MA Thesis

The influence of food labels with indulgent language on healthy food choices: Sensory versus hedonic

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Abstract

Healthy diets are fundamental to public health. Often healthy food is perceived to be less tasty and to have less hedonic potential compared to unhealthy food. Smart food policies aim to stimulate healthy food choices. The use of indulgent language on food labels of healthy food (e.g., *tasty and satisfying vegetables*) may be an effective strategy. Previous studies suggest that indulgent language activates rewarding eating simulations of previously rewarding experiences stored in memory that lead to a higher desire for healthy food and increase healthy food selection. However, which aspect of indulgent language (e.g., sensory, or hedonic language) on food labels has an influence is unclear. The effect of indulgent language may also differ when presented in L1 versus L2. The purpose of the present study was to investigate what the influences are of Label Type (sensory vs hedonic vs neutral) and Language Choice (L1/Dutch vs L2/English) on food labels of healthy foods on the desire, eating simulations and intention to buy healthy food. Food labels with sensory language (e.g., *honeysweet apples as a juicy daily snack*) led to more eating simulations compared to food labels with hedonic language (e.g., *beautiful apples as a refreshing daily snack*) and neutral language (e.g., *red apples as a conscious daily snack*) but did not lead to a greater desire for food or intention to buy. Contrary to expectations, no effect of hedonic language was found. A possible explanation is that other studies presented the indulgent language types together which may have led to a greater influence. There was no effect of Language Choice, which may be due to participants' fairly high English language proficiency that led to native-like conceptual and emotional processing of the food labels. These findings shed new light on the distinct influence of sensory and hedonic language on food labels.

Keywords: Indulgent language; Embodied Language, Food Labels, Grounded Cognition Theory of Desire, Revised Hierarchical Model, Language, Smart Food Policy

Introduction

Unhealthy diets (e.g., low in fruits and vegetables, high in sugar) can increase numerous risks of diseases worldwide (Lim et al., 2013). A poor dietary intake is a major contributor to both mortality and disability (Ronto, Wu & Singh, 2018). A healthy diet is therefore fundamental for public health. Smart food policies aim to stimulate a healthy diet. One intervention often implemented is the use of labels for healthy foods that emphasize healthiness or nutritional benefits (Turnwald & Crum, 2019).

Compared to healthiness, taste is a stronger determinant for people when deciding what to eat (Glanz, Basil, Maibach, Goldberg & Snyder, 1998; Lennernäs et al., 1997; Verbeke, 2006). A challenge arises as the general expectation is that healthy food is less tasty (Fenko, Kersten & Bialkova, 2016; Raghunathan, Naylor & Hoyer, 2006), less filling (Suher, Raghunathan & Hoyer, 2016) and less tempting (Fenko et al., 2016). Raghunathan et al. (2006) investigated the compensatory relationship between food being wholesome (e.g., healthy) and having hedonic potential (e.g., enjoyable). It was found that when the perceived healthiness of food increased, the perceived hedonic potential decreased. Additionally, healthy food items were enjoyed less during consumption and were less likely to be preferred when hedonic goals were salient. The stronger preference for unhealthy food that is expected to be tastier, is referred to as the "Unhealthy = Tasty Intuition" (Raghunathan et al., 2006).

Smart food policies promoting health and nutritional information on food labels may have a reversed effect on consumer behaviour. Emphasizing health qualities on food labels can steer consumers away from healthy food choices as they clash with consumers' food preferences (Fenko et al., 2016; Raghunathan et al., 2006). For smart food policies to be effective they should conform with consumers' food preferences (Turnwald & Crum, 2019). Several meta-analyses have shown that highlighting nutritional information on food labels does not effectively lead to healthier food choices (Fernandes et al., 2016; Kiszko, Martinez, Abrams & Elbel, 2014). Contrarily, other studies found that the use of indulgent language on food labels leads to an increase of healthy food choices in cafeterias and restaurants (Turnwald, Boles & Crum, 2017; Turnwald & Crum, 2019). The use of indulgent language on food labels is therefore a promising strategy to stimulate a healthy food intake. However, it remains unknown whether these effects are generalisable to other contexts and whether the effects are influenced by language choice (native/non-native).

Theoretical Framework

Indulgent Language

Several nudging strategies exist to steer consumers towards healthier food choices, for example, product placement (De Wijk et al., 2016) or portion size (Vandenbroele, Slabbinck, Van Kerckhove & Vermeir, 2018) manipulation. Nudges help consumers to make decisions that they would make if they had more time and effort to choose (Vecchio & Cavallo, 2019). Indulgent language, which refers to the senses and/or hedonic rewards (Turnwald & Crum, 2019), may be an effective strategy to nudge consumers towards healthier food choices and away from bad eating habits.

Unhealthy food is more often associated with rewarding experiences (Raghunathan et al., 2006), which could play a role in bad eating habits. In a study by Papies (2013), participants were asked to complete a feature listing task for neutral and unhealthy food items. It was found that participants more often listed tempting food words (e.g., tasty, delicious) as a feature of unhealthy food items compared to neutral food items. These tempting food words are more likely to activate rewarding eating simulations in which the consumption experience of a certain food is vividly simulated (Papies, Barsalou & Rusz, 2020a). As taste and hedonic potential are strong determinants for food choices (Glanz et al., 1998; Lennernäs et al., 1997; Raghunathan et al., 2006; Verbeke, 2006), indulgent language on labels of healthy food may be an effective nudging strategy to increase healthy food selection by activating rewarding eating simulations and making healthy food seem tastier.

Several studies have observed that the use of indulgent language outperforms both neutral and healthy language on labels of healthy food (Papies, Johannes, Daneva, Semyte & Kauhanen, 2020b; Turnwald et al., 2017; Turnwald & Crum, 2019). Turnwald et al. (2017) conducted an experiment in a university cafeteria. In their experiment, vegetable consumption was measured when vegetables were presented with a basic (e.g., *corn*), healthy-restrictive (e.g., *reduced-sodium corn*), healthy positive (e.g., v*itamin-rich corn*) and indulgent (e.g., *rich buttery roasted sweet corn*) label. Labels with indulgent language increased the vegetable selection compared to all other label types (Turnwald et al., 2017). Similarly, Turnwald and Crum (2019) compared health-focused labelling of vegetables (e.g., *healthy*) to labels with indulgent language (e.g., *delicious*) in a cafeteria. When vegetables were labelled with indulgent language, vegetable selection increased compared to when vegetables were labelled with health-focused language (Turnwald & Crum, 2019).

More recently, Papies et al. (2020b) conducted a series of experiments with food labels of plant-based and meat-based foods. In their third study, they compared simulation-based labels containing indulgent language (e.g., *Indulgent lunch burrito with fragrant mushrooms, flavourful beans, and generously spiced tomato sauce*) to control labels (e.g., *Mushroom burrito wrap with assorted beans, different vegetables, and added tomato sauce*). The indulgent labels contained a combination of sensory (e.g., *fragrant*), hedonic (e.g., *tasty*) and context (e.g., *lunch*) words. Control labels contained neutral words relating to the ingredients (e.g., *mushroom*), food category (e.g., *wrap*) and food composition (e.g., *added*). The use of simulation-based labels led to an increase of attractiveness of both plant-based and meat-based foods compared to control labels, concluding that the use of simulation-based labels is an effective strategy to increase the attractiveness of plant-based food. Moreover, participants thought about eating the food more often when reading simulation-based labels. The effect of food labels on the attractiveness of food may be mediated by such eating simulations (Papies et al., 2020b). As demonstrated by Crum, Corbin, Brownell and Salovey (2011), indulgent language on food labels can also influence the experience and expectations of consumption. When a milkshake was labelled with indulgent language versus sensible language, it was automatically perceived and experienced as more rewarding, higher in caloric value and increased appetite of participants. As shown by Papies et al. (2020b), rewarding simulations of the entire experience of healthy foods can be activated by using indulgent language on food labels. Indulgent language can make the entire experience more rewarding (Crum et al., 2011) and can evoke eating simulations, consecutively increasing the desire for food (Papies et al., 2020b). This is in line with the Grounded Cognition Theory of Desire (Papies, Best, Gelibter & Barsalou, 2017).

The Grounded Cognition Theory of Desire is a continuation of the Theory of Grounded Cognition (Barsalou, 2008) and states that the motivation of consumer's behaviour can be influenced by extrinsic cues (Papies et al., 2017). According to the theory, each time a person consumes a certain food (e.g., eating cake), a rich memory of the entire consumption experience is stored. This memory not only contains information about the food itself (e.g., taste) but also information regarding internal states (e.g., happiness) and contextual information (e.g., location). This creates a situated conceptualization of the entire consumption experience (Barsalou, 2009; Papies et al., 2017; Papies et al., 2020b). When a person is later confronted with an extrinsic cue associated with the situated conceptualization stored in memory (e.g., image of cake), other elements of the conceptualization are activated (e.g., taste, feeling

happy).Elements of the situated conceptualization that are not present are experienced because of associations in memory triggered by extrinsic cues. For example, a cake advertisement can evoke a simulation of a previous cake-eating experience and subsequently activate associations stored in memory such as good taste and the experienced reward. According to the theory, extrinsic cues can, via these simulations and associations, increase the desire for food, food attractiveness and ultimately motivate food choices (Papies et al., 2020a; Papies et al., 2017; Papies et al., 2020b).

Indulgent food labels are such cues that can activate associations stored in memory based on rewarding experiences that increase the desire and attractiveness of healthy food and consequently motivate food choices (Crum et al., 2011; Papies et al., 2017). However, previous studies combined several indulgent language types and/or did not clearly define indulgent language. Therefore, it remains unknown which aspect of indulgent language causes the effects. For example, Papies et al. (2020b), used a combination of sensory, hedonic and context words on food labels in their experiment. The indulgent language types may differently affect consumers. Sensory words may evoke more sensory activations (e.g., taste) stored in memory, whereas hedonic words may evoke more activations related to the hedonic reward (e.g., happiness). Although both sensory and hedonic words may evoke eating simulations that ultimately increase the desire for food, food attractiveness and motivate food choices, they may do so via different routes as they may evoke different activations stored in the situated conceptualization stored in memory. It is also uncertain whether the positive effect of indulgent language on food labels expands beyond cafeteria and restaurants (Turnwald et al., 2017), as previous studies focused on a specific type of food and few studies addressed other contexts (Crum et al., 2011; Papies et al., 2020b). In other contexts, such as supermarkets, consumers may differently choose food products compared to cafeteria and restaurants. Both the setting and the to be fulfilled need may be different as in a cafeteria or restaurant consumers are likely to take time to have a look at the menu and will seek to fulfil the need of consuming an enjoyable meal. In a supermarket consumers are likely to seek products for future consumption and can look at the packaging more closely.

Native vs. non-native language

The use of indulgent language types on food labels may have different effects when presented in L1 or L2 as several lines of evidence suggest that people process L1 and L2 differently (Gerritsen, Korzilius, Van Meurs & Gijsbers, 2000; Luna & Peracchio, 2001; Puntoni, De

Langhe & Van Osselaer, 2009). A decision concerning smart food policy is therefore whether to communicate in a market's L1 or L2, as many countries have a population that also speaks a non-native language, which is often English (Krishna & Ahluwalia, 2008; Seidlhofer, 2005). The use of L1 on food labels may have different effects compared to the use of L2 since they may be differently processed in terms of emotion and the depth of semantic processing.

When information (e.g., an advertisement) is presented in L1 compared to L2, people experience a higher degree of conceptual processing (Luna & Peracchio, 2001), find the information easier to comprehend, have a higher attitude (Gerritsen et al., 2000) and perceive it as more emotional (Puntoni et al., 2009). 'Disembodied cognition' suggests that an L2 leads to more emotional distance compared to L1 (Keysar, Hayakawa & An, 2012; Pavlenko, 2012). This may lead to different embodiment of both languages. As suggested by Keysar et al. (2012) and Pavlenko (2012) emotionality in L1 is more deeply rooted in our emotion system as L1 is acquired simultaneously with the development of the emotion system in early childhood. L1 is also processed more automatically. L2 is less deeply rooted as it is likely acquired at a later age, resulting in greater emotional distance and more analytical and systematic processing. The effect of emotional language in L2 is likely to be reduced (Keysar et al., 2012; Pavlenko, 2012) because of this asymmetry between L1 and L2 processing.

The Revised Hierarchical Model (RHM) (Dufour & Kroll, 1995) can explain the asymmetry between L1 and L2 processing (Luna & Peracchio, 2001). The model states that there are two levels of language representation in memory storage: the lexical and conceptual level. L1 and L2 words are stored separately at the lexical level and collectively at the conceptual level. According to the RHM, the link between L1 words and meaning at the conceptual level is stronger compared to the link between L2 words and meaning. This is a result of language acquisition, as people rely on L1 to gain access to meaning at the conceptual level when interpreting L2. The conceptual meaning of L1 words can be accessed immediately. When L2 proficiency increases the asymmetry and advantage of L1 processing remains, however, to a lesser degree (Dufour & Kroll, 1995). Conceptual processing in L2 is therefore argued to be inferior to conceptual processing in L1 (Ahn & Ferle, 2008; Luna & Peracchio, 2001; Sholl, Sankaranarayanan & Kroll, 1995).

The asymmetry suggests that indulgent language in ones L1 is more likely to be processed conceptually and affectively than L2. Indulgent language requires both sensory and emotional processing for other elements of the situated conceptualization of previously

rewarding consumption experiences to be activated. Indulgent language may therefore be more affected by the asymmetry in emotional and conceptual processing compared to neutral language on food labels. As a result of the stronger conceptual and affective processing, indulgent language in L1 on food labels may therefore be more likely to activate sensory and/or hedonic associations stored in memory than indulgent language in L2, such as good taste and pleasure. Consequently, other elements of the situated conceptualization are more likely to be triggered resulting in rewarding eating simulations based on the associations stored in memory. The simulation of the eating experience can increase the desire and attractiveness of healthy food (Crum et al., 2011; Papies et al., 2017). This means that L1 food labels with indulgent language may be more likely to have a greater influence on healthy food choices compared to neutral language, whereas the influence of indulgent language in L2 is likely to be smaller.

The current study

Up to now, little attention has been paid to contexts other than cafeterias and restaurants when testing the effect of indulgent language on labels of healthy food. Little is known about the effect in other contexts like supermarkets. In supermarkets, consumers are also confronted with food choices and presumably seek products for future consumption. In a restaurant or cafeteria, consumers are likely to order and consume a meal. Although Papies et al. (2020b) conducted an experiment with labels of supermarket foods, participants were not asked to imagine a supermarket context when presented with the labels. The current study investigated whether the effects of indulgent language are generalisable to other contexts by including a supermarket scenario. In addition to the environment being different in contexts such as supermarkets, the decision making process and needs consumers are seeking to fulfil may be different compared to restaurants and cafeteria. For example, in a restaurant consumers may take more time to decide and study a menu when deciding what to eat compared to a food label in a supermarket.

In addition, much of the research up to now did not clearly define indulgent language (Turnwald, 2017) or used a combination of indulgent language types, such as a combination of sensory, hedonic and context words (Papies et al., 2020b). What is not yet clear is which aspect of indulgent language on labels of healthy food has an influence and to what degree this influence differs. As taste and hedonic potential are the main determinants for food choices (Glanz et al., 1998; Lennernäs et al., 1997; Raghunathan et al., 2006; Verbeke, 2006), the current study investigated food labels with two types of indulgent language: sensory and hedonic. Labels with neutral language were included as a control condition. Research also

suggests that sensory and hedonic language may be processed differently when presented in L1 versus L2 because of an asymmetry between how both languages are processed. Organizations do not have scientific validation as to what approach is most efficient to increase healthy food intake. The purpose of the current study was to fill this research gap by answering the following research question:

> ***RQ:*** *What are the influences of type of label (sensory vs hedonic vs neutral) and language choice (L1 vs L2) on food labels of healthy foods on the desire, eating simulations and intention to buy healthy foods?*

Research suggests that the use of indulgent language on food labels of healthy food may increase healthy food intake and has a more positive effect compared to health focused or neutral language (Papies et al., 2020b; Turnwald et al., 2017; Turnwald & Crum, 2019). It was therefore hypothesized that:

> ***H1:*** *Sensory and hedonic language on food labels will lead to greater desire, eating simulations, and intention to buy healthy foods compared to neutral food labels.*

According to the RHM and the embodied approach to language, L1 information is more likely to be processed conceptually and emotionally compared to L2 (Ahn & Ferle, 2008; Dufour & Kroll, 1995; Luna & Peracchio, 2001; Puntoni et al., 2009; Sankaranarayanan & Kroll, 1995). Indulgent language, like sensory and hedonic language, is processed at the conceptual level. As L1 information is more likely to be processed conceptually it was therefore hypothesised that:

> ***H2:*** *L1 food labels will lead to greater desire, eating simulations, and intention to buy healthy foods compared to L2 food labels.*

Taken together that indulgent language on food labels may increase healthy food intake compared to neutral language (Papies et al., 2020b; Turnwald et al., 2017; Turnwald & Crum, 2019) and that information in L1 is more likely to be processed conceptually and emotionally compared to L2 (Ahn & Ferle, 2008; Dufour & Kroll, 1995; Luna & Peracchio, 2001; Puntoni et al., 2009; Sankaranarayanan & Kroll, 1995), indulgent language in L1 may have a more positive effect on healthy food intake compared to indulgent language in L2. Therefore, the following was hypothesized:

H3: *Sensory and hedonic language on food labels will have a more positive effect on desire, eating simulations, and intention to buy healthy foods compared to neutral food labels when presented in L1 than sensory and hedonic language compared to neutral food labels will when presented in L2.*

Methodology

Materials

The independent variable Language Choice was operationalized by Dutch as the L1 and English as the L2. The independent variable Label Type was operationalized by sensory, hedonic, and neutral language on labels of healthy foods. The former two are the labels with indulgent language. Neutral language is included as a control condition. A database with Dutch sensory norms (Speed & Brysbaert, 2020), database with English sensory norms (Lynott, Connell, Brysbaert, Brand & Carney, 2020), database with English emotion norms (Warriner, Kuperman & Brysbaert, 2013) and a database with Dutch emotion norms (Moors et al., 2012) was used to create the food labels.

The three label types were used to create food labels for six healthy food items. This resulted in a total of 18 Dutch and 18 English food labels. The following six food items were selected: apples, brown rice, whole grain bread, almonds, oatmeal, and chickpeas. These items are generally considered healthy and familiar to participants. Additionally, the food items must be available for purchase in a supermarket in The Netherlands, as participants were asked to imagine that they are in a supermarket. Several papers (e.g., Papies, 2013; Turnwald et al., 2017) were used as a starting point and a Dutch supermarket was visited. In the supermarket food labels of the selected food items were looked at to create the food labels for this study with language as used on food labels in supermarkets. It was aimed to keep the meaning of the food labels similar across the Dutch and English food labels. For each language, the length of the descriptions per food item was matched across the three label types. In most cases the food labels for each language were kept similar by only replacing the adjectives for a sensory, hedonic, or neutral word.

In the current study, language is considered sensory when it refers to taste, flavour, or texture (e.g., salted, crunchy) (Papies et al., 2020b), as these aspects are considered to be closely associated with the consumption of food. The database of Dutch sensory norms (Speed & Brysbaert, 2020) was used to create the Dutch food labels with sensory language. All Dutch sensory words selected have a minimum rating of 3 out of 5 on taste. The Dutch food labels

were then translated to English. The database of English sensory norms (Lynott et al., 2020) was used to check the English food labels with sensory language. All English sensory words selected have a minimum rating of 3 out of 5 on gustatory strength (how strong the word is experienced by tasting).

Hedonic language refers to the hedonic experience of pleasure when eating food (e.g., filling, refreshing) (Papies, 2013). The database of English emotion norms (Warriner et al., 2013) was used to create the English food labels with hedonic language. All English hedonic words selected have a minimum rating of 7 out of 9 on emotional valence. The English hedonic words were then translated to Dutch. The database of Dutch emotion norms (Moors et al., 2012) was used to check the translated Dutch hedonic words. Of the Dutch hedonic words, three words were in the database, six words were in the database in another form (e.g., *genotvol* was not, *genot* was) and three words were not in the database themselves nor in another form. Dutch hedonic words that were themselves in the database or in another form had a minimum rating of 5 out of 7 on emotional valence. Additionally, Dutch hedonic words that were themselves in the database of Dutch sensory words (Speed & Brysbaert, 2020) or in another form rate lower than 1.85 out of 5 on taste and odour to ensure that the hedonic words did not also strongly refer to the senses.

The neutral words were chosen based on several criteria to ensure that they did not also refer to the senses or emotion, nor emphasized health/nutritional information (e.g., low-fat) as this may result in the perception that the food is less tasty. The Dutch neutral words have a maximum rating of 1 out of 5 on both taste and odour in the database with Dutch sensory words (Speed & Brysbaert, 2020). The English neutral words have a maximum rating of 1 out of 5 on gustatory strength in the database with English sensory words (Lynott et al., 2020). Additionally, the Dutch and English neutral words were checked in the databases with Dutch (Moors et al., 2012) and English (Warriner et al., 2013) emotion words. Five of the Dutch neutral words were included and rate between 3.5 and 5 (on a scale of 1 to 7) on emotional valence. Nine of the English neutral words were included and rate between 4.5 and 7 (on a scale of 1 to 9). Although the neutral words do not score strongly on emotion, they are still positively valanced.

For each food item a food label with sensory, hedonic, and neutral language was created in Dutch and English. For example, in Dutch, *honingzoete appels als sappig tussendoortje voor iedere dag* for the sensory condition, *mooie appels als verfrissend tussendoortje voor iedere*

dag for the hedonic condition and *rode appels als bewust tussendoortje voor iedere dag* for the neutral condition. For example, in English, honey*sweet apples as a juicy daily snack* for the sensory condition, *beautiful apples as a refreshing daily snack* for the hedonic condition and *red apples as a conscious daily snack* for the neutral condition. An overview of the Dutch and English food labels can be found in Appendix A

As the aim of the current study was to investigate whether the effects of indulgent language expand to contexts besides cafeterias and restaurants, participants were asked to imagine that they are in a supermarket. The food labels were presented on a basic shape in a neutral colour to mimic the packaging of the product to stimulate the supermarket simulation. Moreover, the focus was on the language use on labels of healthy food. By including a basic shape, the chances that participants would be subconsciously distracted or affected was decreased compared to a more prominent and colourful image. An overview of the food labels on the basic shape of each product with Dutch sensory language can be found in Appendix B.

Subjects

A total of 110 participants started the questionnaire, of which 98 participants finished the questionnaire. Participants needed to be above 16 years old. One participants that indicated to not have read the supermarket scenario and 23 participants that incorrectly answered the control question were excluded. Other selection criteria were that participants needed to have Dutch as their mother tongue and should not have started learning the English language from birth to exclude bilinguals. One participant indicated to have started learning English from birth and was excluded. In terms of outliers of time spent, seven participants were excluded as they spent more than 1 hour or less than 5 minutes to complete the questionnaire. With the use of G*Power (Faul, Erdfelder, Buchner & Lang, 2009) it was estimated that 42 participants were needed. After exclusion, 66 participants were left that met all criteria out of which 29 participants were assigned to the Dutch condition and 37 participants to the English condition.

Of the participants 68.2% was female. The educational level ranged from preparatory secondary vocational education to university. Higher professional education (56.1%) was the most frequent level of education, followed by vocational education (30.3%), university (10.6%), higher general secondary education (1.5%) and preparatory secondary vocational education (1.5%). The average age of participants was 41 years old (M = 40.89, SD = 16.25) and ranged from 18 to 65 years. The self-reported English language proficiency of participants was 4.5 (M = 4.54, SD = 1.28) on average and ranged from 2 to 7 (1 = poor, 7 = excellent). The

average age on which participants started learning the English language was 12 years old (M = 12.2, SD = 3.35). On average, participants rated their Health Concern with a 5.35 (M = 5.35, SD = 0.93) and ranged from 2 to 7 (1 = low, 7 = high). Of the participants, 31.8% indicated to consume apples once or twice a week, 37.9% indicated to consume brown rice once or twice a month, 40.9% indicated to consume whole grain bread daily, 33.3% indicated to consume almonds once every few months, 56.1% indicated to never consume oatmeal and 47% indicated to never consume chickpeas.

Several analyses were conducted to establish equal distribution of the participants across conditions. Four separate one-way ANOVA's with as factor Language Choice did not show a significant difference in the age (F (1, 64) = 1.54, p = .219), self-reported English language proficiency (F (1, 64) < 1), age of English language acquisition (F (1, 64) < 1), Health Concern (F (1, 64) = 1.02, p = .317) or Level of Hunger (F (1, 64) < 1) of participants between the two language conditions. Separate Chi-square tests did not show a significant relation between gender and Language Choice (χ^2 (1) = .43, p = .513), between educational level and Language Choice (χ^2 (4) = 4.47, p = .347), between hunger level group and Language Choice (χ^2 (1) = .55, p = .457), nor between health concern group and Language Choice (χ^2 (1) = .64, p = .424). Additional Chi-square tests did not show a significant relation between Language Choice and the consumption frequency of apples (χ^2 (6) = 3.39, p = .758), brown rice (χ^2 (5) = 5.48, p = .360), whole grain bread (χ^2 (6) = 2.89, p = .822), almonds (χ^2 (5) = 3.71, p = .592), oatmeal (χ^2 (6) = 2.92, p = .819) or chickpeas (χ^2 (4) = 6.03, p = .197). Gender, educational level, age, self-reported English language proficiency, health concern group, consumption frequency of the six products, and hunger level group were equally distributed across the language conditions.

Design

The online experiment had a 2 (Language Choice: L1/Dutch or L2/English) x 3 (Label Type: sensory, hedonic, or neutral) mixed design. Language Choice was the between-subject factor and Label Type the within-subject factor. To decrease order effects, six lists were created based on a Latin square design as a counterbalancing measure. Participants were thus exposed to two food labels with sensory language, two food labels with hedonic language, and two food labels with neutral language.

Instruments

The questionnaire was designed to measure three main dependent variables: Desire for Food, Eating Simulations, and Intention to Buy. Desire for Food was measured with two items.

Derived from Ogden et al. (2013), two 7-point Likert scales were used ranging from totally disagree (1) to totally agree (7): 'I have a strong desire to eat this food' and 'I could eat this food right now'. The reliability of Desire for Food comprising two items was excellent: $\alpha = .91$. As Desire for Food only consists out of two items, Cronbach's alpha is merely an indication of reliability. The mean of the two items was used to calculate the compound variable 'Desire for Food' for each level of the within-subject factor label type, which was used in the further analyses.

Based on Papies et al. (2020b), Eating Simulations was measured with two 7-point Likert scales ranging from totally disagree (1) to totally agree (7): 'When I read this label, I think about what the food would taste like' and 'When I read this label, I imagined what it would feel like to eat it'. The reliability of Eating Simulations comprising two items was good: $\alpha = .88$. As Eating Simulations only consists out of two items, Cronbach's alpha is merely an indication of reliability. The mean of the two items was used to calculate the compound variable 'Eating Simulations' for each level of the within-subject factor label type, which was used in the further analyses.

Based on Nederstigt and Hilberink-Schulpen (2018) and Fenko et al. (2016), Intention to Buy was measured using three 7-point semantic differentials following the sentence 'I would …' (not buy this product if I happened to see it in a store/buy this product if I happened to see it in a store, want to have this product/not want to have this product, not consider buying this product/consider buying this product). The second item (want to have this product/not want to have this product) was recoded prior to the analyses. The reliability of Intention to Buy comprising three items was good: $\alpha = .85$. Consequently, the mean of all three items was used to calculate the compound variable 'Intention to Buy', for each level of the within-subject factor label type which was used in the further analyses.

Participants were then asked to indicate where they were asked to imagine to be according to the scenario with an open question: 'where were you according to the scenario that you have read at the beginning of the questionnaire?'. When participants answered incorrectly, they were removed prior to the analyses as they could not recall the supermarket scenario, which may suggest that they did not pay attention. When participants indicated that they were in the supermarket, a 'store' or filled in the name of their favourite supermarket their answer was correct.

Additionally, participants were asked to indicate their Level of Hunger with an open question: 'how many hours ago did you last eat?'. Although the Grounded Cognition Theory of Desire states that rewarding experiences may be activated in the absence of hunger, the effect of the food labels may be influenced when participants do feel hungry (Papies et al., 2020). Therefore, Level of Hunger was included as a control variable. Health concern was measured as participants very concerned with their health may be more inclined to buy healthy food compared to participants less concerned with their health. Based on a scale used in the thesis of Van der Vegt (2020), Health concern was measured with three 7-point Likert scales ranging from totally disagree (1) to totally agree (7): 'I think a lot about my health', 'I am self-aware about my health' and 'I pay attention to my inner feelings about my health'. The reliability of Health Concern comprising three items was good: $\alpha = .81$. Consequently, the mean of all three items was used to calculate the compound variable 'Health Concern', which was used in the further analyses.

Participants were also asked to indicate their consumption frequency of each food item. If participants rarely or never consume the products, they may have been less likely to have an intention to buy or desire for the food compared to participants that often consume the products. Based on the thesis of Gloudi (2019), Consumption frequency was measured with six 7-point Likert scales ranging from never (1) to every day (7) following the question 'how often do you consume these products?'. Based on Krishna and Ahluwalia (2008), Self-reported English language proficiency was measured with three 7-point semantic differentials, ranging from poor (1) to excellent (7) following the sentence 'Please indicate how you would rate your English proficiency on the following areas: 'speaking', 'writing' and 'reading'. It is important that participants are sufficiently proficient as a low language proficiency may impede comprehension of the food label (Gerritsen et al., 2000; Van der Zee, Admiraal, Paas, Saab & Giesbers, 2017). The reliability of self-reported English language proficiency comprising three items was excellent: $\alpha = .90$. Consequently, the mean of all three items was used to calculate the compound variable 'self-reported English language proficiency', which was used in the further analyses. Participants were also asked to indicate at which age they started learning the English language with an open question: 'At which age (in years) did you start learning the English language?'. Participants who are bilingual from birth were consequently excluded prior to the analyses as there is less likely to be a difference between their L1 and L2 processing.

Lastly, demographics of the participants were measured: gender (male/female/other/rather not say), age (in years), mother tongue (Dutch/other, namely) and

educational level (Primary education/Preparatory secondary vocational education/Higher general secondary education/Pre-university education/Intermediate vocational education/Higher professional education/University).

Procedure

The online questionnaire was administered in Qualtrics and shared with friends, family and acquaintances who are native speakers of Dutch. WhatsApp and Facebook were used to distribute the survey. Convenience and snowball sampling was used. Participants did not receive an incentive or reward for participation, which was individual and anonymous. Upon opening of the questionnaire, participants were shown an introductory text in which the set up of the experiment was explained and participants were asked for their consent in participation.

After having given consent participants were firstly asked to read the Dutch supermarket scenario. In the scenario participants were instructed to imagine that they are doing groceries in their usual supermarket when they see the food items and labels that will follow. All participants were exposed to a Dutch (L1) scenario to ensure similar processing of the scenario, as research suggests that L1 and L2 may be processed differently (Ahn & Ferle, 2008; Dufour & Kroll, 1995; Luna & Peracchio, 2001; Puntoni et al., 2009; Sankaranarayanan & Kroll, 1995). The supermarket scenario can be found in Appendix C.

Participants were asked to confirm that they had read the scenario. When participants indicated that they had not read the scenario, they were directed to the end of the questionnaire. Subsequently, the participants were assigned to one of the six lists. The six food labels followed in a random order (two with sensory, two with hedonic and 2 with neutral language). Each food label was followed by 7 items measuring the dependent variables: Desire for Food, Eating Simulations, and Intention to Buy. Only one food label was shown per page. The scenario control question and questions regarding the Level of Hunger, Health Concern, consumption frequency, self-assessed English language proficiency, age of English language acquisition and demographics followed. Participants then continued to the last page of the questionnaire where they were thanked for their participation and where the goal of the research was shared. Contact details were included to give participants the opportunity to contact the researcher. Throughout the questionnaire, participants were not able to go back to a previous page. On average, participation in the questionnaire took 10 minutes and 42 seconds ($M_{seconds}$ = 625.27, $SD_{seconds}$ = 268.04).

Statistical treatment

The analyses were performed as set out in the preregistration on the Open Science Framework (OSF) (https://osf.io/6svuk). Three separate mixed ANOVAs were performed for each dependent variable (Desire for Food/Eating Simulations/Intention to Buy) with as within-subject factor Label Type (sensory vs hedonic vs neutral) and as between-subject factor Language Choice (L1/Dutch vs L2/English). To investigate the role of the control variables, participants were divided into groups (low level of hunger vs high level of hunger/low health concern vs high health concern). Additional mixed ANOVAs were performed for each independent variable with Label Type as the within-subject factor and Language Choice and hunger level group (low/high)/health concern group (low/high) as the between-subject factors resulting in six separate control analyses.

Results

Main analyses

Desire for Food

A mixed ANOVA for Desire for Food with Label Type as within-subject factor and Language Choice as between-subject factor did not show a significant main effect of Label Type (F (2, 128) < 1, η_p^2 = .01), nor a significant main effect of Language Choice (F (1, 64) = 3.50, p = .066, η_p^2 = .05). The interaction of Label Type and Language Choice was not significant (F (2, 128) = 1.02, p = .365, η_p^2 = .02). Means and standard errors of Desire for Food can be found in Figure 1.

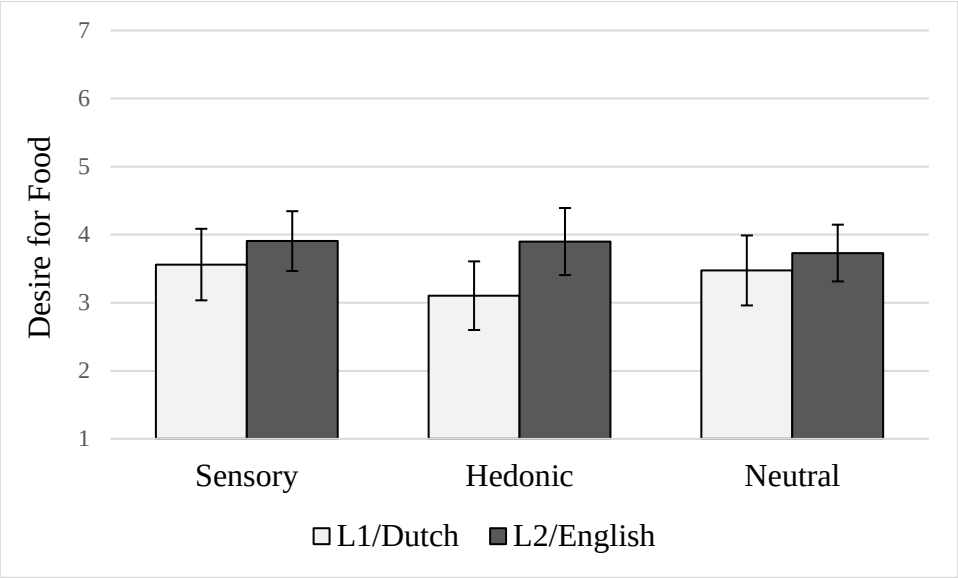


Figure 1: Means and standard errors of Desire for Food (n = 66) as a function of Label Type and Language Choice (1 = low, 7 = high).

Eating Simulations

A mixed ANOVA for Eating Simulations with Label Type as within-subject factor and Language Choice as between-subject factor showed a significant main effect of Label Type (F (2, 128) = 7.85, p = .001, η_p^2 = .11). Pairwise comparisons showed that, irrespective of Language Choice, food labels with sensory language (M = 4.38, SD = 1.46) led to more eating simulations compared to food labels with hedonic language (M = 3.72, SD = 1.43; p = .001) as well as food labels with neutral language (M = 3.98, SD = 1.38; p = .018). The Food labels with neutral language did not lead to more or less eating simulations compared to food labels with hedonic language (p = .090).

There was no significant main effect of Language Choice (F (1, 64) = 2.38, p = .128, η_p^2 = .04). Finally, the interaction of Label Type and Language Choice was not significant (F (2, 128) = 1.46, p = .236, η_p^2 = .02). Means and standard errors of Eating Simulations can be found in Figure 2.

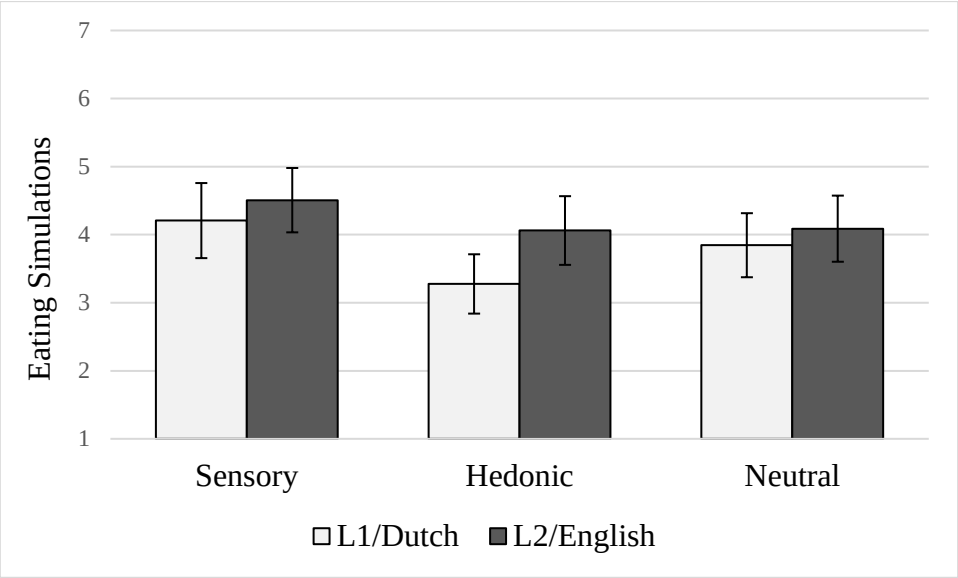


Figure 2: Means and standard errors of Eating Simulations (n = 66) as a function of Label Type and Language Choice (1 = low, 7 = high).

Intention to Buy

A mixed ANOVA for Intention to Buy with Label Type as within-subject factor and Language Choice as between-subject factor did not show a significant main effect of Label Type (F (2, 128) < 1, η_p^2 = .02), nor a significant main effect of Language Choice (F (1, 64) < 1, η_p^2 < .01). The interaction of Label Type and Language Choice was not significant (F (2, 128) < 1, η_p^2 < .01). Means and standard errors of Intention to Buy can be found in Figure 3.

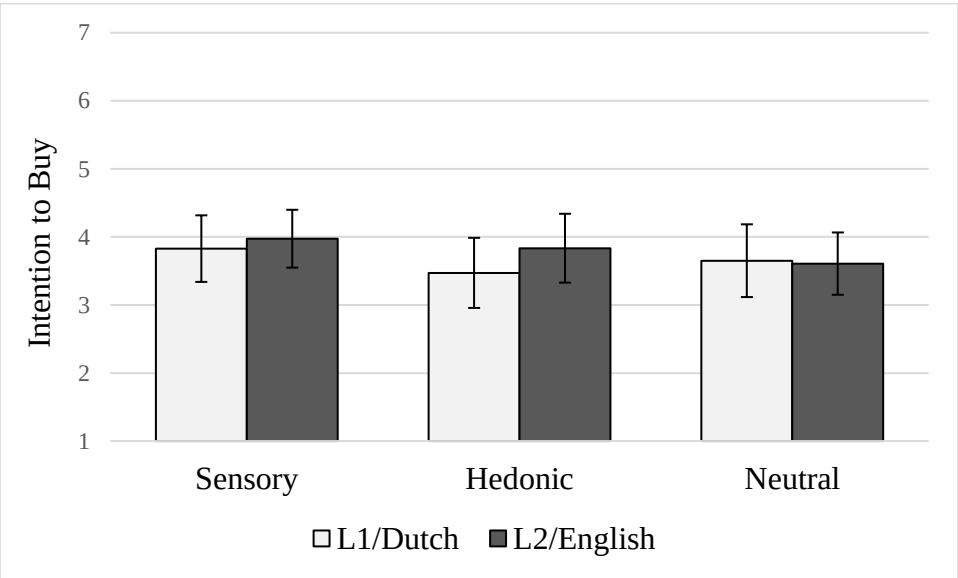


Figure 3: Means and standard errors of Intention to Buy (n = 66) as a function of Label Type and Language Choice (1 = low, 7 = high).

Control variable: Hunger level group

For the control variable Level of Hunger, a low hunger level group and high hunger level group were defined. Based on the indication of participants when they had least eaten, the median was 2.5 hours. A total of 33 participants (50%) indicated to have eaten more recently and were assigned to the low hunger level group. The 33 participants (50%) that indicated to have eaten more than 2.5 hours ago were assigned to the high hunger level group.

Desire for Food

A mixed ANOVA for Desire of Food with Label Type as within-subject factor and Language Choice and Level of Hunger as between-subject factors did not show a significant main effect of Label Type (F (2, 124) < 1, η_p^2 = .01), nor a significant main effect of Language Choice (F (1, 62) = 3.42, p = .069, η_p^2 = .05), nor a significant main effect of Level of Hunger (F (1, 62) < 1, η_p^2 < .01).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Level of Hunger, Language Choice and Level of Hunger, nor of the triple interaction of Label Type, Language Choice and Level of Hunger (all p's > .196). Means and standard errors of Desire for Food per hunger level group can be found in Figure 4.

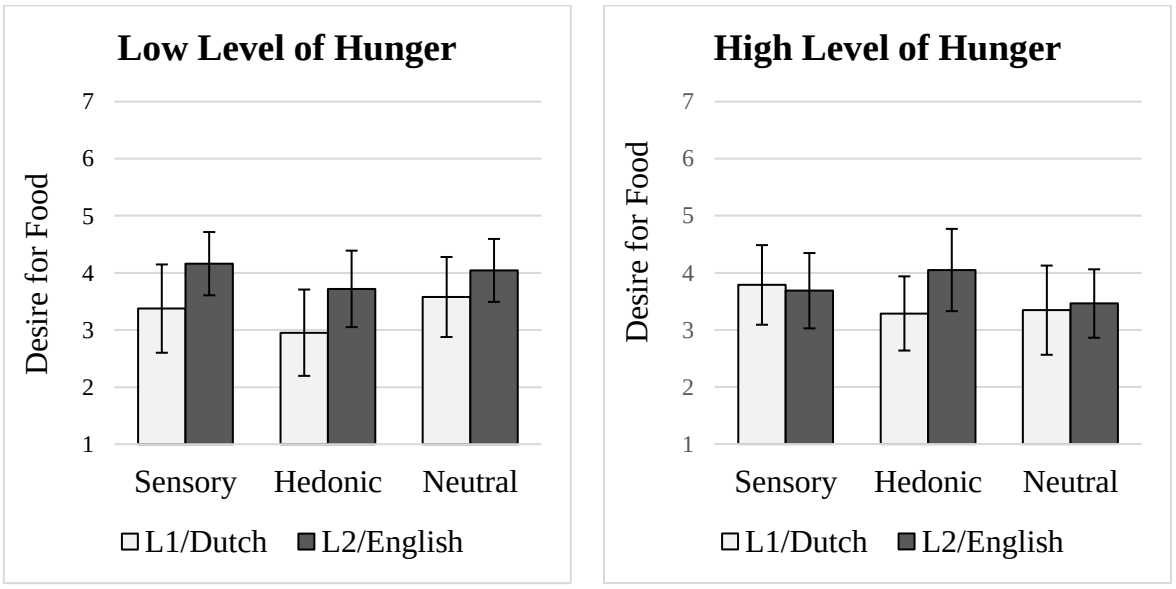


Figure 4: Means standard errors of Desire for Food (n = 66) as a function of Label Type, Language Choice and Hunger Level (1 = low, 7 = high).

Eating Simulations

A mixed ANOVA for Eating Simulations with Label Type as within-subject factor and Language Choice and Level of Hunger as between-subject factors again showed a significant main effect of Label Type (F (2, 124) = 8.09, $p < .001$, $\eta_p^2 = .12$). Pairwise comparisons showed that, irrespective of Language Choice and Level of Hunger, food labels with sensory language (M = 4.38, SD = 1.46) led to more eating simulations compared to food labels with hedonic language (M = 3.72, SD = 1.43; $p < .001$) as well as food labels with neutral language (M = 3.98, SD = 1.38; $p = .017$). The Food labels with neutral language did not lead to more or less eating simulations compared to food labels with hedonic language ($p = .084$). There was no significant main effect of Language Choice (F (1, 62) = 2.31, $p = .133$, $\eta_p^2 = .04$), nor a significant main effect of Hunger Level (F (1, 62) < 1, $\eta_p^2 < .01$).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Level of Hunger, Language Choice and Level of Hunger, nor of the triple interaction of Label Type, Language Choice and Level of Hunger (all p's > .269). Means and standard errors of Eating Simulations per hunger level group can be found in Figure 5.

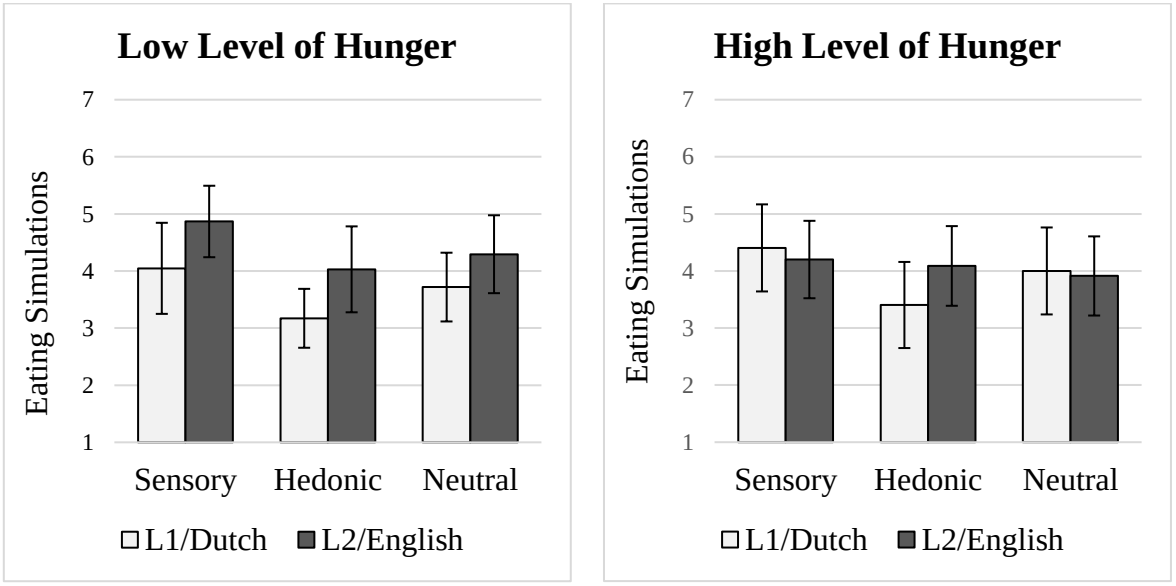


Figure 5: Means and standard errors of Eating Simulations (n = 66) as a function of Label Type, Language Choice and Hunger Level (1 = low, 7 = high).

Intention to Buy

A mixed ANOVA for Intention to Buy with Label Type as within-subject factor and Language Choice and Level of Hunger as between-subject factors did not show a significant main effect of Label Type (F (2, 124) = 1.06, $p = .349$, $\eta_p^2 = .02$), nor a significant main effect of Language

Choice (F (1, 62) < 1, η_p^2 = .01), nor a significant main effect of Level of Hunger (F (1, 62) < 1, η_p^2 < .01).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Level of Hunger, Language Choice and Level of Hunger, nor of the triple interaction of Label Type, Language Choice and Level of Hunger (all p's > .658). Means and standard errors of Intention to Buy per hunger level group can be found in Figure 6.

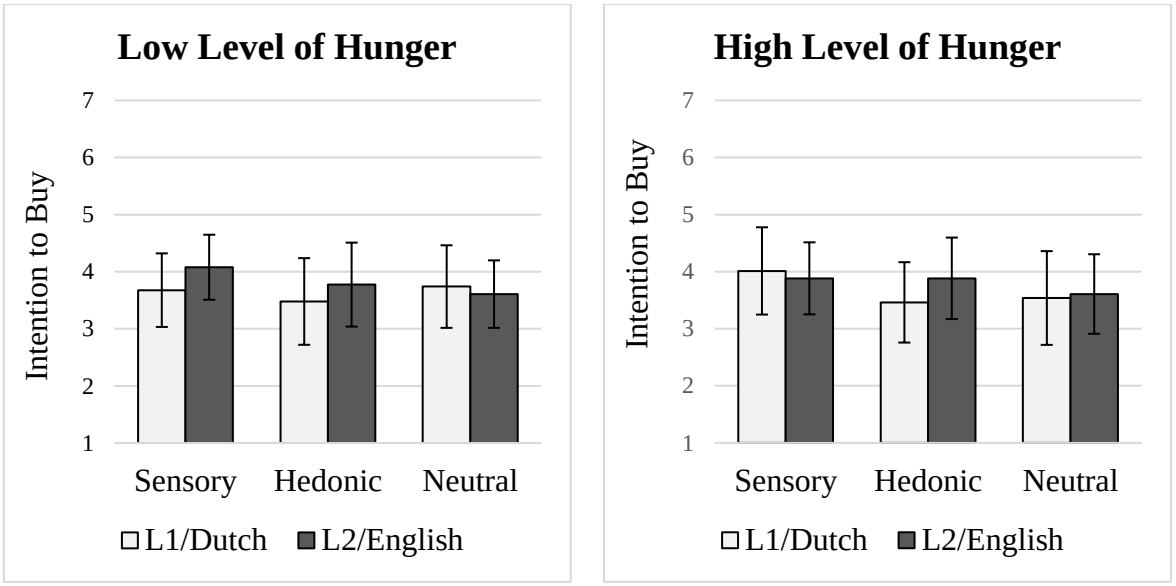


Figure 6: Means and standard errors of Intention to Buy (n = 66) as a function of Label Type, Language Choice and Hunger Level (1 = low, 7 = high).

Control variable: Health concern group

For the control variable Health Concern, a low health concern group and high health concern group were defined. As participants' rating for Health Concern ranged from 1 to 7 and the median rating was 5.3, participants were assigned to the low health concern group when they rated their Health Concern lower than 5.3. Participants that rated higher than 5.3 on Health Concern were assigned to the high health concern group. A total of 26 participants (39.4%) were assigned to the low health concern level group and 40 participants (60.6%) were assigned to the high health concern level group.

Desire for Food

A mixed ANOVA for Desire for Food with Label Type as within-subject factor and Language Choice and Health Concern as between-subject factors showed a significant main effect of Health Concern (F (1, 62) = 9.00, p = .004, η_p^2 = .13). Irrespective of Label Type and Language

Choice, people that were more concerned with their health (M = 3.94, SD = 1.01), had a higher desire for food compared to people less concerned with their health (M = 3.18, SD = 0.86). There was no significant main effect of Label Type (F (2, 124) < 1, η_p^2 = .01), nor a significant main effect of Language Choice (F (1, 62) = 2.64, p = .110, η_p^2 = .04).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Health Concern, Language Choice and Health Concern, nor of the triple interaction of Label Type, Language Choice and Health Concern (all p's > .222). Means and standard errors of Desire for Food per health concern group can be found in Figure 7.

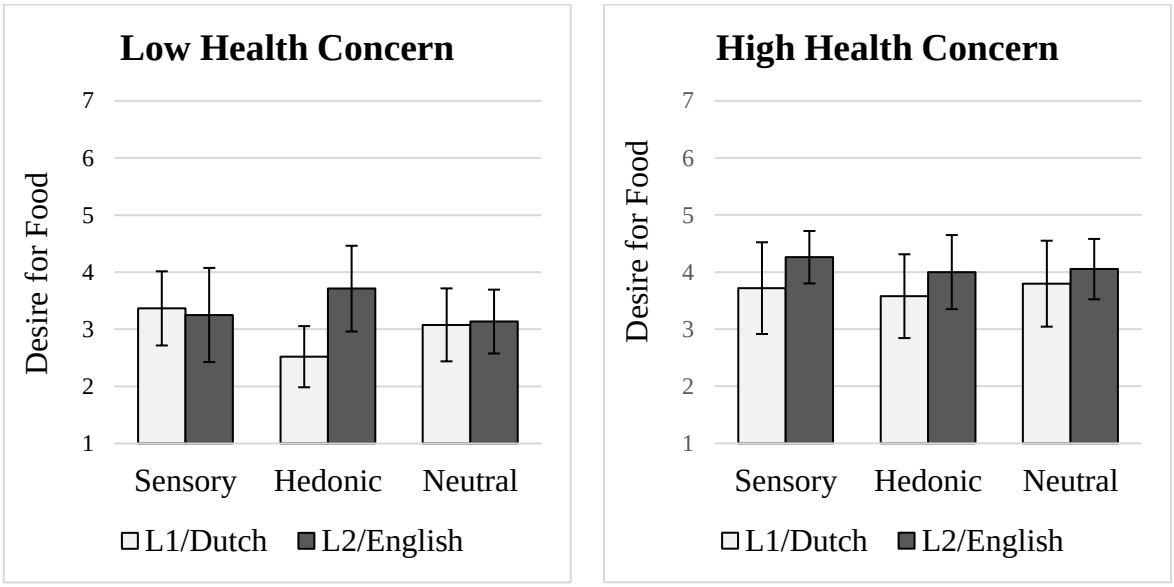


Figure 7: Means and standard errors of Desire for Food (n = 66) as a function of Label Type, Language Choice and Health Concern (1 = low, 7 = high).

Eating Simulations

A mixed ANOVA for Eating Simulations with Label Type as within-subject factor and Language Choice and Health Concern as between-subject factors again showed a significant main effect of Label Type (F (1, 124) = 6.07, p = .003, η_p^2 = .09). Pairwise comparisons showed that, irrespective of Language Choice and Health Concern, food labels with sensory language (M = 4.38, SD = 1.46) led to more Eating Simulations compared to food labels with hedonic language (M = 3.72, SD = 1.43; p = .002) as well as food labels with neutral language (M = 3.98, SD = 1.38; p = .035). Food labels with neutral language did not lead to more or less Eating Simulations compared to food labels with hedonic language (p = .145).

There was also a significant main effect of Health Concern (F (1, 62) = 7.47, p = .008, η_p^2 = .11). Irrespective of Label Type and Language Choice, people that were more concerned

with their health (M = 4.35, SD = 1.09), had more eating simulations compared to people less concerned with their health (M = 3.53, SD = 1.13). There was no significant main effect of Language Choice (F (1, 62) = 1.42, p = .239, η_p^2 = .02).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Health Concern, Language Choice and Health Concern, nor of the triple interaction of Label Type, Language Choice and Health Concern (all p's > .112). Means and standard errors of Desire Eating Simulations per health concern group can be found in Figure 8.

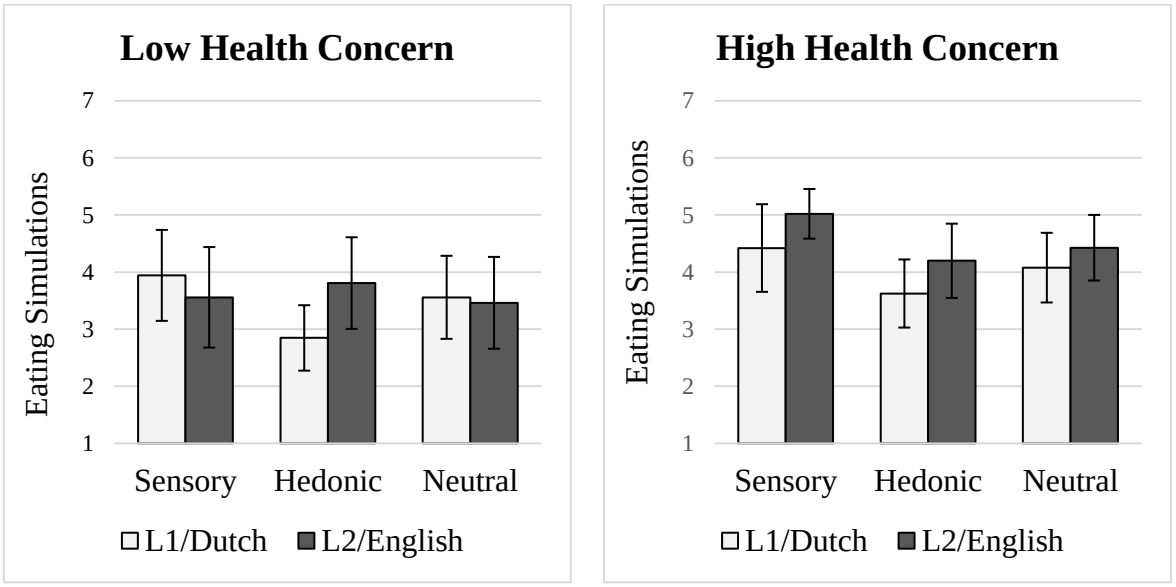


Figure 8: Means and standard errors of Eating Simulations (n = 66) as a function of Label Type, Language Choice and Health Concern (1 = low, 7 = high).

Intention to Buy

A mixed ANOVA for Intention to Buy with Label Type as within-subject factor and Language Choice and Health Concern as between-subject factors showed a significant main effect of Health Concern (F (1, 62) = 6.72, p = .012, η_p^2 = .10). Irrespective of Label Type and Language Choice, people that were more concerned with their health (M = 3.98, SD = 0.82), had a higher intention to buy compared to people less concerned with their health (M = 3.36, SD =1.06). There was no significant main effect of Label Type (F (2, 124) < 1, η_p^2 = .01), nor a significant main effect of Language Choice (F (1, 62) < 1, η_p^2 < .01).

Furthermore, no significant interaction was found of Label Type and Language Choice, Label Type and Health Concern, Language Choice and Health Concern, nor of the triple

interaction of Label Type, Language Choice and Health Concern (all *p*'s > .368). Means and standard errors of Intention to Buy per health concern group can be found in Figure 9.

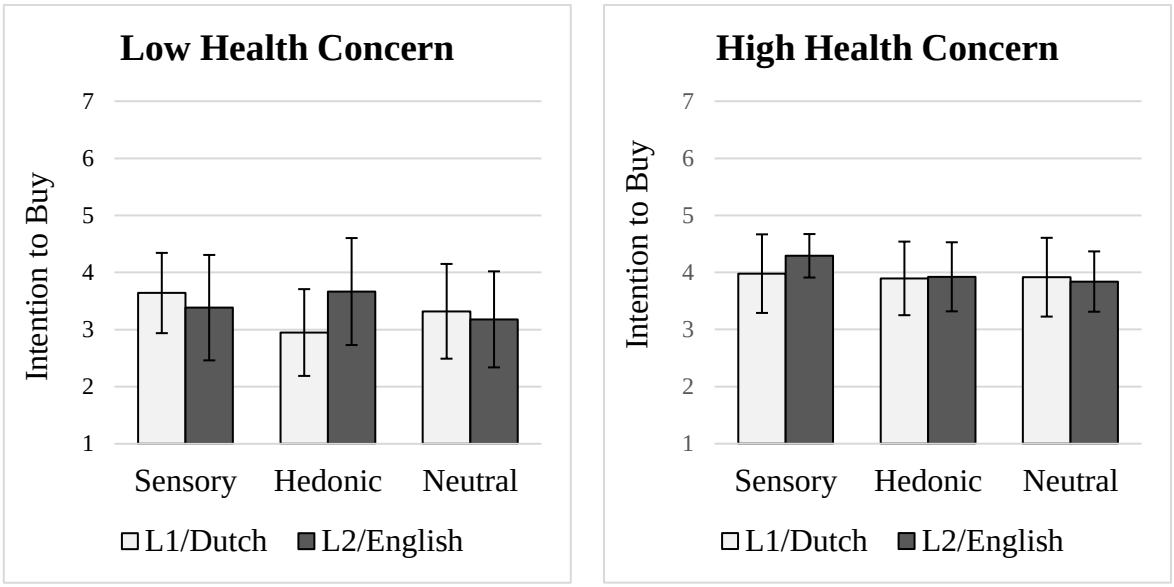


Figure 9: Means and standard errors of Intention to Buy (*n* = 66) as a function of Label Type, Language Choice and Health Concern (1 = low, 7 = high).

Conclusion

The current study was designed to investigate the influence of indulgent language on food labels of healthy food with different Label Types (sensory, hedonic, and neutral) and Language Choice (L1/Dutch and L2/English) on desire for food, eating simulations and intention to buy healthy foods. This was investigated by means of an online experiment where participants were asked to read a supermarket scenario and were subsequently presented with six food labels with sensory, hedonic, and neutral language in either their L1 or L2. The present study did find evidence that food labels with sensory language independently led to more eating simulations in participants compared to both food labels with hedonic language and food labels with neutral language. Contrary to the first hypothesis, hedonic language did not lead to more eating simulations compared to neutral language. Surprisingly, no evidence was found of Label Type influencing desire for healthy food or intention to buy healthy food.

Contrary to expectations, no evidence was found that Language Choice (L1/Dutch vs L2/English) has an influence on desire for food, eating simulations and intention to buy healthy food. Lastly, it was hypothesized that sensory and hedonic language on food labels would have a more positive effect when presented in L1 compared to sensory and hedonic language on food labels presented in L2. However, no evidence of an interaction between Label Type and

Language Choice was found, nor of an interaction with the two control variables Level of Hunger and Health Concern.

The Level of Hunger of participants did not influence desire, eating simulations or intention to buy healthy food. However, for the control variable Health Concern it was found that participants with a high concern for their health reported to have a stronger desire, more eating simulations, and higher intention to buy the healthy food compared to participants with a low health concern.

Discussion

Previous studies have suggested that the use of indulgent language on food labels is an effective strategy to increase the desire of healthy food and ultimately healthy food selection (Crum et al., 2011; Papies et al., 2017; Papies et al., 2020b; Turnwald et al., 2017; Turnwald & Crum, 2019). Based on the Grounded Cognition Theory of Desire (Papies et al., 2017) it has been argued that these effects are a consequence of indulgent language on food labels evoking eating simulations by activating associations stored in memory based on previous rewarding consumption experiences (Crum et al., 2011; Papies et al., 2017). This does not appear to be the case for food labels with hedonic language. The present results did not show that food labels with hedonic language led to more eating simulations, a higher desire for food or a higher intention to buy healthy food. However, food labels with sensory language did lead to more eating simulations compared to food labels with hedonic and neutral language. This is an interesting finding as eating simulations are mostly reserved for unhealthy foods (Papies, 2013). As sensory language can activate such eating simulations, other associations of rewarding consumption experiences may be evoked leading to healthier food choices. Earlier findings suggested that an increase in eating simulations would increase the desire for food and consequently consumers' intention to buy healthy food (Crum et al., 2011; Papies et al., 2020a; Papies et al., 2017; Papies et al., 2020b; Turnwald et al., 2017; Turnwald & Crum, 2019). Therefore, it is somewhat surprising that sensory language did not lead to a higher desire for food or a higher intention to buy healthy food.

This study has therefore been unable to demonstrate that the use of sensory or hedonic language on food labels of healthy food leads to an increase of consumers' desire for food and intention to buy healthy food. Hedonic language also did not lead to an increase in eating simulations. The inconsistency with earlier findings may partly be explained by the fact that other studies, like Papies et al. (2020b), combined indulgent language types on food labels (e.g.,

sensory, hedonic and context words). It may be that the indulgent language types jointly have a greater influence on healthy food choices compared to when the language types are presented individually. The present study raises the possibility to hypothesise that indulgent language types reinforce each other when presented simultaneously and together more strongly influence healthy food intake. This may also explain why in the current study food labels with sensory language did lead to more eating simulations but did not lead to a higher desire for food or greater intention to buy healthy food. The individual effect of food labels with sensory language may not have been sufficiently substantial to lead to these effects. Future work is required to establish whether jointly presented indulgent language types have a greater influence on healthy food intake compared to individually presented indulgent language types. It is noteworthy that in the current study most sensory words exclusively rated high on sensory strength and hedonic words on emotion strength. This highlights one of the strengths of the current study. This is the first study in which sensory, hedonic, and neutral words were carefully selected based on sensory (Lynott et al., 2020; Speed & Brysbaert, 2020) and emotion norms (Moors et al., 2012; Warriner et al., 2013). In future research, food labels of healthy foods containing indulgent words that rate high on both sensory and emotion strength could be compared to food labels containing several indulgent words that are exclusively sensory or hedonic.

Food labels with sensory language increased eating simulations but food labels with hedonic language did not. There are two possible explanations for these results. Firstly, taste is a strong determinant for food choices (Glanz et al., 1998; Lennernäs et al., 1997; Verbeke, 2006) and healthy food is often expected to be less tasty (Fenko et al., 2016; Raghunathan et al., 2006). As sensory language refers to the senses such as taste, it may be more likely to activate associations with rewarding experiences stored in memory leading to more eating simulations compared to hedonic language. Additionally, although healthy food is perceived to have less hedonic potential (Fenko et al., 2016; Raghunathan et al., 2006) it was expected that hedonic language would counterbalance this expectation and ultimately lead to more eating simulations compared to neutral language. A second explanation may therefore be that sensory, and hedonic language possibly activate distinct associations of previously rewarding experiences. Sensory language may be more likely to activate sensory associations. Hedonic language may activate more associations related to the hedonic reward of eating. Future research is required to investigate whether food labels with sensory language activate different associations and simulations compared to food labels with hedonic language. This could be done by asking participants to specifically report the associations evoked by the indulgent

language types. Additionally, it may be that the associations activated by sensory language were more prominent in the items used to measure eating simulations compared to associations activated by hedonic language. In the current study, participants were asked whether they thought about what the food would taste like and whether they could imagine what it would feel like to eat the food. Future studies should therefore also include items that measure the hedonic aspect of eating simulations by adding an item related to hedonic rewards (e.g., whether participants can imagine enjoying the food item).

Another possible explanation for the findings not fully supporting previous research could be attributed to the differences in methodology with previous studies (Turnwald et al., 2017; Turnwald & Crum, 2019). In these studies, actual food choices and food intake of participants in cafeteria and restaurants was measured. In this real-world environment, participants may have behaved more naturally and paid less attention to the food labels. Consequently, participants may have processed the food labels with less awareness resulting in indulgent language unconsciously influencing food choices and intake. In the current experiment, participants were more likely to have processed the food labels consciously. Additionally, participants self-reported their desire for food, eating simulations and intention to buy healthy food. Participants may have found it difficult to self-assess their desire for food and intention to buy the food items. It could also be argued that the discrepancy in results and methodology suggests that the influence of indulgent language may partly be unconscious resulting in participants underreporting the measures. Future research, which considers that indulgent language is possibly processed unconsciously, will need to be undertaken to investigate this hypothesis. This could firstly be executed with the use of implicit measures to measure unconscious processing of indulgent language more accurately. Future studies could, for example, incorporate a word-stem completion task or an Implicit Association Test. These measures would also prevent the participants from having to self-assess their desire for food and intention to buy. Secondly, the experiment could be conducted in a realistic or virtual reality supermarket environment. Although participants were asked to read a supermarket scenario, a (virtual reality) supermarket environment may stimulate natural behaviour. In a (virtual reality) supermarket, participants are likely to actively search for food items making them more susceptible to the influence of food labels.

In addition, the current study was set out to investigate whether food labels with indulgent language have a different influence when presented in L1 compared to L2. Previous studies have suggested that information in L1 is more likely to be processed both conceptually

and emotionally compared to L2 (Ahn & Ferle, 2008; Gerritsen et al., 200; Luna & Peracchio, 2001; Puntoni et al., 2009; Sholl et al., 1995). The asymmetry in emotional processing may be explained by 'Disembodied Cognition', which suggests that L2 is less deeply rooted in our emotion system, leading to emotional distance, compared to L1 (Keysar et al., 2012; Pavlenko, 2012). The asymmetry in conceptual processing may be explained by the RHM, which suggests that the conceptual meaning of L1 words is accessed directly whereas L2 words are accessed via L1 words in memory because of language acquisition at a later age (Dufour & Kroll, 1995). As a result of the stronger emotional and conceptual processing it was hypothesized that food labels in L1 would lead to a greater desire for food, eating simulations and intention to buy healthy food compared to L2. Additionally, it was hypothesized that the influence of indulgent language would therefore be greater when presented in L1 compared to L2.

In contrast to earlier findings and expectations, no evidence was found that food labels of healthy food in L1 have a different influence compared to food labels in L2. The results are likely to be related to the fairly high English language proficiency (M = 4.54) and early age of English language acquisition (M = 12.2) of the participants. The fairly high English language proficiency of participants may subsequentially have reduced the asymmetry in conceptual and emotional processing. Furthermore, both the RHM and Disembodied Cognition suggest that the asymmetry and advantage of L1 processing are partly due to language acquisition. The average age at which participants started learning the English language may therefore also serve as an explanation for the results as the advantage of L1 processing may consequently not have been as significant as predicted. The reduced asymmetry may have led to more equal processing of the sensory, hedonic, and neutral food labels. Consequently, the difference because of the expected language effects on participants' desire for food, eating simulations and intention to buy may have been diminished. Therefore, it is suggested that future experimental investigations incorporate an L2 in which the participant group is less proficient or recruit a participant group that is in general less proficient in English (e.g., Italian, or Portuguese participants). It is more likely that language effects are found for these groups as the asymmetry of conceptual and emotional processing between the L1 and L2 is presumably larger.

Besides the aforementioned, a limitation may be found in the stimuli. The focus of the current study was on language use on food labels and visuals may have affected its influence. Therefore, it was deliberately chosen not to expose participants to actual images or packaging of healthy food. However, it might have dampened the likelihood of finding an effect of indulgent language as an image or actual packaging of the food could have made the stimuli

more realistic. Notwithstanding this limitation and considering that the current study was not performed in an actual supermarket, the results suggest that the effect of indulgent language may be generalisable to a supermarket context. More research is required to investigate this statement. Future studies could increase the realism of the experiment by exposing participants to more realistic food labels.

Taken together, the findings do not support strong recommendations to incorporate in smart food policies with the aim to stimulate a healthy diet. No effects of L1 or L2 were found. However, the findings of this study contribute to existing knowledge on the influence of indulgent language as it sheds new light on the distinct influence of sensory and hedonic language. The most significant finding of this study is that food labels with sensory language led to more eating simulations compared to food labels with hedonic or neutral language. This finding suggests that the use of sensory language on food labels may be an effective strategy to make healthy food seem tastier as it leads to more eating simulations. Further research is needed to confirm that it is indeed an effective nudging strategy to steer consumers towards healthy food choices by conforming with consumers' food preferences as it makes healthy food seem tastier and as having more hedonic potential. Moreover, the question remains unanswered whether the effect of indulgent language is generalisable to other contexts such as supermarkets. In supermarkets, consumers are confronted with many food choices making it a suitable environment to make a difference by stimulating healthy food choices. This would be a fruitful area to be explored in further research. Overall, indulgent language use on food labels of healthy food is still a promising tactic to stimulate a healthy food intake and ultimately improve public health.

References

Ahn, J., & Ferle, C. L. (2008). Enhancing recall and recognition for brand names and body copy: A mixed-language approach. *Journal of Advertising, 37*(3), 107–117. https://doi-org.ru.idm.oclc.org/10.2753/JOA0091-3367370308

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology, 59*(1), 617–645. https://doi-org.ru.idm.oclc.org/10.1146/annurev.psych.59.103006.093639

Barsalou, L. W. (2009). Simulation, situated conceptualization, and prediction. *Philosophical Transactions of the Royal Society B: Biological Sciences, 364*(1521), 1281–1289. https://doi-org.ru.idm.oclc.org/10.1098/rstb.2008.0319

Crum, A. J., Corbin, W. R., Brownell, K. D., & Salovey, P. (2011). Mind over milkshakes: Mindsets, not just nutrients, determine ghrelin response. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association, 30*(4), 424–9. https://doi-org.ru.idm.oclc.org/10.1037/a0023467

De Wijk, R. A., Maaskant, A. J., Polet, I. A., Holthuysen, N. T. E., Van Kleef, E., & Vingerhoeds, M. H. (2016). An in-store experiment on the effect of accessibility on sales of wholegrain and white bread in supermarkets. *PLoS ONE, 11*(3), 1-8. https://doi.org/10.1371/journal.pone.0151915

Dufour, R., & Kroll, J. F. (1995). Matching words to concepts in two languages: A test of the concept mediation model of bilingual representation. *Memory & Cognition, 23*(2), 166–180. https://doi-org.ru.idm.oclc.org/10.3758/BF03197219

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using g*power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149–1160. https://doi-org.ru.idm.oclc.org/10.3758/BRM.41.4.1149

Fenko, A., Kersten, L., & Bialkova, S. (2016). Overcoming consumer scepticism toward food labels: The role of multisensory experience. *Food Quality and Preference, 48*(Part A), 81–92. https://doi.org/10.1016/j.foodqual.2015.08.013

Fernandes, A. C., Oliveira, R. C., Proenca, R. P. C., Rodrigues, V. M., Fiates, G. M. R., & Curioni, C. C. (2016). Influence of menu labeling on food choices in real-life settings: A systematic review. *Nutrition Reviews, 74*(8), 534–548. https://doi-org.ru.idm.oclc.org/10.1093/nutrit/nuw013

Gerritsen, M., Korzilius, H., van Meurs, F., & Gijsbers, I. (2000). English in Dutch commercials: Not understood and not appreciated. *Journal of Advertising Research, 40*(4), 17–31. https://doi-org.ru.idm.oclc.org/10.2501/JAR-40-4-17-31

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why Americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association, 98*(10), 1118–1126. https://doi.org/10.1016/S0002-8223(98)00260-0

Gloudi, Y. (2019). *Old, but gold? The effects of using archaic spelling for Dutch brand names.* (Unpublished Master's thesis). Department of Communication and Information Studies, Radboud University Nijmegen.

Hendriks, B., Van Meurs, F., & Poos, C. (2017). Effects of difficult and easy English slogans in advertising for Dutch consumers. *Journal of Current Issues & Research in Advertising, 38*(2), 184-196. https://doi.org/10.1080/10641734.2017.1291384

Keysar, B., Hayakawa, S. L., & An, S. G. (2012). The foreign-language effect: Thinking in a foreign tongue reduces decision biases. *Psychological Science, 23*(6), 661–668. https://doi.org/10.1177/0956797611432178

Kiszko, K. M., Martinez, O. D., Abrams, C., & Elbel, B. (2014). The influence of calorie labeling on food orders and consumption: A review of the literature. *Journal of Community Health: The Publication for Health Promotion and Disease Prevention, 39*(6), 1248–1269. https://doi-org.ru.idm.oclc.org/10.1007/s10900-014-9876-0

Krishna, A., & Ahluwalia, R. (2008). Language choice in advertising to bilinguals: Asymmetric effects for multinationals versus local firms. *Journal of Consumer Research, 35*(4), 692–705. https://doi-org.ru.idm.oclc.org/10.1086/592130

Lennernäs, M., Fjellström, C., Becker, W., Giachetti, I., Schmitt, A., Remaut de Winter, A., & Kearney, M. (1997). Influences on food choice perceived to be important by nationally-representative samples of adults in the European Union. *European Journal of Clinical Nutrition, 51,* S8–S15.

Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., …, & Ezzati, M. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: A systematic

analysis for the global burden of disease study 2010. *The Lancet, 380*(9859), 2224–2260. https://doi.org/10.1016/S0140-6736(12)61766-8

Luna, D., & Peracchio, L. A. (2001). Moderators of language effects in advertising to bilinguals: A psycholinguistic approach. *Journal of Consumer Research, 28*(2), 284–295. https://doi-org.ru.idm.oclc.org/10.1086/322903

Lynott, D., Connell, L., Brysbaert, M., Brand, J., & Carney, J. (2020). The Lancester sensorimotor norms: Multidimensional measures of perceptual and action strength for 40,000 English words. *Behavior Research Methods, 52*(3), 1271-1291. https://doi.org/10.3758/s13428-019-01316-z

Moors, A., De Houwer, J., Hermans, D., Wanmaker, S., Van Schie, K., Van Harmelen., A. L., …, & Brysbaert, M. (2013). Norms of valence, arousal, dominance, and age of acquisition for 4,300 Dutch words. *Behavior Research Methods, 45*, 169–77. https://doi-org.ru.idm.oclc.org/10.3758/s13428-012-0243-8

Nederstigt, U., & Hilberink-Schulpen, B. (2018). Advertising in a foreign language or the consumers' native language? *Journal of International Consumer Marketing, 30*(1), 2–13. https://doi-org.ru.idm.oclc.org/10.1080/08961530.2017.1363008

Ogden, J., Coop, N., Cousins, C., Crump, R., Field, L., Hughes, S., & Woodger, N. (2013). Distraction, the desire to eat and food intake. Towards an expanded model of mindless eating. *Appetite, 62*, 119-126. https://doi.org/10.1016/j.appet.2012.11.023

Papies, E. K. (2013). Tempting food words activate eating simulations. *Frontiers in Psychology, 4*, 838–838. https://doi-org.ru.idm.oclc.org/10.3389/fpsyg.2013.00838

Papies, E. K., Barsalou, L. W., & Rusz, D. (2020a). Understanding desire for food and drink: A grounded-cognition approach. *Current Directions in Psychological Science, 29*(2), 193–198. https://doi-org.ru.idm.oclc.org/10.1177/0963721420904958

Papies, E. K., Best, M., Gelibter, E., & Barsalou, L. W. (2017). The Role of Simulations in Consumer Experiences and Behavior: Insights from the Grounded Cognition Theory of Desire. *Journal of the Association for Consumer Research, 2*(4), 402–418. http://dx.doi.org/10.1086/693110

Papies, E. K., Johannes, N., Daneva, T., Semyte, G., & Kauhanen, L. L. (2020b). Using consumption and reward simulations to increase the appeal of plant-based foods.

Appetite, *155*, 104812–104812. https://doi-org.ru.idm.oclc.org/10.1016/j.appet.2020.104812

Pavlenko, A. (2012). Affective processing in bilingual speakers: Disembodied cognition? *International Journal of Psychology*, *47*(6), 405–428. https://doi-org.ru.idm.oclc.org/10.1080/00207594.2012.743665

Puntoni, S., De Langhe, B., & Van Osselaer, S. (2009). Bilingualism and the emotional intensity of advertising language. *Journal of Consumer Research*, *35*(6), 1012–1025. https://doi-org.ru.idm.oclc.org/10.1086/595022

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170–184. https://doi-org.ru.idm.oclc.org/10.1509/jmkg.70.4.170

Ronto, R., Wu, J. H., & Singh, G. M. (2018). The global nutrition transition: Trends, disease burdens and policy interventions. *Public Health Nutrition*, *21*(12), 2267–2270. https://doi-org.ru.idm.oclc.org/10.1017/S1368980018000423

Seidlhofer, B. (2005). English as a lingua franca. *ELT Journal*, *59*(4), 339–341. https://doi-org.ru.idm.oclc.org/10.1093/elt/cci064

Sholl, A., Sankaranarayanan, A., & Kroll, J. F. (1995). Transfer between picture naming and translation: A test of asymmetries in bilingual memory. *Psychological Science*, *6*(1), 45–49. https://doi.org/10.1111/j.1467-9280.1995.tb00303.x

Speed, L. & Brysbaert, M. (2020). Dutch sensory modality norms. Preprint. https://doi.org/10.31234/osf.io/zv6pn

Suher, J., Raghunathan, R., & Hoyer, W. D. (2016). Eating healthy or feeling empty? How the "healthy = less filling" intuition influences satiety. *Journal of the Association for Consumer Research*, *1*(1), 26–40. https://doi-org.ru.idm.oclc.org/10.1086/684393

Turnwald, B. P., & Crum, A. J. (2019). Smart food policy for healthy food labelling: Leading with taste, not healthiness, to shift consumption and enjoyment of healthy foods. *Preventitive Medicine*, *119*, 7-13. https://doi-org.ru.idm.oclc.org/10.1016/j.ypmed.2018.11.021

Turnwald, B. P., Boles, D. Z., & Crum, A. J. (2017). Association between indulgent descriptions and vegetable consumption: Twisted carrots and dynamite beets. *Jama*

Internal Medicine, 177(8), 1216–1218. https://doi-org.ru.idm.oclc.org/10.1001/jamainternmed.2017.1637

Van der Vegt, V. S. (2020). *Using indulgent labels for healthy meals on Instagram to make them more attractive.* (Unpublished Bachelor's Thesis). Department of Communication and Information Studies, Radboud University Nijmegen.

Van der Zee, T., Admiraal, W., Paas, F., Saab, N., & Giesbers, B. (2017). Effects of subtitles, complexity, and language proficiency on learning from online education videos. *Journal of Media Psychology, 29*(1), 18–30. https://doi-org.ru.idm.oclc.org/10.1027/1864-1105/a000208

Vandenbroele, J., Slabbinck, H., Van Kerckhove, A., & Vermeir, I. (2018). Curbing portion size effects by adding smaller portions at the point of purchase. *Food Quality and Preference, 64*, 82–87. https://doi-org.ru.idm.oclc.org/10.1016/j.foodqual.2017.10.015

Vecchio, R., & Cavallo, C. (2019). Increasing healthy food choices through nudges: A systematic review. *Food Quality and Preference, 78*. https://doi-org.ru.idm.oclc.org/10.1016/j.foodqual.2019.05.014

Verbeke, W. (2006). Functional foods: Consumer willingness to compromise on taste for health? *Food Quality and Preference, 17*(1), 126–131. https://doi-org.ru.idm.oclc.org/10.1016/j.foodqual.2005.03.003

Warriner, A. B., Kuperman, V., & Brysbaert, M. (2013). Norms of valence, arousal, and dominance for 13,915 English lemmas. *Behavior Research Methods, 45*, 1191-1207. https://doi-org.ru.idm.oclc.org/10.3758/s13428-012-0314-x

Appendix A – Overview of the Dutch and English food labels

Table 1. Overview of the Dutch food labels per food item and language type (Sensory/Hedonic/Neutral). Sensory words are in italic, hedonic words are underlined, and neutral words are bold.

	Sensory	Hedonic	Neutral
Apple	*Honingzoete* appels als *sappig* tussendoortje voor iedere dag	Mooie appels als verfrissend tussendoortje voor iedere dag	**Rode** appels als **bewust** tussendoortje voor iedere dag
Brown rice	*Kruidige* zilvervliesrijst. *Lekker* en ideaal als bijgerecht.	Magische zilvervliesrijst. Genotvol en ideaal als bijgerecht.	**Eersteklas** zilvervliesrijst. **Langwerpig** en ideaal als bijgerecht.
Whole grain bread	*Vers* volkorenbrood met een *krokante* korst. Dagelijks opnieuw gebakken.	Fantastisch volkorenbrood met een bevredigende korst. Dagelijks opnieuw gebakken.	**Ouderwets** volkorenbrood met een **klassieke** korst. Dagelijks opnieuw gebakken.
Almonds	*Gezouten* amandelen. *Knapperig* en direct uit de oven.	Voldoening gevende amandelen. Gelukzalig direct uit de oven.	**Standaard** amandelen. **Authentiek** en direct uit de oven.
Oatmeal	*Smaakvolle* havermout als *smeuïge* en goede basis voor je ontbijt.	Uitstekend havermout als verblijdende en goede basis voor je ontbijt.	**Stevig** havermout als **snelle** en goede basis voor je ontbijt.
Chickpeas	Kikkererwten met een *heerlijke* smaak. *Verrukkelijke* toevoeging.	Kikkererwten om van te genieten. Prettige toevoeging.	Kikkererwten **voor al je gerechten**. **Ultieme** toevoeging.

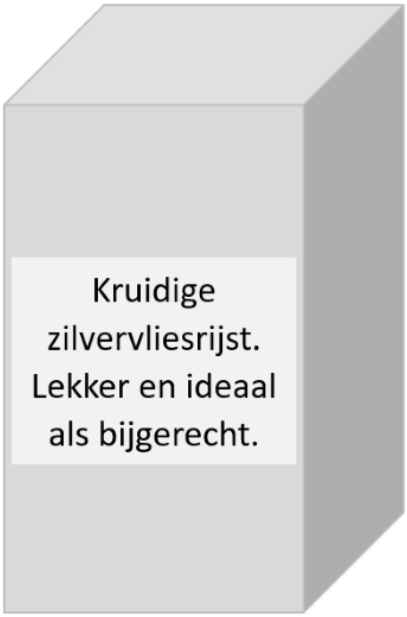
Table 2. Overview of the English food labels per food item and language type (Sensory/Hedonic/Neutral). Sensory words are in italic, hedonic words are underlined, and neutral words are bold.

	Sensory	Hedonic	Neutral
Apple	*Honeysweet* apples as a *juicy* daily snack	Beautiful apples as a refreshing daily snack	**Red** apples as a **conscious** daily snack
Brown rice	*Spiced* brown rice. *Tasty* and ideal as a side dish.	Magical brown rice. Delightful and ideal as a side dish.	**First-class** brown rice. **Long-grained** and ideal as a side dish.
Whole grain bread	*Fresh* whole grain bread with a *crispy* crust. Baked daily.	Fantastic whole grain bread with a gratifying crust. Baked daily.	**Old-fashioned** whole grain bread with a **classic** crust. Baked daily.
Almonds	*Salted* almonds. *Crunchy* and straight from the oven.	Satisfying almonds. Blissful and straight from the oven.	**Basic** almonds. **Authentic** and straight from the oven.
Oatmeal	*Flavourful* oatmeal as a *creamy* and good basis for your breakfast.	Excellent oatmeal as a pleasing and good basis for your breakfast.	**Firm** oatmeal as a **quick** and good basis for your breakfast.
Chickpeas	Chickpeas with a *delicious* taste. *Delectable* addition.	Chickpeas that are fully enjoyable. Pleasurable addition.	Chickpeas **for all your dishes**. **Ultimate** addition.

Appendix B: Basic shapes of the six food items with L1/Dutch sensory language

Food label for *Apples*

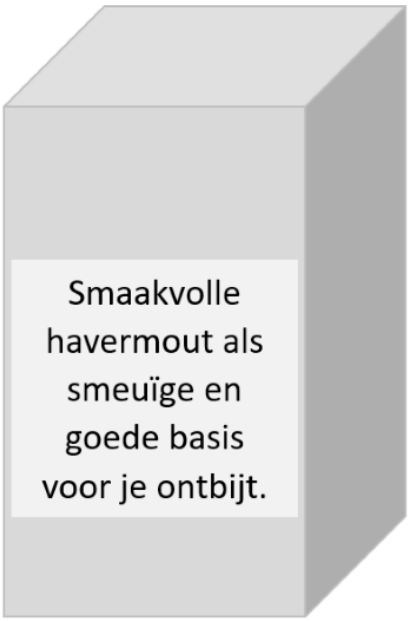
Food label for *Brown rice*



Food label for *Whole grain bread*

Food label for *Almonds*

Food label for *Oatmeal*



Food label for *Chickpeas*

Appendix C – Supermarket Scenario

Participants were asked to read the following supermarket scenario:

> *Hierna volgen zes etiketten van voedselproducten met bijbehorende vragen. Bekijk de etiketten en beantwoord daarna de vragen. Stel je tijdens het bekijken van de etiketten en het beantwoorden van de bijbehorende vragen het volgende voor: Je bent in je gebruikelijke supermarkt om je boodschappen te doen, ziet de voedselproducten en bekijkt wat er op de etiketten staat.*

To aid the reader, the English translation of the scenario is as follows:

> *Hereafter follow six labels of food products with associated questions. View the labels and then answer the questions. As you view the labels and answer the associated questions, imagine the following: you are at your usual supermarket to do your groceries, you see the food products, and check what the labels say.*