25	0.09	3.73	[0.16, 0.51]	<.001
Self-efficacy	0.05	0.17	0.04	1.23	[-0.03, 0.13]	0.221	0.14	0.35	0.03	4.22	[0.07, 0.21]	<.001	0.02	0.17	0.08	0.27	[-0.13, 0.17]	0.791
Environmental awareness	0.38	0.34	0.08	4.98	[0.24, 0.52]	<.001	0.22	0.43	0.06	3.66	[0.08, 0.36]	<.001	0.59	0.31	0.16	3.65	[0.28, 0.91]	<.001
Perceived environmental effectiveness	-0.03	0.12	0.06	-0.49	[-0.17, 0.09]	0.625	0.10	0.29	0.05	2.05	[0.01, 0.21]	<.05	-0.04	0.12	0.13	-0.35	[-0.29, 0.21]	0.729
Age	-0.02	-0.20	0.00	-4.90	[-0.03, -0.01]	<.001	-0.00	-0.03	0.00	-0.31	[-0.01, 0.01]	0.755	-0.02	-0.10	0.01	-2.28	[-0.04, -0.00]	<.05
Gender ^d	0.26	0.15	0.14	1.88	[-0.03, 0.54]	0.060	0.36	0.26	0.11	3.34	[0.15, 0.58]	<.001	0.91	0.20	0.29	3.14	[0.36, 1.50]	<.01

492

493 Note that all the variance inflation factors (VIFs) are < 2 (hence there is no problem with multicollinearity). Further significant B and zero-order
 494 correlations are bold ($p < .05$).

495 ^a $F(9, 460)=12.33, p < .001$, adjusted $R^2=0.18$

496 ^b $F(9, 459)=39.32, p < .001$, adjusted $R^2=0.42$

497 ^c $McFadden R^2=0.16$

498 ^dNote that we collapsed the gender variable into a binary variable as only two respondents have indicated to be non-binary (1=m, 2=f).

499

500

501

502 Differences between *Doers* and *Non-Doers*

503 To test whether and to what extent *Doers* and *Non-Doers* differ in terms of 14
504 (different) preferences (e.g., large variety, low price, and freshness) that typically occur
505 during the process of purchasing fruits and vegetables, we conducted t-tests. An overview of
506 the results is provided in Table 3.

507 *Doers* compared to *Non-Doers* considered the following aspects as less important: full
508 shelves at all times, appearance of the fruits and vegetables, freshness, longest possible shelf
509 life, and large variety of fruits and vegetables. Further, *Doers* compared to *Non-Doers*
510 considered the following aspects as more important: Regionality, organic production, social
511 and ecological sustainability, seasonality and low price.

512 Note that while there were 181 *Doers*, there were 289 *Non-Doers*. In terms of
513 demographics, *Doers* differed from *Non-Doers* with regards to gender and age. *Doers*
514 compared to *Non-Doers* were more likely to be female ($p < .001$) and were younger ($p < .05$).
515 Contrary, *Doers* and *Non-Doers* did not differ in regard of their educational level ($p = .137$),
516 household size ($p = .293$), and salary ($p = .117$).

517 We conducted separate t-tests with correction for multiple comparisons and not a
518 multivariate analysis of variance because our primary interest was in how certain preferences
519 distinguish *Doer* from *Non-Doer*. In fact, our aim was to provide an explorative, fine-grained
520 picture of the differences between *Doers* and *Non-Doers* regarding their situational
521 preferences for fruits and vegetables. A multivariate analysis of variance would mainly help
522 to reveal if *Doers* and *Non-Doers* differ at all and with regard to the sum of all their
523 preferences. Further, we emphasize that our analysis is fairly “pragmatic.” Based on
524 participants’ answers, we computed the *Doer* vs. *Non-Doer* variable that indicates whether or
525 not a participant purchases from any sales outlet that sells abnormally shaped fruits and
526 vegetables. Because we did not ask participants to indicate the frequency with which they
527 visit these sales outlets, we cannot compute a variable that reliably (and in a continuous form)

528 reflects the degree to which participants are (*Non-*)*Doers*. Therefore, we cannot conduct a
529 more informative, that is, continuous-like, analysis.

530 **Table 3**531 **Overview of differences in preferences between *Doers* and *Non-Doers***

532

<i>Predictor</i>	Non-Doers (<i>N</i> =289, 61%)		Doers (<i>N</i> =181, 39%)		<i>t</i>	95% CI [LL, UL]	<i>d</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Appearance of the fruits and vegetables	3.98	1.57	3.05	1.38	6.73	[0.66, 1.20]	0.62	<.001
Large variety	4.47	1.41	4.07	1.25	3.21	[0.15, 0.64]	0.30	<.01
Freshness	5.93	0.88	5.70	0.91	2.73	[0.07, 0.40]	0.26	<.01
Full shelves at all times	2.49	1.31	2.12	1.15	3.29	[0.15, 0.61]	0.30	<.01
In sales	3.59	1.51	3.46	1.42	0.92	[-0.14, 0.40]	0.09	0.358
Longest possible shelf life	4.33	1.52	3.83	1.41	3.63	[0.23, 0.77]	0.34	<.001
Low price	3.87	1.39	4.11	1.21	-1.99	[-0.48, -0.00]	0.18	<.05
Organic production	5.24	1.54	5.50	1.25	-1.99	[-0.51, -0.00]	0.18	<.05
Practical for processing	3.20	1.74	2.91	1.54	1.90	[-0.01, 0.59]	0.17	0.058
Quality	5.99	0.84	5.90	0.93	1.12	[-0.07, 0.26]	0.11	0.264
Regionality	5.94	1.05	6.27	0.79	-3.85	[-0.49, -0.16]	0.34	<.001
Seasonality	5.94	1.08	6.32	0.82	-4.32	[-0.55, -0.21]	0.38	<.001
Social/ecological sustainability	5.73	1.08	6.14	0.83	-4.73	[-0.59, -0.24]	0.42	<.001
Taste	6.27	0.76	6.36	0.69	-1.34	[-0.22, 0.04]	0.12	0.182

533

534 *Note.* Differences in the importance of the 14 aspects that are typically of relevance when buying fruits and vegetables. Bold correlations are also
 535 significant after using the Benjamini–Hochberg procedure with a 10% false discovery rate.

536

Discussion

537 The goals of this research were to first identify the psychological factors that determine the
538 purchase of abnormally shaped fruits and vegetables to reduce food waste and second to
539 conduct a detailed analysis of the differences between people that purchase abnormally
540 shaped fruits and vegetables—i.e., *Doers*—and people that do *not* purchase such fruits and
541 vegetables—i.e., *Non-Doers*. Regarding the first goal, the data from our survey revealed that
542 *personal norms* and *environmental awareness* are relatively strong predictors for (1) the
543 awareness of sales outlets of abnormally shaped fruits and vegetables and (2) the purchase
544 intention and (3) self-reported purchases of abnormally shaped fruits and vegetables.
545 Regarding the second goal, our data revealed that while the *appearance, freshness, large*
546 *variety, full shelves at all times* and *shelf life* of the fruits and vegetables in a sales outlet have
547 higher priority for *Non-Doers* than for *Doers*, *Doers* (vs. *Non-Doers*) give more weight to
548 *regionality, seasonality* and *social and ecological sustainability* when purchasing fruits and
549 vegetables. In the following, we discuss the theoretical and practical contributions, limitations
550 as well as future research avenues of our research.

551

Theoretical contributions

553 In reference to general food waste and behavioral change (intervention) literature, this
554 research has improved the understanding of drivers of (not) purchasing abnormally shaped
555 fruits and vegetables. In fact, there is evidence that environmental awareness and personal
556 norms predict the awareness of sales outlets of abnormally shaped fruits and vegetables as
557 well as the purchase intention and the reported actual purchase behavior of consumers
558 regarding abnormally shaped fruits and vegetables. This is in line with previous research. It
559 has been found, for instance, that one's awareness of the environmental consequences of food
560 waste predicts the intention to purchase abnormally shaped fruits and vegetables (Loebnitz et

561 al., 2015). Further, there is evidence that personal norms, that is, one's personal principles,
562 predict food waste related behaviors such as reducing plate waste (Visschers et al., 2020).

563 While environmental awareness and personal norms were related to purchase intention
564 as well as to self-reported actual purchases, there were also psychological factors—
565 descriptive norms, self-efficacy, and perceived environmental effectiveness—that were
566 associated with the purchase intention but not with the self-reported actual purchase behavior.
567 This emphasizes that when trying to understand the motivation behind actually purchasing
568 abnormally shaped fruits and vegetables, it is important to focus on behavior and not on
569 intention. This seems in line with previous research suggesting that the understanding of how
570 people develop the intention to do a specific behavior is not enough to explain why people
571 actually show the behavior (Armitage & Conner, 2001). Explaining a behavioral intention
572 corresponds only to early volitional phases and not to the entire process of a behavior change
573 (Bamberg, 2013).

574 Besides a systematic analysis of theory-driven psychological drivers of (not)
575 purchasing abnormally shaped fruits and vegetables, this research contributes an analysis of
576 situational aspects as drivers of (not) purchasing abnormally shaped fruits and vegetables. Our
577 *Doers vs. Non-Doers* analysis revealed that people that *do* purchase abnormally shaped fruits
578 and vegetables and people that *do not* purchase such fruits and vegetables are driven by
579 different situational aspects during their purchases. Most pronounced, *Non-Doers* (vs. *Doers*)
580 attach more importance to the appearance of fruits and vegetables. Regarding this relative
581 importance of the appearance of fruits and vegetables, it is relevant to refer to existing
582 research demonstrating that people's subjective perception of the appearance of food
583 determines purchase decisions (Eldesouky et al., 2015; Jaeger et al., 2018). Although the
584 appearance aspect is the most pronounced difference between *Non-Doers* and *Doers*, *Non-*
585 *Doers* and *Doers* also differ in other situational aspects. While *Non-Doers* fancy convenience
586 aspects such as freshness, large variety, full shelves at all times and a long shelf life of the

587 fruits and vegetables in a sales outlet, *Doers* give more weight to pro-environmental aspects
588 such as regionality, seasonality and social and ecological sustainability. This different
589 weighing of convenience and pro-environmental aspects is likely to be driven by the different
590 importance that *Non-Doers* and *Doers* give to the environment.

591

592 **Practical contributions**

593 The findings of the present research have two important implications for the practice.
594 First, the findings emphasize the importance to target environmental awareness and personal
595 norms. Second, the findings highlight the importance to focus on situational aspects, namely
596 the perception of the appearance of abnormally shaped fruits and vegetables.

597

598 *Fostering environmental awareness and personal norms seems promising*

599 The present results suggest that one effective approach to foster the consumption of
600 abnormally shaped fruits and vegetables is to target environmental awareness and personal
601 norms. Therefore, interventions that foster these two psychological factors seem promising.
602 Interventions targeting environmental awareness sensitize people to ecological consequences
603 of wasting abnormally shaped fruits and vegetables. Interventions targeting personal norms
604 foster people's personal standards that come into action when purchasing fruits and
605 vegetables, namely one's feelings of responsibility for negative consequences of exclusively
606 consuming fruits and vegetables that comply to conventional norms (Schwartz, 1973, 1977).

607

608 *The need to change Non-Doers' perception of the appearance of fruits and vegetables*

609 The finding that the most pronounced situational difference between *Non-Doers* and
610 *Doers* is that *Non-Doers* attach more importance to the appearance of fruits and vegetables
611 highlights the need to change the evaluation of the appearance for *Non-Doers*. Having said
612 this, it follows that altering the perception of the appearance of fruits and vegetables is

613 pivotal. Although speculative, it seems possible that the fact that authenticity messages foster
614 the purchases of abnormally shaped fruits and vegetables is driven by a shift in the perception
615 of the appearance. A message focusing on authenticity is thought to activate associative
616 concepts such as “naturalness” and “home-made.” This could not only reduce the importance
617 of conventional norms (e.g., no scabs and standard size) but also increase the acceptance of
618 more diversity in terms of appearance such as scabs and shapes (van Giesen & de Hooze,
619 2019).

620

621 **Limitations and research outlook**

622 Overall, our research is a first step in direction of a better understanding of drivers of
623 (not) purchasing abnormally shaped fruits and vegetables. Yet, future research needs to
624 continue to examine psychological determinants of (not) purchasing abnormally shaped fruits
625 and vegetables, as well as its potential cultural differences. Further, we encourage researchers
626 to examine the relationship between the numerous psychological determinants that we have
627 investigated, and thereby identify psychological mechanisms that lead to an alteration in
628 purchasing behavior. Given the limitation that we did not measure actual behavior in this
629 research, future research should consider measuring actual (and not self-reported) behavior,
630 for example, in the form of observations to mitigate any discrepancy between self-reported
631 and actual behaviors. Given the additional limitation that the present research relies on
632 correlational rather than on experimental data, future research also should look at the causal
633 relationship between actual purchase behavior and environmental awareness, personal norms
634 and situational aspects such as the perception of the appearance of abnormally shaped fruits
635 and vegetables (see e.g., Otterbring et al., 2020).

636

637 *Test interventions targeting environmental awareness and personal norms*

638 Specific intervention types to foster environmental awareness and personal norms are
639 promoting messages and/or events. We encourage future research to test and compare
640 different messages addressing environmental awareness and personal norms. This can be
641 done, for example, by campaigns or events (e.g. “zero waste week”, ‘sustainability week’)
642 that sensitize people to the environmental consequences of only consuming fruits and
643 vegetables that comply to conventional norms, and the positive effects of consuming
644 abnormally shaped fruits and vegetables. Although the present research suggests that
645 messages and/or events fostering environmental awareness and personal norms are relatively
646 effective in motivating people to buy abnormally shaped fruits and vegetables, only
647 experimental testing will be able to provide the necessary causal evidence of the proposed
648 interventions.

649

650 *Test interventions targeting situational aspects that are important for Non-Doers*

651 Although the appearance aspect seems particularly important, there are also other
652 situational aspects that seem promising to address with interventions. In fact, it seems that
653 reducing the importance of convenience aspects such as freshness, large variety, full shelves
654 at all times and a long shelf life could lead *Non-Doers* to be more motivated to purchase
655 abnormally shaped fruits and vegetables. The present results imply that one way to do this
656 could be to increase *Non-Doers*’ environmental awareness and thereby increase the weight
657 that they give to situational aspects such as regionality, seasonality and social and ecological
658 sustainability.

659

660 **Conclusion**

661 This research revealed that personal norms and environmental awareness are
662 particularly good predictors of the awareness of sales outlets of abnormally shaped fruits and
663 vegetables as well as the intention to and reported actual purchase of abnormally shaped fruits

664 and vegetables. Further, this research showed that *Doers* (vs. *Non-Doers*) attach less
665 importance to the appearance, freshness and shelf life, but attach more importance to the
666 regionality, seasonality and sustainability when purchasing fruits and vegetables. This
667 research has theoretical as well as practical implications. Most importantly, it can be used as
668 the basis for the design of effective interventions to foster the consumption of abnormally
669 shaped fruits and vegetables to reduce food waste.

670

671

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