



Consumer Economics
Department of Economics and Management
Faculty of Agriculture and Forestry

From purchase intention to purchase behavior

Purchase intention and other measurements
as predictors of food purchases

Elina Kytö

DOCTORAL DISSERTATION

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ABSTRACT

Purchase behavior is a frequent but highly complicated human behavior affected by numerous factors. In the food industry, several sensory and consumer research responses are generally used to predict future sales to maximize market success. However, the failure rate is estimated to be extremely high, and new methods and measurements for prediction are needed.

This thesis investigates the role of different consumer and sensory research measurements – especially the measure of purchase intention – in food purchase behavior prediction. The aim is to examine the ability of purchase intention, and other explicit and implicit responses, to predict food purchases with varying amounts of product information. The focus is on factors related to the consumer (perception, previous usage, emotions, habits, and beliefs) and the product (expectations, product type, and sensory quality as internal factors, and brand and package design as external factors).

The association between the amount of product information, the different measurements, and the actual purchase behavior regarding two types of dairy snack products (a flavored protein quark and a natural yogurt) is studied. The product information phases were 1) expectation based on the brand and packaging pictures that simulated an in-store experience (before trying the product), 2) sensory quality perception based on blind tasting, and 3) actual perception based on tasting with brand and packaging pictures that simulated an in-home experience (after tasting the product). The responses were measured using explicit responses (purchase intention, pleasantness, emotions, recommendation, brand relationship, and willingness to eat again) and implicit responses (event-related potential, reaction time, and pupil size). In addition, various consumer-related factors, such as previous use of and familiarity with the studied products by brand, change seeking, purchase drivers, purchase moment, and purchase decision level, were measured. Finally, purchase behavior was

measured using self-reported surveys within a one-month period after the evaluations.

Purchase intention and recommendation responses measured in the actual perception condition were found to be the most accurate predictors of food purchases. Overall, explicit responses were associated with purchase behavior more strongly than implicit responses. Furthermore, measurements after only sensory quality perception were poor predictors of purchases. In conclusion, purchase behavior was predicted better when more product information was available.

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Helsinki, February 2020

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LIST OF ORIGINAL PUBLICATIONS

The thesis is based on the following three publications. In the text they are referred to by Roman numerals I-III.

- I KYTÖ, ELINA, JÄRVELÄINEN, ANNI & MUSTONEN, SARI (2018). Hedonic and emotional responses after blind tasting are poor predictors of purchase behavior. *Food Quality and Preference*, 70, 49-56.
- II KYTÖ, ELINA, VIRTANEN, MARKUS & MUSTONEN, SARI (2019). From intention to action: Predicting purchase behavior with consumers' product expectations and perceptions, and their individual properties. *Food Quality and Preference*, 75, 1-9.
- III KYTÖ, ELINA, BULT, HAROLD, AARTS, ESTHER, WEGMAN, JOOST, RUIJSCHOP, RIANNE & MUSTONEN, SARI (2019). Comparison of explicit vs. implicit measurements in predicting food purchases. *Food Quality and Preference*, 78, 103733.

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RESEARCH INPUT AND AUTHORSHIP OF ARTICLES (I–III)

I This study formed the topic for Anni Järveläinen’s master’s thesis. The planning of the study and the data analysis were carried out by all three authors. M.Sc. Anni Järveläinen was responsible for collecting the data together with the research agency, and she issued comments on the manuscript. M.Sc. Elina Kytö was responsible for drafting and writing the manuscript. The study was supervised by Dr. Sari Mustonen, who also offered comments and suggestions on the manuscript.

II M.Sc. Elina Kytö was responsible for analyzing the data and preparing and writing the manuscript. M.Sc. (Tech.) Markus Virtanen was responsible for conducting the binary logistic regression analysis and providing comments on both the other statistical analyses and the manuscript. The study was supervised by Dr. Sari Mustonen, who also provided comments and suggestions on the manuscript.

III The planning of this study was carried out by M.Sc. Elina Kytö, Dr. Sari Mustonen, Dr. Harold Bult, and Dr. Rianne Ruijschop. M.Sc. Elina Kytö was responsible for analyzing the data of explicit measurements as well as preparing and writing the manuscript. The data analysis of implicit measurements was performed by Dr. Harold Bult, who also participated in writing the manuscript. Dr. Esther Aarts, Dr. Joost Wegman, and Dr. Rianne Ruijschop contributed to the manuscript by providing comments and suggestions. The study was supervised by Dr. Sari Mustonen, who also participated in writing the manuscript by offering comments and suggestions.

NOTES AND ABBREVIATIONS

CLT	Central Location Test; controlled environment to conduct consumer and sensory tests
e.g.	exempli gratia; for example
ERP	Event-Related Potential; a brain response that is the spontaneous result of a particular cognitive, sensory, or motor event
Expectation	Based on brand and packaging pictures simulating an in-store experience (before trying the product)
i.a.	inter alia; among other things
NPS	Net Promoter Score; an index ranging from -100 to 100 measuring the likelihood of recommendation of a certain company or product
Perception	Includes actual perception or experience; based on tasting with brand and packaging pictures simulating an in-home experience (after tasting the product)
PS	Promoter Score; an 11-point scale measuring the likelihood of recommendation of a certain company or product

1 INTRODUCTION

Consumers' food purchase behavior has changed remarkably in the past decades. For example, growing product ranges; new product alternatives; store variations, from specific mini stores to hypermarkets; changing trends; and online shopping have all contributed to the current nature of grocery shopping.

Food choices and purchase behavior are complex human behaviors influenced by multiple interrelating factors, and much variation exists between consumers (Köster, 2009). Food choices in grocery stores are rarely a result of consciously considering the advantages and disadvantages, but they are often subconsciously provoked impulses defined by, among other things, prior experiences, habits, convenience, labeling, and consumers' needs and attitudes.

Sensory and consumer research responses, such as pleasantness and purchase intention, are commonly used for predicting the success and future sales of new product launches in food industries. Despite the large amounts of money and time invested in consumer studies prior to launches, the failure rate of product launches in the grocery sector is evaluated to be between 70% and 80% (Blackburn, 2008). Food industries must thus find new ways to predict future sales of new food products.

This study aims to clarify the role of the measurement of purchase intention as a predictor of actual food purchases and the factors that can explain whether intentions to purchase actually lead to purchases. In addition, it examines which of the

other traditional (e.g. pleasantness) and/or novel, explicit (e.g. emojis) consumer survey measurements, as well as implicit measurements (e.g. reaction time measured with a joystick), best predict actual food purchases. The study consists of two consumer experiments, reported in three papers (I–III). Study I examined the ability of hedonic and emotional responses to predict purchases of a dairy product under two different product information conditions: only sensory quality perception (blind tasting) and actual perception (branded tasting). Study II examined the interaction between purchase intention and actual purchases of two dairy products in two phases of the buying process: at the store before tasting the product (expectation) and at home after tasting the product (perception). In addition, the study examined which factors can explain whether the intentions lead to purchases. Study III examined how accurately explicit measurements, implicit measurements, or the combination of them predict purchases.

The thesis is constructed similarly to a funnel: first, it provides a broad overview of consumer purchase behavior in general; then it assesses the factors that influence the behavior before providing an in-depth summary of the findings presented in the three original articles that are part of this doctoral dissertation. In Chapter 2, the background of the study is presented through a literature review regarding consumers' food purchase journey as well as the factors affecting their behavior. While the focus is on purchase behavior, the chapter also refers to food choices and intake. Chapter 3 then describes the materials and methods employed in this study, and the results are presented in Chapter 4. Thereafter, in Chapter 5, the findings are discussed and compared to previous studies executed in the same field. Finally, Chapter 6 presents the contribution of this study to scientific research along with possible implications for the food industry in terms of how it should consider utilizing different consumer research methods and measurements as predictors of future sales.

2 LITERATURE REVIEW

2.1 CONSUMERS' FOOD PURCHASE JOURNEY

Food purchase decisions occur based on both intuition and rational thinking, which are two cognitive processes of dual information processing. By nature, intuitive processes are fast, subconscious, automatic, and emotionally charged, whereas rational thinking processes are slow, conscious, and controlled (Kahneman, 2003). These two modes of thinking or approaches to judging and choosing have also commonly been termed System 1 and System 2 by Kahneman (2011). System 1 (which is fast) includes automatic operations, meaning it operates quickly and automatically with little to no effort. In contrast, System 2 (which is slow) includes controlled and effortful operations.

Various models explain consumers' food-related behavior, and many of them pertain to eating and drinking behavior and food choices (e.g. Cardello, 1994; Köster, 2009), rather than food purchase behavior. However, these varying behaviors are slightly different from one another. Therefore, when concentrating on purchase behavior, it is relevant to focus on traditional stimulus-response models from the marketing field, such as the one from Kotler and Keller (2016). Based on this model of consumer behavior, there are three main elements in purchase behavior: stimulus, consumer, and response (**Figure 1**).

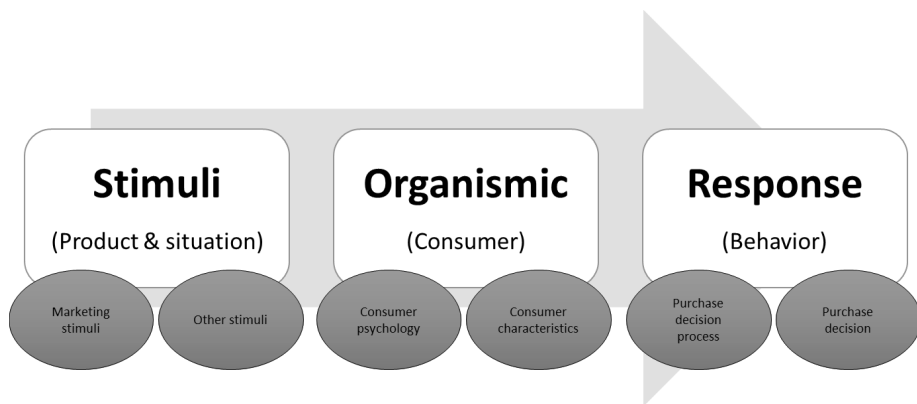


Figure 1. Model of consumer behavior (adapted from Kotler & Keller, 2016).

In Kotler and Keller's (2016) model, marketing (including product, price, place, and promotion) and other environmental stimuli (inter alia [i.a.] cultural and economic factors) reach a consumer's awareness. Then, a group of psychological processes together with consumer characteristics lead to the purchase decision process. This process includes five steps: need recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior (Kotler & Keller, 2016; Kotler, Armstrong, Saunders, & Wong, 1996).

Even though the model of the behavior appears to be a simple process, it is remarkably complex, influenced by many factors and their interactions. According to the Eating Motivation Survey by Renner, Sproesser, Strohbach, and Schupp (2012), liking, habits, need and hunger, and health were the most influential factors, while social image, social norms, affect regulation, and weight control were the least influential. These factors already demonstrate the variety of elements that determine eating and food purchase behavior. The factors are both conscious and unconscious as well as automatic and habitual (Furst, Connors, Bisogni, Sobal, & Falk, 1996). Furthermore, Renner et al. (2012) found differences between subgroups based on gender, age, and body mass index (BMI), indicating that much variation in behavior exists between consumers. This has also been confirmed by Köster (2009).

According to Niva (2008), consumers' ways of accepting functional foods (considered to be novel products at the time of Niva's study) are formed in a multifaceted net of everyday practices concerning food, health, and eating. Food choices can also be seen as a complex process from this point of view. In summary, consumer food purchases are strongly influenced by numerous factors. In this work, the factors are divided into three main groups, namely, consumer, product, and environment and situation, which are explored in detail in the following chapters.

2.1.1 CONSUMER-RELATED FACTORS

Consumer-related factors concern the person who is making the food choice or purchase; they can be biological, physiological, and psychological factors, and all of them influence the food choice and purchase. First, biological factors are related to an individual's biological features, such as age and gender (Shepherd & Sparks, 1994). Ares and Gámbaro (2007) found that perceived healthiness and willingness to try functional foods varied by age and gender. Furthermore, Roininen (2001) found a difference between genders in terms of healthy and light eating: women tended to eat healthier and lighter than men. Beardsworth, Haslam, Keil, Goode, and Sherratt (1999) found that men had a less problematic relationship with food than females in the UK. Females, for example, ate when they were bored, and they felt guilt about eating. In addition, Hearty, McCarthy, Kearney, and Gibney (2007) demonstrated that the older a person is, the more positive is his or her attitude towards food's healthiness based on the responses on a statement 'I make a conscious effort to try and eat a healthy diet'.

Second, physiological factors that have an impact on food choices and purchases are, inter alia, hunger, satiety, appetite, and food allergies. Third, influential psychological factors are, among other things, personality, lifestyle, values, experiences, mood,

believes, attitudes, food preferences, emotions, and motives (Shepherd & Sparks, 1994; Kotler & Keller, 2016; Engel, Blackwell, & Miniard, 1995; Furst et al., 1996). Consumers' motives can be divided into personal and social motives; the former can be related to, *inter alia*, entertainment and learning, while the latter can pertain to, for example, status and authority, communication with others who have a similar interest, and social experiences outside home (Tauber, 1972). The Food Choice Questionnaire (FCQ; by Steptoe, Pollard, & Wardle, 1995) has identified nine food choice motives: sensory appeal, convenience, price, health, weight control, ethical concerns, natural content, familiarity, and mood. The FCQ or modifications thereof have been used in many studies to investigate which motives and factors have an impact on or can predict different food choices. For example, Ares and Gámbaro (2007) examined the connection between food choice motives and perceived healthiness and willingness to try functional foods by using the modified version of the questionnaire.

Consumer behavior is not always rational and cognitive; emotions also play a strong role in behavior (Kotler & Keller, 2016). On the one hand, emotions and mood influence food choices and intake, and on the other hand, food consumption can affect a consumer's mood and feelings (Köster & Mojet, 2015). Psychological processes together with consumer characteristics form one of the key elements in the stimulus-response consumer behavior model (**Figure 1** page 15; Kotler & Keller, 2016). Kotler and Keller (2016) have listed four key psychological processes that crucially affect consumer responses: motivation, perception, learning, and memory.

People have multiple needs at any time. Eating, drinking, and purchasing food products are not only about satisfying physical hunger and thirst. In addition to these basic physiological needs, needs can be related to safety, social, esteem, and self-actualization requirements (Maslow, 1954). A need becomes a motive when it is stimulated to an adequate level of intensity to make people to act on it (Kotler & Keller, 2016). Maslow's, Freud's, and Herzberg's theories are three well-known theories of human

motivation. Almqvist, Senior, and Bloch (2016) have expanded Maslow's need hierarchy with a new model called "elements of value." The fundamental elements of value that products and services deliver cover four types of needs: 1) functional needs, such as sensory appeal, quality and variety; 2) emotional needs, such as wellness and reduces anxiety; 3) life changing, such as motivation and self-actualization; 4) social impact, such as self-transcendence.

In the process of perception, individuals choose, organize, and translate information to create a relevant picture of the world (Kotler et al., 1996). From a marketing perspective, perceptions are more meaningful than reality because they have a stronger impact on consumers' behavior. Perceptions are influenced by actual stimuli as well as a stimuli's connection to the surrounding environment and the individual's condition (Kotler & Keller, 2016).

Learning generates changes in behavior, which originates from earlier experiences. These learnings exist through the interaction of stimuli, drives, cues, responses, and reinforcement. Memory can be either temporary or a more permanent repository of information. Moreover, verbal, visual, contextual, and abstract information can be stored in memory (Kotler & Keller, 2016).

In addition to biological, physiological, and psychological factors, a wide range of other individual-related factors affect one's behavior. These are, for example, family life cycle; critical life events or transitions, such as marriage, illness, or childbirth; actual and desired role and status; occupation; and available resources, such as time and money (Kotler & Keller, 2016; Furst et al., 1996).

2.1.2 PRODUCT-RELATED FACTORS

One of the most essential factors contributing to food choices and food purchases is the product itself – through its internal and external factors. A food product's internal factors are related to its sensory characteristics (e.g. appearance, texture, and taste) and quality, as well as other quality aspects, such as healthiness and functionality, and product type (Köster, 2009). Many studies have demonstrated the significant impact foods' internal factors have on their acceptance and again on food choices and purchase behavior (e.g. Steptoe et al., 1995; Grunert, Loose, Zhou, & Tinggaard, 2015; Carrillo, Varela, Salvador, & Fiszman, 2011). For example, Grunert et al. (2015) found that internal factors are the main cues when Chinese consumers choose meat, and Carrillo et al. (2011) demonstrated sensory appeal to be one of the most important factors affecting food choices of Spanish consumers.

Furthermore, Urala and Lähteenmäki (2003) demonstrated that the perceived healthiness of food products is a complex choice factor. Healthiness-related reasons can pertain to general wellbeing, the prevention of diseases, and improved performance. These findings suggest that consumers' personal motivations must be considered when examining healthiness as a choice factor.

Product type has a major impact on food choices, and it also affects which factors are more relevant in food choices than others. Urala and Lähteenmäki (2003) demonstrated in their study that there were obvious differences between the motives for choosing the various food product categories. Taste and sensory quality were the main motives mentioned when selecting yogurt, juice, ice cream, and sweets, but not among spreads and carbonated soft drinks. In addition, familiarity with the brand was mentioned when choosing yogurt, juice, ice cream, and spreads, but not among carbonated soft drinks and sweets.

The external factors of food products are package, design, brand, price, labels, and product information, among other things (Köster, 2009). With regard to product packaging, numerous elements and functions are involved. Many of the features of packaging are related to a product's physical properties, such as protecting and preserving it; however, the packaging also plays a major role in communication, promotion and sales, and convenience (Rundh, 2005). Package elements can be classified into visual elements, such as graphic, material, form, and size, and verbal elements, such as product information, brand, and producer (Kuvykaite, Dovaliene, & Navickiene, 2009). Silayoi and Speece (2004; 2007) have demonstrated a strong link between packaging and purchase decisions. They found that visual elements play a crucial role in buying decisions, especially when consumers are in a rush (Silayoi & Speece, 2004). In contrast, Kuvykaite et al. (2009) studied milk and washing powder, and they demonstrated that verbal elements are more important for a consumer's purchase decision than visual ones, even when he or she is in a hurry.

Many studies have also examined the importance of different product characteristics as factors influencing food choices. According to Steptoe et al. (1995), sensory attraction, healthiness, convenience, and price are the most important factors of food choices. However, they also found that motives for food choices differ between genders, age groups, and income groups.

Before food consumption, subjects build an expectation about a product. External factors, together with previous experiences, create the subjects' expectations of the product and its internal attributes. Once the product is tasted, expectations can be confirmed or refuted through perception. Thus, a consumer's expectations and perceptions, and their congruence, form the whole product experience (Rizzo, 2016). Furthermore, external attributes influence consumers' attitudes and expectations towards the product and its perception, even before it is tasted (Deliza & MacFie, 1996). For example, Cardello and Sawyer (1992) demonstrated that product

information can either increase or decrease taste and pleasantness expectations. A consumer's first choice is based on his or her expectations of the product's quality, whereas subsequent choices are more affected by the sensory characteristics of the product (Arvola, Lähteenmäki, & Tuorila, 1999). Expectations have been shown to influence perception and the liking of food (i.a. Cardello & Sawyer, 1992; Cardello, 1995; Deliza & MacFie, 1996; Tuorila, Meiselman, Cardello, & Leshner, 1998; Varela, Ares, Giménez, & Gámbaro, 2010). Expectations hence play a major role both in food choices and in purchasing and liking. According to Thomson and Crocker (2015), product characteristics (i.e. the recipe, brand, and packaging combined) should ensure that consumers' expectations and perceptions are met; this would more likely lead to a successful launch of the product.

2.1.3 ENVIRONMENT- AND SITUATION-RELATED FACTORS

Cultural factors are stated to have a deep impact on purchase behavior. Culture, which affects people through families and key institutions, influences consumers' wants and behavior. Other cultural factors are subcultures and social classes. Subcultures include nationalities, religions, and geographic regions (Kotler & Keller, 2016). According to Lappalainen, Kearney, and Gibney (1998), major differences exist between EU countries in the factors affecting food choices. For example, price was mentioned as the most important influencer of food choices by 62% of Finnish respondents in contrast to 18% of Greek respondents.

Solomon, Bamossy, Askegaard, and Hogg (2010) have divided environmental factors into two groups: social (including culture) and physical surroundings. The social environment encompasses not only culture but also other people and social settings present during behavior. The physical environment refers to the physical place where the behavior occurs, and it includes all the sensory stimuli, such as decorations, smells, and temperature.

A store's environment is a key part of a consumer's shopping experience. According to the Point of Purchase Advertising International (POPAI) survey, over 70% of consumers do not make their purchase decision until they are at the store (Liljenwall, 2004). Therefore, Baker, Grewal, and Parasuraman (1994) suggested that a store's environment and in-store elements (e.g. lighting, colors, and music) might have a stronger impact on purchase decisions than other marketing elements, such as traditional advertising, for example, in television or newspapers, which is not present in that moment. They also found that the retail store environment affects consumers' perceptions of product quality. Furthermore, North, Hargreaves, and McKendrick (1999) demonstrated how in-store music influences product selection: French wines were sold more than German ones when French music was played, and vice versa with German music. A store's environment can also affect consumers' decisions to even enter the store (Kotler, 1973).

In addition to social and physical surroundings, situational factors significantly impact food choices and purchases. These factors include the timing of shopping (e.g. morning vs. night), available time to shop (e.g. rush vs. no rush), the people present during shopping (e.g. alone vs. with children, friends, or a parent), and activity during shopping (e.g. talking to someone or listening to music) (modified from Jaeger, Bava, Worch, Dawson, & Marshall, 2011).

2.2 MEASUREMENTS

Multiple measurements have been used to measure the factors that affect food purchase behavior. Below, the measurements are divided into two groups: explicit and implicit measurements. Explicit measurements are referred to as traditional self-report responses, while implicit measurements are referred to as the assessment of mental contents (Gawronski & Hahn, 2019). Moreover, explicit measurements

evaluate responses directly, whereas implicit measurements are, by nature, indirect methods of evaluation (Rocha, Lima, Moura, Costa, & Cunha, 2019).

2.2.1 EXPLICIT MEASUREMENTS

Although there is contradictory evidence of the explanatory power of demographic *background variables* in explaining food choices (e.g. Dagevos, 2005 vs. Wardle, Haase, Steptoe, Nillapun, Jonwutiwes, & Bellisie, 2004), these typical background variables (such as age, gender, and education) are commonly asked of respondents in consumer studies (e.g. Arvola et al., 1999; Mustonen, Hissa, Huotilainen, Miettinen, & Tuorila, 2007). It is also common to ask product-related background questions, especially when the target of the study is a specific product. These types of questions are related to, inter alia, product usage (e.g. Mustonen et al., 2007; Piqueras-Fiszman & Jaeger, 2014), familiarity (e.g. Arvola et al., 1999; Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001; Urala & Lähteenmäki, 2007; Mustonen, Oerlemans, & Tuorila, 2012), and willingness to use or try the product (e.g. Tuorila et al., 2001; Bäckström, Pirttilä-Backman, & Tuorila, 2004; Ares & Gámbaro, 2007).

In addition to background variables, various *attitude* scales have been developed to determine which attitudes can explain food choices and purchases as well as general attitudes towards products. Roininen, Lähteenmäki, and Tuorila (1999) developed the Health and Taste Attitudes Scale, which are used to examine interest in general health, as well as natural and light products. Moreover, using the Price Perception Scale by Lichtenstein, Ridgway, and Netemeyer (1993) as one of the bases, Ollila (2011) developed the Food Price Perception Scale that measures consumers' attitudes towards food prices. Finally, the Food Neophobia Scale was developed by Pliner and Hobden (1992), the shortened Change Seeker Index by Steenkamp and Baumgartner (1995), and a scale for functional food attitudes by Urala and Lähteenmäki (2004).

The *pleasantness* of food has been measured since the 50s when Peryam and Girardot (1952) and Peryam and Pilgrim (1957) introduced the nine-point hedonic scale that is still commonly used in the food research field. It has nine verbally labeled categories: four for “dislike,” one for “neither like nor dislike,” and four for “like.” Many variations of this scale currently exist: verbal labels have been replaced by numerical values; verbal anchors have been used at the ends of the scales only; or both words and numbers have been used on the same scale (Nicolas, Marquilly, & O’Mahony, 2010). Over the decades, multiple other variations of this scale and new scales have been developed to measure pleasantness and likes, such as seven-point scales (used in e.g. Arvola et al., 1999; Mustonen et al., 2007), line scales (used in e.g. Methven, Langrenney, & Prescott, 2012), the Labeled Affective Magnitude scale (LAM; by Schutz & Cardello, 2001), the Labelled Hedonic Scale (LHS; by Lim, Wood, & Green, 2009), and most recently the Many-Facet Rasch Model by Ho (2019). In addition, special scales (e.g. visually labeled smiley scales) have been developed for specific target groups, such as children (e.g. Popper & Kroll, 2011).

For *purchase intention*, a wide range of measures are also used in the food research field. The responses measure either the likelihood of purchases or the willingness to purchase. One most commonly used is five-point structured scale with labels indicating whether a consumer definitely or probably would buy or would not buy as well as a “not sure” option (e.g. Vickers, 1993; Guinard, Smiciklas-Wright, Marty, Sabha, Soucy, Taylor-Davis, & Wright, 1996; Rosas-Nexticapa, Angulo, & O’Mahony, 2005). Other utilized meters are, for example, the Juster scale; the 11-point probability scale (by Juster, 1966); line scales with anchors, such as “definitely would not buy” “maybe buy / maybe not buy,” and “would definitely buy” (e.g. Bower, Saadat, & Whitten, 2003); a seven-point scale (e.g. very unlikely or very likely) (e.g. Arvola et al., 1999; Urala & Lähteenmäki, 2007); and even a dichotomous scale with “yes” and “no” options (e.g. Mørk, Lähteenmäki, & Grunert, 2019).

For measuring *recommendation* and consumers' loyalty, Reichheld (2003) developed a measurement called a Net Promoter Score (NPS). It is an 11-point scale that measures the likelihood of a consumer recommending a certain company or product. Reichheld (2003) claims that this measurement correlates strongly with revenue growth.

Emotions elicited by food and eating or drinking have been studied with both explicit and implicit measurements. Explicit methods have been either visual – for example, the Product Emotion Measurement Tool (PrEmo®) by Desmet (2003) – or verbal (e.g. EmoSemio by Spinelli, Masi, Dinnella, Zoboli, and Monteleone, 2014) self-reported measurements asking respondents to report their feelings or emotions while seeing, smelling, or consuming food products. Multiple emotional lexicons (a list of emotional terms, sentences, or a set of emotional descriptors) have been developed over the years to measure food-elicited emotions (i.a. Desmet, 2003; Spinelli et al., 2014; King & Meiselman, 2010; Thomson, Crocker, & Marketo, 2010). In food research, the EsSense Profile®, developed by King and Meiselman (2010), is one of the most-utilized explicit emotion measurement methods. It contains a comprehensive list of 39 emotion attributes that consumers identify with the test products. In addition to emotions, these attributes include some moods and feelings.

One of the main restrictions of verbal self-reported methods is that to use them within different countries and cultures, they must first be translated into different languages, which might cause a loss of accuracy in their meaning. Therefore, the major advantage of visual self-reported methods is that translation is not needed (Köster & Mojet, 2015). In addition, Vidal, Ares, Machín, and Jaeger (2015) found that consumers use emojis and emoticons to express their food-related emotions more often than words. Emojis and emoticons have consequently gained popularity in measuring food-related emotions in recent years (e.g. Vidal, Ares, & Jaeger, 2016;

Jaeger, Lee, Kim, Chheang, Jin, & Ares, 2017a; Swaney-Stueve, Jepsen, & Deubler, 2018).

Even though explicit measurements are usually rapid and easy for respondents to use, they depend on a respondent's cognitive skills and consequently can be cognitively biased (Leitch, Duncan, O'keefe, Rudd, & Gallagher, 2015). Therefore, implicit measurements have recently gained increased attention.

2.2.2 IMPLICIT MEASUREMENTS

In addition to the wide range of explicit measurements, a diverse set of implicit measurements have been used in the food and consumer research field. One way in which to group these measurements is as physiological, expressive, or implicit behavioral task measures (Lagast, Gellynck, Schouteten, De Herdt, & De Steur, 2017).

Physiological measurements are, inter alia, cardiovascular (i.e. heart rate, blood pressure, and finger temperature), electrodermal (i.e. skin conductance level), pupillary (i.e. pupillary reflex and pupil dilation), and brain response (i.e. electro-encephalography [EEG] and positron emission tomography [PET]) measures. These measures target biological responses (Kreibig, 2010; Lagast et al., 2017). In food and consumer research, they have been used for measuring, among other things, experienced emotions during real-life cooking and tasting using EEG, ECG, and skin potential responses (Brouwer, Hogervorst, Grootjen, Van Erp, & Zandstra, 2017); emotional reactions to food packaging using explicit and implicit measurements, such as pupil dilation (Songa, Slabbinck, Vermeir, & Russo, 2019); and so-called true consumer preferences for the selected food type using EEG (Berčík, Horská, Wang, & Chen, 2016).

Expressive measurements, such as facial expression, have been used to understand expressive reactions. Facial expression measurements engage the facial muscle movements (Lagast et al., 2017), and consumers' facial reactions have been studied both in explicit and implicit ways. Implicit facial reactions have often been studied with Noldus-invented technology and software called *FaceReader™* (e.g. de Wijk, Kooijman, Verhoeven, Holthuysen, & de Graaf, 2012; Danner, Sidorkina, Joechl, & Duerrschmid, 2014; Mojet, Dürrschmid, Danner, Jöchl, Heiniö, Holthuysen, & Köster, 2015). It integrates eye tracking data and physiology data, and it was invented to recognize and analyze facial expressions automatically (Den Uyl & Van Kuilenburg, 2005). Danner et al. (2014) studied the differences between explicit and implicit facial reactions and their connection with the liking ratings. They found significant differences between facial expressions elicited by the various samples with both types of measurements. In addition, both measures explained the liking rating well but with different emotions: explicit reactions with "happy" and "disgusted," and implicit reactions with "neutral," "angry," and "disgusted." Furthermore, Mojet et al. (2015) examined the differences between eye tracking, face reading, and a new emotive projection test in different stages of food consumption. However, because of technical difficulties, they could not report the results of the face reading test. In addition to *FaceReader™*, the Facial Action Coding System (FACS), developed by Ekman and Friesen (1971), and Facial Electromyography (EMG) (e.g. Dimberg, 1982; Dimberg, & Lundquist, 1990; Bailey, 2016) have been used to examine facial expressions. Despite the development, face reading techniques still have some limitations in the reliability, and they are thus not established consumer research methods yet.

Implicit behavioral task measurements, such as the Approach-Avoidance Task (AAT) – also known as the Approach-Avoidance Procedure (AAP) – and the Implicit Association Test (IAT), have been used to measure implicit attitudes and emotional responses as well as motivational tendencies such as attraction or wanting vs. rejection (i.a. Seibt, Häfner, & Deutsch, 2007; Kemps, Tiggemann, Martin, & Elliott, 2013;

Piqueras-Fizman, Kraus, & Spence, 2014). They are typically based on measuring reaction times (Lagast et al., 2017).

2.3 PREDICTION

2.3.1 FOOD CHOICES AND INTAKE

Many researchers have used different ratings and combinations thereof to predict food choices and intake. Most of the utilized measurements are related to hedonic responses, such as pleasantness (e.g. Zandstra, de Graaf, van Trijp, & van Staveren, 1999; De Graaf, De Jong, & Lambers, 1999; Mustonen et al., 2007) or purchase intention (e.g. Ajzen, 1988). In addition, people's attitudes have often been the focus when predicting food choices (e.g. Roininen & Tuorila, 1999). Emotional responses have also recently gained popularity for predicting food choices and intake (e.g. King & Meiselman, 2010; Dalenberg, Gutjar, ter Horst, de Graaf, Renken, & Jager, 2014).

Both Zandstra et al. (1999) and de Graaf et al. (1999) found a positive relationship between pleasantness and food intake. Zandstra et al. (1999) studied yogurt in a laboratory context, while de Graaf et al. (1999) examined meals in a non-laboratory setting. They both demonstrated the important role of environmental factors in food choices and intake. In addition, many other studies (i.a. Arvola et al., 1999; Lähteenmäki & van Trijp, 1995; Urala & Lähteenmäki, 2006) have found a positive link between pleasantness and food choice.

Furthermore, food-evoked emotions have been found to add value beyond liking when predicting food choices (i.a. Gutjar, de Graaf, Kooijman, de Wijk, Nys, ter Horst, & Jager, 2015; Dalenberg et al., 2014). Dalenberg et al. (2014) studied the connection between food choices and both pleasantness and emotions, and they found that the two responses together predict choices better than pleasantness alone.

2.3.2 PURCHASE BEHAVIOR

Purchase intention is a widely used measurement to predict purchases and sales. However, mixed results have been described for the relationship between purchase interest and purchase behavior (e.g. Jamieson & Bass, 1989; Morwitz, Steckel, & Gupta, 2007). The degree to which intention leads to action varies greatly depending on the type of products and the way in which the research has been conducted. According to Morwitz et al.'s (2007) meta-analysis, intention correlates with purchases the strongest in the following cases: 1) for existing products, 2) for durable goods, 3) for short time horizons, 4) when studying in specific brands or models, 5) when buying is measured regarding trial rates, and 6) when purchase intention is measured in comparing set up. In this meta-analysis, the correlation between intentions and purchases varied widely (0.15–0.92).

Rosas-Nexticapa et al. (2005) studied the prediction ability of pleasantness and purchase intention for purchase frequencies regarding yogurts. They found that the more the yogurt was liked, the more it was bought. In addition, prediction was better when the evaluation was made in the informed condition rather than after blind tasting.

In an online shopping environment, users' previous activity has been commonly utilized to predict future purchase behavior. However, more accurate methods for predicting purchases have been tested in multiple studies. For example, Zhao, Yao, and Zhang (2016) examined the predictability of purchases by combining machine learning methods with a threshold-moving approach. Three feature groups were created: click, purchase, and collect-and-cart features. They found that a combination of all three feature groups predicted user purchases successfully.

2.4 THEORETICAL FRAMEWORK OF THIS STUDY

The theoretical framework of this study is based on earlier studies of consumers' food choices and purchase behavior as well as the model of consumer behavior modified from Kotler and Keller (2016). However, the focus of this study is on the prediction of food purchases, not on explaining the reasons for those purchases.

The Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) are both based on the assumptions that people act rationally and make conscious decisions. On the one hand, the TRA proposes that human behavior is defined by the intention to implement a behavior, where intention is a function of subjective norms and human's attitudes toward the behavior. TRA has primarily been used to predict human behavior based on people's intentions and preceding attitudes. Therefore, it can be said that based on this theory, intention is the best predictor of performing a behavior. On the other hand, the TPB is an extension of the TRA, since it also covers unwilling behaviors for prediction. In addition to attitudes and subjective norms, perceived behavioral control forms behavioral intentions and hence behaviors (Fishbein & Ajzen, 1975; Ajzen, 1985).

However, the abovementioned theories have met some criticism because of their low predictive strength, strong theoretical bias, and poor methodology. Past behavior, hedonic recognition, and habits have been found to be better predictors of food choices than psychological concepts, such as intentions and attitudes (Köster, 2009). In addition, Kahneman (2003), for example, has demonstrated that food purchase decisions are based on both intuition and rational thinking, rather than only on the latter as previous theories predicate. Therefore, this study looks beyond intention and hedonic appreciation to understand how purchase intention, pleasantness and other measurements predict purchase behavior individually and combined.

2.5 AIMS OF THE STUDY

The general aims of this study are to examine the role of purchase intention ratings as a predictor of actual food purchases and to determine whether other measurements can bring added value to the prediction. The primary focus is on factors related to consumers (perception, previous usage, emotions, habits, and beliefs) and products (expectations, product type, and sensory quality as internal factors, and brand as the external factor).

Detailed aims are as follows:

- to examine the ability of purchase intention to predict food purchases;
- to examine which factors can explain whether intentions lead to purchases;
and
- to examine which of the explicit and implicit measurements predict food purchases.

3 MATERIALS AND METHODS

3.1 OVERVIEW

The research questions, measurements, product information conditions, samples, and respondents in Studies I–III are described in **Table 1** (on the next page). Study I was conducted to investigate the role of two major product information conditions: 1) sensory quality perception and perception and 2) generally used measurements in the field, namely, pleasantness, purchase intention, and emotions. Study II was conducted to examine the role of two other product information conditions – expectation and perception – as well as the role of different products in prediction. Study III was executed to investigate the role of different types of measurements in predictions: implicit and explicit measurements.

Table 1. Research questions, measurements, product information conditions, samples, and respondents in Studies I-III.

	Research questions	Measurements	Product information conditions	Samples	Respondents
I	1) How do hedonic and emotional responses under different product information conditions (blind and actual perception) predict purchase behavior? 2) Which of these measurements or combinations thereof is/are the best predictor/s of purchases?	Hedonic responses pleasantness and purchase intention Emotional responses	Sensory quality perception Perception	Three blueberry flavored quarks	N=107 20-71 y 37% M, 63% F 28% heavy users, 35% mediocre users, 37% light users
II	1) How do purchase intention responses under different product information conditions (expectation and perception) predict the actual purchases? 2) Which factors on an individual level and on a product category level explain whether the intention leads to actual purchase behavior?	Individual factors Brand loyalty, planning tendency as part of purchase process, previous purchase behavior of product category, brand familiarity and usage, change seeking tendency Product category/factors Establishment of the category, consumption habits of the product types	Expectation Perception	Three blueberry flavored quarks Three natural yogurts	N=107 for quarks 20-71 y 37% M, 63% F 28% heavy users, 35% mediocre users, 37% light users N=105 for yogurts 18-72 y 39% M, 61% F 48% heavy users, 30% mediocre users, 22% light users
III	1) How do explicit and implicit responses under different product information conditions predict the actual purchases? 2) Which of these measurements or combinations thereof is/are the best predictor/s of purchase behavior?	Explicit Emotion, willingness to recommend, pleasantness, brand relationship Implicit EEG, AAT, pupillometry	Expectation Perception	Three blueberry flavored quarks	N=134 for explicit measurements 18-63 y 41% M, 59% F 47% heavy users, 37% mediocre users, 16% light users N=56 for implicit measurements 23-50 y 44% M, 56% F 52% heavy users, 34% mediocre users, 14% light users

Expectation=at store, Sensory quality perception=blind tasting, Perception=branded tasting, actual experience (at home); M=male, F=female; heavy users=daily or 3-5 times per week, mediocre users=1-2 times per week, light users=1-3 times per month

Only general descriptions of the experimental procedures are provided in this section. For more detailed information, see Studies I–III in the appendix.

3.2 RESPONDENTS

A total of 467 consumers from the Helsinki area participated in the studies (I–III), but only 346 of them participated in all phases of the research (online surveys, evaluation sessions [Central Location Test, CLT], and a 1-month follow-up survey). Approximately one third were users of natural yogurt (N = 105, study II), and the rest users of flavored protein quark (N = 107, studies I–II; N = 134, study III). All the consumers were recruited by a nationwide marketing research agency (Norstat). Furthermore, the respondents of implicit measurements were a subset of 56 randomly selected respondents from Study III's population (see **Table 1** for age, gender, and product usage distributions). Finally, the respondents who did not participate in all phases of the research were omitted from the data analysis.

3.3 SAMPLES

Two types of food samples were used in the studies: blueberry-flavored quarks (I–III) and natural yogurts (II). All the samples were commercially available, spoonable, dairy (snack) products. These two types of foods depict the dairy snack product category from different perspectives. In Finland, natural yogurt is often sold in multi-portion packages (1 kg), and it is most frequently eaten for breakfast and mixed with other ingredients, such as berries or granolas. Flavored protein quarks are sold in a single-portion package (150–200 g) and are consumed as such on different occasions during the day. In addition, the samples within a product type represented products having different market position in the category (e.g. the top selling branded product and a private label product).

3.4 PROCEDURE

Studies I and II consisted of an online survey, an evaluation session (Central Location Test, CLT), and a 1-month follow-up period including two online surveys. The initial online survey was designed not only to recruit the target respondents for the studies, but also to work as a preliminary survey to examine consumers' expectations of the studied products based on the brand and packaging pictures of those products. In the CLT, the samples were evaluated first blind (sensory quality perception) and then branded (holistic perception). In both product evaluations, the respondents got 50 g of each product and were asked to taste them in an individually randomized order. Furthermore, in the blind evaluation, more than three products were available to taste, so that the same samples were not in the branded tasting. The CLT was conducted at the premises of the research agency in Helsinki, the capital city of Finland, and the follow-up period began the day after the respondents participated in the CLT. Follow-up surveys were sent every 2 weeks; in these surveys, the respondents reported their quark or yogurt purchases within the follow-up period.

Study III consisted of an online survey, a tasting session (CLT), a session for implicit measures, and a 1-month diary. The initial online survey and the CLT worked in the same way as in Studies I–II without the blind tasting part. The session for implicit measures was conducted a day after the CLT. Moreover, both the CLT and the session for implicit measures were conducted at the premises of the same aforementioned research agency. The filling of the purchase diary began the day after the CLT or the session for implicit measures. The respondents recorded their daily quark purchases in paper diaries and then transferred their purchase notes to the online surveys approximately twice a month.

Table 2 presents more detailed measurements, scales, and product information conditions used in Studies I–III. The measurements and scales used in this study were a

combination of widely used ones, such as pleasantness and purchase intention, and more novel ones, such as emojis and brand relationship, to be able compare and find the best possible responses from a wide range of alternatives.

Table 2. Explicit measurements, scales and product information conditions used in Studies I-III.

Measurement	Scale	Product information condition	Used in the following Studies
Pleasantness #1	7-point structured scale; 1= really bad, 2 = fairly bad, 3= a bit bad, 4 = not bad nor good, 5 = a bit good, 6 = fairly good, 7=really good	Expectation Blind perception Perception	I-II
Pleasantness #2	7-point labelled scale: 1=I do not like at all, 7 = I do like a lot	Expectation Perception	III
Purchase intention	5-point structured scale: 1 = I certainly would not buy, 2 = I hardly would buy, 3 = I am not sure would I buy or not, 4 = I almost certainly would buy, 5 = I certainly would buy	Expectation Blind perception Perception	I-III
Emotion #1	Rate-all-that-apply (RATA): Not checked/0 = not at all 1 = slightly 2 = moderately 3 = very 4 = extremely Verbally and visually presented, emotion terms were the same as are used in a validated emotion measurement PrEmo®	Expectation Blind perception Perception	I
Emotions #2	Check-all-that-apply (CATA): 9 positive emojis 3 neutral emojis 13 negative emojis	Expectation Perception	III
Willingness to recommend product (NPS)	0-10 labelled scale	Expectation Perception	III
Brand relationship	0-100 scale	Expectation	III
Willingness to eat again	4-point structured scale: 1 = I certainly would not eat again, 2 = I hardly would not eat again, 3 = I might eat again, 4 = I certainly would eat again	Perception	III

3.5 DATA ANALYSIS

The data were analyzed by applying standard statistical procedures (analysis of variance, Z-test, Spearman’s rho and Pearson’s *r* correlation coefficient, binary logistic regression, and multivariate linear regression) as described in the original papers (I–III). Purchase data of only the target products were analyzed, and the purchase data

of other products were excluded from this study. The statistical programs used in the analyses were IBM SPSS Statistics for Windows, R statistical language, Caret library by Max Kuhn, Matlab, and Statistica 10.

In Studies I–II, the respondents were divided into two subgroups (non-buyers and buyers), and in Study III, they were divided into three purchase frequency subgroups (non-buyers, light buyers, and heavy buyers) according to their self-reported purchase behaviors (if they purchased or did not purchase the target products). In Study II, the respondents were also divided into three subgroups (non-intenders, hesitants, and intenders) according to their purchase intention.

Two-way analysis of variance (ANOVA) was used to compare pleasantness, purchase intention, and recommendation ratings of purchase status (non-buyer vs. buyer / purchase frequency) under different evaluation conditions (Studies I and III). It was also used to compare the pleasantness ratings of three intention groups under different evaluation conditions (Study II) and the brand relationship and willingness-to-eat-again-ratings of purchase frequency groups (Study III). Repeated measures ANOVA was used to analyze the effects of buyer category on implicit measurements (Study III).

A Z-test was used for calculating differences between the proportions of purchase intention ratings and checked emotions under different evaluation conditions for non-buyers and buyers (Study I). It was also used to compare differences in the proportions of non-buyers and buyers in different intention groups (Study II) and differences in the proportions of emotion, recommendation, pleasantness, and purchase intention ratings of purchase frequency groups under different conditions (Study III).

Spearman's rho correlation coefficient was used to test the correlations between pleasantness, emotions, and purchase intention under different evaluation conditions (Study I). Moreover, Pearson's correlation coefficient was used to test the correlations between purchase frequency groups and explicit and implicit measurements under different evaluation conditions (Study III).

Binary logistic regression was used to analyze the impact of pleasantness, emotions, and purchase intention ratings on the likelihood of a consumer purchasing the product under different evaluation conditions (Studies I–II). Furthermore, multivariate linear regression was used to analyze the impact of explicit and implicit variables on a consumer's likelihood of purchasing (Study III). Finally, ANOVA was used to analyze model fits. For the full 17-predictor model, normalized predictor fits were calculated, and a backward, one-by-one elimination of the least-fitting predictors led to the best-fitting model.

4 RESULTS

The three studies as individual contributions provide insights into how traditional and/or novel, explicit consumer survey measurements and/or implicit measurements predict food purchases the best. **Table 3** (on the next page) illustrates the specific research questions, approach, and contributions of the individual studies.

Table 3. Summary of individual articles

Article no.	Research questions	Top results
I	<ol style="list-style-type: none"> How do hedonic and emotional responses under different product information conditions (blind and actual perception) predict purchase behavior? Which of these measurements or combinations thereof is/are the best predictor/s of purchases? 	<ol style="list-style-type: none"> A stronger association was found between responses and purchases after branded perception compared to blind perception. Purchase behavior was best predicted with purchase intention response only after branded tasting.
II	<ol style="list-style-type: none"> How do purchase intention responses under different product information conditions (expectation and perception) predict the actual purchases? Which factors on an individual level and on a product category level explain whether the intention leads to actual purchase behavior? 	<ol style="list-style-type: none"> With regard to purchase intention, both expectation and perception are significant factors in predicting purchase behavior. Factors differentiating buying and non-buying intenders of spoonable dairy snacks (yogurts and quarks) are mostly dependent on product type. <ul style="list-style-type: none"> Being a user of a brand increases the proportion of intentions leading to actual buying of a staple product (natural yogurt). Heavy usage of a product increases the probability of consumers' intentions leading to actual buying of a personal use product (flavored protein quark).
III	<ol style="list-style-type: none"> How do explicit and implicit responses under different product information conditions predict the actual purchases? Which of these measurements or combinations thereof is/are the best predictor/s of purchase behavior? 	<ol style="list-style-type: none"> Explicit measurements under the perception condition predict the actual purchases the best. <ul style="list-style-type: none"> Explicit measurements were more accurate predictors of purchases than implicit measurements. Explicit measurements distinguished the purchase frequency groups better after perception than after expectation. PS, purchase intention, and pleasantness correlated the strongest with purchase frequency, but they also correlated strongly with one another. <p>Multiple regression models largely confirm these observations, with the exception of the relevance of implicit joystick scores: these contribute prominently to the prediction of purchase frequencies in the best fitting five-predictor model but do not stand out in bivariate comparisons.</p>

4.1 EVALUATION CONDITION IN PREDICTION

Overall, the more information was available, the better purchase behavior was predicted (I–III). Explicit responses were poor predictors of purchase behavior after blind tasting (I). Furthermore, explicit responses after expectation and after the perception condition predicted purchase behavior well; however, prediction based on the responses after the perception condition was better and differentiated the purchase frequency groups better (II–III).

4.2 PURCHASE INTENTION AS A PREDICTOR

Of the hedonic (in this case, pleasantness and purchase intention) and emotion responses, purchase intention had the strongest association with purchase behavior (I). Purchases were predicted better after branded tasting than blind tasting (I), but based on both expectation and perception, purchase intention was the most significant predictor of purchase behavior (II). However, purchase intention ratings distinguished the purchase frequency groups better after perception than after expectation (III). Furthermore, purchase intention was a significant predictor for both product types, namely, flavored protein quark and natural yogurt (II). Of the wide range of explicit measurements and implicit measurements together, purchase intention based on perception was one of the most predictive responses for purchases (III).

In addition, characteristics distinguishing non-buying and buying intenders were mostly product-type dependent (II). Using a certain brand increased the probability of intentions leading to actual purchases of a staple food product, such as natural yogurt. Being a heavy user of a certain product increased the proportion of intentions leading to purchases in a personal use product, such as flavored protein quark (single-portion package).

4.3 OTHER MEASUREMENTS AS PREDICTORS

Of the hedonic (in this case, pleasantness and purchase intention) and emotion responses, pleasantness and emotions had a minor association with purchase behavior (I). Furthermore, of the emotions, desire made the strongest contribution to the prediction of purchase behavior. After both blind and branded tasting, combining these ratings did not improve the prediction of the purchase behavior. Moreover, both hedonic and emotion ratings correlated strongly with each other.

Of the wide range of explicit and implicit measurements combined, overall explicit responses correlated more strongly with purchases than implicit responses (III). They also had a stronger correlation after the perception than expectation condition. In addition, promotion scores and pleasantness ratings correlated with purchase frequency as strongly as purchase intention. Verbalized ratings, such as promotion scores, pleasantness, willingness to eat again, and purchase intention ratings, were associated more strongly with purchases than with emotional responses. Based on the multiple regression best-fitting model, the best five predictors out of 17 responses were as follows: purchase intention (perception), brand relationship (expectation), reaction time (implicit), positive emotions (expectation), and pleasantness (perception).

Of the implicit measurements, the ERP-based product approach bias correlated the strongest with purchase frequency (III). The correlation was as strong as with multiple explicit responses after the expectation condition. Finally, based on the multiple regression analysis, the reaction time of the implicit measurement was included in the best-fitting model as a significant predictor. Overall, explicit responses were associated more strongly with purchase behavior than implicit responses.

5 DISCUSSION

5.1 DIFFERENT MEASUREMENTS AS PREDICTORS

This study demonstrates that consumers have the ability – albeit somewhat limited – to forecast their own purchase behavior by their responses to different explicit measures. In other words, explicit responses are accurate predictors of subsequent purchases. As explicit measures, hedonic measurement and emotion responses, among others, were used. In this study, both pleasantness and purchase intention were determined to be hedonic measurements, although purchase intention is not necessarily generally described as a hedonic measurement. However, this study demonstrates a strong correlation between pleasantness and purchase intention, suggesting that purchase intention also carries a hedonic dimension. Therefore, it is justified to bundle these as hedonic measurements.

5.1.1 PURCHASE INTENTION

The aim of this study was to assess the relevance of purchase intention in predicting purchase behavior. The results indicate that of all the measurements utilized, purchase intention is the best possible measurement to predict purchases. However, it has been stated that the final purchasers of products generally include both those who indicated a clear purchase interest and those who indicated a clear negative intention in the same situation (Tirtiroglu & Elbeck, 2008). According to Armstrong, Morwitz, and Kumar (2000), when studying cars and wireless telephone services, most of the purchases were made by those who did not initially intend to buy.

However, purchasing cars and services are quite different processes than purchasing low-involvement products, such as food items, which were the focus of this study. The current study revealed that the proportion of buyers who initially intended to buy was clearly higher than the proportion who did not intent to buy. The hesitants (initially undecided about whether or not to buy) turned into non-buyers more often than into buyers. These findings suggest that further studies are required to examine the predictive power of even more novel and other implicit responses than those used in this study. In future investigations, it may be possible to use different artificial intelligence methods to approach this issue, as has already been tested in the e-commerce environment (e.g. Zhao et al., 2016).

5.1.2 OTHER EXPLICIT MEASUREMENTS

This study confirms that pleasantness is strongly associated with purchase behavior: buyers gave higher pleasantness ratings than the non-buyers. This finding is in line with that of other studies showing that pleasantness predicts food choices (e.g. de Graaf, Kramer, Meiselman, Leshner, Baker-Fulco, Hirsch, & Warber, 2005; Mustonen et al., 2007). Despite the vast evidence suggesting that responses other than pleasantness also influence purchase intention and food choices (e.g. Kähkönen & Tuorila, 1999; Dahlenberg et al., 2014), and even though the association between pleasantness and purchase intention depends on the product (e.g. Kähkönen & Tuorila, 1999; Tuorila, Huotilainen, Lähteenmäki, Ollila, Tuomi-Nurmi, & Urala, 2008), it is also indisputable that pleasantness is one of the most effective factors to predict food purchase intention and behavior. Although pleasantness and purchase intention also correlate strongly with each other in this study, they still do not measure exactly the same dimension – pleasantness measures how pleasant a product is perceived to be (Mustonen, Vehkalahti, & Tuorila, 2005), whereas purchase intention measures the purchasing probability and product experience more holistically. While a product may be perceived to be pleasant, its other qualities (e.g. unhealthiness) may lead a person to not purchase it and choose, for example, a healthier option in the category.

Therefore, despite the strong association between pleasantness and purchases, hedonic measurements as predictors of market success have been questioned because of such a high failure rate of new product launches (Köster, 2003; Köster & Mojet, 2012; Gutjar et al., 2015).

This study found that positive emotions were checked more often by buyers, while non-buyers checked more negative emotions (Studies I and III). Nevertheless, emotions overall did not contribute any added value to the prediction of purchase behavior, apart from pleasantness and purchase intention. This outcome is contrary to that of Dalenberg et al. (2014), who found that pleasantness together with emotions predicted food choices better than pleasantness alone. However, purchase intention was not measured in their study, which may explain the inconsistency between the findings of these studies.

This study was designed to determine the effect of the utilized measurements or combination thereof in predicting purchase behavior. The results indicate that combining the responses does not substantially improve the prediction of purchases. In addition, many of the explicit responses correlated strongly with one another. It can be assumed that these strong correlations between measurements are some of the main reasons that the prediction of purchase behavior was not improved by combining responses. These results are in line with earlier studies that found a correlation between pleasantness and emotions (Spinelli, Masi, Zoboli, Prescott, & Monteleone, 2015; Ng, Chaya, & Hort, 2013). However, it has also been demonstrated that measures of pleasantness and emotion do not correlate (Porcherot, Delplanque, Raviot-Derrien, Calvé, Chrea, Gaudreau, & Cayeux, 2010; Gutjar et al., 2015), suggesting that emotions together with pleasantness may help to explain food choice behavior. Nonetheless, further work is required to establish the added value of the emotional responses to food choices.

This study also demonstrated that the promoter score (PS) predicted purchases accurately, especially after branded tasting. This result is aligned with that of Reichheld (2003), who found that a high NPS usually corresponds with high sales and company growth. Another finding was that the PS correlated strongly with brand relationship, which confirms the suggestion by Reichheld (2003) that the NPS primarily assesses loyalty towards a specific brand and/or company.

5.1.3 IMPLICIT MEASUREMENTS

The utilized implicit measurements (EEG, reaction times by joystick, and pupil dilation) did not predict purchase behavior as well as the explicit measurements. Only the EEG measure correlated significantly with purchases, and the reaction time responses were one of the three significant predictors in the best-fitting five-predictor multivariate regression model. These findings suggest that even though these measurements do not predict purchase behavior well as such, they explain aspects of purchases not explained by other predictors.

Consumer responses are less reliable predictors of purchase behavior when measuring responses easily affected by respondents' will to give socially desirable ratings (Fischer, 1993; King & Bruner, 2000). The studied products were similar in nearly all aspects (e.g. availability, familiarity, and composition), thus no distinct factor existed which could have influenced the respondents to constrain their actual product impression and offer more socially desirable responses. Therefore, in the absence of social desirability of a specific product choice, implicit responses did not predict purchases of commercially available, familiar products better than the explicit measures did. However, they add some unique understanding of purchase behavior regarding those products. It can be expected that implicit responses become better predictors when studying products with versatile social acceptance scores. Based on this finding, the results might have been different if studying novel and unfamiliar products, such as unlaunched products.

5.1.4 LIMITATIONS AND ADVANTAGES OF THE MEASUREMENTS IN PREDICTION

The current study found that explicit responses, especially purchase intention, promoter score, pleasantness, and willingness to eat again, predicted future purchase behavior quite well. This finding suggests that using one of these ratings as a predictor of future purchases would be sufficient. These ratings correlated strongly with one another, meaning that one is not better than the others. In addition, the prediction of purchases was more accurate after branded tasting than based on expectation, not to mention blind tasting. However, both expectation and perception conditions played a role in prediction; therefore, both conditions should be taken into account in consumer studies.

Pleasantness ratings are still commonly used predictors to forecast the success of new food products. However, this study demonstrates that pleasantness is a poorer predictor of purchases than purchase intention, and these two measures also correlated strongly with each other. These findings thus suggest that pleasantness scores should not be used as a predictor. Pleasantness ratings based on blind tasting in particular correlate poorly with purchases; therefore, these ratings should definitely not be used in prediction. This finding is in line with the well-known failure case of decision-making based on blind tasting: New Coke in the 1980s (Lawless & Heymann, 2010). However, measuring the pleasantness of a product is still useful for other purposes, such as for examining which of the product's quality aspects drive its likeability, which could be useful in, for instance, guiding product development.

Emotional responses were not as accurate predictors of purchases as, for example, hedonic measurements; however, they played a role in purchase behavior. Positive emotions, particularly desire and joy, contributed to purchases. These findings suggest that food product launches should evoke at least some kind of positive emotion

to be able to succeed in the market. However, more research is needed to holistically understand the role emotions play in predicting future purchases and product success in the market. In addition, new implicit methods for measuring emotions are required to be able to identify the real, unconscious emotional expressions.

Surprisingly, implicit measurements did not add predictive value to purchases: they predicted purchases quite accurately but not as well as some of the explicit measures. This finding suggests that the utilized implicit measures are not worth using when the food industry is aiming to predict future sales. These measurements are both technologically and analytically more challenging to conduct than explicit measurements, and a demanding and invasive data collection situation may bias the responses. Furthermore, these measurements are more time consuming and expensive than traditional explicit measurements; the food industry should consequently not use them on a regular basis.

In conclusion to the examined measurements and evaluation conditions, using either purchase intention or promoter score and measured based on expectation and perception, is by far the best means of predicting future sales in the food industry. As background questions, product and brand usage should be measured to be able to validate whether intentions lead to actual behavior. Furthermore, additional questions measuring the same dimension (e.g. pleasantness) do not need to be included in the consumer studies, since they do not seem to offer any added value, and more importantly, the results may become less reliable when a single questionnaire becomes too long for the respondents to answer (Lawless & Heymann, 2010).

5.2 ROLE OF DIFFERENT FACTORS IN PREDICTING PURCHASE BEHAVIOR

5.2.1 ROLE OF CONSUMER-RELATED FACTORS IN PREDICTION

Emotions

Desmet and Schifferstein (2008) demonstrated that, in general, foods evoke more positive than negative emotions. This study confirms that finding: overall, positive emotions were checked more often than negative emotions. Moreover, negative and neutral emotions correlated negatively with purchasing, suggesting that for a food product to be purchased, it must arouse at least some positive emotions. Accordingly, food products evoking only negative or neutral emotions do not necessarily attain success in the market.

Gutjar et al. (2015) argued the importance of examining how a potential (mis)match between emotions elicited by unbranded and branded food products impacts acceptance and choice. Such a mismatch was not found in this study; however, the branded tasting evoked more desire and joy in buyers compared to the blind tasting (Study I). This finding suggests that these emotions may play a role in purchase decisions. In addition, desire as an emotion was the most significant in predicting purchases. Mela (2001) indicated the relevance of the dissimilarity between short-lived wanting (desire to eat) and long-lived liking in food choices. This may imply that desire as an emotion brought a new dimension – other than liking – in predicting in the current study. A further study, with a focus on desire as an emotion in product experience and purchase prediction, is therefore suggested. Furthermore, although this study did not demonstrate a strong relationship between emotions and actual purchases, much previous evidence demonstrates the relationship between food and emotions (e.g. Gutjar et al., 2015, Mela, 2001). This finding suggests that a demand

exists for new, more accurate methods of measuring emotions; method development is thus required in this field.

Habits and beliefs

This study demonstrates that current habits of consuming certain brands have a strong impact on turning purchase intention into purchases, especially in a staple product, such as yogurt. This finding suggests that consumers can more easily forecast their subsequent purchases of products they already use regularly than those of products they have not seen or tasted before. Furthermore, this study supports evidence from previous observations (e.g. Morwitz et al., 2007). Jacoby and Kyner (1973) stated that brand loyalty involves repeated purchase experiences. In this study, during follow-up period, hardly any respondents bought a product they had not tried prior to the study. In other words, almost all the buyers had at least a small amount of former experience of the product they bought during the study. This may have led to a higher level of correspondence between intention and purchases. In particular, it may somewhat explain the relatively high proportion of buyers who are intenders, since intenders could represent the respondents who were pleased with their previous experience.

In case of a product meant for personal use (e.g. single-portion quark), a purchase intention tended to turn into a purchase more frequently if the purchase was planned before going to the store. The probability of an intention leading to a purchase was lower if the consumer was a variety seeker and a spontaneous shopper. This finding supports evidence from previous observations (e.g. Ratner, Kahn, & Kahneman, 1999; Mustonen et al., 2007), which have indicated that people do not constantly want to choose the most preferred option; especially variety seekers might also choose less-preferred products from time to time. In addition, consumers tended to be more accurate in forecasting their later purchases if the drivers behind their choices were favoring or being loyal to a certain brand. In the case of a staple

food product (yogurt) in particular, consumers were less able to predict their future purchases if price was the most important driver of those purchases. This is assumedly related to the reduced prices and offers in the store having a strong impact on the final purchase decision.

5.2.2 ROLE OF PRODUCT-RELATED FACTORS IN PREDICTION

As mentioned in a literature review, the first purchase decision regarding a product is based on the expectation created by the product's external factors, such as package design and brand, and previous experiences with similar types of products. Repurchase decisions are based on these same factors, with the addition of previous experiences with this particular product. For the actual experience, it is important that the expectations and the experiences meet because this has a direct impact on repurchase intention (Solomon et al., 2010). This study confirms that both expectation and perception play important roles in purchase behavior. Furthermore, a study by Lange, Rousseau, and Issanchou (1998) demonstrated the equally strong impact of both the external and internal factors of a product on product choice. Both expectation and perception should hence be taken into account when predicting purchase behavior.

When comparing sensory perception alone versus a holistic perception with all possible information available, the prediction of purchase behavior was more accurate when more product information was available during the evaluation (blind vs. branded tasting). This finding was also reported by Siegrist and Cousin (2009), who demonstrated that a consumers' choice is influenced by the amount of product information. Moreover, Rosas-Nexticapa et al. (2005) found that predictions are more accurate when responses are measured with package information available. In addition, many studies have demonstrated that brand has an effect on pleasantness scores (e.g. Allison & Uhl, 1964; Lange, Martin, Chabanet, Combris, & Issanchou, 2002; Robinson, Borzekowski, Matheson, & Kraemer, 2007). Purchase behavior thus

cannot be predicted by hedonic tests and purchase intention responses based on sensory perception alone. These measures are accurate for other purposes, such as to determine how the sensory quality of a product differs from other similar products.

The reasons that intention turns into behavior varied, to some extent, between the studied products (yogurt vs. quark; Study II), although they represented the same product category (spoonable dairy snack products). One possible explanation for this may be the similarities in the sensory quality of the yogurt samples, while more visible differences existed in the quarks. Another possible explanation relates to the differences in the typical usage occasions and users of the products: natural yogurt represented a staple food product (e.g. milk sold in 1-kg packages that are mostly taken home for the whole household), while flavored protein quark represented a healthy delicacy product sold in a single-portion package, which is typically bought for personal consumption only. One can assume that forecasting choices regarding products that will be consumed together with other people is more difficult than predicting one's own choices. This study indicated that intenders who bought the product also liked the product more, particularly in quarks. This suggests that for a product purchased for oneself only, one's own preference plays a more essential role in the choice. This finding is consistent with a previous study by Morwitz et al. (2007), who stated that even if a respondent assigns his or her own purchase intention to the product, other members in his or her household might have an impact on the final purchase decision.

5.3 METHOD AND RELIABILITY

Collecting data from a long-lasting experiment is always challenging. Multiple evaluation phases cause data loss because of respondents who suddenly quit. When the focus is on smaller subgroups in particular, the number of respondents in each group

is small, which makes these analyses less reliable. In addition, strict exclusion criteria make the recruitment as well as the generalization of the results more difficult and less reliable. Especially the electrophysiological measurements (Study III) had restrictive requirements for respondents to be able to participate in the measures, and this also affected participation regarding the other implicit measurements. However, the results for all 134 respondents (additional analysis) were identical to those of the subset of 50 respondents, suggesting that restrictions did not decrease the reliability of the results. Moreover, the subset corresponded to the total group of respondents well in terms of demographics and other background variables.

This study was conducted only in Helsinki, the capital city of Finland. Therefore, the results cannot be directly generalized to the Finnish population, nor to other countries or market areas. For example, the wideness of the product range may vary much depending on the area in which one lives. However, the effect of product familiarity or usage on purchase probability is more or less similar despite the living area.

Furthermore, only two types of dairy snack products, which already existed in the market, were used in this study. The results thus cannot be generalized to other food product categories. Further experimental investigations, using a broader range of products (different categories and items that have not yet been launched) and areas, are needed to fully understand the relevance and applicability of these results.

Pleasantness and purchase intention are established measures in consumer and sensory research, and they can be considered as reliable measures. However, the basic design used in all three studies may have influenced the explicit responses as well as purchase behavior. Many of the explicit responses (such as pleasantness, purchase intention, and PS in Study III) were measured consecutively in many phases and in the same order. This might have caused the strong correlation between these ratings, as consumers want to be rational and consistent with their responses.

Therefore, further work is required to measure only one response at a time to examine which of the used measures is the most accurate predictor of purchase behavior.

In this study, purchase behavior was measured using self-reported surveys within a one-month period. In Studies I–II, purchases were recorded in online surveys bi-weekly. In this case, the respondents may not have remembered all the purchases they had made within the two weeks. Therefore, in Study III, a paper diary was used to record the purchases for the respondents to be able to make purchase notes every day, thereby eliminating the previously mentioned source of error. Furthermore, the study lasted five to six weeks for each respondent. In that time, respondents were exposed to the studied products multiple times, which may have affected their awareness of those products and consequently their purchase behavior, as previous studies have demonstrated (i.a. Morwitz & Fitzsimons, 2004). For example, Morwitz and Fitzsimons (2004) demonstrated that purchase intention measures alone may change subsequent purchase behavior. Attempts were made to dispel this source of error by collecting the purchase data from numerous other products in the same category as well, not only the studied products.

A future method of predicting sales could be to combine actual sales data from retailers with hedonic product-related data from their customers. This would not only remove the bias caused by exposure and mistakes in diary-based reporting, but also make it possible to gain actual sales data over a longer period of time for thoroughly understanding which measurement values best predict purchases (e.g. first vs. repeated). This type of approach and data combination would also provide information on how often a new product will be chosen over products already on the market. Repeating these new product development (NPD) product tests with recognized customers would make it possible to create a database of the measurements in successful and unsuccessful launches and to reliably define which measurements and their values are the best predictors.

Previous use of and familiarity with the studied product type may have influenced the evaluations. King and Meiselman (2010) found that previous use of a product influenced evoked emotions: users recorded more positive emotions than non-users. Moreover, Di Monaco, Cavella, Di Marzo, and Masi (2004) demonstrated that more familiar products turned out to be the preferred ones when the brand information was available. In addition, the evaluations may have been influenced by the popularity of a certain studied brand. Even in the blind tasting, respondents may have recognized some of the samples by knowing certain brands well. Quark samples in the study had a clear difference in appearance, namely, their color, which may have had an effect on participants recognizing the product. Therefore, this is an important issue for future research. To obtain a complete picture of making choices and predicting the future sales of new products, it is important to also consider how successful a new product is in a choice situation among existing products already in the market. Additional studies, including novel study designs, are thus necessary to be able to more efficiently support new product development.

In this study, emotions were measured by both verbal and visual stimuli (Studies I–II). Dalenberg et al. (2014) demonstrated that product choice is predicted more accurately with a non-verbal emotion meter (PrEmo®) than only with a verbally described emotion meter. Many consumer studies have employed the PrEmo® meter to examine emotions elicited by food (e.g. Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013; Gutjar et al., 2015). In addition, emojis were used to express emotions (Study III). In this regard, Vidal et al. (2016) observed how consumers have been using emojis and emoticons in tweets to express food-related emotions. However, all these measurements are explicit responses of emotions, and the responses are collected at a more or less rational level. Therefore, emotions could have exhibited a greater impact on prediction if they were measured in more implicit, irrational, and unconscious ways. Jaeger, Cardello and Schutz (2013) have also posed a question

concerning the need to examine the methodological issues related to emotional responses when using explicit measurements.

This study was conducted both in online and CLT environments, and previous studies have well demonstrated how the environment and context affect food experience and evaluation (i.a. de Graaf et al., 2005; Boutrolle, Delarue, Arranz, Rogeaux, & Köster, 2007; Piqueras-Fiszman & Jaeger, 2014; Hannum, Forzley, Popper, & Simons, 2019). However, further research is required to investigate the relation between evaluations and purchases in different settings, such as made-up stores and real stores or via immersive techniques (such as Immersive Room [IR] and Virtual Reality [VR]), which simulate real-life environments. In this regard, Sinesio, Moneta, Porcherot, Abbà, Dreyfuss, Guillamet, Bruyninckx, Laporte, Henneberg and McEwan (2019) demonstrated the extensive similarity of the results between the most immersive techniques and the real environment. Tested immersive techniques provided engagement and a strong feeling of presence, corresponding to the feeling in the real environment. In addition, since purchasing, and especially consuming a food product, is actually a multisensory experience, this aspect should be taken into account in future research, as Delarue, Brassat, Jarrot, and Abiven (2019) have recently done.

6 CONCLUSIONS

To predict the future market success, food industries test their products with consumers prior to launch. Traditional consumer surveys and product tests have been widely used to evaluate product acceptance and purchase intention, and these responses have been used for prediction. Nevertheless, the failure rate of new product launches is extremely high (Nielsen, 2014). Therefore, the real predictive value of purchase intention measurement and a wide range of other explicit and implicit measurements of consumers' responses to food products were examined.

This study demonstrated that of the studied measurements, purchase intention and promoter score were the most accurate predictors of purchase behavior. In addition, the predictability was higher when more information (product internal characteristics together with some external characteristics) was available. Other accurate explicit responses that predict purchase behavior were pleasantness and willingness to eat again. However, these scores also correlated strongly with each other, so it cannot be said that any of these are better than the others.

Furthermore, this study demonstrated that especially positive emotions played a role in purchase behavior, although they did not predict the purchases accurately as such. Neutral and negative emotions correlated negatively with purchases, thus suggesting that products that evoke only neutral and/or negative emotions are not ideal for sales. In other words, products must evoke at least some positive emotion.

Overall, this study suggests that the food industry should keep measuring purchase intention or promoter score before making launch-related decisions. However, purchase intention or promoter score should be measured both in the expectation condition and when all the essential product information is available: brand and package design together with product quality. Furthermore, measuring pleasantness may not be as essential in predicting future purchases, since it was a less accurate predictor than purchase intention and correlated strongly with it. Moreover, to obtain a more complete picture of a consumer's food purchase journey, qualitative methods should also be employed in the research. This could enhance the discovery of better solutions for predicting this complicated behavior. Finally, future research is required to focus on different types of food products, as well as those that are not yet launched, to confirm whether this study's results are viable for predicting the success of new food product launches.

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APPENDIX A (ORIGINAL PAPERS I–III)