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# Relationships between functional food consumption and individual traits and values: A segmentation approach

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ABSTRACT

This study aimed to identify, describe, and compare consumer segments based on food- and health-related values and traits and how the segments are related to functional food consumption. A hybrid hierarchical k-means clustering approach was used to identify homogeneous consumer segments based on food innovativeness, food self-control, hedonic eating values, convenience orientation, health importance, and weight management concern. Based on a representative sample in Norway, three consumer segments were identified: the *careless*, the *self-controlled*, and the *convenience-oriented*. The careless were uninterested in food and health matters and did not appreciate novelty or variation in their food choices. The self-controlled were the most receptive to novelty and food innovation and highly engaged in health matters. The convenience-oriented were the most inclined to consume functional foods, had a pronounced convenience orientation, and were concerned about weight gain. How the industry needs to adapt its marketing strategy across consumer segments are discussed.

## 1. Introduction

The term functional foods encompasses both natural and industrially processed foods, which "when regularly consumed within a diverse diet at efficacious levels have potentially positive effects on health beyond basic nutrition" (Granato et al., 2020, p. 94). Therefore, functional foods promote optimal health and reduce the risk of noncommunicable diseases (Granato, Nunes, & Barba, 2017). Several recent reviews (Bimbo et al., 2017; Kaur & Singh, 2017; Mogendi, De Steur, Gellynck, & Makokha, 2016; Santeramo et al., 2018; Topolska, Florkiewicz, & Filipiak-Florkiewicz, 2021) attest to health, convenience, and sensory appeal (i.e., taste/flavor) being key motivational attributes or underlying antecedents influencing functional food consumption behavior in addition to psychological or cognitive antecedents, such as attitude, perceptions, and beliefs. In fact, the success of functional food revolves largely around the proper combination of health, convenience, and taste (Gray, Armstrong, & Farley, 2003), as consumers place great importance on eating healthy, saving time and energy, and indulging in pleasurable food consumption (Vorage, Wiseman, Graca, & Harris, 2020). Furthermore, personal values or more stable personality traits also influence consumers' acceptance or consumption of functional foods (Bimbo et al., 2017; Santeramo et al., 2018).

Research findings are, however, contradictory, and a deeper knowledge about what influences consumption is crucial to successfully drive the development of new products within the functional food category (Alongi & Anese, 2021). According to social cognition models, such as the theory of planned behavior (TPB; Ajzen, 1991) and self-determination theory (SDT; Deci & Ryan, 1985), or the cognitive hierarchy model (Homer & Kahle, 1988), values and traits influence behavioral tendencies indirectly through more proximal beliefs, perceptions, and attitudes in a trait/value–attitude–behavior causal chain (Ajzen, Fishbein, Lohmann, & Albarracín, 2018; Hagger & Chatzisarantis, 2009). Guided by this causal assumption, this study employs a person-centered approach (Howard & Hoffman, 2018) to identify and explore consumer profiles or segments based on theoretically derived personality traits and personal values and to profile the segments by their attitudes, intentions, and consumption of functional food.

Segmentation is an essential part of marketing (Wedel & Kamakura, 2000). An advantage of the person-centered segmentation approach is that it considers the many different combinations of theoretical constructs or variables (e.g., traits and values) that make up an individual, and it tries to understand and describe how subgroups of individuals sharing similar combinations are associated with focal outcome constructs or variables (Howard & Hoffman, 2018). For example,

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personality traits and values can be defined and measured with varying degrees of abstraction, content, and conceptual specification. The relationship between broad or more general personality traits, such as the Big Five (John & Srivastava, 1999; McCrae & Costa, 1997) or universal human values (Bilsky & Schwartz, 1994; Rokeach, 1973), and specific behavior is weak (e.g., Homer & Kahle, 1988; Kassarjian, 1971; Lunn, Nowson, Worsley, & Torres, 2014). The large conceptual distance between general personality traits or personal values and a particular behavioral domain, such as functional food consumption, thus calls for research to identify and apply theoretically and empirically relevant traits and values to achieve a more reliable and valid understanding of consumer attitudes and behavioral tendencies toward the consumption of functional food.

Our contributions to the literature are fourfold. First, we extend the existing literature by introducing domain-specific conceptualizations of trait self-control (Tangney, Baumeister, & Boone, 2004) and consumer innovativeness (Goldsmith & Hofacker, 1991) as bases for segmentation. Previous work has identified self-control (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Stautz, Zupan, Field, & Marteau, 2018) and domain-specific innovativeness (Araujo, Ladeira, & Santini, 2016; Huotilainen, Pirttilä-Backman, & Tuorila, 2006) as important antecedents to food consumption behavior, but to our knowledge, no study of which we are aware has identified a segment of food-specific self-controllers as suggested in the current research. Second, building upon theories about domain-specific values (Vinson, Scott, & Lamont, 1977), this study extends the previous literature by introducing and combining important antecedents such as convenience orientation (Candel, 2001), hedonic eating value (Babin, Darden, & Griffin, 1994; Voss, Spangenberg, & Grohmann, 2003), and health importance (Steptoe, Pollard, & Wardle, 1995; Tudoran, Olsen, & Dopico, 2009) as bases for segmentation. Findings support the general notion that health and hedonism (or sensory appeal) rank as top priorities in consumers' minds (for a review, see Cunha, Cabral, Moura, & de Almeida, 2018) and provide empirical evidence suggesting that the combination of being convenience oriented, concerned about weight gain, and having a low level of self-control is characteristic of consumers with a higher propensity to consume functional food.

Third, the present study advances a person-centered segmentation approach (Howard & Hoffman, 2018) to identify and explore homogeneous consumer segments by integrating and combining more stable personality traits with more dynamic, context-specific personal values in profiling consumer attitudes toward, intention to consume, and consumption of functional food. Finally, most of the previous segmentation studies regarding functional food include smaller, nonrepresentative samples (e.g., Annunziata & Pascale, 2009; Ares & Gámbaro, 2007; van der Zanden, van Kleef, de Wijk, & van Trijp, 2015) or apply factor-clustering techniques (Brečić, Mesić, & Cerjak, 2017; Szakály, Szente, Kövér, Polereczki, & Szigeti, 2012) (for a critical account of factor clustering, see Dolnicar & Grün, 2008). Insufficient sample size and other data-quality issues can influence the validity of segmentation solutions and thereby misguide the practical implications for commercial purposes (Dolnicar & Grün, 2017; Dolnicar, Grün, & Leisch, 2016). The current research employs a nationally representative sample of 810 Norwegian consumers to ascertain valid cluster solutions of appropriate segment sizes and avoids the factor-clustering critique by including all items measuring the theoretical constructs as input in cluster analysis (Dolnicar & Grün, 2008).

To position functional food behaviors in relation to other food behaviors, we also included consumers' consumption of general food categories (e.g., seafood, meat, and chicken) and various specific food categories (e.g., energy drinks, meal replacements, and sweets and snack foods). Functional foods were defined as foods and beverages enriched with minerals, vitamins, fatty acids, or protein for health-promoting or disease-preventing purposes as part of a standard diet and consumed in normal quantities. In the subsequent paragraphs, we introduce individual differences in attitudes and behavioral tendencies toward the consumption of functional food (Section 1.1) and describe how such constructs have been previously used as segmentation bases to profile groups of functional food consumers (Section 1.2), before presenting theoretically sound arguments for why the inclusion of the specific traits and values used as segmentation bases in the present study is relevant (Sections 1.3–1.5).

### 1.1. Exploring differences in attitudes, intention, and consumption of functional foods

Traits and values are causally linked to attitudes, intentions, and behavior (Homer & Kahle, 1988; McCrae & Costa, 1995). Whereas traits are descriptions of behavioral patterns, values are "desirable trans-situational goals, varying in importance, that serve as guiding principles in the life of a person …" (Schwartz, 1994, p. 21). Several consumer studies concerning functional foods explore individual differences in people's attitudes, intentions and/or behavior (see Mogendi et al., 2016; for reviews, see Siró, Kápolna, Kápolna, & Lugasi, 2008). Attitudes represent summary evaluations of psychological objects (Ajzen, 2001). Commonly, attitude is a strong predictor of behavior (Ajzen & Fishbein, 1977) and is associated with behavioral intention to consume a variety of foods (Cook, Kerr, & Moore, 2002; Patch, Tapsell, & Williams, 2005; Verbeke, 2005), including functional foods (Hung, de Kok, & Verbeke, 2016; O'Connor & White, 2010). Intention, in turn, constitutes a motivational force for subsequent behavior (Fishbein & Ajzen, 2010; Sheeran, 2002) that predicts (healthy) eating behavior (Conner, Norman, & Bell, 2002).

Consumer acceptance of functional foods is contingent upon various factors associated with sensory attributes, health claims or benefits, and cognitive, motivational, or attitudinal determinants (Siró et al., 2008). Several studies use the TPB—or factors thereof—to explain or predict attitudes and intention toward, and consumption of functional foods (e.g., Huang, Bai, Zhang, & Gong, 2019; O'Connor & White, 2010). In the context of the present study, attitude refers to the evaluation of *consuming functional foods on a regular basis*, while intention denotes consumers' readiness or motivation to engage in the consumption of functional foods regularly. This study uses a segmentation approach that includes consumers' attitude, intention, and consumption behavior to profile Norwegian consumer segments.

### 1.2. Segmentation of functional food consumers

Segmentation involves identifying and reducing a heterogeneous market into smaller, homogeneous groups of consumers with similar needs and motives (Smith, 1956; Wedel & Kamakura, 2000). A crucial factor in market segmentation is the choice of characteristics—or segmentation bases—on which to base the analysis (Steenkamp & Ter Hofstede, 2002). Several attempts to segment the functional food market have been made using a multitude of different segmentation bases across diverse populations: Ares and Gámbaro (2007) based their segmentation analysis on Uruguayan consumers' food choice motives. Another group of researchers used attitudes, motivation, and knowledge as segmentation bases on a Canadian sample (Herath, Cranfield, & Henson, 2008). Sparke and Menrad (2009) conducted a cross-country segmentation analysis with motives, knowledge, trust in nutrition actors, and purchase patterns as segmentation bases. Annunziata and Pascale (2009) segmented Italian consumers based on their health consciousness, trust in information, and satisfaction. Szakály et al. (2012) applied the FRL approach (Brunsø & Grunert, 1995) to segment Hungarian consumers, whereas van der Zanden et al. (2014, 2015) included food-choice motives, product attributes, and benefits sought as bases to segment elderly consumers. Brečić et al. (2017) based their segmentation analysis on a modified version of the FCQ (Steptoe et al., 1995) using a Croatian sample. Roselli et al. (2020) segmented Italian consumers based on product attributes of extra-virgin olive oil with naturally increased polyphenol content. Finally, Karelakis, Zevgitis, Galanopoulos, and

Mattas (2020) performed several cluster analyses of Greek consumers based on their attitudes toward functional foods and interest in following a healthy diet, among other constructs. The current study is positioned within and extends the cited literature by arguing for the inclusion of domain-specific traits and values as relevant and valuable segmentation bases.

### 1.3. Personality traits and values as segmentation bases

Understanding consumers' underlying consumption motives, values, and goals through psychographic segmentation (i.e., using psychological segmentation bases) adds valuable insights that can be drawn upon for product development, marketing efforts, and behavioral change interventions (Gunter & Furnham, 1992). Several of the previous studies on functional foods cited above integrate traits, values, attitudes, habits, and other motivational or behavioral constructs as bases for segmentation. This study intended to extend the existing literature by integrating and combining stable personality-like traits (e.g., innovativeness and self-control) with more dynamic and context-specific personal values related to food or eating hedonism, health, and convenience—or what people are like vs. what they consider important (Roccas, Sagiv, Schwartz, & Knafo, 2002).

Social psychology theories like the theory of reasoned action (Fishbein & Ajzen, 1975) or the theory of planned behavior (Ajzen, 1991) suggest that traits and values encourage or influence attitudes, intentions, and behavior in a causal chain. However, both personality traits and universal values are relatively stable and transcend specific actions and situations (Kassarjian, 1971; Schwartz & Bilsky, 1987), distinguishing these constructs from attitudes and intentions that usually refer to more specific actions, objects, or situations. Thus, this study does not include attitude, intention, and behavioral constructs as segmentation bases, but rather as profiling variables to discriminate between segments of consumers based on individual differences in traits and values. To achieve stronger trait/value–attitude–consumption relationships (Goldsmith, Freiden, & Eastman, 1995; van Raaij & Verhallen, 1994), we use domain-specific traits (Huotilainen et al., 2006; Stautz et al., 2018; van Trijp & Steenkamp, 1992) and values (Candel, 2001; Lusk & Briggeman, 2009; Steptoe et al., 1995)—previously associated with food choice behavior—as segmentation bases. This study introduces food stimulation and self-control as novel bases for segmentation in combination with more common motives for food consumption (e.g., health importance and hedonism) and functional food consumption (e.g., convenience). In the following, we explain the relevance of including these constructs.

### 1.4. Domain-specific traits: Food stimulation and self-control

Several constructs have been developed to understand individual differences in people's personalities, values, attitudes, and preferences for stimulation: the Big Five factors of personality include one dimension labeled "openness (to experience)" (John & Srivastava, 1999), whereas Schwartz' theory of basic values includes "stimulation" subsumed in the dimension "openness to change" (Schwartz, 2012). Within the context of consumer behavior (toward food), the global concept of optimum stimulation level (OLS), or specifically the concepts of variety-seeking tendency (VST) and consumer innovativeness (CI) have been frequently used owing to their capability to explain or predict specific consumer behavior (Cowart, Fox, & Wilson, 2008; Huotilainen et al., 2006; Kaushik & Rahman, 2014; van Trijp & Steenkamp, 1992). OSL is a stable trait referring to an individual's perceived ideal level of stimulation (Steenkamp & Baumgartner, 1992; van Trijp & Steenkamp, 1992). It is predictive of exploratory tendencies as manifested by "curiosity-motivated behavior, variety seeking, and risk taking" (Steenkamp & Baumgartner, 1992, p. 446), as well as CI (Roehrich, 2004; Steenkamp, Ter Hofstede, & Wedel, 1999).

VST is "the tendency of individuals to seek diversity in their choices of services or goods" (Kahn, 1995, p. 139). In the area of food, consumers demand variety in their diet for hedonic and utilitarian reasons (Baltas, Kokkinaki, & Loukopoulou, 2017). It has been suggested that individuals with strong VST with respect to foods become bored more quickly and are especially receptive to new products but are less inclined to develop loyalty to specific brands or products (van Trijp & Steenkamp, 1992).

CI is defined as "the predisposition to buy new and different products and brands rather than remain with previous choices and consumption patterns" (Steenkamp et al., 1999, p. 56). Reviews (Bartels & Reinders, 2011; Kaushik & Rahman, 2014) have identified three basic dimensions or levels of CI. Among the levels is domain-specific innovativeness, which "reflects the tendency to learn about and adopt new products within a specific domain of interest" (Bartels & Reinders, 2011, p. 604). Meta-analytic evidence points to associations between domain-specific innovativeness and innovation adoption, attitude, behavioral intentions, and product usage (Araujo et al., 2016). Further, research has demonstrated that domain-specific innovativeness is predictive of willingness to try and use new food products, including functional foods (Huotilainen et al., 2006). Both VST and CI are thus relevant concepts in predicting or explaining consumer behavior with respect to foods (Huotilainen et al., 2006; van Trijp & Steenkamp, 1992). We consider VST and CI to be underlying stable traits for behavioral differences and choice and as an integral part of a domain-specific approach to *food innovativeness*. Functional foods belong to a relatively new and ambiguous food category for consumers (Annunziata & Vecchio, 2011; Scrinis, 2008) and hence, it has been suggested to attract attention from food innovators and variety-seekers.

Self-control is highly relevant for explaining or predicting healthy and unhealthy food consumption (de Ridder et al., 2012; Tangney et al., 2004), with both direct and indirect effects on behavior (Hagger, Hankonen, et al., 2019; McCarthy, Collins, Flaherty, & McCarthy, 2017). The concept of self-control entails "the capacity to alter or override dominant response tendencies and to regulate behavior, thoughts, and emotions" (de Ridder et al., 2012). It has been suggested that self-control is a facet of conscientiousness within the Big Five personality framework (Roberts, Chernyshenko, Stark, & Goldberg, 2005; Tangney et al., 2004) and associated with conformity in Schwartz' theory of basic values (Schwartz, 2012). Studies in food consumption tend to conceptualize self-control as "consumers' choice to refrain from hedonic consumption" (Vosgerau, Scopelliti, & Huh, 2020, p. 181). As such, high levels of self-control would imply utilitarian or healthy consumption whereas low levels of self-control would suggest hedonic consumption, although exceptions exist (e.g., Salmon, Fennis, de Ridder, Adriaanse, & De Vet, 2014). We define self-control as the consumers' ability to control and manage their eating habits (Honkanen, Olsen, Verplanken, & Tuu, 2012; Tangney et al., 2004). Individual differences in self-control are related to health-harming consumption behaviors, including consumption of unhealthy foods (for a review, see Stautz et al., 2018). To the authors' knowledge, the only other study investigating associations between trait self-control and functional food consumption is that of Barauskaite et al. (2018). We use self-control as a segmentation basis owing to its ability to conflict with an individual's exploratory behavior (e.g., variety-seeking; OSL) (e.g., Haws & Redden, 2013), and with hedonism, convenience orientation, and health importance, as discussed below.

### 1.5. Domain-specific values: Food hedonism, convenience, and health importance

Core values transcend specific actions and situations (Schwartz, 2012). However, the relationship between universal values and domain-specific decision-making or behavior is complicated and mostly weak (Cieciuch, 2017; Krystallis, Vassallo, & Chryssohoidis, 2012). Thus, several studies find that using domain-specific values is more appropriate for understanding whether and how values are related to specific (food) behavior (e.g., Hansen, Sørensen, & Eriksen, 2018). Domain-

specific values are acquired through "experiences in specific situations or domains of activity" (Vinson et al., 1977, p. 45). Hedonism (e.g., regarding taste), convenience, and health are probably the most salient values underlying food choices (e.g., Markovina et al., 2015; Vorage et al., 2020)—including the choice to consume functional foods (e.g., Kraus, 2015; Urala & Lähteenmäki, 2003)—and are therefore considered in this study.

Hedonism or hedonic consumption involves pleasure and emotional arousal (Alba & Williams, 2013; Hirschman & Holbrook, 1982). Consumers are drawn to the pleasurable sensory attributes of foods (Lusk & Briggeman, 2009), and good taste is a particularly important motive behind food choices (Honkanen & Frewer, 2009; Januszewska, Pieniak, & Verbeke, 2011; Markovina et al., 2015), including functional foods (Urala & Lähteenmäki, 2003; Verbeke, 2006). The current study defined hedonic eating value as the importance consumers attach to the sensory aspects of and the pleasure involved in food consumption. It has been suggested that hedonic-oriented consumers are more open to new experiences (Guido, 2006), seek variety (Olsen, Tudoran, Honkanen, & Verplanken, 2016), and have less self-control (Horwath, Hagmann, & Hartmann, 2020; Vosgerau et al., 2020).

Aside from hedonic eating value, consumers are increasingly concerned about convenience—a huge trend in the food industry (Bleiel, 2010). Convenience orientation with respect to food choices and consumption is "the degree to which a consumer is inclined to save time and energy as regards meal preparation" (Candel, 2001, p. 17). Functional foods promote healthy convenience (Dixon, Hinde, & Banwell, 2006) and "can make the desire for healthy eating and the desire for convenience compatible" (Grunert, 2010, p. 168). However, the association between convenience orientation and functional food behavior is inconsistent (Brečić, Gorton, & Barjolle, 2014; Vorage et al., 2020). The present study regarded convenience orientation as representing consumers' inclination toward saving time and energy in planning, buying, preparing, and consuming foods. Previous studies suggest that convenience orientation is positively associated with hedonism or sensory appeal (Fotopoulos, Krystallis, Vassallo, & Pagiaslis, 2009; Pula, Parks, & Ross, 2014).

The link between diet and health is becoming ever more evident (Domínguez Díaz, Fernández-Ruiz, & Cámara, 2020). Healthfulness is one among several dimensions of food quality and food choices in consumers' minds (Grunert, 2010; Pollard, Steptoe, & Wardle, 1998; Steptoe et al., 1995). Health-related motives or values are also associated with functional food behavior (Brečić et al., 2014; Pappalardo & Lusk, 2016; Vorage et al., 2020) and health motivation is a significant predictor of willingness to buy functional foods (Hauser, Nussbeck, & Jonas, 2013; Siegrist, Shi, Giusto, & Hartmann, 2015). To capture consumers' health-related eating values, the current study targeted three dimensions related to health: importance of health, importance of healthy food, and weight management concern. Health importance refers to the extent that individuals value their health in general, whereas healthy food importance represents the importance of eating healthily. Weight management concern is the degree to which food choices are influenced by concerns about increasing body weight. It has been suggested that consumers engaged in health-promoting behaviors, such as healthy eating, exercise higher levels of self-control (de Ridder et al., 2012; Hagger, Gucciardi, et al., 2019; Hankonen, Kinnunen, Absetz, & Jallinoja, 2013). Health importance is also negatively associated with convenience orientation (Hauser et al., 2013).

## 2. Materials and methods

### 2.1. Sample and procedure

A large sample (N = 810) of the Norwegian adult population—representative of sex, age, and region—was surveyed in January 2019. Respondents were randomly selected from a pool of pre-recruited members of YouGov, a reputed research agency. Respondents were aged from 18 to 74, 49% were male, 28% had one to three years of university education, and 26% had four or more years of higher or university education. Participants completed an online survey using computer-assisted web interviewing (CAWI) that measured food-related values and traits, attitudes toward eating functional foods, intentions to consume functional foods, and consumption frequency of various foods. The definition of functional foods as introduced in *1. Introduction* was presented to participants at the very beginning of the survey. Examples of common functional foods found in the Norwegian market were also given (e.g., vitamin D-enriched milk and other dairy products). Table 1 provides socio-demographic characteristics of the sample.

### 2.2. Measures

#### 2.2.1. Segmentation variables

Food innovativeness was measured with a scale composed of seven items adapted from Goldsmith and Hofacker (1991), van Trijp and Steenkamp (1992), and Steenkamp and Baumgartner (1995). The items were "I eat new foods before other people do," "Compared to my friends, I eat more new foods," "I think it is fun to try out food items one is not familiar with," "I prefer to eat food products I am used to," "I am curious about food products I am not familiar with," "I like to experience novelty and change in my daily eating routine," and "I am continually seeking new food ideas and experiences."

Food self-control was assessed with five items adapted from Honkanen et al. (2012) and Tangney et al. (2004): "I have a hard time breaking bad food habits," "I wish I had more self-discipline when it comes to what I eat," "Sometimes I can't stop myself from eating unhealthy food, even if I know it's wrong," "I have trouble with controlling how much I am eating," and "I resist foods that are bad for my health."

Hedonic eating value was measured with five items from Olsen and Tuu (2017) adaptation of the items from Babin et al. (1994). Respondents were asked to evaluate the following five items following the stem "It is important to me that the foods I eat…": "…help me escape from my daily routines," "…are fun to eat," "…provide me with good sensory feelings (good taste, smell, appearance, appeal)," "…are enjoyable to eat," and "…give me exciting feelings when eating."

Convenience orientation was measured with five items: three items from the convenience sub-scale of Steptoe et al. (1995), one item from Olsen, Scholderer, Brunsø, and Verbeke (2007) modified version of Candel (2001) convenience orientation scale, and one item adapted from Voss et al. (2003). Respondents were asked to evaluate five items following the stem "It is important to me that the foods I eat…" The items were: "…are easy to prepare," "…take no time to prepare," "…are easily available in shops and supermarkets," "…are easy to plan, buy (procure), prepare, and cook," and "…are effective to eat."

Health importance was measured with three items adapted from Tudoran et al. (2009) ("It means a lot to me to have a good health," "Good health is important to me," and "I often think about my health"). To measure healthy food importance, three items from Tudoran et al.

**Table 1**
Socio-demographic characteristics ($N = 810$).

| Variables | Per cent | Variables | Per cent |
|---|---|---|---|
| *Gender* | | *Highest education level* | |
| Male | 49.4 | Primary and lower secondary school | 7.8 |
| Female | 50.6 | Upper secondary school | 37.8 |
| *Age* | | University or university college (1–3 years) | 28.4 |
| Under 30 years | 20.0 | University or university college (4 years or more) | 26.0 |
| 30–39 years | 21.1 | *Number of children living at home* | |
| 40–49 years | 19.0 | 0 | 71.9 |
| 50–59 years | 18.6 | 1 | 12.5 |
| Over 60 years | 21.2 | 2 or more | 15.7 |

(2009) and Olsen (2003) were used: "I think of myself as a person who is concerned about healthy food," "Healthy food is important to me," and "Eating healthy food means a lot to me." Finally, two items from Olsen and Tuu (2017) were used to assess weight management concern: "It is important to me that the foods I eat…": 1) "…help me to control my weight" and 2) "…do not increase my weight."

All items were scored on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

#### 2.2.2. Profiling variables

Attitude toward the consumption of functional foods was measured with four items reflecting the global dimensions of attitude (Crites, Fabrigar, & Petty, 1994; Fishbein & Ajzen, 2010). Subjects were presented with the stem "Eating functional foods on a regular basis would be…" followed by four pairs of adjectives, which the respondents rated on a 7-point semantic differential scale: "…bad–good," "…negative–-positive," "…unfavorable–favorable," and "…dislikable–likable" (α = 0.937).

Intention to consume functional foods was measured with five items adopted from Honkanen, Olsen, and Verplanken (2005) and Fishbein and Ajzen (2010): "I intend to eat functional foods on a regular basis," "I expect to eat functional foods on a regular basis," "I plan to eat functional foods on a regular basis," "I will try to eat functional foods on a regular basis," and "I am willing to eat functional foods on a regular basis" (α = 0.966). Subjects rated the items on a scale from 1 (*highly unlikely*) to 7 (*highly likely*).

General consumption habits were measured on a 7-point frequency scale for 16 food categories (e.g., functional foods, fruit and berries, and meat). Respondents were asked the question: "On average during the last 6 months, how often have you consumed the following foods?" Consumption frequencies were assessed on a scale with the following response options: 1 (*never/seldom*); 2 (*1–3 times a month*); 3 (*once a month*); 4 (*2–4 times a week*); 5 (*5–6 times a week*); 6 (*once a day*); and 7 (*several times a day*). Similar measures have been commonly utilized to assess behavior (Dunn, Mohr, Wilson, & Wittert, 2011; Fishbein & Ajzen, 2010; Goetzke, Nitzko, & Spiller, 2014).

Socio-demographic variables—sex, age, education level, region, and number of children living at home—were included for segment profiling. Age was measured on a five-category scale with the following options: 18–29, 30–39, 40–49, 50–59, and 60–74. Education level included four options: elementary school, high school, higher education (1–3 years), and higher education (≥4 years). Region (of residence) included five broad subdivisions. Finally, number of children living at home was measured on a six-point scale from 0 (*0 children*) to 5 (*5 or more children*).

### 2.3. Analytical procedures

A principal component analysis (PCA) with Varimax rotation was first performed using SPSS (Version 26) to determine the underlying structure of the 30 items measuring the constructs (e.g., convenience orientation and hedonic eating values). The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were used to determine the suitability of a factor analysis. The initial PCA resulted in seven principal components. Inspection of the rotated component matrix suggested that the interpretation of some cross-loadings and components was not straightforward. Hence, the following modifications were made: Three of the seven items measuring food innovativeness were omitted due to their low communality. The item used to capture self-control ("I resist foods that are bad for my health") was omitted due to its cross-loading. Two items measuring hedonic eating value ("…help me escape from my daily routines" and "…give me exciting feelings when eating") were discarded due to cross-loading and low factor loading, respectively. The item measuring convenience orientation ("…is easily available in shops and supermarkets") was omitted owing to cross-loading. Finally, the three items measuring the importance of healthy food were omitted because they loaded onto the same principal component as the three items measuring health importance. The two items capturing weight management concern loaded onto a separate component.

The final PCA revealed six principal components: food innovativeness, food self-control, hedonic eating value, convenience orientation, health importance, and weight management concern. These explained 78% of the total variance (Table 2). Factor loadings ranged from 0.72 to 0.88 and internal reliability scores exceeded the lower threshold of Cronbach's α (i.e., 0.70; Hair, Black, Babin, & Anderson, 2014). Considering the criticisms of "factor–cluster segmentation" (e.g., Dolnicar & Grün, 2008), we used the 20 items rather than the six factors as segmentation bases.

A hybrid hierarchical k-means clustering approach using the packages *cluster* (Maechler, Rousseeuw, Struyf, Hubert, & Hornik, 2019) and *factoextra* (Kassambara & Mundt, 2019) in R 3.6.1 (R Core Team. (2019), 2019) was applied. The raw item scores were standardized (scaled) prior to clustering. The procedure first performed hierarchical clustering with Ward's method (Euclidean distance) to identify cluster centers. Examination of the agglomeration schedule and visual inspection of the dendrogram suggested a two- or three-cluster solution. Next, the identified cluster centers formed the initial cluster centers for k-means clustering. Both the two- and three-cluster solutions were examined, and the three-cluster solution was ultimately retained. To justify this decision, we examined 30 validation indices to determine the most appropriate number of clusters (R package *NbClust*; Charrad,

**Table 2**
Principal components analysis of segmentation variables.

| Construct and item | Factor loading | Cronbach's α | Variance explained |
|---|---|---|---|
| *Food innovativeness* | | 0.90 | 15.78 |
| I think it is fun to try out food items one is not familiar with | 0.87 | | |
| I am continually seeking new food ideas and experiences | 0.81 | | |
| I am curious about food products I am not familiar with | 0.86 | | |
| I like to experience novelty and change in my daily eating routine | 0.85 | | |
| *Food self-control* | | 0.89 | 15.27 |
| I have a hard time breaking bad food habits | 0.88 | | |
| I wish I had more self-discipline when it comes to what I eat | 0.86 | | |
| Sometimes I can't stop myself from eating unhealthy food, even if I know it's wrong | 0.85 | | |
| I have trouble with controlling how much I am eating | 0.83 | | |
| *Hedonic eating values* | | 0.89 | 12.60 |
| … are enjoyable to eat | 0.85 | | |
| … provide me good sensory feelings (good taste, smell, appearance, appeal) | 0.82 | | |
| … are fun to eat | 0.82 | | |
| *Convenience orientation* | | 0.84 | 13.80 |
| … take no time to prepare | 0.87 | | |
| … are easy to prepare | 0.87 | | |
| … are effective to eat | 0.72 | | |
| … are easy to plan, buy (provide), prepare, and cook | 0.73 | | |
| *Health importance* | | 0.87 | 12.03 |
| Good health is important to me | 0.84 | | |
| It means a lot to me to have good health | 0.85 | | |
| I often think about my health | 0.78 | | |
| *Weight management concern* | | 0.86 | 8.59 |
| … help me to control my weight | 0.87 | | |
| … do not increase my weight | 0.85 | | |
| Total variance explained | | | 78.07 |

*Note.* KMO measure: 0.858; Bartlett's test of sphericity 9992.49, df = 190, p < .001. Rotation method: Varimax with Kaiser Normalization.

Ghazzali, Boiteau, & Niknafs, 2014). The majority rule[1] suggested three clusters as the most appropriate solution. A one-way analysis of variance (ANOVA) with Tukey post hoc tests was performed to determine the differences between clusters in terms of the segmentation variables (i.e., values and traits) and profiling variables (i.e., attitude, intention, and consumption). Chi-square tests of independence were run to investigate differences based on the socio-demographic variables.

## 3. Results

### 3.1. Consumer segmentation

Health importance and hedonic eating values were the two most important values across segments (i.e., they exhibited the highest overall mean values). For all the segmentation variables, consumers in segment 1 (34.8% of the sample), whom we call the "*careless,*" exhibited a mean score below the sample mean or near the scale midpoint. They were the least innovative—or most conservative—with respect to foods, with significantly lower scores on variables measuring food innovativeness compared with consumers in the two other segments. The careless consumer was also fairly convenience oriented. The second and smallest segment (24.0% of the sample) presented high levels of food self-control and had the highest scores on the variables measuring food innovativeness. Based on the F-values, we refer to this segment as the "*self-controlled.*" The third and largest segment (41.2% of the sample) was characterized by a strong convenience orientation and weight management concern. Additionally, this segment exhibited particularly low levels of self-control about food. Segment 3 is referred to as the "*convenience-oriented.*" The levels of (the trait) self-control regarding food were the clearest difference between the self-controlled (high levels) and the convenience-oriented (low levels). Food innovativeness (a trait) best distinguishes between the careless and the self-controlled. The levels of hedonic eating values discriminated the most between the convenience-oriented (high levels) and the careless (low levels). Table 3 reports the mean differences between segments obtained from the one-way ANOVA with Tukey post hoc tests.

### 3.2. Profiling based on consumer attitudes toward, intention to consume, and consumption of functional foods

A one-way ANOVA with Tukey post hoc test was also performed to determine differences in consumers' attitudes, intention to consume, and consumption of functional foods across segments (Table 4). Significant differences were observed both for attitudes toward the consumption of functional foods ($F(2,807) = 25.90$, $p < .001$), intention to consume functional foods ($F(2,807) = 20.72$, $p < .001$), and consumption of such foods ($F(2,807) = 6.36$, $p = .002$). The convenience-oriented consumers exhibited a significantly stronger positive attitude toward the consumption of functional foods ($M = 5.23$, $SD = 1.32$) compared with the careless ($M = 4.50$, $SD = 1.23$) and the self-controlled ($M = 4.59$, $SD = 1.61$). The convenience-oriented consumers also presented a stronger intention to consume functional foods ($M = 4.53$, $SD = 1.43$) compared with the self-controlled ($M = 3.92$, $SD = 1.85$) and the careless ($M = 3.80$, $SD = 1.26$). Consumers in the latter two segments did not differ in their attitude toward and intention to consume functional foods. Finally, the convenience-oriented consumers also reported the highest consumption frequency of functional foods ($M = 3.11$, $SD = 1.65$). These

[1] Numerous validity indices for determining the optimal number of clusters exist and no single index is superior. Examining several indices simultaneously (e.g., 30 indices as in the current analysis) has the advantage of providing a stronger basis for deciding the optimal number of clusters. The optimal number of clusters to retain according to the majority rule is the cluster solution that the majority of the indices suggest (for a comprehensive account, see Arbelaitz, Gurrutxaga, Muguerza, Pérez, & Perona, 2013; Charrad et al., 2014).

**Table 3**
Differences in segmentation variables across segments.

| Construct and items | Careless | Self-controlled | Convenience-oriented | *F* | Sig. |
|---|---|---|---|---|---|
| *Food innovativeness* | | | | | |
| I think it is fun to try out food items one is not familiar with | *3.87*$^{c}$ | 5.84$^{a}$ | 5.20$^{b}$ | 155.44 | <0.001 |
| I am continually seeking new food ideas and experiences | *3.57*$^{c}$ | 5.10$^{a}$ | 4.52$^{b}$ | 72.55 | <0.001 |
| I am curious about food products I am not familiar with | *3.78*$^{c}$ | 5.77$^{a}$ | 5.15$^{b}$ | 159.33 | <0.001 |
| I like to experience novelty and change in my daily eating routine | *3.82*$^{c}$ | 5.42$^{a}$ | 4.91$^{b}$ | 117.13 | <0.001 |
| *Food self-control (reverse-scored)* | | | | | |
| I have a hard time breaking bad food habits | 4.01$^{b}$ | 5.36$^{a}$ | *2.93*$^{c}$ | 239.36 | <0.001 |
| I wish I had more self-discipline when it comes to what I eat | 4.00$^{b}$ | 4.97$^{a}$ | *2.52*$^{c}$ | 229.97 | <0.001 |
| Sometimes I can't stop myself from eating unhealthy food, even if I know it's wrong | 4.01$^{b}$ | 4.97$^{a}$ | *2.53*$^{c}$ | 230.57 | <0.001 |
| I have trouble with controlling how much I am eating | 4.30$^{b}$ | 5.70$^{a}$ | *3.43*$^{c}$ | 154.03 | <0.001 |
| *Hedonic eating values* | | | | | |
| …are enjoyable to eat | *4.45*$^{b}$ | 6.11$^{a}$ | 6.04$^{a}$ | 261.30 | <0.001 |
| …provide me good sensory feelings (good taste, smell, appearance, appeal) | *4.28*$^{b}$ | 5.93$^{a}$ | 5.87$^{a}$ | 242.68 | <0.001 |
| …are fun to eat | *4.41*$^{b}$ | 6.20$^{a}$ | 6.07$^{a}$ | 305.41 | <0.001 |
| *Convenience orientation* | | | | | |
| …take no time to prepare | *4.49*$^{b}$ | *3.81*$^{c}$ | 5.40$^{a}$ | 107.83 | <0.001 |
| …are easy to prepare | *4.59*$^{b}$ | *4.55*$^{b}$ | 5.78$^{a}$ | 108.69 | <0.001 |
| …are effective to eat | *4.48*$^{b}$ | *4.18*$^{c}$ | 5.48$^{a}$ | 93.75 | <0.001 |
| …are easy to plan, buy (provide), prepare, and cook | *4.51*$^{c}$ | *5.19*$^{b}$ | 5.94$^{a}$ | 122.01 | <0.001 |
| *Health importance* | | | | | |
| Good health is important to me | *4.70*$^{c}$ | 6.40$^{a}$ | 6.11$^{b}$ | 223.35 | <0.001 |
| | *4.68*$^{c}$ | 6.37$^{a}$ | 6.06$^{b}$ | 193.51 | <0.001 |

(*continued on next page*)

**Table 3** (*continued*)

| Construct and items | Careless | Self-controlled | Convenience-oriented | *F* | Sig. |
|---|---|---|---|---|---|
| It means a lot to me to have good health | | | | | |
| I often think about my health | *4.27*[b] | 5.71[a] | 5.69[a] | 132.80 | <0.001 |
| *Weight management concern* | | | | | |
| …help me to control my weight | *4.10*[c] | 4.91[b] | 5.64[a] | 117.37 | <0.001 |
| …do not increase my weight | *4.19*[c] | 5.07[b] | 5.72[a] | 121.70 | <0.001 |
| *N* (%) | 282 (34.8) | 194 (24.0) | 334 (41.2) | | |

*Note:* Different superscripts ([a–c]) indicate significant differences in means between segments found by the Tukey post hoc tests. Italics indicate segment mean < total mean. $N = 810$.

results suggest that convenience-oriented consumers are more positive toward and more prone to consume functional foods.

### 3.3. Profiling based on food consumption habits

In addition to the consumption of functional foods, we collected data on the consumption of 15 different food items or categories. A one-way ANOVA with Tukey post hoc tests was performed to identify differences in food consumption habits between consumers in the different segments. The segments differed significantly in the consumption of most foods, including vegetables, fruit and berries, sweets and snack foods, and ready-made foods (Table 5). The self-controlled consumed vegetables and fruits and berries the most frequently—and sweets and snack foods and ready-made foods the least frequently—compared with the other two segments. The convenience-oriented consumers reported the highest consumption frequency of meat as a basis for dinner and of sweets and snack foods. Among the consumers in the three segments, the careless consumed vegetables the least frequently and energy and vitamin drinks the most frequently.

### 3.4. Socio-demographic characteristics

The socio-demographic variables included age, sex, education level, region, and number of children living at home. The careless segment consists of 282 consumers—mostly men (61.7%). Most careless consumers have a lower education level (51.2%). All age groups are equally represented, with 50–59-year-olds slightly underrepresented (15.6%). The convenience-oriented segment comprises 334 consumers. The convenience-oriented consumer is typically a woman (59.0%) with higher education (54.2%). Like the careless segment, the age distribution is almost normal but with slightly fewer consumers in the 50–59 age group (16.8%). The self-controlled segment consists of 194 consumers, with women slightly overrepresented (54.1%). Most consumers are older (53.6% are aged 50–74) with higher education (62.9%). No significant differences between segments were observed on the socio-demographic variables region and number of children living at home. Table 6 reports the results of chi-square tests of independence for age, sex, and education level among segments.

## 4. Discussion

The current study contributes to the functional food consumer literature by showing how domain-specific trait self-control and food innovativeness effectively discriminate between consumer segments, adding to the understanding of what characterizes the functional food consumer. The mixture of food-related traits and values as bases for segmentation proves useful in explaining and describing differences in consumer attitudes, intention, and consumption: the combination of being convenience oriented, concerned about gaining weight from what you eat, and having a low level of self-control is characteristic of consumers more inclined to evaluate the consumption of functional food favorably.

This study identifies three consumer segments—the convenience-oriented (41.2%), the self-controlled (24.0%), and the careless (34.8%)—which both confirms and adds to previous research. For instance, the results confirm the presence of a careless segment (sometimes referred to as uninterested, uninvolved, indifferent, or unmotivated) (Brečić et al., 2017; Sparke & Menrad, 2009; Szakály et al., 2012). Similarly, the results suggest that convenience orientation plays an important part in functional food consumption; thus, the identification of a convenience-oriented segment was not unexpected. Although health and hedonism usually are top priorities in food choices (Cunha et al., 2018) and highlighted by consumers across segments in this study, food self-control best distinguishes the self-controlled and the convenience-oriented consumer. Level of food self-control is further manifested in different consumption patterns, suggesting that a lack of food self-control leads consumers to indulge in the consumption of less healthy foods. Although the self-controlled consumer eats naturally healthy foods (e.g., vegetables, fruits, and berries) more often and unhealthy foods (e.g., sweets, snack foods, and ready-made foods) less often, the convenience-oriented consumer has the most favorable attitudes and is most positive about consuming functional foods. Thus, the convenience-oriented consumer may compensate for their lower consumption of naturally healthy foods by consuming more functional foods—a

**Table 4**
Profiling consumer segments based on functional food behavior.

| Construct and items | Careless | Self-controlled | Convenience-oriented | *F* | Sig. |
|---|---|---|---|---|---|
| *Attitude* | | | | | |
| Bad–Good | *4.50*[b] | *4.57*[b] | 5.25[a] | 22.14 | <0.001 |
| Negative–Positive | *4.53*[b] | *4.60*[b] | 5.26[a] | 20.73 | <0.001 |
| Unfavorable–Favorable | *4.54*[b] | *4.74*[b] | 5.27[a] | 21.30 | <0.001 |
| Dislikable–Likable | *4.42*[b] | *4.44*[b] | 5.16[a] | 22.78 | <0.001 |
| *Intention* | | | | | |
| I intend … | *3.82*[b] | *3.86*[b] | 4.48[a] | 15.74 | <0.001 |
| I expect … | *3.78*[b] | *3.90*[b] | 4.41[a] | 13.99 | <0.001 |
| I plan … | *3.67*[b] | *3.74*[b] | 4.38[a] | 17.31 | <0.001 |
| I will try … | *3.78*[b] | *3.94*[b] | 4.56[a] | 20.99 | <0.001 |
| I am willing … | *3.97*[b] | *4.19*[b] | 4.81[a] | 24.23 | <0.001 |
| Consumption | *2.73*[b] | *2.65*[b] | 3.11[a] | 6.36 | 0.002 |
| *N* (%) | 282 (34.8) | 194 (24.0) | 334 (41.2) | | |

*Note:* Different superscripts ([a–c]) indicate significant differences in means between segments found by the Tukey post hoc tests. Italics indicate segment mean < total mean. $N = 810$.

**Table 5**
Profiling consumer segments based on food consumption habits.

| Food item | Careless | Self-controlled | Convenience-oriented | *F* | Sig. |
|---|---|---|---|---|---|
| Vegetables | *4.49*$^{c}$ | 5.61$^{a}$ | 5.05$^{b}$ | 44.79 | <0.001 |
| Fruit and berries | *4.07*$^{b}$ | 4.74$^{a}$ | 4.36$^{b}$ | 10.04 | <0.001 |
| Juice | 3.12 | 3.17 | *2.96* | 1.13 | 0.324 |
| Butter and margarine | *4.37* | 4.65 | 4.57 | 1.57 | 0.208 |
| Cereal products | *4.63*$^{b}$ | 5.15$^{a}$ | 5.10$^{a}$ | 7.48 | 0.001 |
| Seafood (for dinner) | *3.24* | 3.44 | 3.40 | 2.09 | 0.124 |
| Meat (for dinner) | *3.76*$^{b}$ | *3.75*$^{b}$ | 3.99$^{a}$ | 4.28 | 0.014 |
| Chicken (for dinner) | *3.04*$^{ab}$ | *2.87*$^{b}$ | 3.16$^{a}$ | 4.14 | 0.016 |
| Sweets and snack foods | 3.45$^{b}$ | *2.97*$^{c}$ | 3.76$^{a}$ | 21.68 | <0.001 |
| Dairy | *4.49*$^{b}$ | 5.05$^{a}$ | 4.90$^{a}$ | 8.32 | <0.001 |
| Yoghurt | *3.04*$^{ab}$ | *2.89*$^{b}$ | 3.28$^{a}$ | 4.03 | 0.018 |
| Pasta | 2.93$^{a}$ | *2.61*$^{b}$ | 3.01$^{a}$ | 7.92 | <0.001 |
| Meal replacement | 2.22$^{a}$ | *1.67*$^{b}$ | 2.12$^{a}$ | 9.30 | <0.001 |
| Energy/ vitamin drinks | 2.24$^{a}$ | *1.41*$^{c}$ | 1.88$^{b}$ | 20.03 | <0.001 |
| Ready-made foods | 2.74$^{a}$ | *2.01*$^{b}$ | 2.74$^{a}$ | 26.17 | <0.001 |
| *N* (%) | 282 (34.8) | 194 (24.0) | 334 (41.2) | | |

*Note*: Different superscripts ($^{a–c}$) indicate significant differences in means between segments found by the Tukey post hoc tests. Italics indicate segment mean < total mean. $N = 810$.

convenient means to eat healthily. Another potential explanation could be similar to that of Barauskaite et al. (2018), namely that self-controlled consumers evaluate functional food as less distinctive and unique, which subsequently influences their consumption behavior.

Furthermore, food innovativeness—or more precisely a lack thereof—is a significant part of the careless consumer's profile. Similar to Szakály et al. (2012), the careless consumer in the present study resembles the uninvolved consumer: exhibiting little demand for novelties and being conservative in their food choices. Their low levels of food innovativeness may thus help to explain why the careless consumer is more reluctant to eat functional foods. Overall, the roles of food innovativeness and self-control add nuance to the existing literature in the domain of functional food behavior and represent two traits imperative to understanding consumers' food choices. Our person-centered approach also contributes by shedding light on the intraindividual combinations of values and traits and how different consumer profiles relate to functional food behavior and food consumption habits.

Members of the convenience-oriented segment are not only characterized by the fact that they are concerned with saving time and energy in planning, buying, preparing, and consuming foods, but their food choices are also affected by a marked concern about increasing body weight, and their ability to control and manage their eating habits is poor. We believe that this intraindividual combination of low self-control, pronounced weight management concern, and convenience orientation is paramount to understanding their consumption behavior. The convenience-oriented consumer has the most positive attitudes toward eating functional foods, the strongest intentions to consume such foods, as well as the highest consumption frequency of this type of food. It is worth noting that this segment also outnumbers the other two segments and thus represents not only a niche market but potentially a market of significant size that functional food producers can target. The typical convenience-oriented consumers are women of all ages who find it difficult to abandon bad food habits. This agrees with the results of previous studies that have repeatedly reported that women are the main target of functional foods owing to their being more reflective about food and health issues compared with men (Siró et al., 2008). For example, in the study conducted by Karelakis et al. (2020), well-educated women in the middle-to-high income category had more positive perceptions of, and more often consumed, functional food. Furthermore, the convenience-oriented consumer exhibits low levels of self-control and is highly concerned about weight management. Previous studies have demonstrated that weight-concerned people—and women in particular—generally find it difficult to control their food intake (van der Laan, de Ridder, Charbonnier, Viergever, & Smeets, 2014) and that self-control is predictive of weight loss success (Will Crescioni et al., 2011). van der Laan et al. (2014) found that weight-concerned women primarily based their food choices on taste considerations rather than on energy content, which suggests that "self-reports of weight-concerns and restraint are reflective of intentions and wishes to restrict intake, rather than of actual eating behavior" (p. 7). Thus, convenience-oriented consumers' (i.e., mostly women) lack of self-control, combined with a pronounced concern for weight management, may explain their higher consumption frequency of sweets, snack foods, and ready-made foods compared to self-controlled consumers. This is similar to Sparke and Menrad (2009), who identified a segment named the *enthusiastic beauty-oriented*. These consumers often purchased functional foods and were particularly motivated for beauty reasons as opposed to health per se. Hence, the marked concern for weight gain among convenience-oriented consumers can be attributed to concerns about appearance or vanity rather than a desire to lead a healthy life. Their lack of food self-control entails both an admission of having difficulty in abandoning bad food habits and at the same time a desire to improve their self-discipline when choosing what to eat. Hence, the convenience-oriented consumer's lack of food self-control is not solely

**Table 6**
Socio-demographic profile of the segments (%).

| Variable | Level | Careless | Self-controlled | Convenience-oriented | $\chi^2$ | Sig. |
|---|---|---|---|---|---|---|
| Age | 18–29 | 22.0 | 11.9 | 23.1 | 23.77 | 0.003 |
| | 30–39 | 21.3 | 18.6 | 22.5 | | |
| | 40–49 | 21.3 | 16.0 | 18.9 | | |
| | 50–59 | 15.6 | 26.3 | 16.8 | | |
| | 60–74 | 19.9 | 27.3 | 18.9 | | |
| Sex | Female | 38.3 | 54.1 | 59.0 | 27.43 | <0.001 |
| | Male | 61.7 | 45.9 | 41.0 | | |
| Education* | Elementary school | 9.0 | 7.9 | 6.7 | 11.26 | 0.081 |
| | High school | 42.3 | 29.1 | 39.0 | | |
| | Higher education (1–3 years) | 26.9 | 31.7 | 27.7 | | |
| | Higher education (≥4 years) | 21.9 | 31.2 | 26.5 | | |
| *N* (%) | | 282 (34.8) | 194 (24.0) | 334 (41.2) | | |

*Note:* Results of crosstabulation and chi-square tests of independence. $N = 810$. *There were missing data for 14 respondents.

an unconscious trait but rather something of which they are fully aware and would like to change.

The self-controlled consumer fits the description of "the typical functional food consumer" (i.e., being female, well-educated/higher income class, and being older than 55 years) (Siró et al., 2008). In contrast to convenience-oriented consumers, self-controlled consumers are not as concerned about weight management but emphasize the importance of health somewhat more. Their high level of food self-control, coupled with their emphasis on health importance, may therefore explain their higher consumption frequency of naturally healthy foods, such as fruit, berries, and vegetables, and their modest consumption of functional foods, ready-made foods, sweets, and snack foods. Although self-controlled consumers actively seek new food ideas and find pleasure in new food experiences—a trait previously associated with proneness to consuming functional foods (cf., Huotilainen et al., 2006)—their weaker convenience orientation may explain why they do not consider functional foods more favorable (Brečić et al., 2017). Compared to the results of some previous studies using the FRL (e.g., Buckley, Cowan, McCarthy, & O'Sullivan, 2005; Szakály et al., 2012), in the present study, the self-controlled consumer has similarities with both the rational and the adventurous consumer, such as elevated responsiveness to novelty and attraction toward new food products, as well as an emphasis on health.

The careless consumers comprise mostly men and are characterized by a reluctance or incuriosity toward new food experiences. The majority of the careless have a lower level of education (elementary school and high school) and appear to be uninvolved or uninterested in both food and health. Similar characteristics of the careless found in the present study fit the description of the careless/uninvolved/indifferent/conservative consumers proposed by other studies, with their hallmark being low scores on all the variables and a pronounced reluctance toward novelty (Brečić et al., 2017; Buckley et al., 2005; Szakály et al., 2012). The careless consumer has a significantly lower consumption of vegetables and a higher consumption of energy and vitamin drinks compared to the convenience-oriented and the self-controlled consumers.

Our results provide new insights into the underlying motives and goals of consumers susceptible to consuming functional foods and the intraindividual combinations of values and traits that distinguish the different consumer segments. The identification and characteristics of the self-controlled consumer segment is a significant contribution of this study. Both the convenience-oriented and the self-controlled consumer are equally motivated by hedonism, but where the latter has high levels of self-control, the former has low levels of this trait. Level of self-control thus appears to be instrumental in differentiating between consumers who are high vs. low in their consumption of functional food. Convenience plays a significant role in functional food consumers' decision-making. The combination of health benefits and convenience is a hallmark of functional foods that is proposed to be both the main prerequisite for functional foods as well as consumers' underlying motive for consuming them. Controversially, the segment most positive toward functional foods—motivated by weight management concern in particular—is also the one that consumes sweets and snack foods the most. This inconsistency may be due to low levels of self-control regarding food. Although the convenience-oriented consumer is quite engaged with health-related issues, their poor ability to exercise self-control poses a threat when deciding which food to choose, and they thus may fall prey more easily to the temptation that hedonism represents and opt for less healthy alternatives more often (e.g., sweets and snack foods). The stronger weight management concern of the convenience-oriented consumer can possibly be attributed to an underlying motivation to achieve or maintain a desired appearance and may not necessarily reflect a general health motive. However, this potential explanation requires further research attention.

The choices of individual domain-specific traits and values included in this study are both theoretically grounded in the personality and social psychology literature (McCrae & Costa, 1995; Rokeach, 1973; Schwartz, 2012) and are operationally robust in the assessment of constructs (e.g., Tangney et al., 2004). Other strengths of this study pertain to the use of a nationally representative sample, unlike several other segmentation studies (e.g., Annunziata & Pascale, 2009; Ares & Gámbaro, 2007; van der Zanden et al., 2015), and to the use of an "item-clustering" rather than a "factor-clustering" technique (Dolnicar & Grün, 2008). With a large sample size, we expect that our study will yield more valid and reliable results, reinforcing the practical implications for functional food producers and marketers. For example, the resulting segment sizes can more reliably come to represent "true" shares of consumers within the different segments.

## 5. Limitations

This study focused on functional foods as a food category. Consumer acceptance of or consumption behavior related to functional foods is not unconditional but varies according to the perceived fit between the carrier and ingredients (e.g., Krutulyte et al., 2011; Lu, 2015) or the exact product under scrutiny (e.g., de Jong, Ocke, Branderhorst, & Friele, 2003), among other factors. Thus, future studies may benefit from including specific functional food products and examining the extent to which consumer segments are stable—for example, will the convenience-oriented consumer still be most inclined to consume functional foods regardless of the product in question? Additionally, this study was conducted in a single country (Norway). Since food consumption patterns (Gracia & Albisu, 2001) and food choice motives (Prescott, Young, O'Neill, Yau, & Stevens, 2002; Sparke & Menrad, 2009) tend to vary between countries, future research should include consumers from several countries to validate these findings. Furthermore, we have argued for the inclusion and appropriateness of domain-specific traits and values as segmentation bases. Considering how important the choice of segmentation bases is, the inclusion of other variables can prove useful. Relevant candidates include the importance of food safety and food naturalness, (the credibility of) health claims, knowledge about functional foods, and social norms due to their association with consumer acceptance of a product (Siró et al., 2008). In contrast to domain-specific bases, segmentation based on broader personality traits (e.g., Big Five; John & Srivastava, 1999; McCrae & Costa, 1997) and personal values (e.g., universal human values; Bilsky & Schwartz, 1994; Rokeach, 1973) can also be assessed to gain insight into their interrelationships and ability to identify and differentiate between different groups of consumers. Finally, future studies could consider other theoretical perspectives such as SDT, which also includes perceptions of control by internal and external forces related to the self or self-image (Bimbo, Bonanno, Van Trijp, & Viscecchia, 2018; Hagger & Chatzisarantis, 2009; Hartmann, Dohle, & Siegrist, 2015).

## 6. Conclusions

This study has demonstrated how food-related values and traits can successfully distinguish among homogeneous groups of consumers. The person-centered approach has made it possible to uncover and describe how the Norwegian consumer profiles differ from each other in terms of consumption habits, attitudes, and behavioral intentions toward eating functional foods, as well as socio-demographics. These insights should be of great importance to functional food marketers, who can tailor their marketing strategy to match the various consumer profiles. Learning more about what characterizes the consumer of functional foods is a prerequisite for product development and effective marketing efforts (Alongi & Anese, 2021). Worth noting is that the segment most inclined to consume functional foods also had a pronounced concern about weight gain and was overtly convenience oriented. In fact, consumption of functional foods is closely linked to attributes such as convenience and health, and the results of this study therefore suggest that functional foods meet the expectations of the convenience-oriented consumer quite

well.

## Ethical statement

We wish to confirm that the study was conducted in accordance with the Norwegian National Research Ethics Committees' *Guidelines for Research Ethics in the Social Sciences, Humanities, Law and Theology*. All data were collected by YouGov (data processor) from members of its consumer panel. Upon becoming a member of YouGov's consumer panel participants give their informed consent in accordance with YouGov's privacy statement. Participation was voluntary and respondents could withdraw from participation at any given moment. No personal data were collected as part of the survey, and hence the authors have no means of identifying the respondents.

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## CRediT authorship contribution statement

**Bjørn Tore Nystrand:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Project administration, Funding acquisition. **Svein Ottar Olsen:** Conceptualization, Writing – original draft, Supervision.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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