Encouraging Healthy Food Choices with an Emoji-Nudge, in combination with a Feedback and Swap intervention

An experimental study into the influence of an Emoji-Nudge in combination with Feedback and a Swap on encouraging healthy food choices in an online supermarket environment.

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Use of Technology Statement

For my master's thesis, I used different technological tools to improve my writing. First, I used www.Deepl.com to translate words from Dutch to English and to translate parts of scientific papers so I could understand them better. To help paraphrase, I used www.iam-webster.com and www.Thesarus.com. Moreover, I used www.QuillBot.com and www.Grammarly.com to check the grammar of my text and to summarize parts of my written text as inspiration to be able to reduce the word count. www.Scribbr.com was used to save my scientific sources and help formulate the reference list correctly. Lastly, I used www.Chatgpt.com for brainstorming, transcribing, revising, better understanding of scientific sources, and rephrasing text.

Abstract

Promoting healthier eating habits is more important than ever, due to increasing obesity rates and other health-related issues. Despite having good intentions, people often fail to make healthy food choices and maintain healthy dietary behavior, especially in online shopping environments. This study aimed to investigate the effect of an Emoji-Nudge, together with Feedback and Swap intervention, on healthier food choices in an online supermarket.

For this study, an online survey among Dutch participants was conducted. Participants (n = 200) were randomly assigned to one of the six conditions and had to complete a grocery shopping task. The results did not show that the presence of an Emoji-Nudge significantly encouraged healthy food choices. The interaction effects of the Emoji-Nudge together with Feedback or a Swap caused an increase, but mainly the effect of Feedback and the Swap alone demonstrated a significant positive effect on healthy food choices. In addition, Impulsivity and Social Influence both showed that they affected the effectiveness of the three interventions.

This study contributes to the existing literature on behavior change interventions by showing that Feedback and Swap interventions could be a useful strategy to encourage healthier eating behavior in the digital environment. Nevertheless, the results highlight that the design of these interventions is complex, thereby showing the importance of transparency and autonomy in the context of dietary behavior and the potential of tailored communication strategies to improve health outcomes.

Keywords: Digital nudging, emojis, feedback, swap, healthy food choices, influencing behavior, online supermarket.

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1. Introduction

In contemporary society, there is an urgent need for individuals to adopt healthier dietary practices, since the number of diseases linked to dietary habits, such as obesity, is ever-increasing (Phelps et al., 2024; Tsao et al., 2023). In Europe, over half of adults are either overweight or obese, and the global obesity rate has significantly increased between 1990 and 2022 (De Schutter et al., 2020; Phelps et al., 2024). Approximately one billion people are obese today due to adult obesity rates that have more than tripled for men and more than doubled for women. Cardiovascular diseases continue to be the world's leading cause of death, with obesity as a major risk factor; thereby, poor dietary choices cause about 70% of newly diagnosed cases of obesity (Tsao et al., 2023).

The relationship between nutrition and health outcomes is complex. Consuming foods high in fat and sugars but low in fruits, vegetables, fiber, and unrefined sugars increases body fat and thus risk of cardiometabolic problems (De Magalhães Cunha et al., 2018; WHO, 2003). Poor nutrition also affects other physical factors such as blood pressure and liver function (Cheung et al., 2014). On the other hand, consumption of plant-based foods, oily fish, and unprocessed foods shows improvement in cognitive health (Cheung et al., 2014). The results from these studies demonstrate the need not only to reduce obesity but also to encourage eating healthy foods (Mozaffarian, 2016).

Changes in our food system, partly caused by digitization, have resulted in increased availability of convenient, highly processed, and energy-dense foods, and have played an important role in this excessive consumption (Hall, 2017; Swinburn et al., 2011). The role of food marketing in negatively influencing food choices is significant and multiple studies showed a strong link between excessive food marketing exposure and obesity (Chandon & Wansink, 2012; Swinburn et al., 2011; Witkowski, 2007). Frequent exposure to visual food cues significantly influences eating behavior and causes overweight (Boswell & Kober,

2015). By making food products attractive and convenient to purchase, supermarkets contribute to this, and especially with the rise of online supermarkets, this is reinforced even more (Short et al., 2022; Stanton, 2015). Furthermore, these developments contribute to our food choices being shifted from offline to online (Gunday, 2020).

Research shows that it is important to focus on automatic behaviors, such as choosing a familiar brand without actively considering other options (Cohen & Farley, 2008; Simon, 1956), when influencing behavior and food choices. Additionally, the choice environment, which is the context within which decisions are made (Hansen & Jespersen, 2013), plays a significant role in influencing decision-making processes and automatic behaviors (Bargh et al., 1996; Dijksterhuis et al., 2005). A particular strategy that subtly influences decision-making processes and targets this automatic mode of information processing (Thaler & Sunstein, 2008) is nudging. Nudging is a communication strategy that subtly influences behavior by adjusting or altering the environment in which people make choices and thereby shown to be effective in promoting healthier food choices (Broers et al., 2017; Lindstrom et al., 2023; Sunstein, 2014; Thaler & Sunstein, 2008; Wilson et al., 2016).

A fairly new but promising trend in designing nudges is the use of emojis (Bai et al., 2019; Fennessy et al., 2023; Lin & Luo, 2023; Mills, 2022; Sampietro, 2019). Although research on emojis in the dietary context is still emerging, initial studies indicate that emojis can be effective in promoting healthier food choices, especially among children (De Vries Mecheva et al., 2021; Gwozdz et al., 2020; Ostolaza et al., 2021; Siegel et al., 2015). In addition, feedback interventions offer new possibilities in the area of nudging. Feedback nudges can be easily implemented in the digital context where they can effectively influence behavior (Hermsen et al., 2016), and demonstrated effectiveness in encouraging healthier food choices and increasing awareness about nutrition (Imperatori et al., 2018; Oenema & Brug, 2003; Valenčič et al., 2023). Also outside of the digital context, feedback is a highly

valued tool to promote healthier food choices (Imperatori et al., 2018; Oenema & Brug, 2003). Therefore, it is interesting to investigate the combined effect of nudges and feedback together to promote healthy food choices. The combination of feedback with a nudge, particularly in online grocery shopping environments, shows promising results. Especially in a way that healthier options are provided and presented as "Swaps" (Valenčič et al., 2023). However, more work is needed to study such interventions in the digital context.

To summarize, the current study aims to investigate the separate and joint effects of an Emoji-Nudge in the digital context on promoting healthier food choices. Additionally, this study will investigate how combining an Emoji-Nudge with Feedback, or Swaps can improve transparency and remain effective in encouraging healthier food choices (Bruns et al., 2018; Buratto & Lotti, 2024). The central Research Question guiding this study therefore is: *"To what extent does an Emoji-Nudge in combination with Feedback or a Swap influence healthy food choice in an online supermarket environment, and is this effect affected by Impulsivity and Social Influence?".*

2. Theoretical Framework

In this chapter, the relevant concepts and previous research regarding the topic of this study will be discussed. Paragraph 2.1 discusses decision-making concerning food choices and paragraph 2.2 the intention-behavior gap in this context. Paragraph 2.3 explains nudging, after which paragraph 2.4 explains how this can be used to encourage healthier eating, and paragraph 2.5 discusses the opportunities of nudging in the digital environment. Moreover, paragraph 2.6 discusses the use of emojis to promote healthy food choices, and paragraph 2.7 the potential of feedback nudges. Lastly, paragraph 2.8 presents the research question and hypotheses established.

2.1 Decision-making and Food Choices

Decision-making in the context of food choices is a multifaceted process and is therefore influenced by psychological, environmental, and social factors (Chen & Antonelli, 2020). When developing interventions that encourage healthy eating behavior, it is important to understand decision-making. People make their daily choices mainly automatic and unconscious (Cohen & Farley, 2008; Jacquier et al., 2012), and this process can be better understood through Daniel Kahneman's (2011) *dual-process theory*. Kahneman describes two distinct systems of thinking that work together to shape our behavior. *System 1* is fast, automatic, and intuitive. It is based on heuristics, which are mental shortcuts formed by past experiences and environmental cues. These heuristics form automatic routines to prevent cognitive overload. System 1 is activated automatically when quick responses are needed and often operates without conscious thought. In the context of food choices, System 1 might cause you to stop at McDonald's when you drive by while hungry because it is easily accessible and you know from previous experiences that a hamburger is tasty.

System 2, on the other hand, is slow, deliberate, and analytical. It is activated when making complex decisions that require conscious and careful thought. Concerning food

choices, System 2 might cause you to consider your long-term health goals when ordering weekly groceries or considering not having that hamburger. In everyday situations, System 1 thinking often dominates and is more likely to respond to immediate rewards, such as taste, rather than long-term health goals (Kahneman, 2011; Cohen & Farley, 2008; Jacquier et al., 2012). Food choices arise from these automatic responses and significantly shape eating patterns (Cohen & Farley, 2008; Dijksterhuis et al., 2005; Jacquier et al., 2012; Zhang et al., 2017).e

Therefore, these automatic responses to environmental cues, such as food visibility and easy access, lead to increased unhealthy food choices and calorie intake (Cohen & Babey, 2012; Cohen & Farley, 2008). The decision-making context, referring to the environment within which choices are made, contains environmental cues that subtly influence such behaviors (Bargh et al., 1996; Dijksterhuis et al., 2005). In the context of food, this includes factors like the arrangement of products on store shelves, which make certain brands or foods more prominent, as well as social and psychological factors such as advertising and personal preferences (Downs et al., 2020).

For healthy eating behavior like consuming enough fruits and vegetables, individual habits and internal motivation are key determinants (Mullan et al., 2021). However, the automatic nature of eating behavior, caused by System 1 thinking and the abundant presence of environmental cues, creates situations where individuals have intentions to eat healthy but their actual behavior is different (Inauen et al., 2016). It is challenging to align internal motivations with actions and indeed make healthier food choices. Maintaining healthy eating habits requires effort and conscious thought, especially in environments that contain cues that promote unhealthy food choices. These external unhealthy food cues can unknowingly foster heuristics for unhealthy eating habits (Cohen & Farley, 2008). Therefore, it remains easy to fall back on them, especially when there is little time to prepare healthy food or your friends

and family eat unhealthy (Munt et al., 2016). Concluding, habits and internal motivation are significant predictors of healthy eating (Mullan et al., 2021). This is why it is important to understand the interplay between internal motivations, external food cues, and actual consumption behavior to design effective interventions that promote healthier eating.

2.2 Intention-behavior Gap

As mentioned in paragraph 2.1, people often have good intentions to eat healthy but ultimately fail to do so in practice and continue making unhealthy choices. This friction between what people intend to do and what they do is called the intention-behavior gap (Inauen et al., 2016). An intention-behavior gap can occur when environmental food cues trigger rapid and automatic responses, which undermine the connection between intention and behavior (Wansink, 2010). As a result, these food cues have already shaped someone's behavior before there is time for reflective processing and, in terms of Kahneman's dual-process theory, engage in System 2 thinking (Kahneman, 2011; Orbell & Verplanken, 2015).

Several factors contribute to this intention-behavior gap in the food context. One is the physical environment that determines the accessibility and availability of food (Marcone et al., 2020). For instance, when someone has the intention to eat healthy but these products are too expensive or not available in the nearby area, it is difficult to maintain this intention (Marcone et al., 2020). Another major factor is personal characteristics, such as habits, self-control, and impulsivity, that can create friction between someone's intentions and actual behavior (Marcone et al., 2020). Habits are automatic behavioral responses to environmental cues (Verplanken & Aarts, 1999), and self-control refers to someone's ability to regulate emotions, thoughts, and behavior, and align with long-term goals, despite the presence of more immediately appealing alternatives (Duckworth et al., 2019). For instance, when someone's habit is to buy the newspaper on their way to work and grab a croissant with it, this behavior can persist despite their intention to eat healthier. The automatic link between

buying the newspaper and the croissant needs to be broken, but this requires self-control. Therefore, people with lower levels of self-control struggle to maintain healthy eating behaviors, despite strong intentions (Lally & Gardner, 2013).

A commonly used theory to explain this intention-behavior gap in dietary behavior is the *theory of planned behavior* by Ajzen (1991). According to the theory of planned behavior, intention is the biggest predictor of actual behavior. Azjen identifies three key determinants of intention: attitudes toward the behavior, perceived behavioral control, and subjective norms. These determinants together shape dietary behavior and can contribute to friction between intentions and behavior. *Attitudes towards the behavior* are someone's positive or negative evaluation of performing a certain behavior and/or its outcomes, for instance, beliefs about the benefits of healthy eating. *Perceived behavior control* refers to how someone perceives their ability to perform a certain behavior, for instance, beliefs about how difficult it is to resist appealing alternatives. *Social norms* are the perceived social pressures to (not) perform a certain behavior, influenced by expectations and behaviors of significant others, such as family and friends. Social norms can shape eating habits by showing what is considered normal within a social group. For instance, if someone has friends or family who care about healthy eating, they may be more likely to adopt similar behaviors and vice versa. In this way, social norms influence the transition from intention to behavior, depending on the direction and strength of perceived social influence.

In conclusion, there are multiple challenges when it comes to encouraging healthier eating behaviors. Most importantly, interventions are required that can bridge the gap between intention and behavior so that the desired behavior will occur. One particular type of intervention that presents a promising solution to close the intention-behavior gap is nudging, by helping to overcome automatic habits, external triggers, and mental shortcuts (Lakerveld et al., 2018; Walker et al., 2019). Nudging involves subtle changes in the environment to

align people's behavior with their intentions, without forcing them to do so (Sunstein, 2015; Thaler & Sunstein, 2008). Nudging is the focus of this current study and will be explained in more detail in the following section.

2.3 Nudging

Nudging is a strategy in communication and behavioral sciences that subtly influences behavior through environmental cues by adjusting the decision-making context. These small adjustments in the decision-making context, called *nudges*, influence the decision-making process without people being aware (Benartzi et al., 2017; Cappa et al., 2020; Marchiori et al., 2017; Masyhuri, 2023; Thaler & Sunstein, 2008). The term nudge was originally introduced by Thaler and Sunstein (2008), and they emphasize how even small aspects of social situations can influence people's behavior and the way choices are presented significantly influences someone's final choice. Designing the choice environment to nudge people towards a desired behavior is defined as *choice architecture*. It is important to remember here that people should be subtly nudged toward the desired behavior to preserve their freedom of choice.

A simple but great example of nudging is the fly stickers in the urinals at Schiphol Airport (Thaler & Sunstein, 2008), showing how a small, subtle change in the choice environment can guide behavior. The stickers were placed to reduce mess by giving men a target to aim at, based on people's automatic tendency to aim at a visible target. Typically, men do not consciously aim outside of the urinal but also not at a specific target. Through this small adjustment, the old automatic behavior (not aiming at anything specific) is disrupted and replaced with a new heuristic encouraging more precise aiming. This promotes the desired behavior without specific restrictions since they are still free to choose where to aim.

The psychology behind nudging is the dual-process theory of Kahneman (2011). As mentioned in section 2.1, System 1 is the automatic mode of the brain, and System 2 is the

slower decision mode. System 1 reasoning can lead to automatic responses that may not always align with optimal choices (Kahneman, 2003; Miller et al., 2016). Nudges are designed to counterbalance these heuristics by operating at a level beyond conscious awareness, targeting the unconscious part of the brain and guiding individuals towards desired behaviors (Hukkinen, 2016; Kahneman, 2011; Thaler & Sunstein, 2008; Van Gaal et al., 2008; Vlaev et al., 2016). Nudging makes certain choices more appealing and reduces cognitive effort by making decisions easier. Similar to how environmental cues encourage unhealthy decisions, nudges can promote healthier choices without people actively processing the decision (Kahneman, 2011; Thaler & Sunstein, 2008; Vlaev et al., 2016). They disrupt the heuristics and encourage desired behaviors without individuals being fully aware of the nudging influence (Loewenstein et al., 2007; Thaler & Sunstein, 2008).

In the context of dietary behavior, four main types of nudges are primarily distinguished. (1) *Priming* nudges, (2) *Salience* nudges, (3) *Messenger* nudges, and (4) *Default* nudges (Lindstrom et al., 2023). Priming nudges expose individuals to subconscious cues that activate specific thoughts, emotions, or behaviors, subsequently influencing their decisions. An example may be the smell of freshly baked bread in a supermarket to trigger appetite. Salience nudges make specific choices more prominent and noticeable, such as by adding vibrant colors to the packaging of a healthy product. Since people generally tend to focus on the most noticeable elements, this will guide them toward a particular choice (Lyons & Wien, 2018; Schuldt, 2013; Wilson et al., 2016). Messenger nudges use the influence of the sender of the message to influence decisions, and rely on the credibility and relatability of the source (Lindstrom et al., 2023). For example, a doctor shares information about healthy eating behavior. Default nudges, finally, operate by pre-selecting a standard option, the default. People are likely to accept the default option and make a simple choice. For instance,

setting a whole wheat bun as the standard option when ordering a sandwich (Thaler & Sunstein, 2008; Van Kleef et al., 2018).

To conclude, by adding subtle changes to the environment, nudging can effectively promote desired behaviors while preserving individual freedom of choice. Moreover, nudging interventions are often considered cost-saving compared to other approaches to change behavior, making them attractive to add to existing policies (Benartzi et al., 2017).

2.4 Research on Nudging to Encourage Healthy Food Choices

Nudging is effective in promoting healthier food choices and can be applied in various settings, such as supermarkets or restaurants, to encourage the subconscious selection of healthier options (Broers et al., 2017; Lindstrom et al., 2023; Sunstein, 2014; Wilson et al., 2016). Healthier products are selected more frequently when they are highly visible, even in the presence of less healthy alternatives (Grandi et al., 2021). Salience nudges play a significant role in enhancing the visibility of healthier options (Dai et al., 2020).

Recent research on nudging has demonstrated its effectiveness in promoting healthier food choices among adults (Broers et al., 2017; Friis et al., 2017; Lindstrom et al., 2023; Sunstein, 2014; Wilson et al., 2016). Despite variations in study outcomes, nudging remains a promising approach for encouraging healthier decision-making and lifestyles (Lindstrom et al., 2023; Marchiori et al., 2017). Systematic reviews on the effect of nudging have shown that particularly *salience* and *priming* nudges consistently show a positive impact on encouraging healthier food choices (Lindstrom et al., 2023; Wilson et al., 2016). Therefore, the decision was made for the present study to investigate the effect of a salience nudge.

2.5 Shaping Choices in the Digital Environment

People are spending more and more time online and as a result, more decisions are being made within an online choice environment (Liu, 2005; Sparrow & Chatman, 2013). This affects the dietary context because it includes activities such as ordering groceries but

also spending time on social media, which increasingly exposes people to food cues, including advertisements and recommendations (Kucharczuk et al., 2022; Ojha et al., 2023).

This frequent exposure makes it challenging for people to distinguish between correct and incorrect information (Liu, 2005; Ojha et al., 2023) and thereby leads to people spending less time thoughtfully reading. Instead, they scan information and skip sections (Liu, 2005; Ojha et al., 2023). Consequently, reduced attention and decision-making time result in reliance on automatic heuristics and habits (Munt et al., 2016). Here, the concept of nudging is particularly relevant because nudging also works in the digital environment to change automatic habits. By understanding the impact of the digital world, digital nudges can be developed to encourage healthier food choices (Vecchio & Cavallo, 2019).

The term *digital nudging* refers to using nudges in the user interface of digital choice environments, such as mobile apps, social media, or e-commerce (Weinmann et al., 2016; Özdemir, 2019). Common digital nudges include the use of graphic design (e.g. highlighting healthy options), displaying specific words or content (e.g. a button that directs to healthier options), and implementation of small interaction elements (e.g. prompts to encourage to add a piece of fruit to cart) that guide toward healthier behavior (Mirsch et al., 2017).

2.6 Using Emojis to Encourage Healthy Food Choices

Emojis are frequently used in spontaneous messages on social media to express positive and negative emotions about food (Vidal et al., 2016). Emojis are visual symbols in computer-mediated communication that can represent facial expressions and emotions, as well as animals, activities, etc. (Rodrigues et al., 2017). Emojis are now widely used across various contexts, where they can add extra meaning to communications or be used as non-verbal cues to emphasize something or express an emotion (Alshenqeeti, 2016; Dresner & Herring, 2010; Sampietro, 2019).

A relatively new way of using emojis is to use them as cues to influence behavior, i.e. as nudges. Emojis can influence perceptions and purchase intentions by causing positive emotions and expressions, such as joy and happiness (Dai et al., 2019; Fennessy et al., 2023; Lin & Luo, 2023; Mills, 2022). Studies on the use of emojis to encourage healthy eating show varying results. Research on promoting healthier choices within a women's prison showed that a menu design with emojis increases the selection of healthy products (Fennessy et al., 2023). Studies on the influence of emoticon placement in schools showed that the use of happy emojis as a nudge can guide children toward healthy food options and increase purchases (De Vries Mecheva et al., 2021; Gwozdz et al., 2020; Marcano-Olivier et al., 2019; Ostolaza et al., 2021; Siegel et al., 2015). Another study on the influence of emojis to encourage healthy snack choices among children in an elementary school also showed that they were effective on an individual level, but this diminished as soon as the children observed peers who exhibited unhealthy eating behavior (De Vries Mecheva et al., 2021).

Research on the effectiveness of emojis as nudges in the digital environment to promote healthier dietary behavior is scarce, despite them being already implemented in today's society. For example, emojis are frequently used on supermarket websites, food delivery apps, and social media platforms to promote food. Especially since emojis are known to reinforce message intensity, they could well be used to encourage healthy eating habits (Derks et al., 2007). This current research will hopefully contribute to new insights into the usage of emojis to promote healthy food choices.

2.7 Using Feedback to Encourage Healthy Food Choices

Despite their effectiveness in encouraging desired behavior, nudges have also been criticized for being manipulative and potentially threatening people's freedom by pushing people toward choices (Michaelsen et al., 2021). Recent research on this topic showed a way to address these ethical concerns by making nudges more transparent through the use of

feedback. With this approach, the effectiveness of the nudges is maintained (Buratto & Lotti, 2024; Sunstein, 2015), but the goal is made more transparent. Additionally, one particular research suggests that adding transparency leads to a stronger effect of the nudge, although this was a small effect (Bruns et al., 2018). Nudges can subtly influence behavior to be more in line with someone's intentions (Thaler & Sunstein, 2008), and when the goal of the intervention is clearer through increased transparency, this will enhance the link with intentions and improve the effectiveness of the nudge (Bruns et al., 2018; Junghans et al., 2015).

Feedback is a widely used method to influence and encourage desired behavior. By providing information about someone's behavior, feedback can reinforce positive actions, can correct undesirable behavior, and therefore have a powerful impact on learning and performance (Hattie & Timperley, 2007). However, its effectiveness depends on the type of feedback provided and how it is delivered (Hattie & Timperley, 2007). Feedback shows effectiveness in encouraging dietary awareness and dietary change intention (Oenema & Brug, 2003). Thereby, showed to reduce fat intake (Armitage & Conner, 2001) and is highly valued compared to other interventions to encourage desired behavior (Imperatori et al., 2018; Oenema & Brug, 2003). For example, Bedard and Kühn (2015) conducted a study where consumers received feedback on their food choices printed on their receipts after they had paid. At the bottom of the receipt, it was indicated which items they could choose to make a healthier decision on their next visit. This resulted in a positive shift to healthier products.

To disrupt habits and encourage desired behaviors, in particular, feedback delivered through digital technology appears to be effective (Hermsen et al., 2016). Feedback can be considered a way of nudging since it subtly guides people towards a desired behavior. It gives explicit information about behavior or performances but does not restrict choices (Cappa et

al., 2020). In the digital environment, more advanced nudges are possible, and feedback nudges are easier to implement (Mills, 2022; Valenčič et al., 2023). For example, nudges can be designed as immediate, interactive feedback based on user actions, preferences, and behaviors, thereby performing on a larger scale (Bergram et al., 2022; Özdemir, 2019; Sobolev, 2021).

Research on the effect of digital feedback nudges is scarce, but Van der Laan and Orcholska (2022) investigated the impact of immediate personalized feedback on promoting healthier food choices. Their study revealed that displaying a pop-up suggestion after scanning an unhealthy product in the supermarket led to a significant increase in healthier purchases. Subsequently, Shin et al. (2020) investigated real-time feedback through digital dynamic food labels in an online supermarket environment. Indicating that labels identifying the healthiness of products positively influenced healthier purchases. Furthermore, presenting an overall healthiness score of the shopping cart also showed positive results. These studies underscore the opportunities for immediate and tailored feedback as a tool to subtly guide consumers toward healthier food options, indicating it is an interesting topic for further research (Van Der Laan & Orcholska, 2022). Therefore, the potential of feedback interventions to encourage healthier food choices will be examined in my research.

2.9 Using a ‘Swap’ to Encourage Healthy Food Choices

Another potential within feedback lies in providing specific suggestions with healthier alternatives after consumers make their initial choice, which can effectively promote healthier dietary behaviors (Bedard & Kühn, 2015). Valenčič et al. (2023) conducted a meta-analysis on digital nudging in online grocery stores and identified the potential of "*swaps*”. Swaps are feedback interventions that suggest consumers a healthier alternative after they have selected their choices. A systematic review conducted by Hartmann-Boyce et al. (2018) showed that swap interventions in stores were significantly effective in encouraging people towards

desired foods, by presenting feedback with suggested alternatives for high-fat and low-fiber products. It resulted in increases in high-fiber products and low-fat foods and a decrease in high-fat products (Winett et al., 1991). A study in collaboration with an online supermarket showed that fully automatic feedback on selected purchases resulted in a significant decrease in products high in saturated fat (Huang et al., 2006).

In the recent meta-analysis of Valenčič et al. (2023), the potential of personalized interventions as feedback and offering swaps to encourage healthier choices is also emphasized but also showed that results still vary. Bunten et al. (2021) conducted experimental research within a simulation supermarket, showing significant positive effects of displaying healthier product suggestions as a pop-up. This resulted in the selection of products with fewer calories and people ate fewer calories per month. Conversely, Forwood et al. (2015) conducted an experimental study on the effect of healthier food suggestions in a retail environment, but the results did not show a significant effect of the swap. Nevertheless, it provided useful information about swaps being better accepted when offered at the moment of selection than at the checkout.

Thus, in studies on nudging aimed at encouraging healthier eating behavior, varying effects are observed, influenced by uncontrolled factors, and designs that are challenging to compare. This current study aims to address these challenges by measuring choices before and after the swap, thereby enabling a more accurate examination of the impact.

2.10 Impulsivity and Nudge Effectiveness

There is a strong link between impulsivity, obesity, and food intake (Nederkoorn et al., 2009). People with higher impulsivity tend to consume more food and sugar-sweetened drinks. This behavior is further encouraged by e-commerce platforms, where the ease and joy of online shopping promotes impulsive buying behaviors (Gulfraz et al., 2022; Nederkoorn et

al., 2009). Impulsive buying behavior especially arises in the context of food, leading to more unhealthy food choices and lower health outcomes (McCurley et al., 2022).

Marques et al. (2020) investigated the effect of impulsivity traits on food choices within a nudging intervention at a self-service buffet. The results showed that impulsivity did not affect food choice within the context of this nudge intervention, indicating that nudging might work independently of impulsivity traits. This research was conducted in an experimental environment where participants received a free lunch. In contrast, my study focuses on dietary behavior in the digital environment, since studies showed that an online environment encourages impulsive behavior (Gulfraz et al., 2022; McCurley et al., 2022). This raises questions relating to the influence of impulsivity on the effectiveness of nudging interventions in the digital context with the promotion of healthy food choices as a goal. Understanding this relationship is important for the development of more effective interventions. Therefore, it is interesting to explore whether impulsivity influences the effectiveness of online nudging strategies.

2.11 Social Influence and Nudge Effectiveness

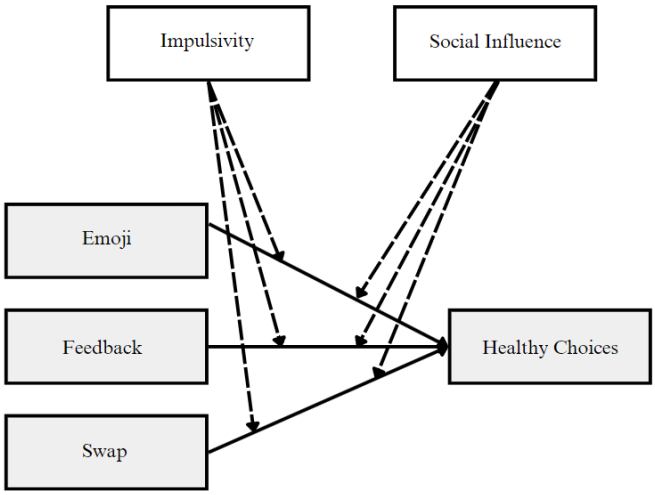
Thaler and Sunstein (2008) explain in their book that people learn from their social environment and learn from others around them, shaping habits and beliefs in this way. Despite being an effective way of learning, this is also how many of our poor habits and assumptions arise, because we have simply adopted them from others. Therefore, social influence can be seen as one of the most effective factors in nudging behaviors. Social influence encompasses interpersonal relationships, social norms, and peer recommendations that influence decision-making (Bagozzi, 2000). Social norms are the unwritten rules about behavior within a social group. Interpersonal relationships refer to the people within this group, while peer recommendations consist of the suggestions and endorsements provided by these peers (Hinde, 1987; Lapinski & Rimal, 2005; Sunstein, 1996).

In the context of dietary behavior, social norms have a powerful effect on food choices and consumption patterns. They can thereby influence healthier choices by providing information about foods and facilitating food sharing (Higgs, 2015). Research showed that the strength of these social norms may sometimes overshadow nudging effects and is ineffective in the presence of negative peer influence (De Vries Mecheva et al., 2021). However, nudges can also be empowered when social norms encourage healthy food choices and an environmental cue evokes a social norm regarding healthy dietary habits and is in line with someone's intentions (Junghans et al., 2015).

To conclude, when someone experiences less or more social influence, this can impact their food choices which makes it interesting to investigate if this influences the effectiveness of the nudging interventions. The two variables and the hypothesized effect are included in Figure 1.

Figure 1

Model Impulsivity and Social Influence



2.8 Research Question and Hypotheses

Research has shown that using a muscle emoji as a nudge can encourage healthier food choices by creating positive feelings (Dai et al., 2019; Fennessy et al., 2023; Lin & Luo, 2023; Mills, 2022). This has been supported in various studies (De Vries Mecheva et al., 2021; Gwozdz et al., 2020; Ostolaza et al., 2021; Siegel et al., 2015). In this study, the muscle emoji was chosen to symbolize healthy food that provides energy and strength, a concept that is understood across different languages (Barbieri et al., 2016).

Regarding recent concerns about nudging, some studies suggest that making nudges clearer through feedback maintains the effectiveness of the nudge and may even make it more effective (Bruns et al., 2018; Buratto & Lotti, 2024). Research on feedback and swap nudges has shown they can help people make healthier food choices, but more research is needed (Hartmann-Boyce et al., 2018; Valenčič et al., 2023). Therefore, this study combines these strategies to see if they can enhance each other's effects. The following research question and corresponding hypotheses are stated:

RQ: *"To what extent does an Emoji-Nudge in combination with Feedback or a Swap influence healthy food choices in an online supermarket environment, and is this effect affected by Impulsivity and Social Influence?".*

H1: "*An Emoji-Nudge increases healthy food choices."*

H2: *"Feedback based on the initial food choice increases healthy food choices."*

H3: *"An Emoji-Nudge and Feedback together strengthen each other in increasing healthy food choices."*

H4: *"A Swap based on the initial food choice increases healthy food choices."*

H5: *"An Emoji-Nudge and a Swap together strengthen each other in increasing healthy food choices."*

Impulsivity strongly influences food intake and impulsive buying behavior, particularly within the food context, and this is strengthened within a digital environment, negatively impacting overall health (Gulfraz et al., 2022; McCurley et al., 2022; Nederkoorn et al., 2009). While nudges can counteract this effect, their impact in a digital setting hasn't been widely studied (Marques et al., 2020). Therefore, this study includes impulsivity to determine if it affects the effectiveness of nudges. The following hypotheses are conducted:

H6a: *"Impulsivity affects the effectiveness of an Emoji-Nudge on encouraging healthy food choices."*

H6b: *"Impulsivity affects the effectiveness of Feedback on encouraging healthy food choices."*

H6c: *"Impulsivity affects the effectiveness of a Swap on encouraging healthy food choices."*

As explained by Thaler and Sunstein (2008), people mostly learn from their social environment. Social norms significantly influence food choices (Higgs, 2015) and can promote both healthy and unhealthy eating behaviors. Their impact in a digital setting has not been widely studied. Thus, social influence was included as a factor in this study to explore whether it influences the impact of the interventions and whether this effect is positive or negative. The following hypotheses are conducted:

H7a: *"Social Influence affects the effectiveness of an Emoji-Nudge on encouraging healthy food choices."*

H7b: *"Social Influence affects the effectiveness of Feedback on encouraging healthy food choices."*

H7c: *"Social Influence affects the effectiveness of a Swap on encouraging healthy food choices."*

3. Method

3.1 Design

To answer the research question, an experimental study with a 2x3 between-subject design was conducted. The independent variables included an *Emoji Nudge* (present vs not present) and *Feedback* (not present vs present vs present as swap). The dependent variable was *Healthy Food Choice* (healthy vs unhealthy). Additionally, two factors were examined that might have impacted the influence of the effectiveness of the nudge and types of feedback: Impulsivity and Social Influence. The participants were randomly assigned to one of the six conditions and were equally divided.

3.2 Participants

Of the 235 participants who started the questionnaire, 35 were deleted because they did not finish the questionnaire or did not meet the criteria to participate, resulting in a final sample of 200 participants. Participants were recruited through convenience sampling through the researcher's network. Social media was used to reach the participants and invite them to complete the questionnaire, in exchange they could win a twenty-euro gift card from Bol.com. To participate in the experiment, participants had to be 18 years or older, speak Dutch, and have access to a computer or smartphone. Participants were required to have no allergies or specific diet. The data was collected in May 2024.

In total, 200 participants participated in the study. 25% of the participants were Male (n = 50), and 75% of the participants were Female (n = 150). The age of the participants ranged between 18 and 81, with a mean age of 41.77 years (SD = 18.13). Additionally, most of the participants completed an HBO bachelor or higher, more specifically 70.5%, whereas 29.5% had a lower education level. These findings are stated in the table below and a complete overview of the demographics can be found in Appendix J.

3.3 Stimuli

The participants of this study were randomly assigned to one of the 6 conditions (Appendix K) within a Qualtrics questionnaire. For the design of the different stimuli, screenshots from products on the Albert Heijn website were used, and the nudge, feedback, and swap were created with Canva.com. Participants were presented with two product pairs each time and asked to choose one. Participants made eleven food choices, one after another, and there was always a healthy option and an unhealthy option.

In the conditions with the Nudge, a biceps muscle emoji was displayed next to the healthier product. In the conditions with Feedback, tailored feedback was provided after the participants made their initial choice. This Feedback provided nutritional information about the option they had chosen, based on the macronutrients of the chosen option or the alternative. Depending on the condition, participants who made an unhealthy choice were presented with a Swap option alongside the feedback and were asked if they wanted to change their initial choice. This was done in a motivational way, designed as a product suggestion. The different conditions of the experiment can be found in Appendix K.

3.4 The Emoji-Nudge

For this current research, a biceps muscle emoji will be used, whose meaning is understood across different languages (Barbieri et al., 2016). In the No-Nudge condition, the biceps muscle was not visible. To maintain focus on measuring the effect of the nudge, the price of the option with the nudge will be higher. Figures 3 and 4 show how these conditions were designed. An overview of the stimuli for all products can be found in Appendix D.

Figure 3

Emoji-Nudge condition for the product combination Cinnamon Biscuits

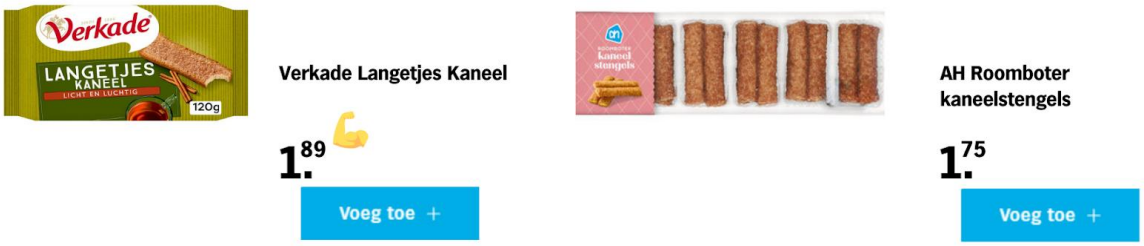
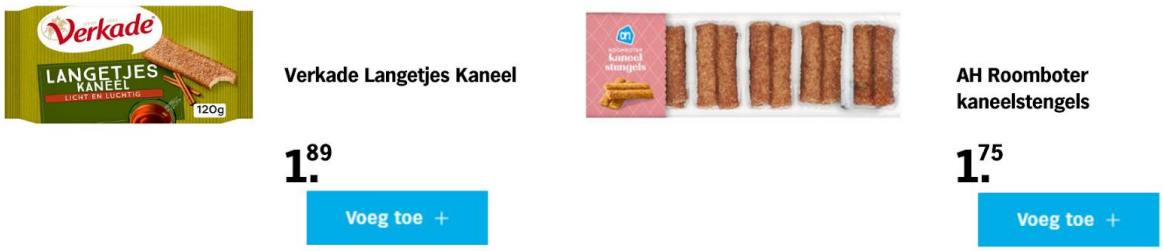


Figure 4

No-Nudge condition for the product combination Cinnamon Biscuits



3.5 Feedback

3.5.1 Feedback Present

In the conditions where Feedback was presented, participants received Feedback about the choice they made. This Feedback provided nutritional information about the option they had chosen, based on the macronutrients of the chosen option or the alternative. The figures below show how the Feedback was designed.

Figure 5

The Feedback condition when the unhealthy choice is selected

Note: Translation: “Tip: These cookies contain 43% less sugar”.

Figure 6

The Feedback condition when the healthy option is selected

Note: Translation: “Good choice! With 43% less sugar per cookie”.

3.5.2 Feedback with a Swap

For the conditions where a Swap was provided, the participants received the same nutritional information but with the opportunity to change their minds. The design looked similar to Figures 3 and 4, but the response options in Qualtrics enabled the participants to indicate whether they wanted to keep or change their current choice. An overview of the stimuli for all of the eleven products can be found in Appendix D.

3.5.3 No Feedback

In the conditions without Feedback, participants did not see any screen after their choice and were immediately presented with the next product combination.

3.6 Instruments

The dependent variable, Healthy Food Choices, was measured as a binary variable (1 = healthy, 0 = unhealthy). Afterwards, a sum score was calculated for each participant, resulting in an overall Healthy Score. In total, they made eleven different choices, resulting in a score between 1 and 11.

For the subject variables, constructs were created by using scales from already existing literature and translated into Dutch for the final questionnaire. To measure Impulsivity, a shortened version of the Barrat Impulsiveness Scale (BIS) with six items (Barratt, 1994; Spinella, 2007) was used. Participants were asked to indicate to what extent they identified themselves with the statements (e.g. I tend to live in the moment without thinking about the future). The scale showed good reliability ($\alpha = .715$) and answers were recorded using a 5-point Likert scale (1 = rarely/never, 5 = almost always/always). To examine Social Influence, a scale was conducted from different measures that had been used in previous studies for this purpose (Larson et al., 2017; Ruiz-Dodobara & Busse, 2019; Venkatesh et al., 2003). Participants indicated to what extent they identified themselves with the statements (e.g. In social settings, I change my food choices based on what my friends are eating) on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), the scale showed good reliability ($\alpha = .710$). An overview of the measures and items can be found in Appendix E.

3.7 Procedure

The participants were recruited through the researcher's network and provided with the link to the online questionnaire in Qualtrics. The questionnaire could be filled out on a

computer or a smartphone. Before starting, participants were presented with an information letter explaining the study's purpose and the informed consent which outlined their rights and confidentiality (Appendix A). After agreeing with this, the questionnaire started.

After demographic questions, participants were briefed about the questionnaire with a small introduction text and asked to imagine shopping for groceries online. They were randomly assigned to one of the six conditions and they were shown eleven product combinations and had to choose between the two products (unhealthy/healthy) each time. Once a choice was made, the question was locked. For participants assigned to the feedback with a swap condition, they were asked if they would like to change their choice.

After the shopping task, participants were asked to assess statements that were constructed for the subject variables: Impulsivity and Social Influence. They responded to six Impulsivity statements and five Social Influence statements using a 5-point Likert scale. These questions were asked at the end to prevent influencing the shopping task. After completing the questionnaire (Appendix B), participants had to confirm their agreement to submit their answers and participate. Respondents were thanked for their participation and could provide their email addresses if they wanted a chance to win the gift card. Responses were securely stored on the server of Tilburg University and processed according to the ethical guidelines. An overview of the procedure can be found in Appendix G.

3.6 Statistical Analyses

The data was analyzed using IBM SPSS Statistics versions 27 and 28. Although the participants were equally divided across the six conditions, Randomization Checks were conducted to check for associations between conditions and demographic variables such as gender, education level, nationality, online shopping frequency, and app/website using experience. This was done by multiple Chi-square tests and a One-Way ANOVA for Age. Furthermore, a Manipulation Check was done via the Frequencies option.

For the main analyses, the independent variables were split into Emoji-Nudge, Feedback, and Swap. The dependent variable was the Healthy Score computed as a sum score of all the healthy choices per participant. For the statistical tests per product combination, the dependent variable was used as the initial binary variable. To test the effectiveness of the Emoji-Nudge (present/not present), on the product choice (healthy/unhealthy) eleven Chi-square tests were conducted. To test the effectiveness of Feedback (present/not present) on the product choice (healthy/unhealthy), a Cochran's Q test with an additional McNemar test was conducted. Additionally, for the effect of the Swap (present/not present) the choices before and after exposure (healthy/unhealthy) were analyzed with eleven Chi-Square tests. To discover if the Emoji-Nudge was strengthened by Feedback or the Swap, two Factorial ANOVA's were conducted on the sum Healthy Score.

Lastly, to explore the subject variables Impulsivity and Social Influence, two Logistic Regression Analyses were done to investigate the main effects and interaction effects on the effectiveness of the three interventions to promote healthier food choices.

4. Results

This section presents the results of the data analysis. Section 4.1 reports on a randomization check and section 4.2 a manipulation check. Paragraph 4.3 reports the combined effects of the Emoji-Nudge, Feedback, and Swap on the sum Healthy Score, paragraph 4.4 further explores the effects of the Emoji-Nudge, paragraph 4.5 the effect of Feedback and paragraph 4.6 discusses the effect of the Swap. Lastly, paragraph 4.7 reports on the influence of Impulsivity, and paragraph 4.8 of Social Influence.

4.1 Randomization Check

To test whether there were potential associations between the conditions and the demographic variables, several Chi-square tests were performed. The results indicated no significant associations between the conditions and gender ($\chi^2(5) = 4.73$, $p = .449$), education level ($\chi^2(40) = 44.15$, $p = .300$), nationality ($\chi^2(10) = 9.26$, $p = .507$), frequency of ordering groceries online ($\chi^2(20) = 15.79$, $p = .730$), or use of apps or websites ($\chi^2(20) = 18.33$, $p = .556$). Additionally, a One-Way ANOVA was performed to test whether there were significant age differences between the conditions. The analysis revealed no significant mean difference ($F(5, 194) = .379$, $p = .863$, $\eta 2 = .01$). These findings indicate that the randomization of participants across the six conditions was successful.

4.2 Manipulation Check[1]

Several manipulation checks were performed to check the implementation of the manipulations. To assess participants' awareness of the manipulations, at the end of the shopping task in the questionnaire, the participants were asked to indicate whether they had

[1] An error in the design caused condition 3 to only receive the control question of the Emoji-Nudge. Fortunately, nudging works without conscious processing, making it not necessary to know if participants actively saw the intervention (Marchiori et al., 2017).

seen an Emoji-Nudge or Feedback intervention. Of the participants who were exposed to the Emoji-Nudge (n = 100), 71% (n = 71) indicated they had seen an emoji on the product images, and 29% (n = 29) indicated not seeing an emoji. Of the participants who were exposed to the Feedback intervention (n = 65), 86.2% (n = 56) indicated they saw the Feedback, and 23% (n = 15) indicated they did not see any Feedback after the product images. Lastly, of the participants that were exposed to the Swap (n = 34), 76.5% (n = 26) indicated they saw the Swap, and 23.5% (n = 8) indicated they did not see a Swap. Overall, this showed that the manipulation was successful.

4.3 The combined effects of the Emoji-Nudge, with Feedback and Swap on Sum Healthy Score

This study aimed to investigate the interaction effects of the independent variables, Emoji-Nudge (present/not present), Feedback (present/not present), and Swap (present/not present) on the Healthy Score. The dependent variable, Healthy Score, was calculated as the sum of healthy choices made by each participant. The respondents were asked which product they would choose, with two options in each case: the healthy option or the unhealthy option. To test both the main and interaction effects of these variables, two Factorial ANOVA's were conducted. One Factorial ANOVA tested the combined effects of the Emoji-Nudge and Feedback on the Healthy Score, and the other one the combined effects of the Emoji-Nudge and the Swap.

4.3.1 Effects of the Emoji-Nudge and Feedback on the Healthy Score

First, to test the effects of the Emoji-Nudge and Feedback on the Healthy Score, a Factorial ANOVA was conducted. The sum score was calculated by adding up all initial choices, so this leaves out the effect of the swap and focuses on the effect of the nudge and feedback. The data were normally distributed, except for the condition nudges without

Feedback ($Z_{skewness}$ = 2.097). The assumption of homogeneity was met (Levene = $F(3,196)$ = .217, p = .885).

Table 1

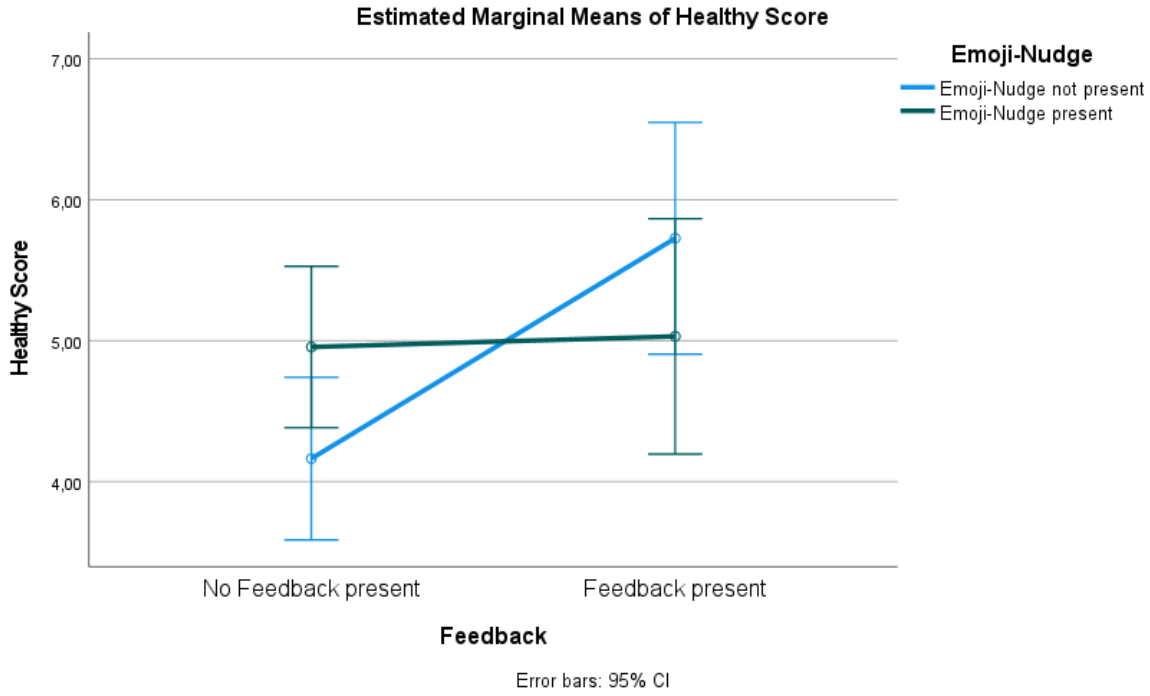
Descriptive Statistics for Healthy Score

Independent Variables	*M*	*SD*
Emoji-Nudge	4.96	2.31
Feedback	5.72	2.45
Emoji-Nudge x Feedback	5.03	2.40

Table 1 shows the descriptive statistics of the different groups that were compared in the analysis. The results of the Factorial ANOVA did not show a main effect of the Emoji-Nudge (H1), $F(1, 196) = .018$, $p = .895$, $\eta^2 = .000$. There was a main effect of Feedback, $F(1, 196) = 5.14$, $p = .025$, $\eta^2 = .026$, indicating that participants who received Feedback about their choices made significantly more healthy choices compared to participants who did not receive feedback (H2). Furthermore, an interaction effect of Emoji-Nudge x Feedback was found, $F(1, 196) = 4.23$, $p = .041$, $\eta^2 = .021$. However, as shown in Figure 7, the interaction effect does not align with the expectation that the interventions would reinforce (H3) each other. It instead seems that the two nudge types compensated for each other's absence. The condition in which the Emoji-Nudge was absent, and only Feedback was presented showed the highest mean Healthy Score.

Figure 7

Effects of Emoji-Nudge and Feedback on Healthy Score



To further investigate the interaction effect of Emoji-Nudge x Feedback, a simple effects analysis was conducted. The results of this analysis showed that for the participants who only received the Feedback intervention, there was a significant increase in the number of healthy choices compared to those who received neither (*MeanDiff* = -1.56, p = .013). The other comparisons between the groups did not show any significant differences. Based on these analyses, hypothesis 3 cannot be supported.

4.3.2 Effects of the Emoji-Nudge and Swap on the Healthy Score

To test the effects of the Emoji-Nudge and Swap on the Healthy Score, a second Factorial ANOVA was conducted. The data were normally distributed, except for the condition Emoji-Nudge without Feedback ($Z_{skewness}$ = 2.097). The assumption of homogeneity was met (Levene = $F(3,196)$ = .433, p = .730).

Table 2

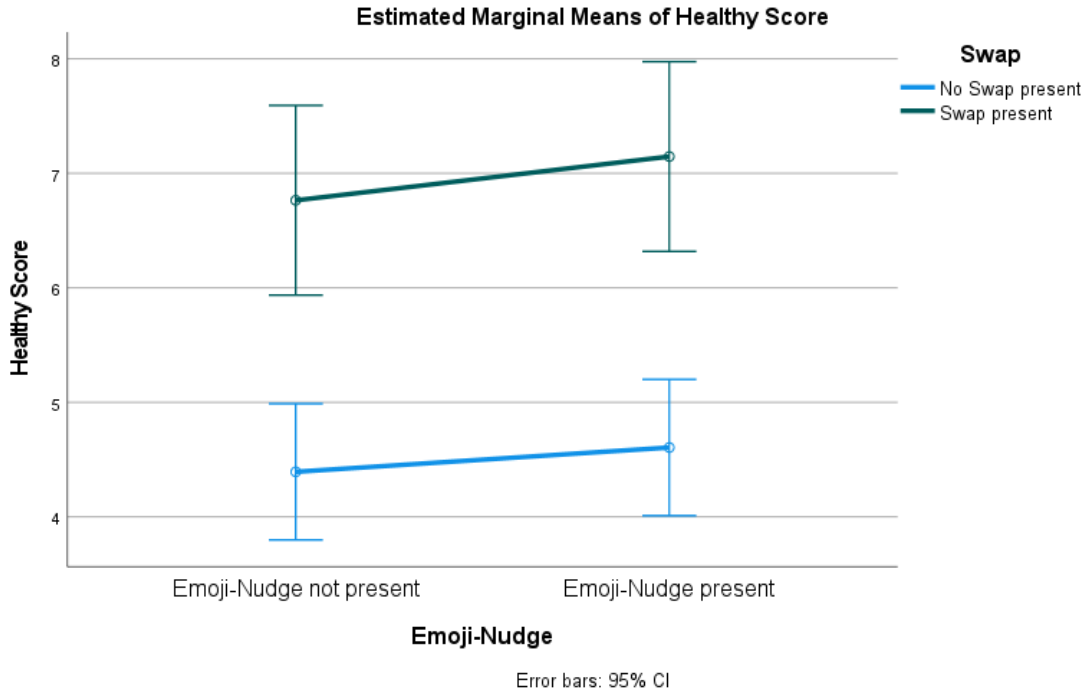
Descriptive Statistics for Healthy Score

Independent Variables	*M*	*SD*
Emoji-Nudge	4.61	2.33
Swap	6.76	2.67
Emoji-Nudge x Swap	7.14	2.19

Table 2 shows the descriptive statistics of the different groups that were compared in the analysis. The results of the Factorial ANOVA did not show a main effect of the Emoji-Nudge (H1), $F(1, 196) = .661$, $p = .417$, $\eta^2 = .003$. Conversely, the results did reveal a significant main effect of the Swap, $F(1, 196) = 45.12$, $p = <.001$, $\eta^2 = .187$, indicating that participants who received a Swap made significantly more healthy choices compared to the other conditions (H4). As shown in Figure 8, the model did not show a significant interaction effect of Emoji-Nudge x Swap, $F(1, 196) = .054$, $p = .816$, $\eta^2 = .000$, only a main effect of the Swap was visible.

Figure 8

Effects of Emoji-Nudge and Swap on Healthy Score



Although the interaction of Emoji-Nudge x Swap did not show significant results, the analysis provided useful insights. The main effect of the Swap was significant, which indicates that the implementation of a Swap led to more healthy choices. However, adding the Swap did not make the Emoji-Nudge more effective and did not significantly influence healthy choices on its own. Based on these results, hypothesis 5 cannot be supported.

4.4 Effect of Emoji Nudging on the Selection of Healthy Food Choices

To further explore if an Emoji-Nudge could increase the number of healthy choices, eleven separate Chi-square tests were conducted, one for each product. The choice of product (healthy/unhealthy) was treated as the dependent variable. To test the effect of the Emoji-Nudge, the comparisons were done for the conditions Emoji-Nudge present (n = 100) and Emoji-Nudge not present (n =100). Only for the product “Haverreep” the Chi-square test produced a significant effect (χ^2 (1) = 5.79, p = .016). Table 3 shows the expected and

observed counts of unhealthy and healthy choices of the two groups for the product ‘Haverreep’, as well as the standardized residuals. The table shows that for this product, 61 participants (Standardized Residual = 1.2) chose the healthy option in the condition where the nudge was presented next to the healthy option, compared to 44 participants in the condition where no nudge was presented. The expected values differed from the observed values, with. For the other 10 products, no significant effects of the Emoji-Nudge on the selection of Healthy Food Choices were found. Therefore, hypothesis 1 cannot be supported by the test results. A complete overview of the Chi-square test results for each product can be found in Appendix H.

Table 3

Emoji-Nudge x Haverreep Crosstabulation

			Haverreep		
			Unhealthy	Healthy	Total
Emoji-Nudge	Emoji-Nudge not present	Count	56	44	100
		Expected Count	47,5	52,5	100,0
		Standardized Residual	1,2	-1,2	
	Emoji-Nudge present	Count	39	61	100
		Expected Count	47,5	52,5	100,0
		Standardized Residual	-1,2	1,2	
Total		Count	95	105	200

4.5 The Effect of Feedback on the Selection of Healthy Food Choices

To further explore the previously found result, that the Feedback intervention significantly increases healthy choices (H2), a Cochran's Q test was conducted to investigate differences in the outcomes across the eleven related samples. This test allows checking whether the choices display a trend towards a gradual increase in healthy choices – as can be expected if the feedback nudge has an effect. The assumptions for Cochran's Q test were met since the data is categorical (dichotomous) and the choices are related. The data was filtered for exposure to Feedback, and for this reason, the first product choice, "Eierkoeken", was not included in the model because the effect of feedback can be measured only from the second product choice. Results of Cochran's Q indicated a significant effect both for the conditions without Feedback $Q(9) = 64.18$, $p < .001$ and for the conditions with Feedback $Q(9) = 39.87$, $p < .001$.

To see if the repeated Feedback intervention across all choices shows the predicted trend, a McNemar correction was conducted (Appendix J). To check for Type I errors due to the serial testing of pairs, a Bonferroni correction was applied by multiplying the p-values for each tested pair by the number of pairwise comparisons that were run (45). Table 4 shows the product pairs of the condition that received Feedback for which the p-value still reached significance, together with the rank number in the experiment.

Table 4

McNemar significant values Feedback Present Condition

Analysis	Pairs (choice number)	McNemar's χ^2	Unadjusted *p*	Adjusted *p*
21	Chips (4) & Woksaus (8)	17.46	<.001	.045
27	Kaas (5) & Woksaus (8)	13.23	<.001	.045
36	Haverreep (7) & Woksaus (8)	12.03	<.001	.045
42	Woksaus (8) & Mayonaise (10)	17.36	<.001	.045

Table 4 suggests that the predicted trend is not present in the data. To be able to suggest a trend, a more pairwise contrast between the 'early' and 'later' choices should have been found. Although four pairs reached significance, they were not distributed across all choices in the predicted manner. Moreover, the results of the No Feedback condition showed more significant differences compared to the Feedback condition (Appendix J), which is in contrast to the expected hypothesis (H2). Other variables or contextual factors may have contributed to this effect. Based on these results, hypothesis 2, that feedback increases healthier product choices, cannot be supported.

4.6 The Effect of a Swap on the Selection of Healthy Food Choices

To further explore the previously found result, that the Swap intervention significantly increases healthy choices, again eleven Chi-square tests for each separate product were conducted. The product choices (healthy/unhealthy) before the swap were compared to those after the swap. To test the effect of the swap, these comparisons were done for the conditions 'with swap' (n = 68) and 'without swap' (n = 132). This way, the crosstabulation displays how many participants changed their choice from unhealthy to healthy as a result of the swap.

A Chi-square test requires data consisting of frequencies, independent samples and expected frequencies in each cell are at least 5. These assumptions were met for all of the tests.

As an example, I present the Chi-square test of “Kaneelkoekjes”, which showed a significant effect: χ^2 (1) = 139.32, p <.001, and suggests that the swap intervention influenced participants to make a healthier food choice. Table 5 shows the observed and expected counts of the healthy and unhealthy choices of the product “Kaneelkoekjes”, including the standardized residuals. The table shows that before the Swap, the distribution between the two choices was equal (34 times healthy and 34 times unhealthy). Of the 34 participants who chose unhealthily, 16 stuck to their initial choice, while 18 changed their initial choice after exposure to the Swap. The 34 participants who already chose healthy were not able to change their choice, so they maintained their choice.

Table 5

Kaneelkoekjes before and after Swap Crosstabulation

			Kaneelkoekjes (after swap)		
			Unhealthy	Healthy	Total
Kaneelkoekjes (before swap)	Unhealthy	Count	16	18	34
		Expected Count	8,0	26,0	34,0
		Standardized Residual	2,8	-1,6	
	Healthy	Count	0	34	34
		Expected Count	8,0	26,0	34,0
		Standardized Residual	-2,8	1,6	
Total		Count	16	52	68
		Expected Count	16,0	52,0	68,0

The same procedure was conducted for each product and showed significant results for all of the Chi-square tests. The crosstabulations can be found in Appendix J. However, the relevant cells of the crosstabulations showed that the actual number of participants changing their unhealthy choice to healthy did vary by product, and an overview of this is shown in Table 6.

Table 6

Overview Unhealthy Food Choices Before and After Swap

Product	Total Unhealthy Before Swap	Unhealthy After Swap	Healthy After Swap	Odds Healthy After Swap
Eierkoeken	43	36	7	.194
Kaneelkoekjes	34	16	18	1.125
Kip	38	31	7	.226
Chips	38	18	3	.167
Kaas	31	27	4	.148
	46	38	8	.211
Haverreep	24	8	16	2.00
Woksaus	46	26	20	.769
Jam	32	27	5	.185
Muesli	32	20	12	.600
Mayonaise	29	29	0	0.00

Table 6 shows that the Swap has an effect (only not for “Mayonaise”) but the effects are relatively small. The product “Haverreep” shows a clear effect, out of 24 participants who

chose unhealthy, 16 participants changed their choice to healthy, with an odds of 2.00 for a healthy choice. The table shows that “Kaneelkoekjes” (odds = 1.125) also has odds above 1, further, “Woksaus” (odds = .769) and “Muesli” (odds = .600) showed a somewhat larger effect, the rest of the values are much lower. Based on these results, hypothesis 3 cannot be supported.

4.7 Influence of Impulsivity Traits

To test whether a person’s Impulsivity affects his or her choices for healthy products, and to check whether this effect is also present when the effects of the manipulated factors are taken into account, a Logistic Regression was conducted with the sum score for healthy choices as dependent variable (H6). The Emoji-Nudge, Feedback, and Swap were inserted in the model as nominal predictors, while Impulsivity was inserted as a continuous predictor.

The results of the Logistic Regression Analysis showed a significant effect of Impulsivity, $\chi^2(7) = 45.05$, $p < .001$. The more impulsive a person is, the fewer healthy choices are made (Exp(B) = .094). The full model explained 33% (Nagelkerke R^2) of the variance in healthy food choices and classified 56.1% of the cases correctly. Moreover, the interaction effect of Emoji-Nudge x Impulsiveness was significantly positive (B = .078, *SE* = .027, Wald = 8.217, p = .004), with an odds ratio of 1.081, indicating that for each point increase on the Impulsiveness variable, 1.08 times more healthy products were chosen when the Emoji-Nudge was provided. Concluding, for people with a high level of impulsivity, the nudge has a less strong negative effect. The other variables (Feedback and Swap) did not show a significant effect, which indicates that the earlier reported effects of these factors are not dependent on the participant’s impulsivity. Impulsivity did interact with the Emoji-Nudge, but since no further main effects were found (see paragraph 4.3), this will be further ignored.

4.8 Influence of Social Influence

The same analysis was conducted to assess the effect of Social Influence on healthy product choices, using Social Influence as the continuous predictor. The results showed a significant effect of Social Influence, $\chi^2(7) = 55.73$, $p < .001$. The more a person perceives Social Influence, the fewer healthy choices are made (Exp(B) = .970). The model explained 33% (Nagelkerke R^2) of the variance in healthy food choices and correctly classified 56.5% of the cases. The interaction effect of Feedback x Social Influence was also significantly positive (B = .116, *SE* = .037, Wald = 10.05, p = .002), with an odds ratio of 1.13, indicating that for each point increase on the Social Influence variable, 1.13 times more healthy products are chosen when Feedback is provided. Moreover, the interaction of Swap x Social Influence was also significantly positive (B = .126, *SE* = .032, Wald = 15.28, p = <.001), with an odds ratio of 1.12, indicating that for each point increase on the Social Influence variable, 1.12 times more healthy products were chosen when a Swap is provided.

These results show that Social Influence affects people through both the interaction effects with Feedback and Swap. In the previous analyses (see paragraph 4.6) positive significant main effects of both variables were found on the Healthy Score. This suggests that Social Influence on its own has a negative influence on the number of healthy choices, but that Feedback and Swaps can therefore cause this effect to be mitigated. This highlights the potential of Feedback and Swaps, and thereby the importance of taking the social context into account when designing interventions to promote healthier dietary behavior.

5. Discussion

5.1 Key Findings

This study examined the effects of an Emoji-Nudge, Feedback, and Swap intervention on Healthy Food Choices in an online supermarket environment. Additionally, it aimed to investigate how Impulsivity and Social Influence potentially might influence these effects. The findings of this study contribute to the existing literature about influencing food choices and in particular to insights on behavioral interventions aimed at promoting healthier food choices in digital environments, such as online supermarkets.

The first finding of this study was that the Emoji-Nudge did not significantly increase healthier food choices (H1), despite the growing popularity of using emojis to attract attention and potentially influence behavior (Dai et al., 2019; Fennessy et al., 2023; Lin & Luo, 2023; Mills, 2022). The analysis showed that the presence of an emoji resulted in a decrease in the amount of healthy food choices. Suggesting that the emoji used in this study did not have enough power to guide the participants into the desired behavior. Participants may noticed the nudge and felt pressure to make a healthy choice instead of being unconsciously influenced by it, which resulted in the opposite behavior.

Results showed a significant main effect of Feedback (H2) on the sum Healthy Score, which is in line with existing literature where feedback corrects behavior and promotes healthy food choices (Bedard & Kühn, 2015; Shin et al., 2000; Van Der Laan & Orcholska, 2022). Moreover, feedback addresses criticism of nudges being coercive, by increasing transparency and making them more effective (Bruns et al., 2018; Buratto & Lotti, 2024). Conversely, the Feedback intervention did not show a significant result when analyzing the effect per product. Some of the product combinations showed a significant effect, but they did not show the expected accumulative trend in the effects of the Feedback nudge, which is not in line with the existing literature (Bedard & Kühn, 2015; Shin et al., 2020; Van Der Laan

& Orcholska, 2022). Suggesting that the overall analysis showed significant results, but this is not robust when exploring the specific products. This highlights the importance of how feedback is designed and presented in digital contexts because this influences how participants perceive and respond to the intervention. Additionally, a positive interaction effect of Emoji-Nudge x Feedback (H3) on the sum Healthy Score was found. Despite the significant interaction effect, the main effect of Feedback showed the highest mean. A reason for this result might be that the participants have perceived the combination of the Emoji-Nudge and Feedback as intrusive or did make them too aware that they were being guided in a certain direction, which could be perceived as an attempt to control their behavior (Michaelsen et al., 2021).

Moreover, the Swap intervention showed a significant main effect when tested on the sum Healthy Score (H4). To further explore this effect, the effects of the Swap were tested across all eleven products and showed significance. Further investigation on the number of participants that changed their unhealthy choice to healthy, showed that only for two products the odds for changing to healthy choice were higher than 1. Based on these results the hypothesis could not be supported (H4). Nevertheless, when looking at the effect on all choices with less strict criteria there is an effect of the Swap. For all products (except "Mayonaise") the results showed that people changed their unhealthy choices to healthy, suggesting that the Swap intervention did increase healthy choices which is in line with the hypothesis. These findings correspond to recent literature that shows the potential of swaps to encourage healthier food choices and that most people accept immediate swaps (Bedard & Kühn, 2015; Forwood et al., 2015; Hartmann-Boyce et al., 2018; Huang et al., 2006; Valenčič et al., 2023; Winett et al., 1991). Conversely, an interaction effect of Nudge x Swap was expected (H5), but no support for this was found in the analyses.

To test the impact of the subject variables, Impulsivity and Social Influence, on the effectiveness of the three interventions (Emoji, Feedback, Swap) to encourage healthier food choices, two logistic regression analyses were conducted. The first analysis explored whether Impulsivity impacted the effectiveness of the interventions in encouraging healthy food choices (H6). These results show that the interaction effect of Emoji-Nudge x Impulsiveness significantly influences the relationship between the interventions and healthy food choices. The second analysis explored whether Social Influence impacted the effectiveness of the interventions in encouraging healthy food choices (H7). Both of the interaction effects, Feedback x Social Influence and Swap x Social Influence, showed a significant positive effect on the likelihood of making a healthy food choice. This demonstrated that as Social Influence increases, the negative influence of the nudge factors decreases. These results indicate again that for different types of people, different types of nudges work, which highlights the importance of tailoring behavioral interventions.

5.2 Implications

This study provides valuable implications to the existing literature on the design and implementation of digital nudges to promote healthy food choices within online supermarket environments. The findings highlight the complexity of interventions to subtly influence behavior to a desired outcome behavior, taking into account the role of the social environment and how an intervention is presented to the audience.

The positive effect of the Feedback intervention on promoting healthier food choices was demonstrated in this study. The increased transparency caused by the Feedback Nudge may have revealed the goal of the interventions to the participants (Duckworth et al., 2019). If this was the case, the goal might have been in line with their intentions and reminded them of these intentions, leading the participants to choose healthier options. These findings are useful for behavior change interventions in the digital environment, particularly in the food

context and health communication. The results show the power of being transparent to reduce people's perception of being controlled. In the area of health communication and interventions to encourage healthier food habits, this can be implemented by making people more aware of their habits and aligning interventions with their personal goals. In the food retail industry, the focus on freedom of choice can be implemented in marketing strategies that support healthier food choices. This shows potential for improving user satisfaction over time, which has many advantages in the area of retail and businesses. Such as increased brand perception and eventually, higher sales, etc.

In this study, no significant results were found of the Emoji-Nudge to encourage healthier food choices, but the results still provide useful implications and contribute to the existing knowledge of digital nudging. Just an emoji next to a product image is not motivational enough to influence automatic habits. Based on the results from the previous section, interventions should communicate their goals to enhance transparency. This transparency can improve the effectiveness of the interventions when this is in line with the intentions of consumers (Bruns et al., 2018; Junghans et al., 2015). This may indicate that when it comes to encouraging healthy food choices, more complex and interactive interventions are needed, but this needs further exploration.

The effect of the Feedback intervention was tested on the choices per product and on the sum Healthy Score. The effect of Feedback on the overall sum score was significant, but when tested for each product separately it did not show significant results. This suggests that Feedback is effective at influencing behavior in a broader context but its impact may be less visible when testing is done per product. For designing interventions that aim to change behavior in the digital environment and encourage healthier choices, this may imply that a Feedback intervention can be more effective when the information provided is based on the bigger picture (e.g. providing an overall healthy score of the products in the online shopping

cart), than targeting individual product choices. In addition, the transparency created by the information provided can make people feel more satisfied about the intervention when this is in line with their personal goals and feel less controlled (Junghans et al., 2015). This aligns with literature that highlights that it is important to design interventions that fit the specific audience and environment, and when this is not the case they can come across as controlling causing them to lose their effect (Michaelsen et al., 2021). Another finding of this current study that is in line with this literature (Junghans et al., 2015; Michaelsen et al., 2021), is the significant effect of the Swap intervention when tested on both the separate product and the overall sum score of the healthy choices, providing support that Swaps can encourage healthy behaviors in the context of a digital supermarket. This may imply that the immediate presentation of the Swap after making the initial product selection allows for more interaction with the consumer, leading to a better understanding of their needs and desires. This, in turn, can improve the interventions and make them increasingly responsive to consumer needs, which again may cause better customer satisfaction.

The positive interaction effects of Feedback and Swap with Social Influence again demonstrate the importance of taking the audience and environment into account when designing interventions to change behavior. Additionally, these results imply that not only digital nudges can be improved and may show more effectiveness when the social environment is included, but they also show the potential to include social norms as part of interventions to encourage healthier food choices. Such as showing peer recommendations or popular choices. Lastly, the positive significant interaction effect of Emoji-Nudge x Impulsivity contributes to this because these findings imply that interventions aimed at promoting healthier food choices should consider individual differences. These tailored interventions can enhance the effectiveness.

5.3 Limitations and Future Research

As is always the case, also this study has several limitations that must be considered when interpreting the results. These limitations also provide useful guidelines for designing future research.

One limitation is that the effectiveness of the three interventions was tested with a questionnaire with a choice task rather than in a real-world setting. For the time and space available for this master's thesis, it was sufficient. However, implementing the interventions in a more realistic virtual online supermarket environment would have strengthened the study. A more elaborate design with clickable products and interactive notifications just-in-time presented would have made it easier for participants to immerse in the shopping task. The current study design may have made participants more aware of being part of a research project. This may have caused them to react differently than they would in a real-life situation. For future research, I suggest a more real-life interface or a collaboration with a supermarket that already has a widely used online supermarket environment. Ethical guidelines require consent, but when the intervention blends smoothly into an environment and is familiar, participants may show more natural behavior.

Moreover, this study investigated the effectiveness of one specific Emoji-nudge, a muscle emoji. This needs to be taken into account when generalizing the findings about the Emoji-Nudge because it could be that other types of emojis do work to influence healthy food choices. To increase generalizability and to conclude whether or not emojis work to encourage healthy food choices, future research is needed. This could include testing many more different types of emojis, as existing literature does indicate that emojis can be useful in this context (Fennessy et al., 2023; De Vries Mecheva et al., 2021; Gwozdz et al., 2020; Ostalaza et al., 2022; Siegel et al., 2015. In addition, more research is needed to further examine the interaction effect of Emoji-nudge x Feedback together. The findings of this study indeed showed that Feedback enhances the working of the Nudge intervention, but also

demonstrated that the combination of the two interventions did not necessarily result in more healthy choices than just presenting Feedback. This asks for a deeper dive into the effects of m Feedback to encourage healthy food choices.

The study examined the impact of Social Influence and found that the social environment of people affects their healthy food choices. However, it would have been helpful to gather more detailed information about this influence. Several personal characteristics were collected but did not show a significant effect. For follow-up research, it would be interesting to explore whether people are already health-oriented and identify the social factors that positively or negatively impact their food choices. Investigating factors such as product familiarity and taste could provide important information for understanding the factors that influence their decisions. This deeper understanding will contribute to more insights into how interventions to influence behavior can be designed in a way that is more tailored to their audience.

5.4 Conclusion

This study aimed to investigate the effects of an Emoji-Nudge, Feedback, and Swap intervention on Healthy Food Choices in an online supermarket environment and the roles of Impulsivity and Social Influence. To conclude, the results of this study showed that the Emoji-Nudge had limited influence, and Feedback and Swap interventions were shown to significantly promote healthier food choices by enhancing transparency and autonomy. Although, when looking at the separate products this effect is not robust. Impulsivity and Social Influence do influence the effectiveness of the interventions. These findings contribute to the existing literature about choice architecture and decision-making. This study emphasizes the importance of taking transparency, autonomy, and social context into account to effectively promote healthier eating habits in digital environments.

References

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Alshenqeeti, H. (2016, August 16). Are emojis creating a new or old visual language for new generations? a socio-semiotic study. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3709343

Armitage, C. J., & Conner, M. (2001). Efficacy of a minimal intervention to reduce fat intake. Social Science & Medicine, 52(10), 1517–1524. https://doi.org/10.1016/s0277-9536(00)00265-3

Bagozzi, R. P. (2000). On the Concept of Intentional Social Action in Consumer Behavior: Figure 1. *Journal of Consumer Research*, *27*(3), 388–396. https://doi.org/10.1086/317593

Bai, Q., Dan, Q., Mu, Z., & Yang, M. (2019). A Systematic Review of Emoji: Current research and future Perspectives. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.02221

Barbieri, F., Kruszewski, G., Ronzano, F., & Saggion, H. (2016). How Cosmopolitan Are Emojis?: Exploring Emojis Usage and Meaning over Different Languages with Distributional Semantics. Proceedings of the 24th ACM international conference on Multimedia. https://doi.org/10.1145/2964284.2967278.

Bargh, J. A., Chen, M., & Burrows, L. J. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, *71*(2), 230–244. https://doi.org/10.1037/0022-3514.71.2.230

Barratt, E. S. (1994). Impulsiveness and aggression. In J. Monahan & H. J. Steadman (Eds.), Violence and mental disorder: Developments in risk assessment (pp. 61–79). The University of Chicago Press.

Bedard, K., & Kühn, P. (2015). Micro-marketing healthier choices: Effects of personalized ordering suggestions on restaurant purchases. *Journal of Health Economics*, *39*, 106–122. https://doi.org/10.1016/j.jhealeco.2014.10.006

Benartzi, S., Beshears, J., Milkman, K. L., Sunstein, C. R., Thaler, R. H., Shankar, M., Tucker-Ray, W., Congdon, W. J., & Galing, S. (2017). Should governments invest more in nudging? Psychological Science, 28(8), 1041–1055. https://doi.org/10.1177/0956797617702501

Bergram, K., Djokovic, M., Bezençon, V., & Holzer, A. (2022). The Digital Landscape of Nudging: A Systematic Literature Review of Empirical research on digital nudges. *CHI Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/3491102.3517638

Boswell, R. G., & Kober, H. (2015). Food cue reactivity and craving predict eating and weight gain: a meta-analytic review. *Obesity Reviews*, *17*(2), 159–177. https://doi.org/10.1111/obr.12354

Broers, V. J. V., De Breucker, C., Van Den Broucke, S., & Luminet, O. (2017). A systematic review and meta-analysis of the effectiveness of nudging to increase fruit and vegetable choice. European Journal of Public Health, 27(5), 912–920. https://doi.org/10.1093/eurpub/ckx085

Bruns, H., Kantorowicz-Reznichenko, E., Klement, K., Jonsson, M. L., & Rahali, B. (2018). Can nudges be transparent and yet effective? Journal of Economic Psychology, 65, 41–59. https://doi.org/10.1016/j.joep.2018.02.002

Bunten, A., Porter, L., Sanders, J. G., Sallis, A., Riches, S. P., Van Schaik, P., González-Iraizoz, M., Chadborn, T., & Forwood, S. (2021). A randomised experiment of health, cost and social norm message frames to encourage acceptance of swaps in a

simulation online supermarket. PloS One, 16(2), e0246455. https://doi.org/10.1371/journal.pone.0246455

Buratto, A., & Lotti, L. (2024). Encouraging sustainable food consumption through nudges: An experiment with menu labels. *Ecological Economics*, *216*, 108024. https://doi.org/10.1016/j.ecolecon.2023.108024

Cappa, F., Rosso, F., Giustiniano, L., & Porfiri, M. (2020). Nudging and citizen science: The effectiveness of feedback in energy-demand management. Journal of Environmental Management, 269, 110759. https://doi.org/10.1016/j.jenvman.2020.110759

Chandon, P., & Wansink, B. (2012). Does food marketing need to make us fat? A review and solutions. *Nutrition Reviews*, *70*(10), 571–593. https://doi.org/10.1111/j.1753-4887.2012.00518.x

Chen, P., & Antonelli, M. (2020). Conceptual models of food choice: influential factors related to foods, individual differences, and society. *Foods*, *9*(12), 1898. https://doi.org/10.3390/foods9121898

Cheung, B., Ho, I., Chan, R., Sea, M. M. M., & Woo, J. (2014). Current evidence on dietary pattern and cognitive function. In Advances in food and nutrition research (pp. 137–163). https://doi.org/10.1016/b978-0-12-800270-4.00004-3

Cohen, D. A., & Babey, S. H. (2012). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Reviews*, *13*(9), 766–779. https://doi.org/10.1111/j.1467-789x.2012.01001.x

Cohen, D., & Farley, T. A. (2008, January 1). *Peer Reviewed: Eating as an Automatic behavior*. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248777/

Dai, J., Cone, J., & Moher, J. (2020). Perceptual salience influences food choices independently of health and taste preferences. *Cognitive Research: Principles and Implications*, *5*(1). https://doi.org/10.1186/s41235-019-0203-2

De Magalhães Cunha, C., De Farias Costa, P. R., De Oliveira, L. P. M., De Oliveira Queiroz, V. A., Pitangueira, J. C. D., & De Oliveira, A. M. A. (2018). Dietary patterns and cardiometabolic risk factors among adolescents: systematic review and meta-analysis. British Journal of Nutrition, 119(8), 859–879. https://doi.org/10.1017/s0007114518000533

De Schutter, O., Jacobs, N., & Clément, C. (2020). A 'Common Food Policy' for Europe: How governance reforms can spark a shift to healthy diets and sustainable food systems. *Food Policy*, *96*, 101849. https://doi.org/10.1016/j.foodpol.2020.101849

De Vries Mecheva, M., Rieger, M., Sparrow, R., Prafiantini, E., & Agustina, R. (2021). Snacks, nudges and asymmetric peer influence: Evidence from food choice experiments with children in Indonesia. *Journal of Health Economics*, *79*, 102508. https://doi.org/10.1016/j.jhealeco.2021.102508

Derks, D., Bos, A. E. R., & Von Grumbkow, J. (2007). Emoticons and online message interpretation. *Social Science Computer Review*, *26*(3), 379–388. https://doi.org/10.1177/0894439307311611

Dijksterhuis, A., Smith, P. J., Van Baaren, R. B., & Wigboldus, D. (2005). The Unconscious Consumer: Effects of Environment on Consumer Behavior. *Journal of Consumer Psychology*, *15*(3), 193–202. https://doi.org/10.1207/s15327663jcp1503_3

Downs, S. M., Ahmed, S., Fanzo, J., & Herforth, A. (2020). Food Environment Typology: Advancing an Expanded Definition, Framework, and Methodological Approach for Improved Characterization of Wild, Cultivated, and Built Food Environments toward Sustainable Diets. Foods, 9(4), 532. https://doi.org/10.3390/foods9040532

Dresner, E., & Herring, S. C. (2010). Functions of the nonverbal in CMC: emoticons and illocutionary force. Communication Theory, 20(3), 249–268. https://doi.org/10.1111/j.1468-2885.2010.01362.x

Duckworth, A. L., Taxer, J. L., Eskreis-Winkler, L., Galla, B. M., & Gross, J. J. (2019). Self-Control and academic achievement. Annual Review of Psychology, 70(1), 373–399. https://doi.org/10.1146/annurev-psych-010418-103230

Fennessy, A., Homer, M. S., & Ensaff, H. (2023). Nudging food choice in a prison setting: an investigation using food choice data. Journal of Human Nutrition and Dietetics. https://doi.org/10.1111/jhn.13252

Forwood, S. E., Ahern, A. L., Marteau, T. M., & Jebb, S. A. (2015). Offering within-category food swaps to reduce energy density of food purchases: a study using an experimental online supermarket. International Journal of Behavioral Nutrition and Physical Activity, 12(1). https://doi.org/10.1186/s12966-015-0241-1

Friis, R., Skov, L. R., Olsen, A., Appleton, K. M., Saulais, L., Dinnella, C., Hartwell, H., Depezay, L., Monteleone, E., Giboreau, A., & Perez-Cueto, F. J. A. (2017). Comparison of three nudge interventions (priming, default option, and perceived variety) to promote vegetable consumption in a self-service buffet setting. *PloS One*, *12*(5), e0176028. https://doi.org/10.1371/journal.pone.0176028

Grandi, B., Burt, S., & Cardinali, M. G. (2021). Encouraging healthy choices in the retail store environment: Combining product information and shelf allocation. *Journal of Retailing and Consumer Services*, *61*, 102522. https://doi.org/10.1016/j.jretconser.2021.102522

Gulfraz, M. B., Sufyan, M., Mustak, M., Salminen, J., & Srivastava, D. (2022). Understanding the impact of online customers' shopping experience on online impulsive buying: A study on two leading E-commerce platforms. Journal of

Retailing and Consumer Services, 68, 103000. https://doi.org/10.1016/j.jretconser.2022.103000

Gunday, (2020). How European shoppers will buy groceries in the next normal. McKinsey & Company. https://www.mckinsey.com/industries/retail/our-insights/how-european-shoppers-will-buy-groceries-in-the-next-normal

Gwozdz, W., Reisch, L., Eiben, G., Hunsberger, M., Konstabel, K., Kovacs, E., Luszczki, E., Mazur, A., Mendl, E., Saamel, M., & Wolters, M. (2020). The effect of smileys as motivational incentives on children's fruit and vegetable choice, consumption and waste: A field experiment in schools in five European countries. *Food Policy*, *96*, 101852. https://doi.org/10.1016/j.foodpol.2020.101852

Hall, K. D. (2017). Did the Food Environment Cause the Obesity Epidemic? *Obesity*, *26*(1), 11–13. https://doi.org/10.1002/oby.22073

Hansen, P. G., & Jespersen, A. M. (2013). Nudge and the manipulation of choice. European Journal of Risk Regulation, 4(1), 3–28. https://doi.org/10.1017/s1867299x00002762

Hartmann-Boyce, J., Bianchi, F., Piernas, C., Riches, S. P., Frie, K., Nourse, R., & Jebb, S. A. (2018). Grocery store interventions to change food purchasing behaviors: a systematic review of randomized controlled trials. the American Journal of Clinical Nutrition, 107(6), 1004–1016. https://doi.org/10.1093/ajcn/nqy045

Hattie, J., & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77(1), 81–112. https://doi.org/10.3102/003465430298487

Hermsen, S., Frost, J., Renes, R. J., & Van De Kerkhof, P. (2016). Using feedback through digital technology to disrupt and change habitual behavior: A critical review of current literature. *Computers in Human Behavior*, *57*, 61–74. https://doi.org/10.1016/j.chb.2015.12.023

Higgs, S. (2015). Social norms and their influence on eating behaviours. *Appetite*, *86*, 38–44. https://doi.org/10.1016/j.appet.2014.10.021

Hinde, R. A. (1987). Individuals, relationships and culture: Links between ethology and the social sciences. CUP Archive.

Huang, A., Barzi, F., Huxley, R., Denyer, G., Rohrlach, B., Jayne, K., & Neal, B. (2006). The Effects on Saturated Fat Purchases of Providing Internet Shoppers with Purchase-Specific Dietary Advice: A Randomised Trial. *PLoS Clinical Trials*, *1*(5), e22. https://doi.org/10.1371/journal.pctr.0010022

Hukkinen, J. (2016). Addressing the practical and ethical issues of nudging in environmental policy. Environmental Values, 25(3), 329–351. https://doi.org/10.3197/096327116x14598445991501

Imperatori, C., Mancini, M., Della Marca, G., Valenti, E. M., & Farina, B. (2018). Feedback-Based Treatments for Eating Disorders and Related Symptoms: A Systematic Review of the literature. *Nutrients*, *10*(11), 1806. https://doi.org/10.3390/nu10111806

Inauen, J., Shrout, P. E., Bolger, N., Stadler, G., & Scholz, U. (2016). Mind the Gap? An intensive longitudinal study of Between-Person and Within-Person Intention-Behavior relations. Annals of Behavioral Medicine, 50(4), 516–522. https://doi.org/10.1007/s12160-016-9776-x

Jacquier, C., Bonthoux, F., Baciu, M., & Ruffieux, B. (2012). Improving the effectiveness of nutritional information policies: assessment of unconscious pleasure mechanisms involved in food-choice decisions. *Nutrition Reviews*, *70*(2), 118–131. https://doi.org/10.1111/j.1753-4887.2011.00447.x

Junghans, A. F., Cheung, T. T., & De Ridder, D. D. (2015). Under consumers' scrutiny - an investigation into consumers' attitudes and concerns about nudging in the realm of

health behavior. BMC Public Health, 15(1). https://doi.org/10.1186/s12889-015-1691-8

Kahneman, D. (2003). Maps of Bounded Rationality: Psychology for Behavioral Economics. The American Economic Review, 93(5), 1449–1475. https://www.jstor.org/stable/3132137

Kahneman, D. (2011). Thinking, fast and slow. Farrar, Straus and Giroux.

Kucharczuk, A. J., Oliver, T. L., & Dowdell, E. B. (2022). Social media's influence on adolescents′ food choices: A mixed studies systematic literature review. Appetite, 168, 105765. https://doi.org/10.1016/j.appet.2021.105765

Lakerveld, J., Mackenbach, J. D., De Boer, F., Brandhorst, B., Broerse, J. E., De Bruijn, G. J., Feunekes, G., Gillebaart, M., Harbers, M., Hoenink, J., Klein, M., Mensink, F., Middel, C., De Ridder, D. T., Rutters, F., Sluijs, I., Van Der Schouw, Y. T., Schuitmaker, T. J., Velde, S. J. T., . . . Beulens, J. W. (2018). Improving cardiometabolic health through nudging dietary behaviours and physical activity in low SES adults: design of the Supreme Nudge project. BMC Public Health, 18(1). https://doi.org/10.1186/s12889-018-5839-1

Lally, P., & Gardner, B. (2013). Promoting habit formation. *Health Psychology Review*, *7*(sup1), S137–S158. https://doi.org/10.1080/17437199.2011.603640

Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, *15*(2), 127–147. https://doi.org/10.1111/j.1468-2885.2005.tb00329.x

Lin, T. S., & Luo, Y. (2023). Health persuasion through emoji: How emoji interacted with information source to predict health behaviors in COVID-19 situation. SSM-Population Health, 21, 101343. https://doi.org/10.1016/j.ssmph.2023.101343

Lindstrom, K. N., Tucker, J. A., & McVay, M. (2023). Nudges and choice architecture to promote healthy food purchases in adults: A systematized review. *Psychology of Addictive Behaviors*, *37*(1), 87–103. https://doi.org/10.1037/adb0000892

Liu, Z. (2005). Reading behavior in the digital environment. Journal of Documentation, 61(6), 700–712. https://doi.org/10.1108/00220410510632040

Loewenstein, G., Brennan, T., & Volpp, K. G. (2007). Asymmetric paternalism to improve health behaviors. JAMA, 298(20), 2415. https://doi.org/10.1001/jama.298.20.2415

Lyons, S. J., & Wien, A. H. (2018). Evoking premiumness: How color-product congruency influences premium evaluations. *Food Quality and Preference*, *64*, 103–110. https://doi.org/10.1016/j.foodqual.2017.10.006

Marcano-Olivier, M. I., Horne, P. J., Viktor, S., & Erjavec, M. (2019). Using nudges to promote healthy food choices in the school dining room: A systematic review of previous investigations. Journal of School Health, 90(2), 143–157. https://doi.org/10.1111/josh.12861

Marchiori, D., Adriaanse, M. A., & De Ridder, D. T. D. (2017). Unresolved questions in nudging research: Putting the psychology back in nudging. Social and Personality Psychology Compass, 11(1). https://doi.org/10.1111/spc3.12297

Marcone, M. F., Madan, P., & Grodzinski, B. (2020). An overview of the sociological and environmental factors influencing eating food behavior in Canada. *Frontiers in Nutrition*, *7*. https://doi.org/10.3389/fnut.2020.00077

Marques, I., Ting, M., Cedillo-Martínez, D., & Pérez-Cueto, F. J. (2020). Effect of Impulsivity Traits on Food Choice within a Nudging Intervention. *Nutrients*, *12*(5), 1402. https://doi.org/10.3390/nu12051402

Masyhuri, M. (2023). Nudge Concept and its Controversy - The Behavioural Economics Applications. Journal of Business Management and Economic Development, 1(03), 379–393. https://doi.org/10.59653/jbmed.v1i03.183

McCurley, J. L., Buckholtz, J. W., Roberto, C. A., Levy, D. E., Anderson, E., Chang, Y., & Thorndike, A. N. (2022). The association of impulsivity with effects of the ChooseWell 365 workplace nudge intervention on diet and weight. Translational Behavioral Medicine, 13(5), 281–288. https://doi.org/10.1093/tbm/ibac10

Michaelsen, P., Johansson, L., & Hedesström, M. (2021). Experiencing default nudges: autonomy, manipulation, and choice-satisfaction as judged by people themselves. *Behavioural Public Policy*, *8*(1), 85–106. https://doi.org/10.1017/bpp.2021.5

Miller, G. F., Gupta, S., Kropp, J. D., Grogan, K. A., & Mathews, A. (2016). The effects of pre-ordering and behavioral nudges on National School Lunch Program participants' food item selection. Journal of Economic Psychology, 55, 4–16. https://doi.org/10.1016/j.joep.2016.02.010

Mills, S. (2022). Finding the 'nudge' in hypernudge. Technology in Society, 71, 102117. https://doi.org/10.1016/j.techsoc.2022.102117

Mirsch, T., Lehrer, C., & Jung, R. (2017). Digital Nudging: Altering user behavior in digital environments. CBS Research Portal. https://research.cbs.dk/en/publications/digital-nudging-altering-user-behavior-in-digital-environments

Mozaffarian, D. (2016). Dietary and policy priorities for cardiovascular disease, diabetes, and obesity. Circulation, 133(2), 187–225. https://doi.org/10.1161/circulationaha.115.018585

Mullan, B., Olivier, C., & Thøgersen-Ntoumani, C. (2021). Mind the gap: Habit and self-determined motivation predict health behaviours in middle-aged and older adults.

British Journal of Health Psychology, 26(4), 1095–1113. https://doi.org/10.1111/bjhp.12522

Munt, A. E., Partridge, S. R., & Allman-Farinelli, M. (2016). The barriers and enablers of healthy eating among young adults: a missing piece of the obesity puzzle: A scoping review. *Obesity Reviews*, *18*(1), 1–17. https://doi.org/10.1111/obr.12472

Nederkoorn, C., Guerrieri, R., Havermans, R. C., Roefs, A., & Jansen, A. (2009). The interactive effect of hunger and impulsivity on food intake and purchase in a virtual supermarket. *International Journal of Obesity*, *33*(8), 905–912. https://doi.org/10.1038/ijo.2009.98

Oenema, A., & Brug, J. (2003). Feedback strategies to raise awareness of personal dietary intake: results of a randomized controlled trial. *Preventive Medicine*, *36*(4), 429–439. https://doi.org/10.1016/s0091-7435(02)00043-9

Ojha, R. P., Srivastava, P. K., Awasthi, S., Srivastava, V., Pandey, P. S., Dwivedi, R. S., Singh, R., & Galletta, A. (2023). Controlling of fake information dissemination in online social networks: An Epidemiological approach. IEEE Access. https://doi.org/10.1109/access.2023.3262737

Orbell, S., & Verplanken, B. (2015). The strength of habit. Health Psychology Review, 9(3), 311–317. https://doi.org/10.1080/17437199.2014.992031

Ostolaza, J. M. B., Echávarri, R., García-Prado, A., & Osés-Eraso, N. (2021). Using visual stimuli to promote healthy snack choices among children. Social Science & Medicine, 270, 113587. https://doi.org/10.1016/j.socscimed.2020.113587

Özdemir, Ş. (2019). Digital nudges and dark patterns: The angels and the archfiends of digital communication. *Digital Scholarship in the Humanities*, *35*(2), 417–428. https://doi.org/10.1093/llc/fqz014

Phelps, N. H., Singleton, R. K., Zhou, B., Heap, R. A., Mishra, A., Bennett, J. E., Paciorek, C. J., Lhoste, V. P., Carrillo-Larco, R. M., Stevens, G. A., Rodriguez-Martinez, A., Bixby, H., Bentham, J., Di Cesare, M., Danaei, G., Rayner, A. W., Barradas-Pires, A., Cowan, M. J., Savin, S., . . . Ezzati, M. (2024). Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. Lancet, 403(10431), 1027–1050. https://doi.org/10.1016/s0140-6736(23)02750-2

Rodrigues, D., Prada, M., Gaspar, R., Garrido, M. V., & Lopes, D. (2017). Lisbon Emoji and Emoticon Database (LEED): Norms for emoji and emoticons in seven evaluative dimensions. *Behavior Research Methods*, *50*(1), 392–405. https://doi.org/10.3758/s13428-017-0878-6

Ruiz-Dodobara, F., & Busse, P. (2019). Peer Networks and Intention to Consume Unhealthy Food: The Association Through Cognitive Mediators in Peruvian Adolescents. The Journal of School Nursing, 36(5), 376-385. https://doi.org/10.1177/1059840519839118

Sampietro, A. (2019). Emoji and rapport management in Spanish WhatsApp chats. Journal of Pragmatics, 143, 109–120. https://doi.org/10.1016/j.pragma.2019.02.009

Schafer, J. B., Konstan, J., & Riedl, J. (1999, November). Recommender systems in e-commerce. In Proceedings of the 1st ACM conference on Electronic commerce (pp. 158-166). https://doi.org/10.1145/336992.337035

Schuldt, J. P. (2013). Does green mean healthy? Nutrition label color affects perceptions of healthfulness. *Health Communication*, *28*(8), 814–821. https://doi.org/10.1080/10410236.2012.725270

Shin, S., Van Dam, R. M., & Finkelstein, E. A. (2020). The Effect of Dynamic Food Labels with Real-Time Feedback on Diet Quality: Results from a Randomized Controlled Trial. Nutrients, 12(7), 2158. https://doi.org/10.3390/nu12072158

Short, S., Strauß, B., & Lotfian, P. (2022). *Food in the digital platform economy – making sense of a dynamic ecosystem*. https://doi.org/10.46756/sci.fsa.jbr429

Siegel, R. M., Anneken, A., Duffy, C., Simmons, K., Hudgens, M., Lockhart, M. K., & Shelly, J. (2015). Emoticon use Increases Plain Milk and Vegetable Purchase in a School Cafeteria without Adversely Affecting Total Milk Purchase. *Clinical Therapeutics*, *37*(9), 1938–1943. https://doi.org/10.1016/j.clinthera.2015.07.016

Simon, H. A. (1956). Rational choice and the structure of the environment. *Psychological Review*, *63*(2), 129–138. https://doi.org/10.1037/h0042769

Sobolev, M. (2021). Digital nudging: Using technology to nudge for good. Social Science Research Network. https://doi.org/10.2139/ssrn.3889831

Sparrow, B., & Chatman, L. (2013). Social cognition in the internet age: same as it ever was? Psychological Inquiry, 24(4), 273–292. https://doi.org/10.1080/1047840x.2013.827079

Spinella, M. (2007). NORMATIVE DATA AND a SHORT FORM OF THE BARRATT IMPULSIVENESS SCALE. International Journal of Neuroscience, 117(3), 359–368. https://doi.org/10.1080/00207450600588881

Stanton, R. (2015). Food retailers and obesity. *Current Obesity Reports*, *4*(1), 54–59. https://doi.org/10.1007/s13679-014-0137-4

Sunstein, C. R. (1996). Social norms and social roles. Columbia Law Review, 96(4), 903-968.

Sunstein, C. R. (2014). Nudging: a very short guide. Social Science Research Network. https://doi.org/10.2139/ssrn.2499658

Sunstein, C. R. (2015). Do people like nudges? *Social Science Research Network*. https://doi.org/10.2139/ssrn.2604084

Swinburn, B., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M., & Gortmaker, S. L. (2011). The global obesity pandemic: shaped by global drivers and local environments. *The Lancet*, *378*(9793), 804–814. https://doi.org/10.1016/s0140-6736(11)60813-1

Thaler, R. H., & Sunstein, C. R. (2008). Nudge : improving decisions about health, wealth, and happiness. Yale University Press.

Tsao, C. W., Aday, A. W., Almarzooq, Z. I., Anderson, C. A., Arora, P., Avery, C. L., & American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. (2023). Heart disease and stroke statistics—2023 update: a report from the American Heart Association. Circulation, 147(8). https://doi.org/10.1161/cir.0000000000001123

Valenčič, E., Beckett, E. L., Collins, C. E., Seljak, B. K., & Bucher, T. (2023). Digital nudging in online grocery stores: A scoping review on current practices and gaps. *Trends in Food Science and Technology*, *131*, 151–163. https://doi.org/10.1016/j.tifs.2022.10.018

Van Der Laan, L. N., & Orcholska, O. (2022). Effects of digital Just-In-Time nudges on healthy food choice – A field experiment. Food Quality and Preference, 98, 104535. https://doi.org/10.1016/j.foodqual.2022.104535

Van Gaal, S., Ridderinkhof, K. R., Fahrenfort, J. J., Scholte, H. S., & Lamme, V. a. F. (2008). Frontal cortex mediates unconsciously triggered inhibitory control. the Journal of Neuroscience/the Journal of Neuroscience, 28(32), 8053–8062. https://doi.org/10.1523/jneurosci.1278-08.2008

Van Kleef, E., Seijdell, K., Vingerhoeds, M. H., De Wijk, R. A., & Van Trijp, H. C. (2018). The effect of a default-based nudge on the choice of whole wheat bread. *Appetite*, *121*, 179–185. https://doi.org/10.1016/j.appet.2017.11.091

Van Larson, N., Miller, J. M., Eisenberg, M. E., Watts, A. W., Story, M., & Neumark-Sztainer, D. (2017). Multicontextual correlates of energy-dense, nutrient-poor snack food consumption by adolescents. Appetite, 112, 23-34. https://doi.org/10.1016/j.appet.2017.01.008

Vecchio, R., & Cavallo, C. (2019). Increasing healthy food choices through nudges: A systematic review. *Food Quality and Preference*, *78*, 103714. https://doi.org/10.1016/j.foodqual.2019.05.014

Venkatesh, V., Morris, M., Davis, G. B., & Davis, F. D. (2003). User acceptance of information Technology: toward a unified view. *Management Information Systems Quarterly*, *27*(3), 425. https://doi.org/10.2307/30036540

Verplanken, B., & Aarts, H. (1999). Habit, attitude, and planned behaviour: Is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology*, *10*(1), 101–134. https://doi.org/10.1080/14792779943000035

Vidal, L., Ares, G., & Jaeger, S. R. (2016). Use of emoticon and emoji in tweets for food-related emotional expression. Food Quality and Preference, 49, 119–128. https://doi.org/10.1016/j.foodqual.2015.12.002

Vlaev, I., King, D., Dolan, P., & Darzi, A. (2016). The Theory and Practice of "Nudging": Changing Health Behaviors. PAR. Public Administration Review/Public Administration Review, 76(4), 550–561. https://doi.org/10.1111/puar.12564

Walker, L. A., Chambers, C. D., Veling, H., & Lawrence, N. S. (2019). Cognitive and environmental interventions to encourage healthy eating: evidence-based

recommendations for public health policy. Royal Society Open Science, 6(10), 190624. https://doi.org/10.1098/rsos.190624

Wansink, B. (2010). From mindless eating to mindlessly eating better. Physiology & Behavior, 100(5), 454–463. https://doi.org/10.1016/j.physbeh.2010.05.003

Weinmann, M., Schneider, C., & Brocke, J. V. (2016). Digital nudging. Business & Information Systems Engineering, 58(6), 433–436. https://doi.org/10.1007/s12599-016-0453-1

WHO. (2003). Diet, nutrition and the prevention of chronic diseases. World Health Organ Tech Rep Ser, 916(i-viii), 1-149.

Wilson, A., Buckley, E., Buckley, J. D., & Bogomolova, S. (2016). Nudging healthier food and beverage choices through salience and priming. Evidence from a systematic review. *Food Quality and Preference*, *51*, 47–64. https://doi.org/10.1016/j.foodqual.2016.02.009

Winett, R. A., Moore, J. F., Wagner, J. L., Hite, L. A., Leahy, M., Neubauer, T. E., Walberg, J. L., Walker, W. B., Lombard, D., Geller, E. S., & Mundy, L. L. (1991). ALTERING SHOPPERS' SUPERMARKET PURCHASES TO FIT NUTRITIONAL GUIDELINES: AN INTERACTIVE INFORMATION SYSTEM. *Journal of Applied Behavior Analysis*, *24*(1), 95–105. https://doi.org/10.1901/jaba.1991.24-95

Witkowski, T. H. (2007). Food marketing and obesity in developing Countries: analysis, ethics, and public policy. *Journal of Macromarketing*, *27*(2), 126–137. https://doi.org/10.1177/0276146707300076

Zhang, X., Chen, S., Chen, H., Gu, Y., & Xu, W. (2017). General and Food-Specific inhibitory control as moderators of the effects of the impulsive systems on food choices. Frontiers in Psychology, 8. https://doi.org/10.3389/fpsyg.2017.00802

Appendix A

Information Letter and Informed Consent

Toestemmingsformulier deelnemer

U bent uitgenodigd om deel te nemen aan een onderzoek naar het winkelgedrag binnen een online supermarkt omgeving. Dit toestemmingsformulier geeft informatie over het onderzoek en je rechten als deelnemer. Lees daarom dit formulier nauwkeurig en twijfel niet om uw vragen te stellen voordat u akkoord gaat met het deelnemen.

Onderzoeker

Anne-Floor van Opzeeland

J.f.vanopzeeland@tilburguniversity.edu

Tilburg University

Faculteit Tilburg School of Humanities and Digital Sciences

Het doel

Het doel van dit onderzoek is het vergaren van meer kennis over het koopgedrag van consumenten in een online supermarkt omgeving. Mocht u vragen of opmerkingen hebben over het onderzoek dan kunt u contact opnemen met de onderzoeker.

Taak en duur

Uw deelname aan dit onderzoek bestaat uit het invullen van een online vragenlijst. Deze bestaat uit een fictieve winkel taak en hierop aansluitende vragen. Ook zullen er een aantal demografische vragen gesteld worden om de data-analyse makkelijker te maken. Het invullen van de online vragenlijst zal ongeveer 10 à 15 minuten duren.

Vrijwillige deelname

Deelname aan dit onderzoek is volledig vrijwillig en u heeft het recht om op elk gewenst moment alsnog af te zien van uw deelname. Hiervoor hoeft u geen reden te geven en dit zal uiteraard ook geen negatieve consequenties voor u hebben.

Risico's en voordelen

Aan het deelnemen aan dit onderzoek zijn geen risico's verbonden. Als dank voor uw deelname kunt u kans maken op een bol.com cadeaubon van 20 euro. Aan het einde van de vragenlijst kunt u uw e-mailadres achterlaten als u hiervoor in aanmerking wil komen.

Dataverzameling en analyse

De verzamelde gegevens worden vertrouwelijk opgeslagen en alleen gebruikt voor onderzoeksdoeleinden. De gegeven antwoorden worden geanonimiseerd en voor maximaal 5 jaar opgeslagen op de servers van Tilburg University. Mocht u uw e-mailadres opgeven voor het winnen van de cadeaubon dan wordt dit los opgeslagen en zal niet terug te leiden zijn naar uw eerder gegeven antwoorden. Deze gegevens zullen direct verwijderd worden nadat het gewenste aantal participanten is bereikt.

Door deel te nemen aan dit onderzoek ga ik akkoord met de volgende punten:

- Ik ben 18 jaar of ouder.
- Ik heb geen voedselallergieën of intoleranties.
- Ik vermijd geen voedingsmiddelen vanwege mijn geloofsovertuiging.
- Ik heb de toestemmingsverklaring hierboven nauwkeurig gelezen en begrijp het doel van het onderzoek.
- Ik heb voldoende tijd gehad om te beslissen of ik wil deelnemen aan dit onderzoek.

- Ik ben me ervan bewust dat deelname aan dit onderzoek geheel vrijwillig is en ik op elk moment af kan zien van de deelname, zonder negatieve gevolgen en ik hoef hiervoor geen reden te geven.
- Ik ben me ervan bewust dat ik op elk moment kan vragen om mijn gegevens te verwijderen.
- Ik ben me ervan bewust dat mijn deelname anoniem is en alleen de onderzoeker de gegevens kan inzien.
- Ik ben me ervan bewust dat mijn gegevens gebruikt wordt voor onderzoeksdoeleinden.
- Ik geef toestemming om mijn onderzoeksgegevens te gebruiken voor het hierboven beschreven onderzoek.
- Ik geef toestemming om mijn geanonimiseerde onderzoeksgegevens op te slaan voor de beschreven periode van 5 jaar.

Door verder te gaan geeft u toestemming voor deelname aan dit onderzoek.

- Ja, ik ga akkoord.
- Nee, ik ga niet akkoord.

Appendix B

Online Questionnaire and Shopping Task

Demografische vragen

- Wat is je geslacht?
    - Man
    - Vrouw
    - Non-binair
    - Anders_____
- Wat is je leeftijd?
- Wat is je nationaliteit?
- Wat is je hoogst genoten opleiding?
    - Ik heb geen opleiding afgerond
    - Basisschool
    - VMBO
    - HAVO
    - VWO
    - MBO
    - HBO
    - WO Bachelor
    - WO Master
    - PhD
- Hoe lang ben je in centimeters?
- Hoeveel kilo weeg je?
- Gebruik je vaak de website of app van een supermarkt om te kijken welke producten er verkocht worden?

    - Always
    - Most of the time
    - About half the time
    - Sometimes
    - Never
- Bestel je je boodschappen online?
    - Always
    - Most of the time
    - About half of the time
    - Sometimes
    - Never

Winkeltaak

In het volgende deel van deze enquête krijgt u beelden uit een experimentele online supermarktomgeving te zien. Stelt u zich voor dat u boodschappen gaat bestellen bij Albert Heijn via de website of app. U heeft boodschappen nodig voor één week en de boodschappen zullen bij u thuis worden bezorgd.

Uw boodschappenlijstje:

- Eierkoeken
- Brood
- Koekjes
- Broodbeleg
- Chips
- Kaas
- Pasta
- Noten
- Rijst
- Vlees
- Tussendoortje

U krijgt 11 keuze mogelijkheden voor deze producten waarbij u gevraagd wordt aan te geven welke producten u zou kiezen wanneer u daadwerkelijk uw boodschappen online aan het bestellen zou zijn. Baseer de keuzes op de factoren die u normaal gesproken ook in uw dagelijks leven in overweging neemt bij het maken van productkeuzes in een (online) supermarkt. Denk hierbij aan prijs, smaak of kwaliteit.

Kijk goed naar de beelden die worden weergeven en neem de tijd.

Alvast bedankt voor uw deelname!

Subject Variables

Impulsivity

- In mijn dagelijks leven…..
    - Zeg ik dingen zonder erover na te denken
    - Doe ik dingen zonder ze van tevoren te plannen
    - Merk ik dat ik me gemakkelijk laat afleiden wanneer ik ergens mee bezig ben
    - Voel ik me rusteloos tijdens colleges of presentaties.
    - Slaag ik er vaak niet in om van tevoren plannen te maken.
    - Heb ik de neiging om in het moment te leven en hierbij niet aan de toekomst te denken.

Social Influence

- In mijn dagelijks leven….
    - Ervaar ik druk van mensen die belangrijk voor me zijn om gezond voedsel te consumeren.
    - Verander ik in sociale situaties mijn voedselkeuzes op basis van wat mijn vrienden eten.
    - Heb ik het gevoel dat mijn vrienden invloed hebben op mijn eetgewoonten.
    - Word ik beïnvloed in mijn keuzes door mensen die belangrijk voor me zijn.
    - Vinden de mensen die voor mij belangrijk zijn het belangrijk om gezond te eten.

Appendix B

End of Survey

Ontzettend bedankt voor het invullen van mijn enquête!

Dankzij uw bijdrage ben ik weer een stapje verder in mijn afstudeeronderzoek.

Onder de deelnemers wordt een bol.com cadeaubon van €20,- verloot. Wil u hierop kans maken? Laat dan hier uw e-mailadres achter.

Appendix D

Overview Food stimuli

Table 1

Overview Product combinations

Healthy product	Unhealthy product	Health Information
AH Volkoren Eierkoeken	AH Eierkoeken	2x zoveel vezels
Verkade Langetjes	AH Kaneelstengels	43% minder suiker
Kipfilet minder vet	Kipfilet	45% minder vet
Lays Oven Baked Chips	Lays Naturel Chips	50% minder vet
Zaanse Hoeve Kaas 30+	Zaanse Hoeve Kaas 48+	35% minder vet
Calvé 100% Pindakaas	Calvé Pindakaas	25% minder vet, 51% meer vezels
Bolletje haverreep	Liga Haverreep	46% minder suiker, 2x zoveel vezels
Go Tan Teriyaki Woksaus	AH Teriyaki Woksaus	60% minder suiker
AH Fruitspread minder suiker	AH Jam	49% minder suiker
Zonnatura krokante muesli chocolade	Cruesli muesli chocolade	52% minder suiker
Remia Mayolijn	Remia Mayonaise	53% minder vet, 48% minder suiker

Figure 1

Eierkoeken Nudge Not Present

Figure 2

Eierkoeken Nudge Present

Figure 3

Eierkoeken Feedback Healthy Choice

Figure 4

Eierkoeken Feedback Unhealthy Choice

Figure 5

Kaneelkoekjes Nudge Not Present

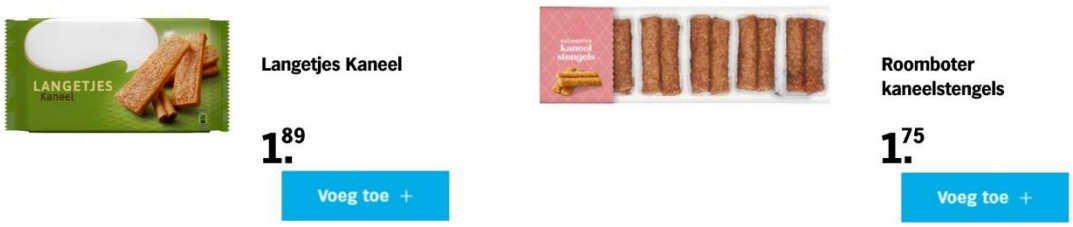


Figure 6

Kaneelkoekjes Nudge Present

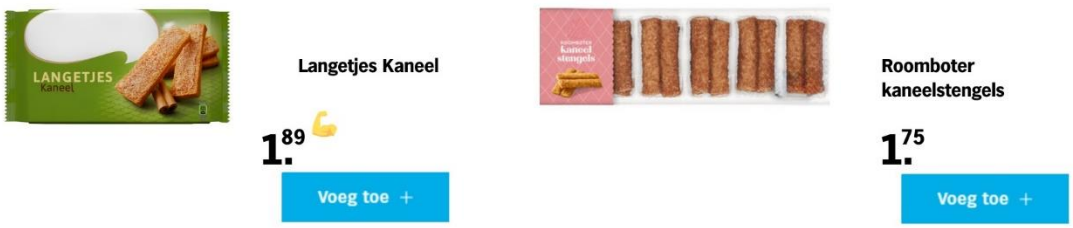


Figure 7

Kaneelkoekjes Feedback Healthy Choice

Figure 8

Kaneelkoekjes Feedback Unhealthy Choice

Figure 9

Kipfilet Nudge Not Present

Figure 10

Kipfilet Nudge Present

Figure 11

Kipfilet Feedback Healthy Choice

Figure 12

Kipfilet Feedback Unhealthy Choice

Figure 13

Chips Nudge Not Present

Figure 14

Chips Nudge Present

Figure 15

Chips Feedback Healthy Choice

Figure 16

Chips Feedback Unhealthy Choice

Figure 17

Kaas Nudge Not Present

Figure 18

Kaas Nudge Present

Figure 19

Kaas Feedback Healthy Choice

Figure 20

Kaas Feedback Unhealthy Choice

Figure 21

Pindakaas Nudge No Present

Figure 22

Pindakaas Nudge Present

Figure 23

Pindakaas Feedback Healthy Choice

Figure 24

Pindakaas Feedback Unhealthy Choice

Figure 25

Haverreep Nudge Not Present

Figure 26

Haverreep Nudge Present

Figure 27

Haverreep Feedback Healthy Choice

Figure 28

Haverreep Feedback Healthy Choice

Figure 29

Woksaus Nudge Not Present

Figure 30

Woksaus Nudge Present

Figure 31

Woksaus Feedback Unhealthy Choice

Figure 32

Woksaus Feedback Unhealthy Choice

Figure 33

Jam Nudge Not Present

Figure 34

Jam Nudge Present

Figure 35

Jam Feedback Healthy Choice

Figure 36

Jam Feedback Unhealthy Choice

Figure 37

Muesli Nudge Not Present

Figure 38

Muesli Nudge Present

Figure 39

Muesli Feedback Healthy Choice

Figure 40

Muesli Feedback Unhealthy Choice

Figure 41

Mayonaise Nudge Not Present

Figure 42

Mayonaise Nudge Present

Figure 43

Mayonaise Feedback Healthy Choice

Figure 44

Mayonaise Feedback Unhealthy Choice

Appendix E

Overview Different Constructs and Items

Table 1

An overview of the different constructs and items

Constructs	Items	References
Healthy Food Choices	Participants make a choice per product combination, so this will be calculated by summing up how many times they chose the healthy option. In total, they make 11 different choices, so this will be a score between 1 and 11.	
Impulsivity	1. I say things without thinking. 2. I do things without planning them beforehand. 3. I find myself easily distracted when working on a task. 4. I am restless at lectures or talks. 5. I often fail to make plans in advance. 6. I tend to live in the moment without thinking about the future. Response categories: 1 = Rarely/never, 2 = Occasionally, 3 = Often, and 4 = Almost always/always	A shortened version of the Barratt Impulsiveness Scale. Derived from Barratt (1994) and Spinella (2007).

Social Influence	1. I feel pressure from people who are important to me to consume unhealthy foods. 2. In social settings, I change my food choices based on what my friends are eating. 3. I feel like my friends influence my eating habits. 4. I am strongly influenced in my choices by people who are important to me. 5. The people who are important to me find it important to eat healthily. Response categories: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree	Derived from Venkatesh et al. (2003), Larson et al. (2017), and Ruiz-Dodobara and Busse (2019).

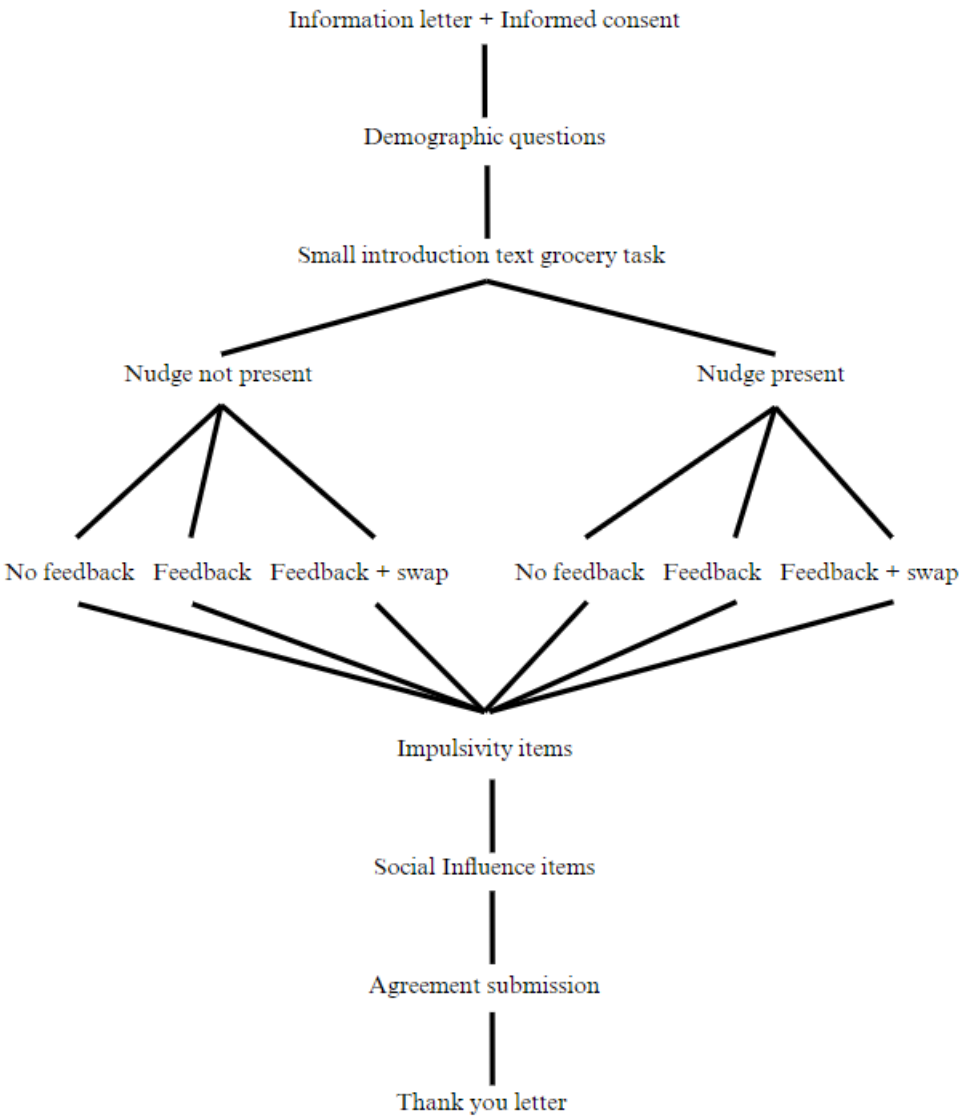
Appendix F

Control Questions Questionnaire

- Heeft u naast bepaalde producten onderstaande emoji zien staan?
- Heeft u feedback gezien met betrekking tot uw gemaakte product keuzes?

Appendix G

Tree Diagram Procedure Experiment



Appendix H

Results Chi-square Tests Effect Emoji-Nudge on Healthy Choices

This Appendix shows the eleven Chi-square tests that were conducted to test the effectiveness of an Emoji-Nudge to encourage healthy food choices.

Table 1

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Eierkoeken'

			Eierkoeken		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	61	39	100
		Expected count	61	39	100
		Standardized residual	.00	.00	
	Present	Count	61	39	100
		Expected count	61	39	100
		Standardized residual	.00	.00	
		Total	122	78	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) =.00, p = 1.00. The standard residuals are .000, which means there is no difference between the observed count and the expected count. This implies that the values do not contribute to the chi-square value. Concluding, for the product 'Eierkoeken' the data does not support hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food*

choices". The results suggest that people chose the same product with and without being presented with the nudge.

Table 2

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Kaneelkoekjes'

			Kaneelkoekjes		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	50	50	100
		Expected count	52.5	47.5	100
		Standardized residual	-.30	.40	
	Present	Count	55	45	100
		Expected count	52.5	47.5	100
		Standardized residual	.30	-.40	
		Total	105	95	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) =.501, p = .479. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Kaneelkoekjes' the data does not support hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results suggest that people while being presented with the nudge make more unhealthy choices, instead of healthy choices.

Table 3

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Kipfilet'

			Kipfilet		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	66	34	100
		Expected count	60.5	39.5	100
		Standardized residual	.70	-.90	
	Present	Count	55	45	100
		Expected count	60.5	39.5	100
		Standardized residual	-.70	.90	
		Total	121	79	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = 2.53, p = .112. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Kipfilet', the data is in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices compared to the absence of an emoji-nudge*". The results suggest that people while being presented with the nudge make a healthier product choice, but this difference is not significant.

Table 4

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Chips'

			Chips		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	41	59	100
		Expected count	39.5	60.5	100
		Standardized residual	.20	-.20	
	Present	Count	38	62	100
		Expected count	39.5	60.5	100
		Standardized residual	-.20	.20	
		Total	79	121	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = .188, p = .664. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Chips', the data is in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices compared to the absence of an emoji-nudge*". The results suggest that people while being presented with the nudge make a healthier product choice, but this difference is not significant and very small.

Table 5

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Kaas'

			Kaas		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	41	59	100
		Expected count	44.0	56.0	100
		Standardized residual	-.50	.40	
	Present	Count	47	53	100
		Expected count	44.0	56.0	100
		Standardized residual	.50	-.40	
		Total	88	112	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = .731, p = .393. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Kaas', the data is not in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results suggest that people while being presented with the nudge do not make a healthier product choice.

Table 6

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Pindakaas'

			Pindakaas		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	57	43	100
		Expected count	63.5	43.0	100
		Standardized residual	-.80	1.1	
	Present	Count	70	30	100
		Expected count	63.5	36.5	100
		Standardized residual	.80	-1.1	
		Total	127	73	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = 3.65, p = .056. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Pindakaas', the data is not in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results suggest that people while being presented with the nudge do not make a healthier product choice.

Table 7

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Haverreep'

			Haverreep		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	56	44	100
		Expected count	47.5	52.5	100
		Standardized residual	1.2	-1.2	
	Present	Count	39	61	100
		Expected count	47.5	52.5	100
		Standardized residual	-1.2	1.2	
		Total	95	105	200

The X^2-test did show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = 5.79, p = .016. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Haverreep', the data is in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results suggest that people while being presented with the nudge do make a healthier product choice.

Table 8

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Woksaus'

			Woksaus		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	77	23	100
		Expected count	75.5	24.5	100
		Standardized residual	.20	-.30	
	Present	Count	74	26	100
		Expected count	75.5	24.5	100
		Standardized residual	-.20	.30	
		Total	151	49	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = .243, p = .622. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Teriyaki Woksaus', the data is not in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results stated that people while being presented with the nudge do not make a healthier product choice.

Table 9

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Jam'

			Jam		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	59	41	100
		Expected count	58	42	100
		Standardized residual	.10	-.20	
	Present	Count	57	43	100
		Expected count	58	43	100
		Standardized residual	-.10	.20	
		Total	116	84	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = .082, p = .774. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Jam', the data is in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results stated that people while being presented with the nudge do make a healthier product choice, but this difference is not significant and very small.

Table 10

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Muesli'

			Muesli		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	57	43	100
		Expected count	57	43	100
		Standardized residual	.00	.00	
	Present	Count	57	43	100
		Expected count	57	43	100
		Standardized residual	.00	.00	
		Total	114	86	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = .000, p = 1.00. The standard residuals are .000, which means there is no difference between the observed count and the expected count. This implies that the values do not contribute to the chi-square value. Concluding, for the product 'Muesli' the data does not support hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results stated that people chose the same product with and without being presented to the nudge.

Table 11

Observed and Expected frequencies Emoji Nudge vs. No Emoji Nudge on 'Mayonaise'

			Mayonaise		
			Unhealthy	Healthy	Total
Emoji Nudge	Not Present	Count	40	60	100
		Expected count	44.5	55.5	100
		Standardized residual	-.70	.60	
	Present	Count	49	51	100
		Expected count	44.5	55.5	100
		Standardized residual	.70	-.60	
		Total	89	111	200

The X^2-test does not show a significant difference between the variables *Nudge* and *Choice*: χ^2 (1) = 1.64, p = .200. The standard residuals are significant, because the values fall in between -1.96 and 1.96. This means the values contribute to the chi-square value. Concluding, for the product 'Mayonnaise', the data is in line with hypothesis **H1**: "*The presence of an emoji-nudge increases healthy food choices*". The results stated that people while being presented with the nudge do not make a healthier product choice.

Appendix I

Results Cochran's Q tests Effect Feedback on Healthy Choices

Table 1

McNemar significant values No Feedback Condition

Analysis	Pairs (choice number)	McNemar's χ^2	Unadjusted *p*	Adjusted *p*
6	Kaneelkoekjes (2) & Woksaus (8)	13.98	<.001	.045
19	Chips (4) & Pindakaas (6)	21.55	<.001	.045
21	Chips (4) & Woksaus (8)	31.58	<.001	.045
22	Chips (4) & Jam (9)	11.76	<.001	.045
25	Kaas (5) & Pindakaas (6)	13.85	<.001	.045
27	Kaas (5) & Woksaus (8)	21.55	<.001	.045
31	Pindakaas (6) & Haverreep (7)	11.39	<.001	.045
35	Pindakaas (6) & Mayonaise (10)	12.15	<.001	.045
36	Haverreep (7) & Woksaus (8)	21.88	<.001	.045
42	Woksaus (8) & Mayonaise (10)	18.01	<.001	.045

For the following product pairs, the initial p-values of the McNemar test were significant. However, after correcting for multiple comparisons, they did not remain significant.

Table 2

Feedback Condition

Analysis	Pairs (choice number)	McNemar's χ^2	Unadjusted *p*	Adjusted *p*
1	Kaneelkoekjes (2) & Woksaus (8)	9.26	.002	.09
2	Kipfilet (3) & Chips (4)	6.25	.012	.54
3	Kipfilet (3) & Kaas (5)	5.30	.021	9.45
4	Kipfilet (3) & Mayonaise (10)	8.26	.004	.18
5	Chips (4) & Jam (9)	4.32	.038	1.71
6	Pindakaas (6) & Woksaus (8)	6.62	.010	.45
7	Woksaus (8) vs. Jam (9)	5.33	.021	9.45
8	Woksaus (8) vs. Muesli (10)	8.04	.005	.225

Table 3

No Feedback Condition

Analysis	Pairs (choice number)	McNemar's χ^2	Unadjusted *p*	Adjusted *p*
2	Kaneelkoekjes (2) & Chips (4)	5.64	.018	.81
4	Kaneelkoekjes (2) & Pindakaas (6)	5.14	.023	1.04
10	Kipfilet (3) & Chips (4)	8.68	.003	.135
11	Kipfilet (3) & Kaas (5)	4.13	.042	1.89
14	Kipfilet (3) & Woksaus (8)	7.84	.005	.225
23	Chips (4) & Muesli (10)	9.77	.002	.09
29	Kaas (5) & Muesli (10)	4.82	.028	1.26
40	Woksaus (8) & Jam (9)	8.17	.004	.18
41	Woksaus (8) Muesli (10)	8.16	.004	.18

Appendix J

Overview Demographics Participants

Table 1

Demographic data participants

		N	Percent	*M*	*SD*
Gender	Male	50	25%		
	Female	150	75%		
Age		200		41.77	18.13
Nationality	Dutch	200	100%		
Education	VMBO	9	4.5%		
	HAVO	9	4.5%		
	VWO	9	4.5%		
	MBO	29	14.5%		
	HBO	90	45.0%		
	WO Bachelor	9	4.5%		
	WO Master	42	21.0%		
	PhD	2	1.0%		
Ordering groceries	Always	9	4.5%		
	Often	14	7.0%		
	Half of the time	14	7.0%		
	Rarely	74	37.0%		
	Never	89	44.5%		
App/Website Use	Always	52	26.0%		
	Often	31	15.5%		
	Half of the time	13	6.5%		
	Rarely	71	35.5%		
	Never	33	16.5%		
Total		200	100%		

Appendix K

Overview Conditions

Table 1

Different Conditions Experiment

Condition	Emoji Nudge	Feedback
1	Present	Not Present
2	Present	Present
3	Present	Present as Swap
4	Not Present	Not Present
5	Not Present	Present
6	Not Present	Present as Swap

Appendix L

Results Chi-Square Tests Effect Swap on Healthy Choices

This appendix shows all of the conducted Chi-Square tests and the observed healthy and unhealthy choices of the whole sample before and after the swap with the odds ratio.

Table 1

Chi-Square test results for "Eierkoeken"

				Eierkoeken (After Swap)		
				Unhealthy	Healthy	Total
Swap	Eierkoeken (Before Swap)	Unhealthy	Count	36	7	43
			Expected Count	22,8	20,2	43,0
			Standardized Residual	2,8	-2,9	
		Healthy	Count	0	25	25
			Expected Count	13,2	11,8	25,0
			Standardized Residual	-3,6	3,9	
	Total		Count	36	32	68
			Expected Count	36,0	32,0	68,0

The overall X^2-test showed a significant result : χ^2 (1) = 172.99, p <.001. This suggests that for the product Eierkoeken, the swap intervention significantly motivated participants to make a healthier choice. The odds ratio

Table 2

Chi-Square test results for "Kaneelkoekjes"

				Kaneelkoekjes (After swap)		
				Unhealthy	Healthy	Total
Swap	Kaneelkoekjes (Before Swap)	Unhealthy	Count	16	18	34
			Expected Count	8,0	26,0	34,0
			Standardized Residual	2,8	-1,6	
		Healthy	Count	0	34	34
			Expected Count	8,0	26,0	34,0
			Standardized Residual	-2,8	1,6	
	Total		Count	16	52	68
			Expected Count	16,0	52,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 139.32, p <.001. This suggests that for the product Kaneelkoekjes, the swap intervention significantly motivated participants to make a healthier choice.

Table 3

Chi-Square test results for "Kipfilet"

				Kipfilet (After Swap)		
				Unhealthy	Healthy	Total
Swap	Kipfilet (Before Swap)	Unhealthy	Count	31	7	38
			Expected Count	17,3	20,7	38,0
			Standardized Residual	3,3	-3,0	
		Healthy	Count	0	30	30
			Expected Count	13,7	16,3	30,0
			Standardized Residual	-3,7	3,4	
	Total		Count	31	37	68
			Expected Count	31,0	37,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 184.33, p <.001. This suggests that for the product Kipfilet, the swap intervention significantly motivated participants to make a healthier choice.

Table 4

Chi-Square test results for "Chips"

				Chips (After Swap)		
				Unhealthy	Healthy	Total
Swap	Chips (Before Swap)	Unhealthy	Count	18	3	38
			Expected Count	5,6	15,4	38,0
			Standardized Residual	5,3	-3,2	
		Healthy	Count	0	47	132
			Expected Count	12,4	34,6	132,0
			Standardized Residual	-3,5	2,1	
	Total		Count	18	50	68
			Expected Count	18,0	50,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 187.75, p <.001. This suggests that for the product Chips, the swap intervention significantly motivated participants to make a healthier choice.

Table 5

Chi-Square test results for "Kaas"

				Kaas (After Swap)		
				Unhealthy	Healthy	Total
Swap	Kaas (Before Swap)	Unhealthy	Count	27	4	31
			Expected Count	12,3	18,7	31,0
			Standardized Residual	4,2	-3,4	
		Healthy	Count	0	37	37
			Expected Count	14,7	22,3	37,0
			Standardized Residual	-3,8	3,1	
	Total		Count	27	41	68
			Expected Count	27,0	41,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 184.33, p <.001. This suggests that for the product Kaas, the swap intervention significantly motivated participants to make a healthier choice.

Table 6

Chi-Square test results for "Pindakaas"

				Pindakaas (After Swap)		
				Unhealthy	Healthy	Total
Swap	Pindakaas (Before Swap)	Unhealthy	Count	38	8	46
			Expected Count	25,7	20,3	46,0
			Standardized Residual	2,4	-2,7	
		Healthy	Count	0	22	22
			Expected Count	12,3	9,7	22,0
			Standardized Residual	-3,5	3,9	
	Total		Count	38	30	68
			Expected Count	38,0	30,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 168.89, p <.001. This suggests that for the product Pindakaas, the swap intervention significantly motivated participants to make a healthier choice.

Table 7

Chi-Square test results for "Haverreep"

				Haverreep (After Swap)		
				Unhealthy	Healthy	Total
Swap	Haverreep (Before Swap)	Unhealthy	Count	8	16	24
			Expected Count	2,8	21,2	24,0
			Standardized Residual	3,1	-1,1	
		Healthy	Count	0	44	44
			Expected Count	5,2	38,8	44,0
			Standardized Residual	-2,3	,8	
	Total		Count	8	60	68
			Expected Count	8,0	60,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 144.32, p <.001. This suggests that for the product Haverreep, the swap intervention significantly motivated participants to make a healthier choice.

Table 8

Chi-Square test results for "Woksaus"

				Woksaus (After Swap)		
				Unhealthy	Healthy	Total
Swap	Woksaus (Before Swap)	Unhealthy	Count	26	20	46
			Expected Count	17,6	28,4	46,0
			Standardized Residual	2,0	-1,6	
		Healthy	Count	0	22	22
			Expected Count	8,4	13,6	22,0
			Standardized Residual	-2,9	2,3	
	Total		Count	26	42	68
			Expected Count	26,0	42,0	68,0

The overall X^2-test showed a significant difference between the values: χ^2 (1) = 123.22, p <.001. This suggests that for the product Woksaus, the swap intervention significantly motivated participants to make a healthier choice.

Table 9

Chi-Square test results for "Jam"

Swap				Jam (After Swap) Unhealthy	Healthy	Total
Swap	Jam (Before Swap)	Unhealthy	Count	27	5	32
			Expected Count	12,7	19,3	32,0
			Standardized Residual	4,0	-3,3	
		Healthy	Count	0	36	36
			Expected Count	14,3	21,7	36,0
			Standardized Residual	-3,8	3,1	
	Total		Count	27	41	68
			Expected Count	27,0	41,0	68,0

The overall X^2-test showed a significant Jam between the values: χ^2 (1) = 180.63, p <.001. This suggests that for the product Kipfilet, the swap intervention significantly motivated participants to make a healthier choice.

Table 10

Chi-Square test results for "Muesli"

				Muesli (After Swap)		
				Unhealthy	Healthy	Total
Swap	Muesli (Before Swap)	Unhealthy	Count	20	12	32
			Expected Count	9,4	22,6	32,0
			Standardized Residual	3,5	-2,2	
		Healthy	Count	0	36	36
			Expected Count	10,6	25,4	36,0
			Standardized Residual	-3,3	2,1	
	Total		Count	20	48	68
			Expected Count	20,0	48,0	68,0

The overall X^2-test showed a significant difference between the values : χ^2 (1) = 157.04, p <.001. This suggests that for the product Mayonaise, the swap intervention significantly motivated participants to make a healthier choice.

Table 11

Chi-Square test results for "Mayonaise"

				Mayonaise (After Swap)		
				Unhealthy	Healthy	Total
Swap	Mayonaise (Before Swap)	Unhealthy	Count	29	0	29
			Expected Count	12,4	16,6	29,0
			Standardized Residual	4,7	-4,1	
		Healthy	Count	0	39	39
			Expected Count	16,6	22,4	39,0
			Standardized Residual	-4,1	3,5	
	Total		Count	29	39	68
			Expected Count	29,0	39,0	68,0

The overall X^2-test showed a significant difference between the values : χ^2 (1) = 200.00, p <.001. This suggests that for the product Mayonaise, the swap intervention significantly motivated participants to make a healthier choice.