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"Yummy, a feast for the eyes! Exploring the influence of unhealthy and healthy food cues in different levels of interaction with media characters within television entertainment on children's attention. An eye tracking study"

verfasst von / submitted by

Ines Katrin Spielvogel, Bakk. phil.

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Tables

1. Introduction

"Food advertisements are designed to grab attention […]"
Folkvord, Anschütz, Wiers, & Buijzen, 2015, p. 257

Promoting food to a youthful audience is a booming business. According to a complex food marketing expenditures report by the Federal Trade Commission (2012), food companies in 2009 spent approximately 1.80 billion dollars on food marketing aimed at children and teenagers. Visual food cues are disseminated via many forms of media, including television, the Internet, and print (Castellanos et al., 2009). Thus, it is alarming that a high number of unhealthy food products, i.e. food items that are high in fat, sugar, and salt, are being advertised and presented to children (Cairns, Angus, & Hastings, 2009). Unhealthy food cues have become pervasive in people's living environment and consequently lead individuals into temptation (van der Laan, Papies, Hooge, & Smeets, 2017). This circumstance raises health-related issues such as "the rise in overweight and obesity rates is often attributed to the fact that energy-rich foods as well as attractive food cues have become omnipresent […]" (van der Laan et al., 2017, p. 82). The World Health Organization (2016) reported that worldwide obesity has more than doubled between 1980 and 2014. Furthermore, from the latest information for the year 2014, it can be concluded that globally 41 million children under the age of five are classified as overweight or obese (WHO, 2016).

To attract children's attention, companies use different marketing strategies and media channels, including traditional television commercials as well as newer marketing approaches, the so-called stealth marketing techniques (Calvert, 2008). The latter implies product placements that are embedded in the program content, in movies for instance. An audience of young people examined on an annual basis in the years between 1996 and 2005 were exposed to nearly 3.1 billion food and beverage impressions in movies. The promoted food products were inconsistent with dietary recommendations, as sugar-sweetened beverages and quick-serve fast food restaurants made up the most part of these appearances over this decade (Skatrud-Mickelson, Adachi-Mejia, MacKenzie, & Sutherland, 2011). Furthermore, characters from popular children movies or television programs are regularly used as "celebrity spokes-characters" (e.g. SpongeBob

SquarePants who appears on packaging of Kellogg's cereals and Cheez-it snack crackers) for marketing junk food to children (Batada & Wootan, 2007; Campbell, 2006). Moreover, media characters are often shown handling or eating certain food items (e.g. SpongeBob SquarePants and his craving for Krabby Patties) in movies and television programs that are aimed at children. Thus, they even demonstrate high enthusiasm for certain food items, especially unhealthy eatable products (Radnitz et al., 2009).

Although an increased use of new media by marketers to reach children can be observed, television advertising is still central to most marketing strategies (Federal Trade Commission, 2008). In addition, recent statistical data demonstrate that Austrian children mostly spend their leisure time in playful outdoor activities, closely followed by watching television (Pfarrhofer, 2016a). Television plays a considerable part in the course of the day, as the audience aged between six and ten years watch 95 minutes of television on average daily (Pfarrhofer, 2016b). Moreover, 47% of the children express their desire for more intensive television use and 45% see television as an indispensable device (Pfarrhofer, 2016c). However, when considering the domestic environment as a key role in determining obesity risk, research perceives television watching—especially heavy television viewing—as one great contributor for childhood overweight, as not only pattern of eating but also norms of activity are correlated with overweight (Jordan, 2007). This circumstance underlines the existence of unintended effects of food advertising in children, like weight gain or even obesity (Schwartz, Kunkel, & DeLucia, 2013). Moreover, intended effects of food marketers in children include high product recallability, a desirable positive brand attitude, or even a higher probability of purchasing if children are already involved in the decision-making process (Schwartz et al., 2013).

There are several evidences that food advertising—both traditional and non-traditional—and its effects can lead to cognitive, affective, and conative responses in the youth audience (e.g. Uribe & Fuentes-Garcia, 2015). As the question came up whether attention to unhealthy food advertising is a requirement for negative health outcomes, certain studies investigated the role of children's attention. There is empirical evidence of the impact of children's attention toward unhealthy food products in either traditional food advertisements (Velazquez & Pasch, 2014) or in new forms of food advertising—the so-called advergames (Folkvord et al., 2015). A recently published study investigated the influence of cartoon characters on children's attention to food products (Ogle, Graham, Lucas-Thompson, & Roberto, 2017). Hence, this lack of empirical evidence does underline the importance of further research into children's perception of food advertising, especially within the television entertainment context, due to the fact that television watching remains a high priority for children's leisure time (Pfarrhofer 2016a, 2016b, 2016c). Furthermore, changes in young people's media environment must be considered (Buijzen, Van Reijmersdal, & Owen, 2010). New interactive formats do not present facts about the products; rather, they involve a depiction in which the product or brand is linked with rewarding stimuli (Nairn & Fine, 2008).

First, an overview of the current state of research should be given. Chapter 2 provides information about the types of promoted food products that children are actual exposed to while watching television (see Chapter 2.1) and how these food products are represented to them (see Chapter 2.2). According to the representation styles of the advertised food products, Subchapter 2.3 includes a side note to the topic that takes into consideration the fact that children in certain circumstances copy the observed behavior of television media characters. Chapter 3 is devoted to two communication processing models (see Chapters 3.1–3.2) to clarify how promoted food products can be processed and—in the next step—how children respond to food advertising (see Chapters 3.3–3.5). Subsequently, the existing explanation approaches for advertising effects are mentioned (see Chapter 3.6). In the following chapter, current research in the particular area of children's attention toward food advertising is presented (see Chapter 4). Before presenting the results (see Chapter 9), the overarching research question, the derived hypotheses (see Chapter 5), the method (see Chapter 6), measures (see Chapter 7) and created indices (see Chapter 8) are considered. Chapter 10 reveals the limitations of the study, before the findings are discussed in the last chapter.

2. Implications of food advertising on children's television watching habits

Different content analyses demonstrate that the youth audience is exposed to a great deal of food advertising. Food companies promote food products through traditional television ads (e.g. Batada & Wootan, 2007; Lewis & Hill, 1998; Li, Ye, Blades, & Oates, 2016; Speers, Harris, & Schwartz, 2011; Zuppa, Morton, & Metha, 2003) or through television programs in the form of food placements, i.e. food brand appearances as well as food cues themselves (e.g. Olafsdottir & Berg, 2016; Radnitz et al., 2009; Roseman, Poor, & Stephenson, 2014; Scully et al., 2015; Speers et al., 2011). Other studies are devoted to movies that target children and report a great number of eatable products as well (Sutherland, MacKenzie, Purvis, & Dalton, 2010; Throop et al., 2014). Hence, numerous studies shed light on the nutritional content of food advertising to examine the types of food products promoted to children. In the following subsection, findings of the listed content analyses are represented.

2.1. Types of promoted food products

With respect to traditional television commercials and non-traditional advertising (i.e. embedded advertising practices), there are certain content analyses that examine the nutritional content, provide a breakdown of those by *food categories* (e.g. Lewis & Hill, 1998; Roseman et al., 2014; Speers et al., 2011; Sutherland et al., 2010; Throop et al., 2014), or make further a distinction between *unhealthier* and *healthier* food products (e.g. Batada & Wootan, 2007; Li et al., 2017; Olafsdottir & Berg, 2016; Radnitz et al., 2009; Scully et al., 2015; Zuppa et al., 2003). A comparison is made more difficult by the different coding styles of the authors. Therefore, the exact number of hours is indicated, as well as the kind of program used, to facilitate comparison. The findings of these studies are presented chronologically, yielding the most recent analysis.

Lewis and Hill (1998) found in their analysis that 30.1% of the advertised food products in a total of 828 ads in 91.33 hours of British children's broadcasting depicted cereals, while the other products displayed were confectionary and savory snacks (29.8%), other foodstuff (34.3%), and fast food (5.8%).

Zuppa et al. (2003) collected data from 544 food advertisements that were recorded on 63 hours of Australian children's programs. Their conclusion was that 21% of all food advertisements were healthy food (i.e. core food like fruits and vegetables), whereas the remaining 79% represented non-core food. The most heavily advertised food products were fast food, chocolate, and confectionery, which made up almost 50%.

Furthermore, Batada and Wootan (2007) investigated the nutritional quality of eatable products represented in food ads in 28 hours of television programs on the Nickelodeon channel as well as in food ads on four issues of Nickelodeon magazine. With respect to the nutritional quality of the advertised eatable products in food ads, 88% were unhealthy (i.e. of poor nutritional quality). Nickelodeon magazines had 21 food ads, of which 76% represented food products of poor nutritional quality.

Radnitz et al. (2009) examined the nutritional content of food represented in food ads in 136 hours of Public Broadcasting System television programs aimed at children under five years and made a clear dichotomy between unhealthy and healthy foodstuff to consider differences of total airtime. Results showed a total airtime of 321.03 minutes (45%) for unhealthy food cues, whereas the total airtime for healthy food cues was only 184.72 minutes (26%). Food products that could not be clearly identified as unhealthy or healthy (i.e. combination stimuli) made up the rest, with 206.23 minutes (29%).

Speers et al. (2011) analyzed Nielsen's data from 2008 to draw a conclusion about the average extent of television advertisements and food brand appearances (the latter was only monitored on prime-time television programs) viewed by children. With respect to the food category, the lowest share of advertised food products recorded in television ads was made up by meats, poultry, and fish, followed by fruits and vegetables as the second lowest amount and gum and other candies as the third lowest amount. An average child predominantly viewed food ads for cereals, followed by convenience food products and sweets and desserts (except candies). The largest portion of prime-time brand appearances was for beverage products, followed by restaurants and food products. The brand Coca Cola made up about 70% of the children's average exposure to beverages' brand appearances at prime time.

Roseman et al. (2014) analyzed the content of 20 hours of Disney channel programs, in which a total of 331 food-related scenes were obtained with reference to 810 food items. The authors found that only 24% of the 810 food appearances depicted fruits or vegetables, whereas 42% of the food items were categorized as "other food." However, the following must be noted: "The majority of the 'other' food were high in sugar and/or fat" (p. 24). In consequence, this category included examples like candy, cookies, chips, donuts, and sugar-sweetened beverages.

Scully et al. (2015) coded a total of 1,155 food and beverage cues (apart from background cues), which appeared in 82.5 hours of children-specific television broadcasting materials on UK and Irish television channels, in various genres. The authors made a breakdown by food category and further defined food cues as healthy (e.g. bread and grains, cereals, meat and fish, dairy, fruit, vegetables, sandwiches) or energy-dense and nutrient-poor (e.g. fast food and convenience meals, pastries, savory and sweet snacks, ice cream, and candy). With respect to cartoon programs, which generally had the highest appearance of food and beverage cues in comparison to other genres, 52.0% of all food appearances were energy-dense and nutrient poor food products. The highest percentage of unhealthy food cues was found in animation programs with 68.2%, which had the second highest score of all food and brand appearances together.

Olafsdottir and Berg (2016) examined 287 program sections of 24.45 hours of a popular children's television show in Sweden and coded 773 food appearances, which were categorized into 23 food groups. Findings showed that fruit and berries (21%) and vegetables (18%) were the most frequent food groups, followed by the food categories of coffee and tea (8%), cookies and pastry (7%), and bread and cereals (6%). In the next step, the authors differentiated between high-calorie and low-nutrient food as well as fruit and vegetables to draw a conclusion about their appearing differences. High-calorie low-nutrient food made up 18.6%, whereas fruit and vegetables together accounted for 39.3%. According to Scully et al. (2015), there is one more noticeable finding concerned program section—89% of high-calorie low-nutrient food and 62.5% of fruit and vegetables appeared in films and cartoons. In contrast, 11% of the high-calorie low-nutrient food products and 37.5% of fruits and vegetables were shown in studio.

Li et al. (2016) investigated the nature of food advertisements of 56 hours of material of China Central Television children's channel programs and included television ads as well as food references (the latter within the first 30 minutes of one recorded television program). In traditional television commercials, unhealthy food (e.g. unhealthy beverages, snacks, desserts, fast food, sweets) made up 86.2%, whereas the rest of the food adverts promoted healthy food (e.g. dairy, baby food). Unhealthy beverages were the most advertised unhealthy food products, followed by snacks (e.g. savory food and bubble gum) and desserts. On the contrary, in the food environment of editorial content, healthy food (i.e. fruit and vegetables) made up of 74.2%—the largest proportion of all eatable products shown in the program. Desserts were the most commonly appearing unhealthy food product type, amounting to 5.3%.

With regard to the devotion to children movies, an elaborate study by Sutherland et al. (2010) investigated 200 movies that represented the top 20 per year from 1996 to 2005, and provided a comprehensive analysis of the prevalence of food and beverage brands in movies aimed at children. The authors identified 1,180 brand placements, of which 427 were food brands, 425 beverage brands, and the rest food retail establishment brands. With respect to the brand distribution by food type, candy and confections made up 26%, salty snack food products 22%, and sweet snacks and desserts 12%, which represented the top three types of food placements. Finally, six companies (i.e. PepsiCo, Coca-Cola, Nestle, McDonald's, Dr Pepper Snapple, and Burger King) constituted 45% of all brand placements and represented the dominance of sugar-sweetened beverages with 76% of all beverage brands and of fast food with 62% of all rest food retail establishment brands.

Throop et al. (2014) examined a smaller sample of movies, including the four top-grossing children movies released annually from 2006 to 2010. For each of the 20 movies, the authors assessed the prevalence of nutrition behaviors that formed key elements of obesogenic lifestyles and included food groups by type, like unhealthy snacks, fast food, or sugar-sweetened beverages. The results showed that 26.9% of all coding segments depicted unhealthy snacks and 9.8% depicted sugar-sweetened beverages, whereas 2.1% portrayed fast food. Apart from the prevalence of unhealthy food cues themselves, branded food products were less prevalent and occurred in 6.7% of all segments.

Altogether, previous as well as recent research showed that children are indeed exposed to high volumes of *unhealthy* food advertising. This circumstance has been demonstrated in both traditional television ads and even in media content itself. The latter constitutes non-traditional forms of food advertising (i.e. food placements) and mainly occurs in cartoon and animation programs (Olafsdottir & Berg, 2016; Scully et al., 2015) as well as in films within television programs (Olafsdottir & Berg, 2016) or in films displayed in theaters (Sutherland et al., 2010).

2.2. Representation of promoted food products

Apart from analyzing the types of food products to which children are exposed, certain content analyses have also focused on the representation styles of these food products (Lewis & Hill, 1998; Li et al., 2017; Olafsdottir & Berg, 2016; Radnitz et al., 2009; Throop et al., 2014).

Lewis and Hill (1998) also collected data on themes, the presence of main and additional characters, and the appeal used. In comparison to non-food advertisements, food advertisements showed a significantly greater use of animated main characters, humor-orientated themes, and story formats, as well as significantly higher promotion of fun, happiness, and mood alteration. This demonstrates that even the nature of traditional television advertising aimed at children has changed (Nairn & Fine, 2008).

Furthermore, Radnitz et al. (2009) studied the eating habits of television characters and found 137 incidents in which characters were shown eating unhealthy food. In contrast, 78 incidents for healthy food consumption were observed. In addition, there were significantly higher ratings for excessive consumption (i.e. a large amount of food eaten by a character in a short period of time), and of unhealthy rather than healthy food cues. The same pattern was observed for valuing—enthusiastic endorsements were significantly higher for unhealthy food cues. On the whole, higher endorsement and more valuation than negative consequences were found in the depiction of unhealthy food products.

Throop et al. (2014) additionally focused on the stigma against overweight and underweight people and their prevalence in 20 children movies. In all, 24.9% of all segments incorporated weight-related stigma, in which most of the indices included stigma against overweight people (23.3%). The authors also investigated if and how often the size of food portions was represented in exaggeration, and found that 13.5% of all segments showed overstated portion sizes.

Olafsdottir and Berg (2016) also examined how and with whom food products were represented, and compared unhealthy (i.e. high-calorie and low-nutrient food) and healthy (fruit and vegetables) food products in this context. Even though fruit and vegetables made up the most frequent group of all food appearances, they were more frequently shown in the background in comparison to unhealthy food products. There was also a significant difference between these two groups in regard to whom (i.e. children or adults) they were displayed with together—most of the unhealthy food was shown with children (51.5%) rather than with adults, whereas healthy food was particularly presented with adults (69.8%). "HCLN [author note: high-calorie and low-nutrient] foods were proportionally more often presented in active situations, e.g. eating, compared with the other food groups. Fruits and vegetables were more frequently shown in passive situations and more often visual than verbal, e.g. as fruit bowls in the background" (p. 487).

Li et al. (2016) collected data about the appeal used and of the presence of promotional characters in television ads aimed at children as well as the integration of food references within television programs (background versus foreground motives). The authors reported that the three most frequently used advertising appeals for unhealthy food were emotional appeals that communicate fun and happiness (that is in line with the findings for food advertisements in general by Lewis and Hill, 1998), brand equity characters, and nutritional claims. Furthermore, fruit and vegetables made up most of all food references and were for the most part only visible (and not verbal) in the foreground as well as in the background, though the background appearances slightly dominated. Although unhealthy food products appeared in a considerably lower amount, they were more likely to be shown in the foreground. The visual food references of desserts were particularly positioned prominently.

2.3. A side note to the topic: modeling observed behavior of television characters

Taking into consideration the findings that in comparison to healthy food, unhealthy food cues are often shown in active situations (Olafsdottir & Berg, 2016) and get higher enthusiastic endorsements (Radnitz et al., 2009), Roseman et al. (2014) argued the following: “Children can develop strong connections to television characters, so seeing these characters show enthusiasm for certain food items could arguably have more influence than food advertising” (p. 21). Based on the social learning theory of Bandura (1977), which states that children’s liking or admiration of an individual increases the likelihood of children’s imitation of that individual, several studies have examined the impact of modeling on children’s food preferences and food intake (Roseman et al., 2014).

For instance, Hendy and Raudenbush (2000) found that enthusiastic teacher modeling can increase new food acceptance. Preschool children were exposed to enthusiastic teacher modeling together with the presentation of two food products across five meals. In comparison to the control group, which had a simple exposure, children with exposure to enthusiastic teacher modeling showed significantly more interest in the new food.

This pattern may also be true for modeling of television characters and their enthusiasm for certain food products (Roseman et al., 2014). Kraak and Story (2015) did a systematic review of empirical studies for the time period 2000–2014, which examined the influence of mostly familiar, but also of unknown, media characters on children. Their conclusion had two different aspects. On the one hand, the use of familiar media character branding is more powerful than the use of unknown characters. This is especially true for the promotion of unhealthy food products like cookies, candies, or chocolate and less true for healthy food products like fruits or vegetables. However, on the other hand, compared to no character branding at all, the use of cartoon media characters can have a positive impact on children’s fruit and vegetable intake.

A study by Tapper, Horne, and Fergus (2003) is worth mentioning as it supports the latter conclusion of Kraak and Story (2015), in which they investigated children’s exposure to healthy eating patterns demonstrated by television characters and its subsequent impact on children’s consumption of healthy food products. The authors created a “Food Dude” program and carried it out in schools (one experimental school that received the full program and one control school that merely received additional fruit and vegetables for the duration of the study). The “Food Dude” program included a video that treated a group of four children, the so-called “Food Dudes,” who eat a variety of fruits and vegetables and consequently gain superpowers. In comparison to the control school, the experimental school demonstrated a significant increase in fruit and vegetable intake.

However, apart from Tapper et al. (2003), who also included in their program different rewards (e.g. “Food Dudes” merchandise like stickers) which certainly reinforced the modeling effect (Zipfel, 2009), it must be noted that individuals in general perceive the behavioral actions of others and subsequently direct their own behavior to the observed behavior (Bloesch, Davoli, Roth, Brockmole, & Abrams, 2012). With respect to the embedment of food cues within children’s television programs, it can be consequently argued that “watching a character carrying and consuming a product may thus lead to second-hand learning, which, in turn, increases the perceived value of the product” (Naderer, Matthes, Marquart, & Mayrhofer, 2016). Different integration styles of food placements and their impact on children are also discussed in the third chapter.

Finally, as the presented studies provide evidence for different countries (i.e. USA, UK, Ireland, Sweden, Australia, China), the intensive advertisement of unhealthy eatable products and their conspicuous presentation to the youth audience—apart from the findings of Li et al. (2016) for children’s programs in China, which are in line with results of western countries only in some aspects—are a phenomenon that appears in several countries worldwide. This assertion is supported in a study by Kelly et al. (2010) in which each of 13 independent research groups in 11 countries analyzed 192 hours of television broadcasting of the three channels most popular with children. The findings are as follows:

> “For all countries, the majority of food advertisements were for noncore foods (67%). Germany had the highest proportion of noncore food advertisements [...] The most frequently advertised food groups were fast-food restaurant meals (12% of food advertisements), chocolate and confectionery (12%), low-fat dairy products (9%), high-fat, high-sugar, or high-salt spreads and sauces (8%), and full-fat dairy products […]” (p. 1731).

The authors concluded that the absolute frequency of this advertising varies by country, but the marketing of unhealthy food products can be seen as a consistent aim. Hence, this situation gives rise to health-related questions about their impact on children. The effects of food promotion on children are discussed in the following chapter.

3. Effects of food advertising on children

Regarding the effects of food advertising on children's eating behavior, the *reactivity to embedded food cues in advertising model* (REFCAM) by the authors Folkvord, Anschütz, Boyland, Kelly, and Buijzen (2016)—one of the most recent models—yields a new theoretical framework. The model consolidates theoretical and empirical insights into three foundational assumptions:

> "First, it assumes a two-step process, where (1) food cues induce physiological and psychological reactivity to food (advertising effect process), which (2) leads to a reciprocal relationship with eating behavior (incentive-sensitization process). Second, message factors […] of food cues, influence their effect, because the message and its media context influence the level of elaboration. Third, individual dispositional factors determine susceptibility to food cues in advertisements" (p. 28).

By considering that children are indeed frequently exposed to food cues through food advertising, the *cue-reactivity theory* (see Jansen, 1998) is an important theoretical explanation of how individuals react physiologically (e.g. increased heart rate) and psychologically (e.g. increased thoughts about food products) to advertised food cues (Folkvord et al., 2016). The cue reactivity model declares that "[…] cues which reliably signal food intake, such as the sight, smell and taste of food, may start to act as conditioned stimuli which trigger cue reactivity or conditioned responses" (Jansen, 1998, p. 269).

The REFCAM model of Folkvord et al. (2016) is also based on two communication processing models—*the processing of commercialized media content (PCMC) model* (Buijzen et al., 2010) and *the differential susceptibility to media effects model (DSMM)* (Valkenburg & Peter, 2013), which should first be presented to better understand how food cues in advertising can be differently processed. Hence, several empirical findings are given below. According to the authors Balasubramanian, Karrh, and Patwardhan (2006), who stated that the exposure to product placements can lead to (I) cognitive, (II) affective, or (III) conative responses of the audience, results of certain impact studies will be subdivided into three possible responses to make an overview of present research. Cognitive outcomes include recognition or recall of placements, whereas brand ratings or brand attitudes are considered as affective outcomes. In contrast, conative responses involve behavioral outcomes like brand choices or brand usage behavior (Balasubramanian et al., 2006). It must be noted that in some cases, responses can be related. For instance, identification with a story character is classified by Balasubraminan et al. (2006) as an affective effect. However, whether or not an imitation occurs, a character identification can possibly also lead to conative responses (see Chapter 2.3). For the presentation of impact studies, the division into these three levels intends to provide a structured overview. The aforementioned two communication processing models are presented first.

3.1. A processing model for commercial media content

Buijzen et al. (2010) first emphasized that there are three different types of integration between a persuasive message and its context:

> "Format integration refers to the level of integration between the message format and the editorial context […]. Thematic integration refers to the conceptual fit or congruence between the persuasive message and its context […]. Finally, narrative integration refers to the semantic or conceptual relevance of the persuasive message within the narrative of the surrounding media context […]" (p. 427–428).

The investigative framework for young people's PCMC mainly addresses a model of children's persuasion processing and focuses on how children process persuasive messages with respect to changes in media environment of the young audience from traditional advertising to nontraditional advertising, like new media technologies. Based on adult persuasion models, the authors first differentiated between three levels of processing—*systematic*, *heuristic*, and *automatic* persuasion processing.

The characteristics of the systematic persuasion processing include high attention to and awareness of the persuasive message, high motivation, and ability to process all available information. Furthermore, two levels of systematic processing can be distinguished. While critical systematic processing appears at the most elaborate level, where the recipient is aware of the persuasive intent of a message, noncritical systematic processing occurs at a less elaborate level, where the recipient is not aware of the persuasive intent.

Heuristic and automatic processing are characterized as follows: "Compared with the systematic process, [author note: in heuristic persuasion processing] the recipient uses merely moderate to low levels of message attention and awareness, and a low motivation and ability to process the message. […] automatic persuasion processing is characterized by a minimal level of cognitive elaboration" (p. 430–431).

With respect to children's development in a cognitive, social, and personality-related way—in particularly to their persuasion knowledge dependent on their current phase of development—the authors conclude that the triple-process model may be a useful device to predict the processing of persuasive messages by young people, though it cannot be applied in a straight manner. The authors also argue that young people are particularly sensitive to a less elaborate processing mechanism (i.e. heuristic or automatic processing), because of developmental changes in childhood, which may inhibit rational systematic processing. Furthermore, Buijzen et al. (2010) state that cognitive resources are not inevitably linked to elaboration and argue: "It is conceivable that resources are allocated, for example, in response to an attention-grabbing stimulus, but that the information is not processed further because attention is not maintained" (p. 435). Hence, to explain the link between the persuasive message, cognitive elaboration, and resource allocation, the authors also list the resources required by the message and conclude that a recipient only uses the resources that are required to process it when allocating a certain amount of resources to the message. Buijzen et al. (2010) have combined these conclusions and assembled a framework that can be applied to integrated commercial media content, by regarding four processing situations determined by the ratio of resources allocated (RA) to resources required (RR), regarding either the persuasive message itself as primary task or the context of the persuasive message as primary task and the persuasive message itself as the secondary task (see Table 1).

Table 1. Four processing situations determined by the ratio of resources allocated (RA) to resources required (RR) by the persuasive message itself and the context of the persuasive message, as given by Buijzen et al. (2010), modified

Processing situations by RA, RR and message elaboration			**Examples**
Situation 1: RA to persuasive message: low RR by persuasive message: low message elaboration: no or low	⇨ ⇨ ⇨ ⇨	no or automatic processing	subtle simple logo in the background of a program scene
Situation 2: RA to persuasive message: high RR by persuasive message: low message elaboration: moderate	⇨ ⇨ ⇨ ⇨	heuristic or noncritical systematic processing	prominent placement that is used by a movie character
Situation 3: RA to persuasive message: high RR by persuasive message: high message elaboration: high	⇨ ⇨ ⇨ ⇨	critical systematic processing	very prominent placement that plays a role in the program story
Situation 4: RA to persuasive message: low RR by persuasive message: high cognitive overload	⇨ ⇨ ⇨ ⇨	automatic or heuristic processing	too high complexity as a characteristic of a message

Table 1. *(continued)* Four processing situations determined by the ratio of resources allocated (RA) to resources required (RR) by the persuasive message itself and the context of the persuasive message, as given by Buijzen et al. (2010), modified

Processing situations by RA, RR and elaboration of context		**Examples**
Situation 1: ⇨ RA to context: low ⇨ RR by the context: low ⇨ elaboration of context: no or low ⇨ *amount of resources available for* ⇨ *RA to persuasive message: low* ⇨	1. no or automatic processing 4. automatic or heuristic processing …depending on the RR by the persuasive message	low-involvement media e.g. television entertainment
Situation 2: ⇨ RA to context: high ⇨ RR by the context: low ⇨ elaboration of context: moderate ⇨ *amount of resources available for* ⇨ *RA to persuasive message: high* ⇨	2. heuristic processing 3. systematic processing …depending on the RR by the persuasive message	brand placements in video games and differences of experience
Situation 3: ⇨ RA to context: high ⇨ RR by the context: high ⇨ elaboration of context: high ⇨ *amount of resources available for* ⇨ *RA to persuasive message: low* ⇨	1. no or automatic processing 4. automatic or heuristic processing …depending on the RR by the persuasive message	highly immersive first-person shooting game
Situation 4: ⇨ RA to context: low ⇨ RR by the context: high ⇨ cognitive overload ⇨ *amount of resources available for* ⇨ *RA to persuasive message: low* ⇨	1. no or automatic processing 4. automatic or heuristic processing …depending on the amount of RA to the primary task	too high complexity of TV programming

For example, when regarding the persuasive message as the primary task, the first situation indicates that processing of a subtle and simple logo in the background of a program scene is characterized by low resources allocated to and required by the persuasive message. Therefore, message elaboration seems to be relatively low. This leads to no or automatic processing. However, when regarding the context of the persuasive message as the primary and the persuasive message itself as the secondary task, the first situation of low-involvement media is one example that evokes low persuasive processing. While viewing television entertainment, resources allocated to as well as required by the context are relatively low, whereby low resources will also be available for the persuasive message. Thus, depending on the resources required by the persuasive message, this will result in Situation 1 (i.e. no or automatic processing) or Situation 4 (i.e. automatic or heuristic processing) of the aforementioned four situations, where the persuasive message itself comprises the primary task.

3.2. Differential susceptibility to media effects model

Based on earlier and recent (individual-level) media-effects theories, Valkenburg and Peter (2013) constructed the DSMM to explain the particular susceptibility of some individuals to media effects (i.e. *what* kind of individuals are more susceptible and *how* and *why* they get influenced by media use) and to provide evidence about the enhancement or reduction of media effects. To do so, the authors attempted to integrate propositions of the *social cognitive theory* of Bandura, because in contrast to other media effects theories, it includes all five features of media effects theories—conditional media effects, three types of indirect effects (i.e. media use, media response states, and media effects on itself as mediators), and transactional media effects. Additionally, Valkenburg and Peter (2013) recognized a lack of consensus among some media-effects theories and their different notions about the role of and relationship among non-media variables (e.g. individual differences or social context variables) and media variables (e.g. media response variables like identification with characters). For instance, the latter were either considered as mediators or moderators between the media use and media effects. Hence, the DSMM aims to clarify this lack of consensus by integrating four related propositions that highlight the relationship among these variables.

The first proposition takes notice of conditional media effects and their dependence on dispositional, developmental and social differential-susceptibility variables:

> "Dispositional susceptibility is defined as all person dimensions that predispose the selection of and responsiveness to media […] Developmental susceptibility is defined as the selective use of, and responsiveness to, media due to cognitive, emotional, and social development. […] Social susceptibility is defined as all social-context factors that can influence an individual's selective use of and responsiveness to media" (p. 226–227).

The second proposition includes indirect media effects and three media response states—*cognitive* (e.g. investment of cognitive effort toward motivations of characters), *emotional* (e.g. affective reactions to characters), and *excitative* (e.g. the activation of the sympathetic nervous system) responses. In regard to the relationship between media use and media effects, these three media response states have a mediatory role, because their origination was attributed to media use by the authors. Additionally, it is assumed that these three media response states should be viewed distinctly in a phenomenological way, even though they are not distinct in an ontological view.

The third proposition refers to the predictor and moderator roles of the differential-susceptibility variables presented in the first proposition. "First, they all predict media use

[...]. Second, they all stimulate or reduce media effects. This happens through their moderating influence on the effect of media use on media response states" (p. 231).

Finally, the fourth proposition states that media effects are transactional and therefore have an impact (i.e. a reciprocal causal effect) on media use, but also on media response states (second proposition) and differential-susceptibility variables (first and third proposition).

Hence, after explicating two communication processing models, which should be considered by interpreting the effectiveness of food advertising in children, recent research proving children's *cognitive* (e.g. Arredondo, Castenada, Elder, Sylmen, & Dozier, 2009; Auty & Lewis, 2004; Hudson & Elliott, 2013; Matthes & Naderer, 2015; Uribe & Fuentes-Garcia, 2015), *affective* (e.g. Boyland, Kavanagh-Safran, & Halford, 2015; Charry, 2014; Dixon, Scully, Wakefield, Whiter, & Crawford, 2007; Matthes & Naderer, 2015; Naderer et al., 2016; Uribe & Fuentes-Garcia, 2015), and *conative* (e.g. Arendt et al., 2015; Auty & Lewis, 2004; Boyland et al., 2015; Brown et al., 2017; Charry, 2014; Halford et al., 2008; Harris, Bargh, & Brownell, 2009; Matthes & Naderer, 2015; Naderer et al., 2016; Uribe & Fuentes-Garcia, 2015) responses to food advertising are presented in the next three chapters. These studies address either traditional advertising forms like television ads (Arendt et al., 2015; Boyland et al., 2015; Dixon et al., 2007; Halford et al., 2008; Harris et al., 2009; Uribe & Fuentes-Garcia, 2015) or non-traditional advertising practices like food placements, i.e. food brand appearances as well as food cues themselves (Arredondo et al., 2009; Auty & Lewis, 2004; Brown et al. 2017; Charry, 2014; Hudson & Elliott, 2013; Matthes & Naderer, 2015; Naderer et al., 2016; Uribe & Fuentes-Garcia, 2015). Certain studies furthermore considered placements effects, such as the impact of integration type (Naderer et al., 2016) or modality of placements (Charry, 2014). The findings of these studies are listed chronologically, yielding the most recent analysis.

3.3. Children's cognitive responses to food advertising

Regarding children's cognitive responses to food advertising, impact studies in particular refer to recall measures (Auty & Lewis, 2004; Hudson & Elliott, 2013; Matthes & Naderer, 2015; Uribe & Fuentes-Garcia, 2015), though memory-related measures like recognition are also used (Arredondo et al., 2009; Hudson & Elliott, 2013).

Auty and Lewis (2004) tested the mediating factor of cognitive ability on recall after the exposure to a branded film clip from the movie "Home Alone." The majority of both younger and older children were able to recall the soft drink Pepsi that was promoted in the movie. However, repeated exposure to the movie contributed to the ability to recall among younger children.

Arredondo et al. (2009) tested children's recognition of food logos through a logo-matching procedure with 11 brand logo cards depicting either unhealthy (i.e. fast food chains like McDonald's, Domino's Pizza) or healthy (e.g. Yoplait, Chiquita) examples and their corresponding products (e.g. fast food, yogurt, fruits) on a game board. Results demonstrate that fast food logos were recognized correctly with a higher frequency by participants compared to other (i.e. healthy) food logos. Additionally, in contrast to children with normal weight, overweight children were more likely to recognize logos of fast food providers compared to other food logos. The authors conclude that these findings may reflect children's greater exposure to fast food advertisements.

Furthermore, Hudson and Elliott (2013) conclude from their study that after exposure to brand appearances of unhealthy (e.g. Pepsi, Reese's Pieces, Frito-Lay Cheetos) or healthier (e.g. Milk 2 Go, Black Diamond Cheestrings, Dole fruit cops) food products respectively within the segments of "Pop idol," children's unaided recall was especially strong for the unhealthy food products. In terms of aided recall, among participants who saw the unhealthy segment, most recognized Pepsi, followed by Frito-Lay Cheetos and Fruit Gushers, whereas of the children who were allocated to the healthier segment, most recognized Milk 2 Go, followed by Yoplait tubes and Cheestrings.

Matthes and Naderer (2015) carried out a manipulation check of the various placement frequencies that have been created to test affective (see Chapter 3.4) and conative responses (see Chapter 3.5) to food placements within children's movies by controlling product recall. The authors found significant differences in the two treatments groups; children in the moderate-frequency condition (verbal and visual placements) were less likely to recall the branded product as opposed to children in the high-frequency condition (additional reinforcement of placements through a song about the target product). In addition, prior exposure to the movie increased product recall.

Uribe and Fuentes-Garcia (2015) investigated children's cognitive responses after being exposed to product placements of the fast food brand McDonald's in a film scene from the movie "Richie Rich" by using a top-of-the-mind brand recall. In contrast to the control group, which included no food brand appearances at all, children of the experimental group showed a significant increase in brand awareness. Another experimental group included two kinds of food advertising—besides food placements, children were additionally confronted with television ads of the fast food brand McDonald's. In comparison to the experimental group, which was only exposed to product placements, the synergic condition with both kinds of food promotion showed significant increase in brand awareness.

3.4. Children's affective responses to food advertising

Some studies proved affective outcomes of exposure to food advertising in the form of food attitude and food liking (Boyland et al., 2015; Charry, 2014; Dixon et al., 2007). In contrast, some studies could not prove children's affective responses after being exposed to unhealthy food ads (Uribe & Fuentes-Garcia, 2015), unhealthy food brand placements (Matthes & Naderer, 2015; Naderer et al., 2016; Uribe & Fuentes-Garcia, 2015), or a combination of the two advertisements styles (Uribe & Fuentes-Garcia, 2015).

Dixon et al. (2007) tested children's food attitude before and after an advertising experiment by asking them how they would classify (e.g. boring/fun, yucky/yummy) certain healthy food products (e.g. fruits and vegetables) and junk food products (e.g. chocolate, fast food). In the advertising experiment, participants were exposed to ads that promoted either junk food products, or healthy food products, or both food types (i.e. unhealthy and healthy), or to no food ads at all. While the exposure to junk food ads did not lead to enhanced attitude toward unhealthy food products, the exposure to healthy food ads did have a positive impact on attitude to healthy food products. Additionally, children who viewed a combination of junk and healthy food ads had more negative attitude toward vegetables.

Moreover, Charry (2014) examined the modality of healthy food placement and its effect on pre-adolescent attitudes. Participants were exposed to one of two different videos of a popular French television show. Videos included either visual (a scene picturing a plate of fruits on the table while one character was eating an apple) or audio-visual placements (a scene where a character asked for help while preparing carrots for a meal). The author found greater positive effectiveness of the latter scene on attitudes toward fruit and vegetables, i.e. toward the food products that were audio-visually promoted in the video.

In the study by Boyland et al. (2015) children took part in an experiment featuring two conditions with a week interval in between, which on the one hand included non-food ads and on the other hand ads of a fast food meal bundle aimed at children, both times embedded in a cartoon in the form of commercial breaks. After viewing the cartoon and the television advertisements, children were asked how much they like the food from McDonald's and fast food in general. While participants' rating of McDonald's food products showed no significant differences between the experimental group and the control group, children who viewed the food adverts of McDonald's demonstrated more attraction toward fast food products in general.

3.5. Children's conative responses to food advertising

Impact studies also provided empirical evidence of children's conative responses after being exposed to food advertising, such as behavioral intentions (Boyland et al., 2015; Charry, 2014; Uribe & Funtes-Garcia, 2015) or actual behavior (Arendt et al., 2015; Auty & Lewis, 2004; Brown et al., 2017; Halford et al., 2008; Harris et al., 2009; Matthes & Naderer, 2015; Naderer et al., 2016).

With respect to children's conative responses to food placements, the study by Auty and Lewis (2004) is a pioneering work in this area. The authors tested children's actual behavioral outcomes after being exposed to either product placements of the brand Pepsi or to no product placements at all in a film clip of the movie "Home alone," by offering them two choices of soft drinks (Pepsi and Coke) straight afterwards. Participants of the treatment condition were significantly more likely to choose the advertised brand, i.e. Pepsi, than participants of the control group. Additionally, prior exposure had an impact on brand choice; for those children who had seen the film before, there were significant differences of brand choice between participants of the treatment condition and of the control group. The authors also reported that explicit memory (see Chapter 3.3) did not directly affect choice, because results showed no differences in terms of brand choice between children who recalled the brand correctly or incorrectly.

Halford et al. (2008) proved children's conative outcomes after being shown a cartoon, which was followed by toy adverts (control group) or food ads (including unhealthy snacks like chocolate bar or sweets) in the form of food selection and intake. Participants could choose between five different food products. The authors classified three of the offered food products (chocolate, jelly sweets, and crisps) as high-energy-dense. Findings indicated that children who viewed the food ads demonstrated a significantly higher total energy intake as well as a greater intake of high-energy-dense food products than participants who saw the non-food ads. In particular, overweight and obese children showed a significantly higher intake in comparison to participants with a healthy weight.

Furthermore, Harris et al. (2009) let children view an episode of "Disney's Recess," including an advertisement either of unhealthy food products (e.g. fruit roll-ups, potato chips) or with no food featured; the children were offered a snack during the course of the cartoon that was not promoted in the advertisement. The experiment showed that children who saw food advertisements ate significantly more of Goldfish crackers while watching, as opposed to participants who did not see advertised eatable products at all. The volume of consumed snacks was only predicted by the individual liking of the offered snack, i.e. Goldfish crackers.

Besides investigating affective outcomes (see Chapter 3.4), Charry (2014) also tested the effect of healthy food placements on children's snack choice by offering a list of ten snack options that included two healthy options. Participants who viewed an audio-visual condition of healthy food products chose significantly more healthy snacks in comparison to pre-adolescents who viewed a visual condition.

Arendt et al. (2015) examined the impact of food television commercials on children's brand choice. Participants viewed an episode of "Tom & Jerry" with commercial breaks. The control group included two non-food-related commercials and the treatment group contained further one more commercial of a chocolate candy brand (kinder Schoko-Bons). After watching the episode with the commercial breaks, the children could choose between three options. Besides offering the advertised brand, two comparable sweets brands were available (that were Nimm 2 and Raffaello). There was empirical evidence that children of the treatment condition chose the advertised brand significantly more often in comparison to participants of the control condition. In addition, the authors manipulated the temporal delay between children's exposure and brand choice. The authors demonstrated that the behavioral effect faded with time, i.e. conative responses mostly appeared at low temporal delay levels.

Moreover, Matthes and Naderer (2015) investigated children's cognitive (see Chapter 3.3), affective (see Chapter 3.4), and conative responses to food product placements. The procedure, based on Auty and Lewis (2004), carried out a subsequent implicit test of preference immediately after the exposure to an entertainment movie. Participants saw an excerpt of the movie "Alvin and the Chipmunks" and were randomized to either a treatment condition that involved product placements of the brand Utz Cheese Balls or a control condition. The authors created two different kinds of treatment groups (i.e. moderate-frequency and high-frequency conditions). While both treatments included verbal and visual placements, children in the high-frequency group also saw a scene where the characters sang a song about the target product. After being exposed to this, children could choose between three snacks—the advertised snack and two comparable cheese snacks. Analyses only showed a significantly positive effect on brand choice within the high-frequency experimental group. It is to be considered that although prior exposure to the movie generally led to a higher food intake of the target food product, it had no significant moderate influence on the effect of the current exposure on brand choice.

Besides examining cognitive (see Chapter 3.3) and affective (see Chapter 3.4) responses, Uribe and Fuentes-Garcia (2015) also researched children's conative responses after they viewed food advertisements of the fast food brand McDonald's. Apart from the participant's intention to select the shown brand by offering different fast food chain brands, the children's willingness to eat fast food was also studied by offering them different kinds of meal alternatives (e.g. rice and meat, chips, and hamburger). Results showed that children exposed to fast food brand appearances tended to eat significantly more fast food and were more interested to go to McDonald's. Both effects significantly increased when children were exposed to two promotional tools—product placements and commercial breaks of McDonald's. The authors concluded that traditional as well as untraditional advertising forms showed consistent behavioral effects, while the combination of the two tools was even more meaningful.

While Boyland et al. (2015) investigated affective responses to advertisements featuring unhealthy food (see Chapter 3.4), the authors also wanted to test hypothetical food choices when being exposed to non-food ads or ads of a fast food meal bundle aimed at children. The authors wanted to test whether the promotion of healthier food options in a "McDonald's Happy Meal" (i.e. fish fingers, fruit bag, and mineral water) affects children's snack choice. Participants could create their own "McDonald's Happy Meals" by choosing between different main food products (e.g. cheeseburger, fish fingers), side items (e.g. fruit bag, French fries), and beverages. While the two advert conditions demonstrated no significant differences in terms of nutritional content in the selection of the hypothetical menu tasks, children with a lower nutritional knowledge were more likely to create meals with a higher energy content after they watched the food adverts.

Naderer et al. (2016) examined, on the one hand, children's affective responses (see Chapter 3.4), and on the other hand the effectiveness of unhealthy food screen-placements (i.e. placements that are embedded in the background) and plot-placements (i.e. presenting a character-product interaction) within a self-made entertaining program on brand choice by offering three different salty snacks, i.e. the salty snack integrated in the cartoon Fritos and two alternatives. The main result was that children who saw the plot-placements tended to choose the target fast-food brand significantly more frequently as opposed to the participants who were in the screen-placement condition. Another notable result was that the frequency of placements did not affect brand choice, i.e. the brand chosen by the children was only dependent on the type of integration.

One of the latest studies of Brown et al. (2017) examined the influence of food product placements on children's snack choice by letting the participants watch a whole movie. Due to the frequency of unhealthy and branded food messages within the movie, children were exposed to either a high-dose movie ("Alvin and the Chipmunks," food on-screen time: 8 min 58 sec) or a low-dose movie ("Stuart Little," food on-screen time: 3 min 20 sec). After being exposed to one of them, children chose between two similar snack options five times (e.g. Utz Cheese Balls versus Cheetos Cheese Puffs, Lindor Chocolate Truffles versus Hershey's Chocolate Bar) and ate ad libitum in subsequent session groups. One of the five snack pair options was a healthy food, while the remaining were four rather unhealthier food products. The authors found that children exposed to the high-dose movie were significantly more likely to select Utz Cheese Balls, which were the most dominant snack in that movie. Prior exposure to the movie did not affect children's snack choice or ad libitum consumption.

Altogether, the studies listed above predominantly focused on the impact of the promotion of *unhealthy* food products. The dichotomy between unhealthy versus healthy advertised food products and the investigation of children's conative outcomes mainly received attention in quite a new form of advertising—the so-called "advergames" that promote food products via online games (Dias & Agante, 2011; Folkvord, Anschütz, Buijzen and Valkenburg, 2013).

Dias and Agante (2011) examined the influence of healthy (e.g. banana, lettuce, carrots) and unhealthy (e.g. potato chips, cookies, pizza) food placements respectively within advergames on children's intentional snack choice. After playing the advergame, participants could select six out of 12 snacks on two pictured cards, which contained two food products that were not promoted in the advergame. The findings showed that children mainly chose the same food products that were promoted; i.e. participants who played the healthy advergame selected more healthy food products in comparison to participants of the unhealthy advergame, who picked more unhealthy eatable products.

Similarly, Folkvord et al. (2013) tested the effect of playing a healthy (i.e. fruit promotion) or an unhealthy (i.e. energy-dense snack promotion) advergame. The authors used two more groups—an advergame with non-food product promotion and a control group. After playing one of these advergames, children could eat ad libitum from a choice of different kinds of energy-dense (jelly candy, milk-chocolate candy) and healthy (bananas, apples) food products. There was empirical evidence that children who played a food promoting advergame ate significantly more food compared to children who played a non-food promoting advergame. Additionally, when comparing the intake of unhealthy food products between the children of the unhealthy, healthy, and control conditions, results showed that more energy-dense snacks were eaten after playing the unhealthy *and* the healthy advergame in comparison to the control group. Hence, an unhealthy rather than a healthy food intake was the result of the fruit promotion within an advergame.

3.6. Explanation approaches for advertising effects

According to Zipfel (2009), different explanation approaches exist for advertising effects. One of them is the *social learning theory* given by Bandura (1977), which has already been mentioned in Chapter 2.3. Dixon et al. (2007) also relied on the social learning theory in their study, because they expected "[…] that children exposed to patterns of eating behaviour modeled as prevalent and favourable in TV food ads will adopt cognitions and behaviours supportive of such" (p. 1313).

Naderer et al. (2016) considered the social learning theory as an alternative explanation for their findings of behavioral outcomes (see Chapter 3.5), but also suggested a *mere-exposure effect* (see Zajonc, 1968) for possible attentional reactions that could not be detected in their study. The mere-exposure effect is based on the idea that the repeated presentation of a stimulus is sufficient for a more positive attitude toward the stimulus (Zipfel, 2009). It is assumed that the mere-exposure effect is most pronounced when using unknown and complex stimuli and when a short and inconspicuous presentation occurs. In this case, a parenthetical perception of the stimulus is of importance, because otherwise a more intensive examination of further information about the stimulus would take place and consequently would operate as a disturbance. Furthermore, Zipfel (2009) pointed out that too many performances may also lead to a negative rating. Based on current findings, 10 to 20 repetitions are regarded as the ideal frequency. Finally, an inconspicuous integration also implies that a placement should be varied only to a little extent to prevent reactance (Zipfel, 2009).

While Naderer et al. (2016) did not find an effect on children's brand evaluations that would speak for a mere-exposure effect (see Chapter 3.4), they also envisioned a mechanism that influences implicit attitudes, as children only showed an impulse to choose the placed brand. This leads to another existing explanation approach—the so-called *evaluative conditioning*, which implies that only the multiple common presentation of a neutral stimulus (i.e. the product) and an unconditioned, positive, or even negative stimulus (e.g. character) transfers the valence to the neutral stimulus (Zipfel, 2009). The effect constitutes a process that does not need to be aware of the recipient and requires less attention in terms of information processing; however, the multiple common presentation is a requirement in order for the effect to occur. This also indicates that "the paring of products with positive stimuli can effect implicit attitude change in the absence of explicit attitude change. Implicit consumer attitudes, in turn, can direct consumer choices even when they conflict with the individual's explicit consumer attitude in low-control situations" (Nairn & Fine, 2008, p. 458).

Additionally, several authors attributed their proven conative outcomes (see Chapter 3.5) of food advertising to a *priming* effect (Arendt et al., 2015; Auty & Lewis, 2004; Harris et al., 2009). Based on the basic psychological research, media-priming research occurs as a special form and consists of two temporary steps (Peter, 2002). In the first step, certain knowledge units get primed by information from the media and are made more accessible. These more accessible knowledge units will later be more likely to be activated than other knowledge units that are less accessible. The second step characterizes the activation and use of these more accessible knowledge units by receiving, interpreting, or evaluating a subsequently encountered environmental information—the so-called target stimulus, which can also ultimately affect behavior. Most importantly, more accessible knowledge units can only be activated if they are applicable to the subsequently encountered environmental information. This depends on an overlap of characteristics, i.e. an individual's attention will be attracted when the characteristics of the more accessible knowledge unit strongly overlaps with the characteristics of the target stimulus. Furthermore, in order for a product characteristic to be shaped in the perception of the recipient, a more frequent stimulus presentation is required, preferably in the same form (Zipfel, 2009). Arendt et al. (2015) moreover provided empirical evidence for the theoretical consideration that priming effects are time-bound, as in their experiment, the behavioral effect of the children after the exposure to food advertising was not observed after a few minutes and therefore faded with time.

Priming can affect behavioral reactions even more when an individual demonstrates motivational behavior when the primed concept occurs (van der Laan et al., 2017). "Specifically, external cues (e.g. images of attractive food) can increase the mental accessibility of an associated goal (e.g. eating and enjoying tasty food), and motivate behavior to attain it […]" (van der Laan et al., 2017, p. 82). Van der Laan et al. (2017) argued that attentional mechanism may be responsible for behavioral responses to goal priming. Due to this assumption and the aforementioned fact that a successful overlap of the knowledge unit and the target stimulus leads to attention, an investigation of children's visual attention toward food advertising is required. Therefore, the following chapter lists the current research in this particular area.

4. Children's attention towards food advertising

Since many studies have examined the impact of food advertising immediately after exposure by researching children's cognitive, affective, and conative responses, the state of being exposed by paying attention to media content has also received research interest. As illustrated by the DSMM, participants differ in their processing and reaction to food cues in advertising (Valkenburg & Peter, 2013). Individual differences in visual attention toward food cues can be considered as one of the individual dispositional factors (Folkvord et al., 2016). Furthermore, Velazquez and Pasch (2014) considered that there is an empirical need to examine whether attention to unhealthy food advertising is a requirement for negative health outcomes, or whether exposure alone is enough to influence the youth audience. Thus, certain studies investigated the role of children's attention toward promoted food products with the help of objective attention measures assessed by an eye tracker (Folkvord et al., 2015; Ogle et al., 2017; Velazquez & Pasch, 2014). Again, studies are represented chronologically, yielding the latest analysis.

In the study by Velazquez and Pasch (2014), children and adolescents viewed a total of 40 static food and beverage advertisements, of which more than two-third represented unhealthy food advertisements. While viewing, each participant's attention was recorded and areas of interest (AOIs) were created to make a statement about fixation length and fixation count for unhealthy food and beverage products. The authors wanted to test the association between these attention indicators and self-reported food and beverage preferences and choices. Analyses showed that participant's fixation length and fixation count for unhealthy food and beverage products were positively associated with their unhealthy food and beverage preferences, whereas only a trend toward significance was found between children's fixation count for unhealthy food products and beverages and their unhealthy food and beverage choices. However, the positive association between children's greater attention toward unhealthy food products and beverages and their preferences for unhealthy food products and beverages was no longer present when controlling for gender, age, and BMI.

Furthermore, Folkvord et al. (2015) examined the effect of children's exposure to unhealthy food products in an advergame on actual food caloric intake and also took dispositional differential-susceptibly factors into account (Valkenburg & Peter, 2013). The authors explained individual susceptibility to food advertising through the amount of attention that children paid to food cues during exposure and tested its moderating role. Based on the *attentional bias theory* in addictive behavior (see Field & Cox, 2008), attentional bias for food cues denotes longer duration of gazing and a preferred attention toward food products (Folkvord et al., 2015). The authors randomized the children to either an advergame that included a popular candy brand and energy-dense snacks or an advergame without food products. While playing, eye movements were recorded. After playing the game, participants were allowed to eat ad libitum from two bowls of unhealthy snacks, of which one was promoted in the advergame. Children who played an advergame with food-related cues showed a significantly higher food intake in comparison to participants who played the advergame without food products. Moreover, the main observation in terms of children's attentional bias (high vs. low) was that children with a higher gaze duration for food cues were significantly more likely to eat more of the promoted snacks, compared to children with low attentional bias.

Ogle et al. (2017) concentrated on the impact of cartoon media characters on children's attention to food and beverage products. Participants were confronted with two products simultaneously and had to choose the food product that they would prefer to eat. The authors distinguished between more and less healthy products that were either shown alone or together with one of three familiar characters. This resulted in six possible combinations: (I) both food products (unhealthy and healthy) without a character, (II) both food products with a character, (III) one food product with and the other without a character, (IV) reverse, (V) only one food product with and without a character, and (VI) the same for the other food. The findings demonstrated that children significantly viewed food products longer when presented together with a character in comparison to food products without character representation. Furthermore, children significantly preferred unhealthy over healthy food products, both when characters were present and absent. Contrary to the expectations of the authors, participants did not demonstrate a preference for food products that appeared together with characters and did not prefer healthier food products with a character in comparison to unhealthier food products without a character.

Altogether, to the knowledge of the author, the particular studies presented above illustrate current research in regard to the examination of children's attention toward food advertising. With respect to visual attention toward unhealthy and healthy food products and to the consequential outcomes in the form of intentional food choices, the study of van der Laan et al. (2017) is also worth mentioning, although it was not children but young adults who participated in their study. While participants chose between high-energy food products (e.g. cookies, crisps) and low-energy food products (e.g. whole wheat bread, fruits) in an online supermarket choice test, eyes movements were recorded. The authors designed a health and diet prime condition: "[…] participants were primed during food choice with recipe banners that contained words related to health and dieting" (p. 84). Additionally, a control prime condition (recipe banners with words unrelated to health and dieting) and a no-prime condition were created. Results showed that participants in the health prime condition significantly chose more and looked longer at low-energy food products, compared to young adults of the control prime as well as no-prime condition. Furthermore, visual attention mediated the effect of health goal prime on food choice. The authors assumed a diet goal activation through the primed concept of dieting, which consequently steered the attention of the participants.

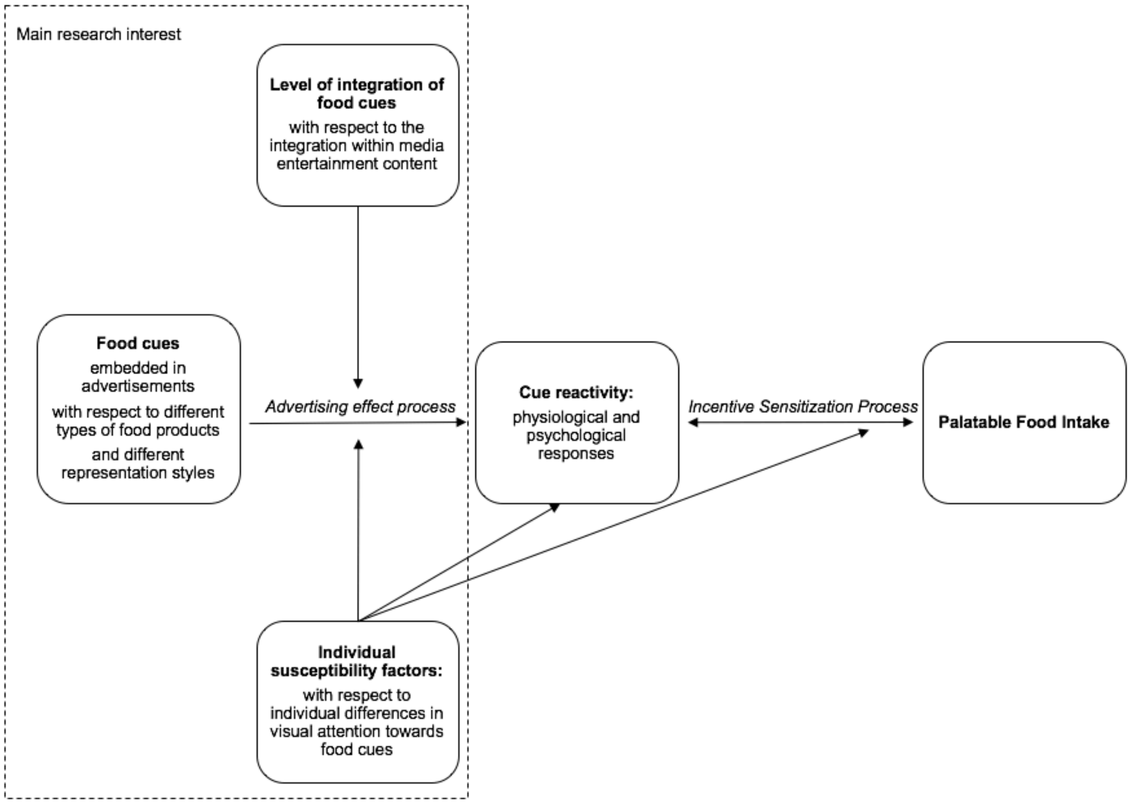
5. Research question and hypotheses

Based on the outlined research, it can be derived that different types of food products are promoted, both in television ads and through media content, and that unhealthy food products are well-represented in both traditional and non-traditional advertising forms (see Chapter 2.1). In addition, unhealthy food products are often shown in active situations, whereas healthy food products are frequently presented in a passive way (see Chapter 2.2). These different integration types of food placements are processed differently by children (see Chapter 3.1). However, individual differences in processing and reacting to food cues in advertising must be viewed as well (see Chapter 3.2). Many studies have examined children's exposure to food advertising and how it affects their cognitive (see Chapter 3.3), affective (see Chapter 3.4), and/or conative (see Chapter

3.5) outcomes, though with different emphases. Most studies have concentrated on children's exposure to traditional or non-traditional food advertising and its effect (i.e. cognitive, affective, and/or conative), while certain studies have furthermore considered placement effects, e.g. the impact of integration type (Naderer et al., 2016) or modality of placements (Charry, 2014). When interpreting the advertising effects, several explanation approaches must be differentiated (see Chapter 3.6). In addition, current research provides preliminary knowledge of "[…] whether exposure alone is enough to influence youth or whether attention must actually be paid to advertising for negative health outcomes" (Velazquez & Pasch, 2014, p. 578), by examining both children's attention toward food products in television ads (Velazquez & Pasch, 2014) and toward food placements within advergames (Folkvord et al., 2015) as well as the influence of cartoon media characters on children's attention toward food products (see Chapter 4). In the following chapter, the main research interest, the overarching research question, and the derived hypotheses of the present Master's thesis are presented.

Figure 1 visualizes the main research interest by modifying the REFCAM model given by Folkvord et al. (2016). The present study focuses on the advertising process of the two-step process (Folkvord et al., 2016) by regarding children's differences in visual attention, which can be defined as a dispositional differential-susceptibility factor (Folkvord et al., 2015; Valkenburg & Peter, 2013). Furthermore, the study takes into consideration the changes in young people's media environment (Buijzen et al., 2010) by inserting food cues within media entertainment content. Additionally, the REFCAM model also underlines the importance of the type of food placements (Folkvord et al., 2016). Therefore, the focus is on the current scientific consideration about the food-calorific value and its effects on children's eating habits (e.g. Dias & Agante, 2011). This is achieved by embedding unhealthy and healthy food cues to make a statement about children's actual visual attention to—or rather attentional bias for—these different eatable products. Finally, in regard to the different representation styles of food products (e.g. Olafsdottir & Berg, 2016), passive representation of food products and active patterns with a main character and their effects on children's visual attention are examined.

Figure 1. REFCAM model of Folkvord et al. (2016) to determine the main research interest of the present Master's thesis, modified



Since the interpretation of attention measures is not yet clearly clarified, two different premises exist, because it is not exactly clear whether indicators of attention should be considered as a set of dependent or independent variables (Geise, 2011). Therefore, Geise (2011) recommends interpreting the data through an interleaving of both analytic perspectives (pp. 66–67).

Hence, the present study primarily aims to examine children's visual attention toward unhealthy and healthy food cues in different levels of interaction (i.e. interaction with or without the main character) in media content. In terms of the interaction level, the present study is based on the assessment by Olafsdottir and Berg (2016), who differentiated between three forms of food-related representation styles: (I) passive representation (including backgrounded or explicit), (II) handle/crave, and (III) eat/drink. Considerations are verbalized as the overarching research question.

Overarching research question:

How much visual attention do children pay to a variety of unhealthy and healthy food cues within child-friendly media content and how does the visual attention differ between the food shown with (I) no interaction, (II) interaction, and (III) consumption, and is there a relation between the food-calorific value and the level of interaction of the food?

To examine these deliberations, the author holds the premise that visual attention is primarily dependent on certain stimuli, i.e. that the visual stimulus has an impact on gaze behavior (Geise, 2011).

Gaze behavior and the calorific value of the food cues

With respect to children as target audience of food advertising, the dichotomy between unhealthy and healthy food products has already been researched in scientific focus by for example examining the impact of exposure to unhealthy or healthy food products on eating habits in advergames (Dias & Agante, 2011). Nevertheless, to the knowledge of the author children's attention toward unhealthy and healthy food cues in media content has not yet been studied, but still toward mostly unhealthy food advertisements (Velazquez & Pasch, 2014) or toward unhealthy food products within an advergame (Folkvord et al., 2015).

Recent research has proved behavioral priming effects after children's exposure to food advertisements (Auty & Lewis, 2004; Arendt et al., 2013; Harris et al., 2009). However, the influence on behavior is the last (and certainly the most important) "instance," but primes can be also activated and used when an individual receives, interprets, or evaluates the subsequently encountered target stimulus (Peter, 2002). Therefore, it could be argued that actual child-friendly media content might prime the relevant memory traces of children and these knowledge units might get subsequently activated—or rather subsequently used—during exposure. As to the actual embedment of food products in children's media environment, unhealthy food cues are well-represented (e.g. Scully et al., 2015; Sutherland et al., 2010). Thus, it can be assumed that unhealthy food cues are more accessible knowledge units than healthy food cues and these more accessible knowledge units consequently are more likely to get activated and used during media entertainment reception. The author supposes that this activation or use can be detected by an increased attention toward unhealthy food cues.

Moreover, the assumption is based on empirical evidence. Castellanos et al. (2009) examined the visual attention of obese and normal-weight adults to food cue images.

The findings indicated that all participants (i.e. obese as well as normal-weight individuals) demonstrated higher gaze duration for high-calorie than low-calorie food products.

According to the theoretical considerations of a priming effect (Peter, 2002) and the existing empirical evidence of increased attention for adults toward high-caloric food pictures (Castellanos et al., 2009), the author assumes that children might tend to pay more as well as earlier visual attention toward unhealthy food cues than healthy ones, which are embedded in an example for television entertainment aimed at children. Therefore, the following hypothesis is established:

H_1: Children pay (a) more and (b) earlier attention to unhealthy rather than healthy food cues.

Gaze behavior and the level of interaction of the food cues

As food placements are embedded differently in media content (e.g. Olafsdottir & Berg, 2016), promoted food products can consequently be processed (Buijzen et al., 2010) and may influence (e.g. Naderer et al., 2016) in different ways. The PCMC model states that children allocate a lower amount of resources to a placement in the background than to a more prominent placement, i.e. use by a character (Buijzen et al., 2010). Furthermore, there are current empirical findings that children are more likely to view food products much longer when they are presented together with characters in comparison to food products that are presented without characters (Ogle et al., 2017).

Taking into consideration the theoretical foundations of the PCMC model, the findings about the higher impact of character-product interaction placements (Kamleitner & Jyote, 2013; Naderer et al., 2016), and the effectiveness of media characters in capturing attention (Ogle et al., 2017), the author assumes that children might pay more visual attention toward food cues that are shown together with a main character, irrespective of their calorific value. Therefore, participants might pay lower and delayed attention toward food cues that are not used interactively (first interaction level), while attention might increase when a main character handles a food product (second interaction level). Consequently, the highest and earliest visual attention score might gain food cues for food shown to be consumed by the main character (third interaction level). These assumptions are summarized in H_2.

H_2: The higher the level of interaction, the (a) more and (b) earlier attention to food cues will be paid by children.

Gaze behavior and the relationship between the calorific value as well as the level of interaction of the food cues

Van der Laan et al. (2017) concluded that "once an attentional bias for palatable food has been initiated, [...] it becomes increasingly difficult to direct attention away from palatable unhealthy foods" (p. 87). This triggered attentional bias is caused by the activation of an eating enjoyment goal through the exposure to environmental cues (see Papies, Stroebe, & Aarts, 2008). In regard to H_1, which assumes an increased and earlier attention toward unhealthy (more accessible knowledge units) rather than healthy food cues (less accessible knowledge units), it could be furthermore supposed that this initiated attentional bias might continuously activate the "eating enjoyment goal" (van der Laan et al., 2017) and maintain children's attention toward unhealthy food products.

Additionally, Ogle et al. (2017) found that children significantly tend to prefer unhealthy over healthy food products, both when characters are present and absent on both (i.e. unhealthy as well as healthy) food products. Considering Velazquez and Pasch (2014), who found a positive association between the fixation length for unhealthy food items and children's unhealthy food preferences, one might assume that the results of Ogle et al. (2017) in regard to children's food preferences could also be reflected in their visual attention toward food cues in media content; diverse unhealthy eatable products that are on the one hand shown without a character (first interaction level) and on the other hand together with a character who handles (second interaction level) or eats (third interaction level) these unhealthy food products, might in sum gain more attention than diverse healthy food products that are represented with the same character in the same three interaction levels.

Thus, according to the theoretical consideration of goal priming (Papies et al., 2008; van der Laan et al., 2017) and first empirical findings (Ogle et al., 2017), the present Master's thesis comes to the supposition that, in contrast to healthy food products, unhealthy food products might gain in sum increased attention in every level ofinteraction. H_3 is as follows:

H_3: Children pay (a) more and (b) earlier attention to unhealthy food cues than to healthy food cues in every level of interaction.

Another existing premise is that visual attention exhibits a requirement for subsequent outcomes, i.e. that gaze behavior has an impact on subsequent outcomes like recall or recognition (Geise, 2011).

Gaze behavior and explicit memory

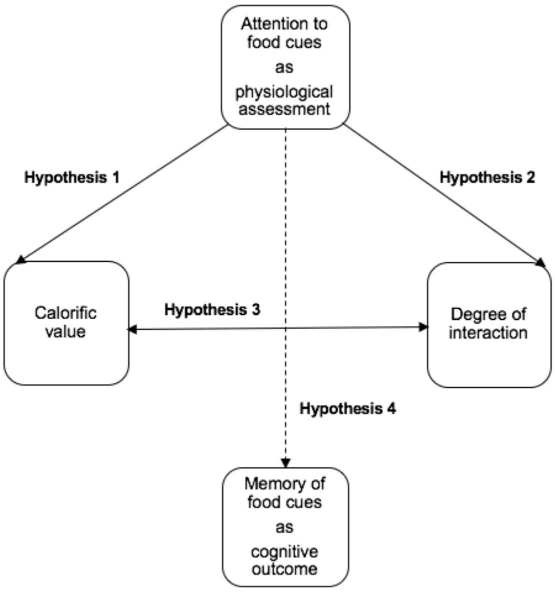
Fox, Krugman, Fletcher, and Fischer (1998) revealed that "eye movements during exposure provide a physiological assessment of attention that is linked directly to cognitive processing" (p. 60) There are also indications that—besides the frequency of product appearances in media content—the amount of time that adolescents dwell on products predicts recall (SensoMotoric Instruments, 2011).

H_3 refers to goal-activation through external cues. However, it must also be considered that a goal can also be activated through internal cues (e.g. hunger) and that active goal can additionally affect attentional mechanism (van der Laan et al., 2017). According to the DSMM given by Valkenburg and Peter (2013), attentional bias for food cues demonstrates one dispositional pre-existing factor that can stimulate media effects (Folkvord et al., 2016). Folkvord et al. (2015) found a significant relationship between higher attentional bias for unhealthy food cues and a higher intake of promoted unhealthy food products, in comparison to other unhealthy food products offered. One might argue that an increased attention toward goal-congruent food products increases the likelihood of being chosen and consequently affects food choice behavior (van der Laan et al., 2017). For instance, in one study, children who reported being hungry ate more of the advertised snacks (Folkvord et al., 2013).

Hence, the author also supposes an existing link between children's attention toward food cues and their subsequent explicit memory of those food cues used as stimulus, i.e. an increased attention for food cues will be considered as internally motivated behavior that consequently has an impact on cognitive media effects like recall or recognition. However, to the knowledge of the author, no study to this day has tried to link children's attentional differences toward unhealthy and healthy food cues in child-friendly media content with subsequent cognitive outcomes. To do so, the author poses H_4, as follows. Figure 2 gives a final overview of all proposed hypotheses.

H_4: There is a link between children's visual attention toward unhealthy and healthy food cues in child-friendly media content and the value of subsequently remembered food products in terms of (a) recall and (b) recognition.

Figure 2. Proposed hypotheses model



6. Method

This chapter reveals the methodological approach: the research design, the used stimulus material for the eye tracking session, the post-treatment interview, the pilot study, and the participants and the procedure.

6.1. Research design and stimulus material

The use of an eye tracker is a common method for examining children's attention toward food products (Folkvord et al., 2015; Ogle et al., 2017; Velazquez & Pasch, 2014). Visual communication research uses eye tracking as a methodological approach or methodological supplement to examine an individual's attention toward different advertising mechanism (Geise & Schumacher, 2011). Fox et al. (1998) highlighted the usefulness and advantages of eye tracking: "Eye tracking provides a moment-by-moment recording [...] and a record of what a subject looks at within the context [...] It is extremely useful in determining whether, and for how long, a subject actually looks at a feature of an ad" (p. 60).

An eye tracking study was conducted to provide information about the gaze behavior with respect to food cues within a manipulated picture story[2]. A within-subjects design was used. All participants saw a picture story with 40 slides, out of which 18 were manipulated and 22 were non-manipulated pictures. Each manipulated picture included one food cue.

Calorific value of the food cues

In total, nine food pairs were embedded in the picture story; the same picture was shown once with an unhealthy food cue and once with a healthy food cue (for slides, see Appendix A, Figures 9–48). The used unhealthy food cues were presented at the top of the food pyramid and were high in fat, sugar, or salt, whereas the used healthy food cues were presented on the bottom four shelves of the food pyramid and were more wholesome compared to the unhealthy food cues (Department of Health, 2012). The food cues on the pictures were placed randomly, e.g. one food pair was shown on the left side on the upper part of the screen, whereas another food pair was embedded in the middle of the picture. According to Castellanos et al. (2009), the size and the color of each food pair were matched as closely as possible (see Appendix A, Figures 49–57). The embedded food cues were independent of the narrative treatment, i.e. the implemented food cues were not decisive to the story. Otherwise, there would be no variation, because the visual attention of the children would have been directed to the food stimuli. Other items (e.g. umbrella, a picture frame) were inserted to keep the 18 food cues inconspicuous. To prevent all participants from seeing the food cues in the same order, a randomization of every food pair was established. Between the manipulated pictures, some non-manipulated pictures were also shown.

Level of interaction

According to the differentiation between diverse representation styles of food products of Olafsdottir & Berg (2016), the level of interaction of the main character with the food cues was also manipulated and grouped into (I) no interaction, (II) interaction, and (III) consumption. In contrast to the randomization of the food pairs, the level of interaction was maintained. Figure 3 gives an overview of the within-subjects design.

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[2] Scully et al. (2015) detected that the genre with the most cues recorded was cartoon programs. However, the used eye tracker only allowed pictures and no video files. Thus, the used pictures exhibited a cartoon style in order to get as close as possible to children's actual media environment. Additionally, background music was provided to approximate an audiovisual cartoon.

Figure 3. Visualization of the within-subjects design

Manipulated pictures	Level of interaction (not randomized)	Food pairs (randomized) unhealthy or	healthy
Picture 1	Level 1: no interaction	Bonbons	Raspberries
⇩			
Picture 2	Level 1: no interaction	Mixed candies	Mixed fruits
⇩			
Picture 3	Level 2: interaction	French fries	Carrots
⇩			
Picture 4	Level 3: consumption	Ice cream	Banana
⇩			
Picture 5	Level 3: consumption	Pizza	Whole-grain bread with cheese and tomatoes
⇩			
Picture 6	Level 2: interaction	Apple rings	Apple slices
⇩			
Picture 7	Level 2: interaction	Pancakes	Peach yoghurt
⇩			
Picture 8	Level 1: no interaction	Fruit torte	Cereal bar with raspberries
⇩			
Picture 9	Level 3: consumption	Hotdog	Corncob

The picture story (3 minutes 33 seconds, five seconds per picture) was designed using the software PowToon. The story deals with two panda brothers on vacation. The main character, Peppino, is very excited about going on vacation. Unfortunately, his mother cannot come along, so he takes his little brother Rondo with him. Together they visit different countries and meet new friends. When they come back home, Peppino realizes that they forgot to get presents. Thus, they go on vacation again, meet their friends one more time and pick up a little present in every country.

6.2. Post-treatment interview

Geise (2011) states that the combination of eye tracking and subsequent interviews is an acknowledged method to collect data about the unaided and aided memory of objects that previously appeared (i.e. food cues in different interaction levels). The post-treatment interview was conducted directly after eye tracking to generate an intuitive and spontaneous response (Geise, 2011). The interview was standardized and performed by a second study assistant with each participant individually. The interview primarily collected data of explicit memory-related measures (Auty & Lewis, 2004), namely (I) recall and (II) recognition.

Additional analyses

In addition, as some children tend to answer in a socially desirable way when responding to questions about dietary intake (Baxter et al., 2004), the author was also interested in obtaining data for the additional analyses of intentional snack choices to investigate if children might overreport healthy and underreport unhealthy food products (Baxter et al., 2004) for themselves compared to an intentional snack choice for their friends. To do so, the author differentiated between a (III) first-person snack selection of food products used as stimulus as well as alternative food and a (IV) third-person snack selection of the same food as in the first-person snack selection. Furthermore, data of (V) food aesthetics of food products used as stimulus, (VI) character evaluation, (VII) perceived healthiness of food products used as stimulus and alternative food, and (VIII) hunger were collected. The interview also considered children's food neophobia; however, Cronbach's α was −.05. Therefore, the scale items shared no covariance.

According to Dias and Agante (2011), pictorial food cues were used for recognition, firs-person snack selection and third-person snack selection. The author created two versions of the interview. The questions and the order of the questions in both versions were the same. The only difference between the first and the second version was the order of the food pictures on the 4x3 sized cards, i.e. they were inverted to allow a randomization and avoid a selection that was impaired by the sequence of the food pictures. Both versions of post-treatment interviews are represented in appendix B.

6.3. Pilot study

To test the attraction to the stimulus material and the understanding of the questions of the post-treatment pictured interview and the functionality of the eye tracker with children, a pilot study was conducted with eight children aged 6–12 years (62.5% female, M_{age} = 8.63, SD = 2.07).

Stimulus material

In general, the children liked the picture story and the accompanying music. After the pilot study, the study assistant asked the children, whether anything in the picture story seemed conspicuous to them. Only one female participant (12 years old) claimed to notice the embedded pandas in the pictures. Nobody mentioned that the food cues looked like they were inserted. Some children told the study assistant that the picture of the “hotdog” used as stimulus material looked strange. Therefore, a new food picture was selected, which was more recognizable as a hotdog.

Post-treatment pictured interview

Because of the confoundment regarding the food picture “hotdog” in the pilot study, two more questions were included in the interview for a randomization check, i.e. to control if the eye tracking results were confounded. These two questions are summarized as “food aesthetics” and asked whether the participants considered some food pictures as very beautiful or not at all beautiful.

In similar lines to Dias and Agante (2011), the interview of the pilot study included two questions about food liking. With two different 4×3 cards (one card included all unhealthy food used as stimulus and unhealthy alternative food, the other card all healthy food used as stimulus and healthy alternative food, see Appendix A, Figures 60–61) and with the help of a four-point scale for each card, the children were asked how much they like all food products together (1 = I don’t like them at all; 2 = I do like them a little bit; 3 = I do like them; 4 = I do like them very much). In addition, according to Dixon et al. (2007), an explicit attitude toward food was measured by one adjective. The children were requested to assess each card on a four-point scale (unhealthy versus healthy) how much fun these food products are all together (1 = not at all fun, 2 = a bit fun, 3 = fun, 4 = a lot of fun). The pilot study showed that measuring food attitudes with the cards was difficult for children, because they tended to select some food pictures individually. In particular, younger participants started differentiating between the diversity of food products. With a sum of 18 food cues, the food liking for every food cue was impossible to measure with respect to time management. Therefore, the item of food liking has been removed and thus no evidence about the food liking levels and attitude toward the food cues used as stimulus could be collected. Instead, the children were asked some questions about their food neophobia (see Pliner, 1994), because it could represent an important predictor, particularly in regard to the visual attention toward food. The participants were asked to answer the following three questions using a four-point scale methodology (1 = not true;

4 = totally true): “If I do not know a food, I do not eat it,” “I like to try new food,” and “I only eat what I already know well.” However, as already mentioned in the previous chapter, Cronbach’s α for the three food neophobia items was −0.05. Therefore, the results of food neophobia are not included in the presentation of findings.

6.4. Participants and procedure

The data for this study were collected in one primary school in Austria in November 2016. A total of 61 children aged 6–12 years (52.5% female; M_{age} = 7.93; *SD* = 1.56) took part in the eye tracking study with post-treatment pictured interviews. In addition, their parents filled out a questionnaire a week prior to the experiment. The Regional Education Authority approved the study and parents’ written consent was obtained before the study took place. All children were tested individually. Parallel to the eye tracking study, another experimental study was also undertaken.

The eye tracking and the post-treatment interview took place in two different classrooms. The room where the eye tracking was done was darkened with the help of roller blinds. Artificial light best fulfills the requirements for constant light conditions. From every class, a minimum of three and a maximum of five children participated in the eye tracking study. Before the study started, every child received some instructions. First, the participants were requested to sit down in front of the eye tracker. Then, a study assistant related some facts about the picture story that were necessary for understanding it. The study assistant showed a world map with different symbols on it to help the children recognize the different places visited by the characters in the story (see Appendix A, Figure 8). Afterward, the study assistant explained the eye tracker as well as the calibration procedure and placed headphones onto every participant. While watching the picture story, the melody of the “Jeopardy thinking music” ensured a relaxed atmosphere and made it more suitable for children.

The visual attention of the participants while watching the picture story was recorded. The eye tracking data were obtained with a stationary SMI iView X^{TM} RED eye tracker, with which the stimulus material was presented. In contrast to other studies (e.g. van der Laan et al., 2017), the eye tracker did not include a chin rest, which is closer to the actual reception of media content and contributes to a better validity (Geise, 2011). This is especially important for this current study, as it wants to record eye movements while watching a self-created example of child-friendly television entertainment. The tracker recorded gaze data of both eyes at 120 Hz. The gaze of each child was calibrated prior to testing. The children were asked to fixate on the circle on the screen and to follow the circle when it started to move. They were also told not to move their head while watching the picture story. If the calibration was not successful, it was repeated for a maximum of three times. Then the best value was selected. If the first calibration was successful, the experiment commenced. Because of the narrative treatment, the picture story required the continuous attention of the children.

Once the eye tracking was finished, each participant was brought to another room, where the second study assistant asked them some questions. When the post-treatment pictured interview was finished, participants of the eye tracking study as well as of the other experimental study were brought into another classroom where they played together with a soft ball under supervision. Provided that there was time remaining, some children who participated in the other experimental study also attended the eye tracking session (n = 13). The stimulus and the interest of research differed between the two studies. Nevertheless, the author controlled the significance of the results of the model (see Chapter 9.4) by excluding these participants. The conducted analysis showed no deviating results, as represented in Chapter 9.4.

7. Measures

This chapter describes the measurement procedure for the main analyses (Chapters 9.1–9.5) as well as for additional analyses (Chapter 9.6). All of the quantitative data were analyzed using IBM Statistics 24.

Visual attention

The eye tracking data were exported using the SMI BeGaze software. Given that only the food cues within the picture story were essential for the main research interest, eye tracking data were selectively synchronized by creating areas of interest (AOIs), which is a well-utilized method (Geise, 2011). Therefore, each of the 18 food cues was defined as one AOI. The coverage of all AOIs varied between 2.7% and 7.4% and represented the size of the AOIs in comparison to the white space. The AOI coverage of the food pairs was all of similar size, with the exception of the food pair "raspberries vs. bonbons," which differed by 0.1%. AOI-related statistics were given by two metrics—dwell time and entry time—which were calculated for each AOI. Dwell time includes the sum of all fixations and saccades on an AOI, which are the two important structural components of eye movements (Geise, 2011). It makes a statement about the mean time of total viewing in an AOI (Ogle et al., 2017). Entry time can be compared to the indicator time to first fixation (Geise, 2011); it gives information about the time of first contact with an AOI.

Explicit memory-related measures

Recall

After showing the visual stimulus and recording the eye tracking data, the participants were asked to recall everything eatable that they saw in the picture story. The children were asked this question three times.

Recognition

To measure recognition, the children were asked to select between 24 alternate food types—18 food products that were embedded in the picture story and six alternative food products that were not promoted in the picture story. The six alternative food products tried to cover most of the food categories (e.g. fast food, fruits) used as a food cue in the picture story. The 24 food pictures were divided into two different 4×3 cards (see Appendix A, Figures 58–59). When the participants were asked which food products they recognized in the picture story, both cards were shown together. Answers were coded 0 if the food was not selected and 1 if it was selected.

Additional analyses

Intentional snack selection

To measure first-person snack selection, the two 4×3 cards used for measuring recognition were left on the table. The children were asked to imagine that the questioner is their caregiver and asked which of these food products they would like to eat now. Again, answers were coded 0 if the snack was not selected and 1 if it was selected. The participants were able to make a maximum of four choices. To consider a third-person snack selection, the children were also asked which food products they would like to share with their friend. The third-person snack selection was also sampled with the two cards. Answers were coded 0 if the snack was not selected and 1 if it was selected. The children were able to make a maximum of four choices.

Food aesthetics

The participants were asked whether some food products were very beautiful or not beautiful at all. Food aesthetics were also sampled with the two 4×3 cards. Answers were coded 1 if the food was considered very beautiful and 2 if it was considered not at all beautiful. These questions also involved a randomization check to control if the eye tracking results were confounded.

Character evaluation

The evaluation of the two characters of the picture story was also measured. A picture with both characters (the main character Peppino and his little brother Rondo) was shown and the children were first asked how much they like Peppino and then how much they like Rondo. To measure character liking, a four-point scale was used (1 = I don't like him at all, 2 = I like him a little bit, 3 = I like him, 4 = I like him very much). To facilitate the understanding of the children, smiley faces illustrated each option (e.g. Dias & Agante, 2011).

Perceived healthiness

To analyze the conceptions of the participants in regard to nutrition and healthiness, two more 4×3 cards were prepared (see Appendix A, Figures 60–61). For each card (with either unhealthy or healthy food products) that was shown, the children had to decide how healthy these food products were all together. To measure their assessment of healthiness, a four-point scale with smiley faces was again used (1 = very unhealthy, 2 = unhealthy, 3 = healthy, 4 = very healthy). The food products were the same as on the other two cards that were prepared to measure recognition, snack selection, third-person snack election, and food aesthetics.

Hunger

Following Bennett and Blissett (2014), a self-made four-point scale was used. The same figures of pandas available in the software program PowToon were used and edited. Four pandas illustrated the different options. A hole in the stomach of the pandas, which was filled with different number of apples, showed the stomach contents. The children could choose between the following degrees: 1 = really hungry, 2 = quite hungry, 3 = a little bit hungry, and 4 = not hungry at all. In contrast to other studies, which collected data before their experiments (e.g. Brown et al., 2017; Folkvord et al., 2015; Harris et al., 2009), the current hunger status was requested after exposure to the visual stimuli and not before the eye tracking session, to avoid priming effects. Hence, no evidence about the impact of the visual stimulus on hunger status could be observed.

BMI

Children's body-mass index (BMI) was measured by data collected from the parents' questionnaires. Parents were asked the weight and height of their children. Since children's BMI also depends on gender and age (National Obesity Observatory, 2011), gender and age of the participants were collected in the interview. The BMI was determined with all these collected data. Then, the thresholds of the guidelines for children's BMI of the World Health Organization (2016) were used to compute a metric variable to observe if the BMI of a participant moved between the median scores of BMI-for-age, or was assigned to the respective standard deviations (WHO, 2007a, 2007b).[3]

8. Indices

In this chapter, all the indices created for the main analyses (Chapter 9.1–9.5) are described. Additive and average indices were used to examine the proposed hypotheses. Appendix A (Figures 49–57) lists the exact food products with the respective food-calorific value or level of interaction.

Additive indices

Dwell time

First, two new variables were created corresponding to the additive indices: an "unhealthy index" (*M* = 15818.82, *SD* = 3847.08) that indicated the sum of dwell time (ms) on all unhealthy food cues, and a "healthy index" (*M* = 14473.52, *SD* = 3109.26) that contained the sum of dwell time (ms) on all healthy food cues. In addition, a further breakdown was made to determine the additive indices for all levels of interaction, irrespective of the calorific value of food cues, i.e. indices for all food cues that were shown with (I) no interaction (*M* = 7247.49, *SD* = 2365.95), (II) interaction (*M* = 10705.86, *SD* = 2594.74), and (III) consumption (*M* = 12338.99, *SD* = 2926.01). Finally, one last breakdown was made in terms of whether the food cues in different levels of interaction were

[3] For instance, the BMI of a 10-year's old female is 20 kg/m2. According to the WHO reference (2007a), the median score of BMI-for-age for 10-year old girls ranges between 14.8 and 19.0. Values over 19.0 and under 22.6 are assigned to 1 standard deviation (SD). In this case, value of "1" was given to the metric variable.

unhealthy or healthy, i.e. indices for all unhealthy food cues that were shown with (I) no interaction (M = 3811.24, SD = 1536.66), (II) interaction (M = 5609.97, SD = 1853.41), and (III) consumption (M = 6397.61, SD = 1805.57) as well as for all healthy food cues that were shown with (I) no interaction (M = 3436.25, SD = 1283.18), (II) interaction (M = 5095.89, SD = 1509.40), and (III) consumption (M = 5941.38, SD = 1607.59).

Recognition

Additive indices for recognition were also created. Again, this includes one "unhealthy index" (M = 5.37, SD = 1.91) that contained the sum of all recognized unhealthy food products and one "healthy index" (M = 4.23, SD = 2.09) that indicated all recognized healthy food products.

Average indices

Dwell time

For calculating the proportion of mean total dwell time on unhealthy and healthy food cues (see Chapter 9.2), two new variables were created corresponding to average indices—one index that included the mean total dwell time on all unhealthy food products (M = 1757.65, SD = 427.45) and one index that contained the mean total dwell time on all healthy food products (M = 1608.17, SD = 345.47). Furthermore, three new variables were created—one index that included the mean total dwell time on all food products shown with no interaction (M = 1207.91, SD = 394.33), a second index that contained the mean total dwell time on all food products shown with interaction (M = 1784.31, SD = 432.46), and a third index that represented the mean total dwell time on all food products shown with consumption (M = 2056.50, SD = 487.67).

For a factorial repeated-measures ANOVA (see Chapter 9.4) average indices were constituted for all independent variables. These indices included the average of dwell time (ms) for all unhealthy food cues shown with (I) no interaction (M = 1270.41, SD = 512.22), (II) interaction (M = 1869.99, SD = 617.80), and (III) consumption (M = 2132.54, SD = 601.85), as well as for all healthy food cues shown with (I) no interaction (M = 1145.42, SD = 427.73), (II) interaction (M = 1698.63, SD = 503.13), and (III) consumption (M = 1980.46, SD = 535.86).

Entry time

The same procedure that was used for dwell time was done for the values of entry time (ms), i.e. average indices of entry time of all unhealthy (M = 711.91, SD = 266.16) and all healthy food cues (M = 706.90, SD = 237.21), for all food products that were shown with (I) no interaction (M = 921.78, SD = 492.44), (II) interaction (M = 654.95, SD = 197.81), and (III) consumption (M = 570.92, SD = 239.22), for all unhealthy food products shown with (I) no interaction (M = 875.91, SD = 614.95), (II) interaction (M = 703.45, SD = 375.86), and (III) consumption (M = 541.38, SD = 330.86), and for all healthy food products shown with (I) no interaction (M = 927.47, SD = 688.62), (II) interaction (M = 601.23, SD = 215.76), and (III) consumption (M = 604.27, SD = 355.14). In contrast to dwell time, where 0 is the lowest value, instances of entry time with a dwell time score of 0 were reported as missing values to avoid a distortion of the results.

9. Results

In this chapter, the results of the present study are presented. First, a detailed elaboration of the sample is offered, followed by analyses that either verify or falsify the hypotheses, and finally additional analyses to report data that were additionally collected.

9.1. Elaboration of the sample

For meaningful results, children with a calibration and a validation value of 1.0 and more and children with language problems were excluded from the analyses. The final sample consisted of 52 children aged 6–12 years (53.8 % female; M_{age} = 8.12; SD = 1.59). Table 2 shows the sample constitution along with age and BMI (19 missing values, M = 0.67, SD = 1.30).

Table 2. Sample constitution along with age and BMI

	Age			BMI-for-age (WHO)[1]				Total
	6-7 years	8-9 years	10-12 years	SD from -1 to -3	Media-tion	SD from +1 to +3	Missing	n (%)
M	9	8	7	2	8	5	9	24 (46.2%)
F	12	10	6	0	9	9	10	28 (53.8%)
n (%)	21 (40.4%)	18 (34.6%)	13 (25.0%)	2 (3.8%)	17 (32.7%)	14 (26.9%)	19 (36.5%)	52 (100%)

Note: n = 52; M = male; F = female; [1]SD (from -1 to -3) = underweight, median = normal weight, SD (from +1 to +3) = overweight

The parents' questionnaires provided information about the average intensity of the media use of their children, about how often and what kind of media content their children watch, and about their food-related mediation strategies (see Naderer et al., 2017). Of all the children who took part in the study (n = 52), a total of 42 parents filled out the questionnaire. This relates to a response rate of 80.8%.

Regarding the intensity of media use, the parents were asked for the average hours their children spent watching films or series (regardless of the device) on an average day during the week (*M* = 2.33, *SD* = 1.63, n = 40) as well as on an average weekend day (*M* = 3.21, *SD* = 1.85, n = 40). According to media research methods, many different measurement tools of children's television viewing exist (Gunter, 2000). According to Gerbner, Gross, Signorielli, Morgan, and Jackson-Beek (as cited in Gunter, 2000), who defined a child watching three hours or less of television per day as a "light viewer," participants were classified as light or heavy viewers (i.e. more than three hours per day). The visual classification of the average hours of watching films or series on a usual day during the week showed that 61.5% of all participants (n = 52) were defined as light viewers and 15.4% as heavy viewers (n = 40, 12 missing values). However, the classification of a usual weekend day led to an increase of heavy viewers to 34.6% and a decrease of light viewers to 42.3% (n = 40, 12 missing values).

Additionally, data were collected to evaluate how often the children watch entertaining television series aimed at them (*M* = 5.17, *SD* = 1.03, n = 42), entertaining television series aimed at adults (*M* = 2.79, *SD* = 1.81, n = 39), movies aimed at children (*M* = 4.60, *SD* = 1.33, n = 42), and movies aimed at adults (*M* = 2.30, *SD* = 1.65, n = 40) using a six-point scale (1 = seldom; 2 = several times per year; 3 = monthly; 4 = once a week; 5 = several times per week; 6 = daily). Mean values demonstrate that children of the present sample on average mostly viewed entertaining television series as well as movies aimed at children and fewer entertaining television programs aimed at adults.

Moreover, food-related mediation styles of the parents were obtained with a seven-point scale (1 = seldom; 7 = very often). A *restrictive* food-related mediation included three items (i.e. "I have clear rules on what my child is allowed to eat"; "I have clear restrictions on how much of a certain food my child is allowed to eat"; "I forbid my child from eating certain products"), which were summarized to an average index (n = 40, Cronbach's α = .69, *M* = 4.38, *SD* = 1.63). In contrast, *active* food-related mediation also comprised three items ("I explain my child why certain products are healthy, or unhealthy"; "I talk to my child about consequences of unhealthy eating behavior"; "While eating, I explain to my child what products are healthy and why they are healthy"), which were likewise summarized to an average index (n = 41, Cronbach's α = .88, *M* = 5.72, *SD* = 1.50). The results of a conducted paired-samples *t*-test showed that significantly fewer parents of the present sample used a restrictive food-related mediation style (*M* = 4.38, *SE* = 0.25) and accordingly more preferred an active food-related mediation style (*M* = 5.72, *SE* = 0.23), $t(40) = -5.62$, $p \leq .001$.

9.2. Visual attention to unhealthy and healthy food cues

In general, the visual attention (dwell time in ms) to all food cues was at least 14458.70 milliseconds long, whereas the highest dwell time score was 42026.00 milliseconds (*M* = 30292.34, *SD* = 6186.16), i.e. the children payed minimum 14.5 and maximum 42.0 seconds of visual attention to different food cues within a picture story, which had a total duration of 213 seconds. The food cues with the highest average score of dwell time (ms) of all participants (n = 52) constituted the "whole-grain bread with cheese and tomatoes" (*M* = 2900.19, *SD* = 980.19) with 25%, followed by "pizza" (*M* = 2721.43, *SD* = 1066.67) with 23.1%. Considering the calorific value of the food products, 55.8% of the food cues with the highest score of dwell time (ms) scores were unhealthy.

A paired-samples *t*-test was conducted to compare the sum score of dwell time of unhealthy and healthy food cues used as stimulus. On average, children had a significantly higher dwell time on unhealthy food cues (*M* = 15818.82, *SE* = 533.49) than on healthy food cues (*M* = 14473.52, *SE* = 431.18), *t*(51) = 2.97, $p \leq .01$, *r* = 0.38. The results indicate that participants on average viewed unhealthy food cues about 1.3 seconds longer than healthy food cues. Table 3 visualizes the results.

Mean entry time showed no significant difference at all between the visual attention toward unhealthy (*M* = 711.91, *SE* = 36.91) and healthy (*M* = 706.90, *SE* = 32.90) food products, *t*(51) = 0.10, *p* = .920. Therefore, participants gazed significantly longer at unhealthy foods rather than healthy foods, but not earlier.

Table 3. Visual attention (dwell time in ms) to unhealthy and healthy food cues

	Dwell time (ms)					
	1st variable	**2nd variable**				
	Mean (SE)	**Mean (SE)**	**t**	**df**	**p (2-tailed)**	**effect size *r***
(1) unhealthy food cues vs.	15818.82	14473.52				
(2) healthy food cues	(533.49)	(431.18)	2.97	51	.005*	.38

*Note: n = 52; SE = Standard Error Mean; * p ≤ .01; additive indices of dwell time (ms) were used for analyses*

According to van der Laan et al. (2017) the proportion of mean total dwell time on unhealthy food cues (*M* = 0.52, *SD* = 0.05) was calculated by dividing the mean total dwell on unhealthy foods (i.e. mean “unhealthy” index) by the sum of the mean total dwell times on healthy (i.e. mean “healthy index) and unhealthy food products. The same pattern was done for healthy food cues (*M* = 0.47, *SD* = 0.05) to compare the proportions between the two food-calorific values.

The conducted paired-samples *t*-test reinforced the previous results by showing that children had a significantly higher proportion of mean total dwell time on unhealthy food cues (*M* = 0.52, *SE* = 0.01) compared to the mean total dwell time on healthy food cues (*M* = 0.48, *SE* = 0.01), *t*(51) = 2.77, $p \leq .01$, *r* = 0.23.

9.3. Visual attention to food cues in different levels of interaction

A paired-samples *t*-test was conducted to compare the sum score of dwell time with different levels of interaction used as stimulus. The results showed significant differences between all pairs. On average, participants paid significantly less visual attention to food cues with no interaction (Level 1) than to food cues with interaction (Levels 2 and 3), i.e. the first level of interaction got less visual attention (M = 7247.49, SE = 328.10) than the second level of interaction (M = 10705.86, SE = 359.83), $t(51) = 9.33$, $p \leq .001$, $r = .79$. The same pattern was seen when comparing the second level of interaction (M = 10705.86, SE = 359.83) and the third level (M = 12338.99, SE = 405.77), $t(51) = 3.72$, $p \leq .001$, $r = .46$. The higher was the level of interaction used as stimulus, the higher was the visual attention to food cues. In particular, the effect size between the first and third level of interaction is very high, $r = .89$. Table 4 shows the results of all the different levels.

Table 4. Visual attention (dwell time in ms) to food cues in different levels of interaction

	Dwell time (ms)					
	1st variable	**2nd variable**				
	Mean (SE)	**Mean (SE)**	**t**	**df**	**p (2-tailed)**	**effect size *r***
(1) level 1 no interaction vs.	7247.49	10705.86				
(2) level 2 interaction	(328.10)	(359.83)	9.33	51	.000*	.79
(1) level 2 interaction vs.	10705.86	12338.99				
(2) level 3 consumption	(359.83)	(405.77)	3.72	51	.000*	.46
(1) level 1 no interaction vs.	7247.49	12338.99				
(2) level 3 consumption	(328.10)	(405.77)	13.64	51	.000*	.89

*Note: n = 52; SE = Standard Error Mean; * p ≤ .001; additive indices of dwell time (ms) were used for analyses*

In addition, the entry time indicated significant differences between the three levels of interaction. Participants gazed at food cues less early in no interaction (M = 921.78, SE = 68.29) than in interaction (M = 654.95, SE = 27.43), $t(51) = 3.53$, $p \leq .001$, $r = .25$. However, when comparing interaction (M = 654.95, SE = 27.43) and consumption (M = 570.92, SE = 33.17), $t(51) = 1.89$, results had only marginal significance ($p = .064$).

In contrast to the non-significant results of the entry time in terms of visual attention to unhealthy and healthy food cues, values of the level of interaction declared that children examined the food cues earlier when they were shown with interaction than with no interaction. Table 5 demonstrates the results of the paired-samples *t*-tests according to entry time.

Table 5. Visual attention (mean entry time in ms) to food cues in different levels of interaction

	Mean entry time (ms)					
	1st variable	2nd variable				
	Mean (SE)	Mean (SE)	t	df	p (2-tailed)	effect size *r*
(1) level 1 no interaction vs.	921.78	654.95				
(2) level 2 interaction	(68.29)	(27.43)	3.53	51	.001*	.25
(1) level 2 interaction vs.	654.95	570.92				
(2) level 3 consumption	(27.43)	(33.17)	1.89	51	.064	-
(1) level 1 no interaction vs.	921.78	570.92				
(2) level 3 consumption	(68.29)	(33.17)	4.58	51	.000*	.29

Note: N = 52; SE = Standard Error Mean; *** *p ≤ .001; average indices of entry time (ms) were used for analyses*

According to van der Laan et al. (2017), also the proportion of mean total dwell time on food cues with no interaction (*M* = 0.24, *SD* = 0.05) was calculated by dividing the mean total dwell on foods shown with no interaction (i.e. mean index of all food products shown in passive patterns) by the sum of the mean total dwell times on foods shown with no interaction, on foods shown with interaction, (i.e. mean index of all food products that were handled by the main character), and on foods shown with consumption (i.e. mean index of all food products that were consumed by the main character). The same pattern was made for food products shown with interaction (*M* = 0.35, *SD* = 0.06) and food products shown with consumption (*M* = 0.41, *SD* = 0.06). to compare the proportions of each of the three levels of interaction.

The conducted paired-samples *t*-test reinforced the previous results by showing that children had a significantly higher proportion of mean total dwell time on food cues shown in the first level of interaction (*M* = 0.24, *SE* = 0.01) compared to the proportion of mean total dwell time on food cues in the second interaction level (*M* = 0.35, *SE* = 0.01), $t(51) = -8.93$, $p \leq .001$, $r = .39$. Additionally, the proportion of mean total dwell time was significantly higher in food cues shown in the second level of interaction (*M* = 0.35, *SE* = 0.01) in contrast to foods shown in the third level of interaction (*M* = 0.24, *SE* = 0.01), $t(51) = -3.38$, $p \leq .001$, $r = .25$. Finally, the highest significant difference was shown between the first level of interaction (*M* = 0.24, *SE* = 0.01) and the third interaction level (*M* = 0.24, *SE* = 0.01), *t*(51) = −13.02, p ≤ .001, *r* = .45. Table 6 includes all results concerning the proportion of mean total dwell time.

Table 6. Proportions of mean dwell time on unhealthy and healthy food cues in different levels of interaction

	Proportion of mean dwell time					
	1st variable	**2nd variable**				
	Mean (SE)	**Mean (SE)**	**t**	**df**	**p (2-tailed)**	**effect size *r***
(1) unhealthy food cues vs.	0.52	0.48				
(2) healthy food cues	(0.01)	(0.01)	2.77	51	.008*	.23
(1) level 1 no interaction vs.	0.24	0.35				
(2) level 2 interaction	(0.01)	(0.01)	-8.93	51	.000**	.39
(1) level 2 interaction vs.	0.35	0.41				
(2) level 3 consumption	(0.01)	(0.01)	-3.38	51	.001**	.25
(1) level 1 no interaction vs.	0.24	0.41				
(2) level 3 consumption	(0.01)	(0.01)	-13.02	51	.000**	.45

*Note: n = 52; SE = Standard Error Mean; * p ≤ .01, ** p ≤ .001; average indices of dwell time (ms) were used for analyses*

9.4. Visual attention to unhealthy and healthy food cues in different levels of interaction

The results given in Chapter 9.3 refer to the visual attention to food cues in different levels of interaction, irrespective of the calorific value of the food cues. The pairwise comparison of the calorific value of the food cues within each level of interaction showed only some tendencies of significance: There was no significance difference between the visual attention to unhealthy food cues (*M* = 3811.24, *SE* = 213.10) and healthy food cues (*M* = 3436.25, *SE* = 177.95) shown with no interaction, *t*(51) = 1.74, *p* = .088, to unhealthy food cues (*M* = 5609.97, *SE* = 257.02) and healthy food cues (*M* = 5095.89, *SE* = 209.32) shown with interaction, *t*(51) = 1.71, *p* = .093, as well as to unhealthy food cues (*M* = 6397.61, *SE* = 250.39) and healthy food cues (*M* = 5941.38, *SE* = 222.93) shown with consumption, *t*(51) = 1.86, *p* = .069.

In addition, entry time showed no significant differences between the visual attention to unhealthy food (*M* = 875.91, *SE* = 85.28) and healthy food (*M* = 927.47, *SE* = 95.49) shown with no interaction, $t(51) = -0.46$, $p = .645$, to unhealthy food (*M* = 703.45, *SE* = 52.12) and healthy food (*M* = 601.23, *SE* = 29.92) shown with interaction, $t(51) = 1.57$, $p = .123$, as well as to unhealthy food (*M* = 541.38, *SE* = 45.88) and healthy food (*M* = 604.27, *SE* = 49.25) shown with consumption, $t(51) = -0.94$, $p = .353$.

Table 7. Summary of the results of visual attention (dwell time in ms) to unhealthy and healthy food cues in different levels of interaction

	Dwell time (ms)					
	1st variable	2nd variable				
	Mean (SE)	**Mean (SE)**	**t**	**df**	**p (2-tailed)**	**effect size *r***
(1) unhealthy food cues vs.	15818.82	14473.52				
(2) healthy food cues	(533.49)	(431.18)	2.97	51	.005*	.38
(1) level 1 no interaction vs.	7247.49	10705.86				
(2) level 2 interaction	(328.10)	(359.83)	9.33	51	.000**	.79
(1) level 2 interaction vs.	10705.86	12338.99				
(2) level 3 consumption	(359.83)	(405.77)	3.72	51	.000**	.46
(1) unhealthy + no interaction vs.	3811.24	3436.25				
(2) healthy + no interaction	(213.10)	(177.95)	1.74	51	.088	-
(1) unhealthy + interaction vs.	5609.97	5095.89				
(2) healthy + interaction	(257.02)	(209.32)	1.71	51	.093	-
(1) unhealthy + consumption vs.	6397.61	5941.38				
(2) healthy + consumption	(250.39)	(222.93)	1.86	51	.069	-

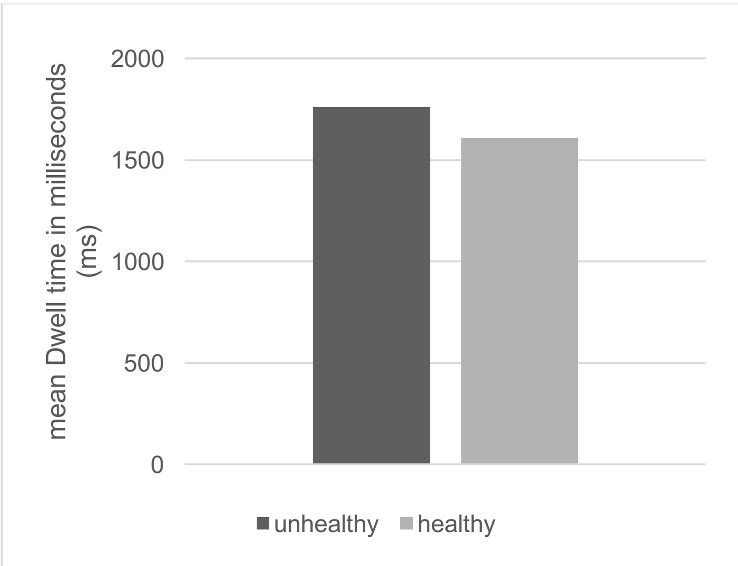
*Note: n = 52; SE = Standard Error Mean; * p ≤ .01, ** p ≤ .001; additive indices of dwell time (ms) were used for analyses*

For an interim conclusion, Table 7 gives an overview of the results of all paired-samples *t*-tests. Besides the paired-samples *t*-tests, a factorial repeated-measures ANOVA was conducted to shed light on the effects of unhealthy and healthy food cues in three different levels of interaction used as stimulus on visual attention.

Mauchly's test of sphericity was omitted as a prerequisite for the independent variable calorific value of the food cues, because only two repeated-measures conditions were available. For the independent variable level of interaction, the assumption of sphericity was met ($p = .257$). Mauchly's test indicated that the assumption of sphericity had been violated for the interaction effect between the calorific value of the food cue and the level of interaction, $\chi^2(2) = 7.42$, $p \leq .05$. Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .88$).

There was a significant main effect ($p \leq .01$) of unhealthy and healthy food cues used as a stimulus on visual attention, $F(1, 51) = 8.82$, partial $\eta^2 = .15$, $r = .38$. The partial eta-squared amounted to a total of 15% and showed a high effect. This suggests that participants had a significantly different gaze behavior concerning unhealthy and healthy food cues, irrespective of the level of interaction. Figure 4 demonstrates the main effect of the calorific value of the food cues.

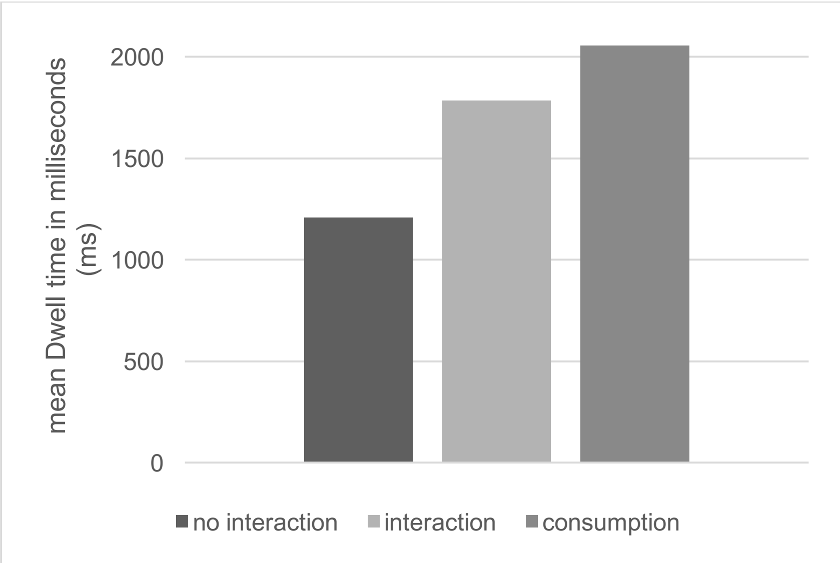
Figure 4. Attention to unhealthy and healthy food cues (mean dwell time in ms)



Note: n = 52; average indices of dwell time (ms) were used for analyses

There was also a significant main effect ($p \leq .001$) of the different levels of interaction used as a stimulus on visual attention, $F(2, 102) = 86.39$, partial $\eta^2 = .63$. The partial eta-squared amounted to a total of 63% and showed a very high effect. This suggests that participants have a significantly different gaze behavior concerning the level of interaction, irrespective of the calorific value of the food cue. A pairwise comparison was conducted to control the error rate by using a Bonferroni adjustment. The *post hoc* tests indicated that the significant main effect reflects significant differences between all levels, i.e. between Levels 1 and 2 (no interaction vs. interaction), between levels 1 and 3 (no interaction vs. consumption), and between Levels 2 and 3 (interaction vs. consumption), all $p \leq .001$. Furthermore, simple contrasts confirmed the significant differences found with the *post hoc* tests. The first contrast compared the first level of interaction (i.e. no interaction) to the third level of interaction (i.e. consumption) and verified significant differences in visual attention, $F(1, 51) = 185.97$, $p \leq .001$, $r = 0.87$. The second contrast confirmed the significant difference in visual attention found in the second level of interaction (i.e. interaction) compared to the third level of interaction, $F(1, 51) = 13.86$, $p \leq .001$, $r = 0.46$. Figure 5 illustrates the main effect of the interaction level with the food cues.

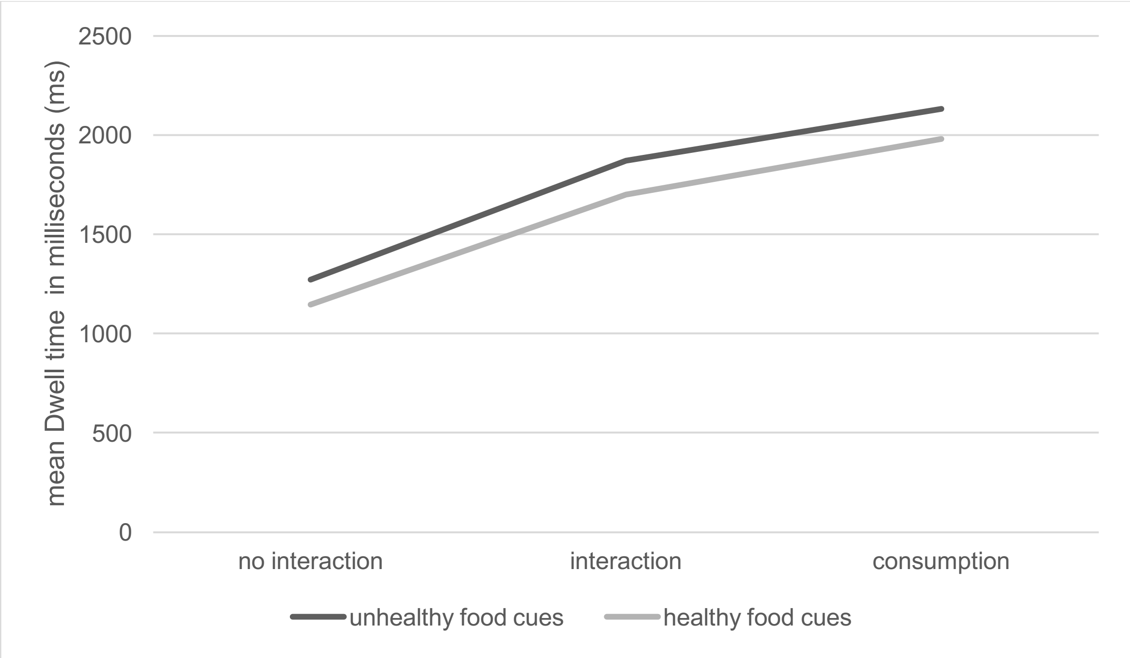
Figure 5. Attention to food cues in different levels of interaction (mean dwell time in ms)



Note: n = 52; average indices of dwell time (ms) were used for analyses

Altogether, two main effects can be derived, but there is no significant interaction effect ($p = .906$) between unhealthy and healthy food cues and the level of interaction. Figure 6 gives a final overview of both main effects. In consequence, there is sufficient evidence to support H_{1a} and H_{2a}, i.e. children were both more likely to look longer at unhealthy rather than healthy food cues and at food cues that were shown together with the main character compared to passive food cues. Additionally, there is insufficient evidence for H_{1b} and sufficient evidence for H_{2b}, i.e. children did not look earlier at unhealthy than at healthy food cues, but looked earlier at food cues at higher levels of interaction in comparison to food products at a lower interaction level. In terms of H_{3a} and H_{3b}, only tendencies with the paired-samples *t*-tests can be derived. Therefore, there is no support for this assumption.

Figure 6. Attention to unhealthy and healthy food cues in different levels of interaction (mean dwell time in ms)



Note: n = 52; average indices of dwell time (ms) were used for analyses

Finally, BMI and hunger were added as covariate to the usual model. When controlling for children's BMI, the significant main effect of visual attention toward unhealthy and healthy food cues remained, $F(1, 31) = 8.02$, partial $\eta^2 = .21$, $r = .46$, $p \leq .01$. In contrast, controlling for children's hunger reduced the main effect of visual attention toward unhealthy and healthy food cues to non-significant, $F(1, 49) = 1.99$, $p = .165$. According to the main effect of the interaction level, in the case of hunger as covariate, a significant level remained, as well as when considering the *post hoc* tests. However, when controlling with BMI and regarding the *post hoc* tests and its comparison of each interaction level, the significant difference between the second and third level of interaction disappeared ($p = .152$).

9.5. Visual attention and explicit memory

In the final step, the author tried to link visual attention with cognitive outcomes like recall and recognition. H_{4a} assumes a link between visual attention and recall. Due to the problems emerging from not including sufficiently-detailed food names (e.g. "bread") in the assignment, only those instances where food products could be clearly identified (e.g.

“bread with cheese”) were absorbed. In contrast, H_{4b} assumes a link between visual attention and recognition. Before linking visual attention with recognition, it was investigated specific to food products, whether there were interferences between dwell time and the report of perceived food products. Dwell time of all 18 food cues and for each participant (n = 52) yielded a total of 936 scores, which were recorded and analyzed. No dwell time (0 ms) occurred 64 times, where nine times food products were incorrectly reported as recognized even though no dwell time scores were recorded.

To integrate dwell time scores into a regression model, the average index of dwell time toward all food cues in milliseconds (*M* = 1682.91, *SD* = 343.68) was converted into a new metric variable in which the mean dwell time scores were reported in seconds (*M* = 1.68, *SD* = 0.34).

A stepwise multiple linear regression was conducted to test whether visual attention (mean dwell time scores) influences recall. The first step included sociodemographic data about gender and age. In the second step, the metric variable of mean dwell time scores (s) on all food cues was inserted. In the third block, two control variables were inserted, namely hunger and character evaluation. ANOVA demonstrated that the initial model significantly improved the ability to predict the number of food products recalled $F(2,48) = 5.39$, $p \leq .01$, $R^2 = .18$, $R^2_{Adjusted} = .15$. However, the new model with the extra predictor of visual attention showed no significant increase in variance ($p = .455$). The same applied to the other new model (i.e. the third step) with the extra predictors of hunger and character evaluation ($p = .720$). The findings indicated no association between visual attention toward food cues and the number of recalled food products ($\beta = .10$, $t(50) = 0.75$, $p = .455$). This circumstance was also observed when controlling with two more variables in the third step ($\beta = .08$, $t(50) = 0.91$, $p = .586$). Instead, a positive association between the predictor age and the number of foods recalled unaided was shown in all three models (third step: $\beta = .41$, $t(50) = 2.88$, $p \leq .01$). Table 8 summarizes the results.

Table 8. Summary of stepwise multiple linear regression for the prediction of the number of recalled food cues

	B	*SE B*	β
Step 1			
gender	-0.18	0.50	-.05
age	0.51	0.16	.42*
Step 2			
gender	-0.15	0.51	-.04
age	0.47	0.17	.39*
mean dwell time (s)	0.58	0.77	.11
Step 3			
gender	-0.20	0.52	-.05
age	0.49	0.17	.41*
mean dwell time (s)	0.44	0.80	.08
hunger	0.20	0.24	.11
character evaluation	-0.02	0.35	-.01

Note: n = 50; R^2 = .17 for Step 1, ΔR^2 = .01 for Step 2 (p = .455), ΔR^2 = .09 for Step 3 (p = .150);
* $p \leq .01$

To test the assumption that mean dwell times scores (s) of the participants might affect the number of recognized food products used as stimulus, a stepwise multiple linear regression was again conducted. Similar to the previous regression, the first step included sociodemographic data about gender and age and the second step the metric variable of mean dwell time scores (s) on all food cues. The third block also included two control variables, namely hunger and character evaluation. ANOVA demonstrated that the initial model did not significantly improve the ability to predict the number of recalled food products $F(2,48) = 1.39$, $p = .260$, $R^2 = .06$, $R^2_{Adjusted} = .02$. Moreover, the new model, with the extra predictor of visual attention, showed no significant increase in variance ($p = .426$). The same applied to the other new model (i.e. the third step), with the extra predictors of hunger and character evaluation ($p = .201$). Findings indicated no association between time of visual attention toward food cues and the amount of recalled food products ($\beta = .12$, $t(50) = 0.80$, $p = .426$). This circumstance was also observed when controlling with two more variables in the third step ($\beta = .11$, $t(50) = 0.71$, $p = .481$). Instead, a marginally significant positive association between character evaluation and the number of recognized food cues was found ($\beta = .25$, $t(50) = 1.81$, $p = .077$).

Table 9. Summary of stepwise multiple linear regression for the prediction of the number of recognized food cues

	B	*SE B*	β
Step 1			
gender	0.43	1.04	.06
age	0.54	0.33	.23
Step 2			
gender	0.50	1.04	.07
age	0.46	0.34	.20
mean dwell time (s)	1.28	1.59	.12
Step 3			
gender	0.61	1.04	.08
age	0.47	0.34	.20
mean dwell time (s)	1.14	1.61	.11
hunger	-0.13	0.49	-.04
character evaluation	1.29	0.71	.25*

Note: n = 50; R^2 = .06 for Step 1, ΔR^2 = .01 for Step 2 (p = .426), ΔR^2 = .07 for Step 3 (p = .201); * *p* = .077

Altogether, results of the first linear regression showed that mean dwell time scores of the participants had no influence on the number of food cues recalled. Therefore, there is insufficient evidence to support H_{4a}. The second linear regression also demonstrated no association between the mean time of visual attention on food cues and the number of recognized food products. Hence, H_{4b} was also not supported.

9.6. Additional analyses

In this chapter some additional analyses, which were not essential to verify or falsify the hypotheses, are given. Further findings about recall, recognition, intentional first-person and third-person snack choices, food aesthetics, character evaluation, perceived healthiness, and hunger are reported.

Recall

A multiple linear regression was carried out to see if age, gender, or BMI of the children predicted the number of correctly explicitly recalled food cues used as stimulus. It was found that these variables explained to a significant extent of the variance in the value of the amount of correctly explicit remembered food cues, $F(3,29) = 4.60$, $p \leq .01$, $R^2 = .30$, $R^2_{Adjusted} = .23$. The analysis showed that gender ($\beta = -.03$, $t(32) = -0.18$, $p = .857$), and BMI ($\beta = .19$, $t(32) = 1.18$, $p = .248$) of the children did not significantly predict the number; however, age had a positive effect on the number of correctly explicitly remembered food cues ($\beta = .49$, $t(32) = 3.07$, $p \leq .01$). The findings reinforced the findings of the stepwise multiple linear regression (see Chapter 9.5) by the additional consideration of BMI in the model. The results can be interpreted as follows: The older were the participants, the higher was the number of correctly unaided recalled food products.

Recognition

The most common initially recognized food used as stimulus (i.e. first association) among all participants (n = 52) was “apple rings” with 13.5%, followed by “fruit torte,” “pizza,” and “mixed candies” (each 11.5%). Regarding the calorific value of the food cues, 67.3% of the children (n = 50, two missing values) initially associated one unhealthy food, whereas 28.8% of the participants first selected one healthy food. The dominance of recognized unhealthy food products was also observed in the next three associations. Table 10 gives an overview of the food cues that the participants initially recognized (i.e. their initial four associations) regarding the calorific value of the food products.

Table 10. Children’s initially recognized food products with respect to the calorific value of the food used as stimulus

	Recognition of food products			
	1st association	**2nd association**	**3rd association**	**4th association**
Unhealthy	35 (67.3%)	30 (57.7%)	34 (65.4%)	26 (50.0%)
Healthy	15 (28.8%)	21 (40.4%)	16 (30.8%)	23 (44.2%)
Missing	2 (3.8%)	1 (1.9%)	2 (3.8%)	3 (5.8%)
Total	52 (100%)	52 (100%)	52 (100%)	52 (100%)

Note: n = 52

First-person and third-person snack selection

With regard to the most chosen food category, the food most frequently chosen first among all participants (n = 52) in the first-person snack selection was “pizza” with 26.9% and in the third-person snack selection “donut” with 15.4%. With respect to the calorific value of the food products, frequency results showed that 59.6% of all children (n = 52) first selected unhealthy food products for themselves, whereas 40.4% first chose healthy food products. In the subsequent third-person snack selection, the first choices of participants (n = 52) were predominantly unhealthy (78.8%) and less healthy (21.2%). Thus, frequencies of the first choice would imply differences between the first-person and third-person snack selection. However, children had the opportunity to make a maximum of four choices. Table 11 shows all four snack selections that children made for their own and for a third person with respect to the chosen food product's calorific value. It was apparent that the choice of healthy food products for a third person increased with every opportunity of choice, whereas in the first-person snack selection, the choice of healthy food products decreased, albeit not as strongly as the increase in the third-person snack selection.

Table 11. First-person and third-person snack selection with respect to the calorific value of the food used as stimulus as well as alternative food

	First-person snack selection			**Third-person snack selection**		
	Unhealthy	**Healthy**	**Total**	**Unhealthy**	**Healthy**	**Total**
1st selection	31 (59.6%)	21 (40.4%)	52 (100%)	41 (78.8%)	11 (21.2%)	52 (100%)
2nd selection	32 (61.5%)	20 (38.5%)	52 (100%)	35 (67.3%)	17 (32.7%)	52 (100%)
3rd selection	32 (61.5%)	20 (38.5%)	52 (100%)	30 (57.7%)	22 (42.2%)	52 (100%)
4th selection	34 (65.4%)	18 (34.6%)	52 (100%)	29 (55.8%)	23 (44.2%)	52 (100%)

Note: n = 52; values include alternative food of the 4x3 cards with regard to the calorific value

A paired-samples *t*-test was conducted to compare the first-person and third-person snack selections of unhealthy and healthy foods. There were no significant differences at all between the pairwise comparison of the sum of unhealthy snack choices of the children (M = 2.46, SD = 1.41, SE = 0.20) and the sum of unhealthy snack choices for a third-person (M = 2.58, SD = 1.21, SE = 0.17), $t(51) = -0.56$, p = .579. The same pattern was shown when comparing the sum of all healthy snack choices of the children (M = 1.54, SD = 1.41, SE = 0.20) and the sum of all healthy third-person snack choices (M = 1.42, SD = 1.21, SE = 0.17), $t(51) = -0.56$, p = .579. However, according to the results, it must be noted that it is necessary to control children's tendency to give socially desirable responses (e.g. Baxter et al., 2004), which has not been done in the present study.

Food aesthetics

Children were also asked which food products they considered very beautiful or not beautiful at all. Cases where the answers of the children were inconsistent (i.e. simultaneously very beautiful *and* not at all beautiful) were excluded[4]. First, no confoundment of the eye tracking data can be derived, because non-selection was dominant in all cases.

Considering the highest scores, 42.3% of all children (n = 52) said that the picture of the healthy food "mixed fruits" was very beautiful, followed by two unhealthy food pictures—"pizza" and "ice cream"—although "mixed fruits" (*M* = 1241.69, *SD* = 896.35) had one of the lowest dwell time scores. In contrast, 28.8% of the participants stated that the healthy foods "peach yoghurt" and "cereal bar with raspberries" were not a bit beautiful, followed by the healthy food "carrots" with 23.1%.

The healthy food cue "whole-grain bread with cheese and tomatoes" got the main highest dwell time of all participants, followed by the unhealthy food cue "pizza." However, "pizza" was considered as more beautiful than "whole-grain bread with cheese and tomatoes." Answers toward the aesthetic component of the "whole-grain bread with cheese and tomatoes" were balanced (63.5% non-selection; 17.3% very beautiful; 19.2% not a bit beautiful; n = 52). As a result, children might not gaze at food cues because of their appealing aesthetics components.

Character evaluation

Most of the children liked the main character. Results of the single item (1 = I like him not at all; 4 = I like him very much) showed that participants demonstrated a positive evaluation of the main character (*M* = 3.54, *SD* = 0.80). The same pattern was seen for the minor character Rondo (*M* = 3.31, *SD* = 0.85).

Perceived healthiness

The participants identified—on a four-point scale (1 = very unhealthy; 4 = very healthy)—the healthiness of two 4×3 cards that showed either all unhealthy or all healthy food items used as stimulus. Similar to the results of the study by Dias and Agante (2011), most of the children correctly identified the unhealthy card (*M* = 1.63, *SD* = 0.96) as well as the healthy card (*M* = 3.46, *SD* = 0.85). Of the participants (n = 51, one missing value) 84.6%

[4] Inconsistent cases applied to six children. The author took only the consistent cases of these children into account.

classified the unhealthy card as very unhealthy or unhealthy, whereas 88.5% of all children (n = 52) identified the healthy card as very healthy or healthy.

Hunger

Hunger was measured with a four-point single item (1 = really hungry; 4 = not hungry at all). The current hunger status of all children (n = 51, one missing value) was very different (M = 2.75, SD = 1.09); 19.2% of the participants reported that they were really hungry, 15.4% felt quite hungry, 34.6% were a little bit hungry, and 28.8% said they were not hungry at all. When time of study participation was categorized into morning (from 8 to 9 AM, n = 15), forenoon (from 9 to 11 AM, n = 26), and midday (from 11 AM to 12 noon, n = 11), Pearson's correlation coefficients showed no relationship between time and hunger ($r = -0.23$, $p = .104$).

10. Limitations

The presented results are limited in generalizability and must be considered with caution. Before further discussing the results, several limitations must be noted.

First, the used stimulus material was a self-created picture story, which had been prior-tested in children in terms of understanding and liking. The *external validity* can be contested. The author has tried to adapt to the current media environment of children as closely as possible. However, the consumption of one food pair was not quite realistic (panda eats during parachute jumping). There was also a difference with the actual media embedment of healthy food cues. In contrast to actual embedment (e.g. Olafsdottir & Berg, 2016), healthy food cues were also shown prominently to examine the distinction between children's attention to unhealthy and healthy food cues. Although the self-created example of television entertainment comes very close to the actual food embedment in children's media environment in terms of embedding both types of food calorific values, the present study used a high variety of food cues, which somewhat reduces the validity of the results.

Second, Geise (2011) refers to two types of attention. The author predominantly considered an involuntary, stimulus-based exogenous form of attention (*bottom-up*), i.e. attention that is primarily controlled by characteristics of the stimulus. However, an intentional endogenous form of attention (*top-down*) was also regarded by supposing goal-activation through internal cues, i.e. a more goal-driven attention because of individual characteristics and their impact on explicit memory.

Third, not every level of interaction included food products from every used *food category*. For example, the first interaction level did not include fast food, while the third interaction level did not contain sweets.

Fourth, the *healthiness* of the chosen food can be discussed. From a nutritional point of view, the amount eaten plays an important role, particularly for children (Department of Health, 2012). However, in light of the food pyramid given by the Department of Health (2012), the classification in high-calorie and low-calorie (i.e. unhealthy vs. healthy) within the food pairs seems to be adequate.

Fifth, individual *food preferences* (i.e. individual bias) were not obtained, though they could be important predictors for visual attention and subsequent memory.

11. Discussion

In this chapter, the presented findings will be discussed. The present Master's thesis first and foremost carried out preliminary work and focused on the impact of a visual stimulus that included unhealthy and healthy food cues in different levels of interaction on children's visual attention. To draw a conclusion about the attentional differences in children, in contrast to previous studies, the author embedded unhealthy and healthy food cues. Up till now, certain research works have tested the attention of adults to food pictures with different calorific values of the food products in non-narrative treatment (Castellanos et al., 2009). In communication science, there are currently fewer studies that examine the role of children's attention to food advertisements and commercials (Velazquez & Pasch, 2014) or the role of children's attentional bias for food products in an advergame (Folkvord et al., 2015) and the subsequent effect on their food preferences or choices. With respect to the results of the present work, the following points should be noted and discussed.

Regarding the findings of visual attention, it can be shown that eye tracking data displayed a superordinate pattern among all participants (Geise, 2011). Attentional focus on unhealthy food cues as well as on higher interaction levels can be derived, although irrespective of each other. As for the reactivity to embedded food cues in the advertising model (REFCAM) given by Folkvord et al. (2016), which is based on theoretical considerations of the cue-reactivity theory (Jansen, 1998), it can further be argued that the food cues induced physiological reactivity to food because attention to food cues represents a physiological assessment. However, in regard to the used design, no statement about the incentive sensitization process (Folkvord et al., 2016) can be made.

The author used a combination of methods (i.e. eye tracking and a subsequent post-treatment interview) to facilitate and clarify the interpretation of the complexity of eye tracking data. Thus, two premises in data interpretation were considered (Geise, 2011).

First premise: the effect of the visual stimulus on gaze behavior

Visual attention and the calorific value of the food cues

In terms of H_{1a}, paired samples *t*-tests showed significant differences between the sum of dwell time of unhealthy and healthy food cues. Furthermore, factorial repeated-measure ANOVA indicated a major effect of the food-calorific value on visual attention. In line with the findings of Castellanos et al. (2009), children also significantly tended to look longer at unhealthy (i.e. high caloric) than at healthy (i.e. low caloric) food. In contrast, entry time showed no significant difference between unhealthy and healthy food products, i.e. children were not more likely to look first at unhealthy than at healthy food products. Therefore, H_{1b} was refuted. However, it must be noted that both studies used different attention measures (i.e. gaze direction bias vs. entry time; gaze duration bias vs. dwell time), which makes comparison more difficult.

Peter (2002) concluded that media can facilitate the accessibility of cognitions that can consequently affect the reception, interpretation, and evaluation of subsequently encountered environmental information. Furthermore, Peter (2002) pointed out that for an activation, the applicability of a more accessible knowledge unit on the subsequently encountered environmental information is imperative. The more the characteristics of a knowledge unit overlap with the features of the environmental information, the more likely it is for an individual to pay attention to these target stimuli (Peter, 2002). As for the findings, it could be argued that the increased attention toward unhealthy (i.e. more accessible knowledge units) than toward healthy (i.e. less accessible knowledge units) food cues represented a "successful" application. Although priming represents one of several existing explanatory approaches for the effects of food placements (Zipfel, 2009), it is the most obvious interpretation in this case. For instance, a mere exposure effect includes a repeated presentation of one stimulus and not of a variety of stimuli (Zipfel, 2009); i.e. it is not recommended by a strong variation, as in this case. Furthermore, the explanation of a mere exposure "[…] would predict an effect on brand evaluation which, in turn, should determine brand choice" (Naderer et al., 2016, p.14). In the present study, the evaluation of food products was not done and the facility as a within-subjects design also makes it difficult to demonstrate an effect after exposure. In contrast, priming effects can also be detected during exposure (Peter, 2002). However, what must be critically considered is the unknown time interval between the stimuli (Zipfel, 2009), i.e. the time between prior and current exposure to child-friendly television entertainment.

Visual attention and the level of interaction of the food cues

Meaningful results implied the different types of embedment of the food cues. The interaction level in which the food cues were embedded revealed significant differences in the average sum of dwell time. In regard to H_2, both the results of the paired samples *t*-tests of mean dwell time scores and analyses of entry time showed significant differences between the interaction levels. In line with H_{2a}, factorial-repeated measures ANOVA showed a major effect of interaction level on visual attention. Thus, the higher was the level of interaction, the greater was the likelihood that children will pay increased attention toward food cues. As for H_{2b}, in comparison to the first interaction level participant's first contact with the food cues was significantly earlier in the third level of interaction. Moreover, children looked earlier at food products when a main character handled a food product, whereas eatable products that were passively represented gained delayed attention from viewers. However, the comparison of the second and the third interaction level showed only a trend toward significance.

These findings are also in line with the PCMC model given by Buijzen et al. (2010), which states that a subtle simple placement in the background of a program scene draws less attention and therefore will not evoke high resources allocated, because recipients only use the resources that are required to process it. In contrast, the use of a product by a character represents a more prominent placement and requires low resources as well, because it does not coercively play an important role in a program. However, it draws more attention and consequently leads to higher resource allocation. As the findings of visual attention toward food cues showed an increase with every interaction level, it could be concluded that the resource allocations of the children also increased with every level of interaction. This in turn would imply that the passive food cues were not or automatically processed, whereas food cues in active patterns were heuristically or non-critical-systematically processed.

However, when regarding the context of the persuasive message as the first task and the processing of persuasive messages—like the processing of food cues in the present study—as the second task, heuristic or even noncritical systematic processing is rather unrealistic, because participants were exposed to an example of television entertainment rather than to a video game, which leads to heuristic or systematic processing. Similar to children's automatic processing of food cues within advergames with a low level of elaboration and a simultaneous unawareness about the persuasive intent (Folkvord et al., 2016), participants of the present study had most likely also automatically processed the food cues within the picture story.

Moreover, it can also be concluded that children generally recognize food cues as a part of everyday life and do not regard different food cues as persuasive messages. This assumption is based on the fact that placements in media content make it more difficult to recognize the persuasive intent of the message, because "[…] product placements seem to come as Trojan horses, carrying hidden messages" (Matthes & Naderer, 2015, p. 132). Indeed, children have problems in understanding the practice of embedded advertising, like movie placements, compared to traditional television advertising (Owen, Lewis, Auty, & Buijzen, 2013). Thus, it could be concluded that the recognition of persuasive influence is even more difficult in cases when unbranded unhealthy food products are promoted. However, it must be noted that although unhealthy products (like fast food) are not labeled, children assign them to the respective (fast food) brands more quickly than in the case of healthy food products (Arredondo et al., 2009). This circumstance highlights the need for further research with respect to food cues themselves (Radnitz et al., 2009).

According to the social learning theory given by Bandura (1977), it must be further noted that children's character evaluation was indeed very high. Modeling is characterized by an increased attention of the observer to the observed character (Zipfel, 2009), which can be derived from the findings. A high degree of attention is needed for this explanation approach. Consequently, it can be assumed with high probability that modeling behavior would have occurred subsequently. However, this has not been studied and cannot be derived. Only the prerequisites for this explanation approach (i.e. increased attention) have been fulfilled.

Finally, the results of the present study are also in line with the results of Ogle et al. (2017). The authors concluded that children looked longer at food product pairs that displayed a character. In the present study, children were not exposed to pictures but to a character who was involved in a story. In this case, it could be also determined that children paid more attention to food cues that were shown together with a character rather than in passive forms.

Visual attention and the possibility of an interaction effect between the calorific value of the food cues and the level of interaction of the food cues

In terms of H_{3a} and H_{3b}, repeated measures showed no significant interaction effect between the food-calorific value and the interaction level. Additionally, only tendencies can be derived from the paired samples *t*-tests. The mean values of dwell time scores differed minimally, but the average sum of dwell time of unhealthy food products in the respective levels of interaction always proved to be the higher value. For future research, it would be interesting to test this assumption with a bigger sample and a more suitable design (e.g. with less variety of food cues). However, this study showed that, independent of the food calorific value, a higher interaction level attracts children's attention more than a lower one. Thus, the assumption is not supported that the results of Ogle et al. (2017) of children's preferences of unhealthy food products over healthy food products, both when characters were present or absent, can be reflected in their visual attention toward unhealthy and healthy food cues within media content.

While van der Laan et al. (2017) indicated that the maintenance of gaze toward palatable unhealthy food products is caused by an activation of an eating enjoyment goal, in the present study such an activation can be excluded. Rather, the character in the story has drawn attention to food products he handled or ate, as that attention toward unhealthy food cues was maintained irrespective of the level of interaction. Thus, the embedment of food products in active roles with the media character plays an important role and sheds new light on the praxis, if one considers that increased attention toward mostly unhealthy food products relates to unhealthy food preferences (Velazquez & Pasch, 2014) or that a faster latency of initial fixation to unhealthy food cues results in caloric intake (Folkvord et al., 2015). This pattern might be also true for healthy food products. Furthermore, admiration for a character can lead to imitation (Bandura, 1977) and can consequently influence children's food preferences and intake.

Certain impact studies proved that children with higher weight were more responsive to promoted food products (e.g. Halford et al., 2008; Forman, Halford, Summe, MacDougall, & Keller, 2009), tried to clarify the impact of hunger status on food intake after exposure to food advertising (e.g. Harris et al., 2009), or even found that children ate energy-dense snacks in higher quantity when they reported being hungry (Folkvord et al., 2013). Similarly, for a review of food-related attention bias studies (Nijs & Franken, 2012), most recent research works in this area have investigated attentional differences to food cues between overweight and normal weight adults and furthermore have taken the participant's level of hunger and satiety into account (see Castellanos et al., 2009; Nijs, Muris, Euser, & Franken, 2010; Werthmann, Roeffs, Nederkoorn, Mogg, Bradley, & Jansen, 2011). In lines with the current research, the BMI and current hunger status of the participants were consulted for controlling the model of children's visual attention toward unhealthy and healthy food cues in different interaction levels. When controlling for children's BMI, the significant effect of the food calorific value remained, but controlling for children's hunger reduced the main effect to non-significant. According to the major effect of the interaction level, in the case of hunger as covariate, a significant level remained, also when regarding the *post hoc* tests. However, when controlling with BMI and regarding the *post hoc* tests and the comparison of each interaction level, the significant difference between the second and third level of interaction disappeared.

Second premise: the effect of gaze behavior on subsequent outcomes

According to the theoretical foundations (Folkvord et al., 2016) and the emerging health-related questions, recent studies understandably mostly concentrated on the impact of children's attention on food preferences (Velazquez & Pasch 2014) or food intake (Folkvord et al., 2015). The present study wanted to rectify this lack of empirical evidence and tried to link participants' mean dwell time scores with explicit memory-related measures of recall and recognition.

According to the DSMM, attentional bias for food cues demonstrates one dispositional pre-existing factor that can stimulate media effects (Folkvord et al., 2016). In this case, no association between the mean dwell time on food cues and the amount of recalled and recognized food cues can be proved. However, the author suspects that a stimulus material with less variety of food references could yield different results.

However, the link between eye tracking data and recognition data is also considered controversial in science. Bias in recognition measures can occur if participants are confronted with a well-known brand and claim to have seen this brand over and above the actual attention given (Aribarg, Pieters, & Wedel, 2010). However, in the present study, food cues were used instead of well-known food brands. In regard to this debate, it must also be noted that one weakness of eye tracking use is that only a part of the perception can be covered, namely the so-called foveal perception (Geise, 2011). For instance, cases of context-related perception cannot be reflected in eye tracking data. The effects of contextual scenes on the identification of objects (see Palmer, 1975) are just important during exposure to media content and when regarding how the food cues are embedded in the context.

On the whole, it can be argued that a priming effect occurred, given that all children tended to look longer at unhealthy food cues (H_{1a}). Unhealthy food products can be defined as more accessible knowledge units in comparison to healthy food cues because of their dominant embedding in child-friendly media content. However, the time of first contact between both types of food-calorific value did not differ (H_{1b}). In fact, the time of first contact was contingent upon the interaction level of the food cues (H_{2b}). Furthermore, the increased attention toward food products in higher interaction levels (H_{2a}) led to a falsification of the assumption that the initiated attention to unhealthy food cues (H_{1a}) will be maintained irrespective of the level of interaction (H_{3a+b}). Although it is difficult to direct attention bias when being first initiated (Lan et al., 2017), following the main character of the story and his activities gained the children's attention. Finally, no association between the mean dwell time on food cues and the subsequent memory of these products was found (H_{4a+b}). Figure 7 gives a summary of results.

Figure 7. Summary of Results

	Hypothesis Description	Summary of Result	Verification or falsification	
H_{1a} + H_{1b}	Children pay (a) more and (b) earlier attention to unhealthy rather than healthy food cues.	Children were more likely to (a) gaze longer (b) but not earlier at unhealthy foods.	H_{1a} supported H_{1b} not supported	✓ ×
H_{2a} + H_{2b}	The higher is the level of interaction, the (a) more and (b) earlier children will pay attention to food cues.	Children were more likely to both (a) gaze longer and (b) earlier [1] at food cues in higher levels of interaction.	H_{2a} supported H_{2b} supported	✓ ✓
H_{3a} + H_{3b}	Children pay (a) more and (b) earlier attention to unhealthy food cues in every interaction level rather than to healthy food cues.	Children did not pay more or earlier attention to unhealthy food cues in every level of interaction.	H_{3a} not supported H_{3b} not supported	× ×
H_{4a} + H_{4b}	There is a link between children's visual attention toward food cues and the number of remembered food products in terms of (a) recall and (b) recognition.	No significant association between visual attention and (a) recall or (b) recognition was found.	H_{4a} not supported H_{4b} not supported	× ×

[1] *Note: The comparison of entry time (ms) between the second (i.e. interaction) and third (i.e. consumption) level of interaction showed only marginal significance (p = .064)*

Conclusively, a bigger sample is needed to strengthen the results. For further research, it would also be necessary to examine children's attention toward unhealthy or healthy food cues in media content and to link it with cognitive, affective, or conative outcomes. With respect to children's exposure to unhealthy and healthy food cues, the author did not address the link between visual attention toward unhealthy and healthy food cues and the subsequent intentional snack choice. The primary objective of the present Master's thesis was to examine the effect of children's exposure to unhealthy and healthy food cues in different interaction levels on visual attention as well as the effect of visual attention on subsequent cognitive outcomes in the form of recall and recognition. For linking the conative responses of the participants in the form of subsequent intentional snack choices of unhealthy and healthy food products used as stimulus, a *control group* without manipulation would have been a requirement. However, this would go beyond the scope of the present Master's thesis. Moreover, in the case of a variety of 18 food cues, the statement of a behavioral effect would be rather small.

Regarding the main findings about the visual attention toward unhealthy and healthy food cues in different levels of interaction, a conclusion can be made by answering a part of the following question: How long and when do children actually look at different food cues within media content? The findings demonstrated the important role of the level of interaction; a higher interaction level of the food cues led to higher attention toward food products. For instance, 42.3% of all participants considered the bowl of "mixed fruits"—which was shown with no interaction—to be very beautiful, but children on average gazed less on it compared to the "whole-grain bread with cheese and tomatoes" which was shown with consumption and represented the highest average dwell time score. With regard to all food cues together in every interaction level, the average of dwell time score significantly increased with every level of interaction. Although children have individual differences in terms of attention to certain food products (Folkvord et al., 2016; Valkenburg & Peter, 2013), their real main goal was to follow the story and while following the adventures of the main character, their attention toward food cues increased when the main character handled or ate certain food products, irrespective of the calorific value. However, an increased attention toward unhealthy food cues was also observed. This points to a possible priming effect, because unhealthy food products are heavily promoted in the media environment of children and are consequently more accessible knowledge units.

Additionally, a practical reference can be made. For a children's film producer, it would be necessary to show healthier food in interaction with or being consumed by the character, because the findings suggest that the level of interaction does not depend on the food-calorific value. Regardless of the interaction level, unhealthy food cues significantly get more visual attention. Regardless of the food calorific value, food cues with interaction received significantly more visual attention than food products with no interaction. Hence, no interaction effect could be found between the food calorific value and the interaction level. Therefore, if healthy food products would be more prominent in a story and unhealthy food products in contrast more subtle, it might have a positive impact on children's healthiness. Kotler, Schiffmann, and Hanson (2012) have already demonstrated the influence of media characters on children's food choices and have reported that "[…] children are more willing to try more pieces of healthy food if a favored character is promoting that food compared with an unknown or disliked character" (p. 896) However, the reality looks different. Content analyses showed that in comparison to healthy food products, unhealthy food products are mostly shown in active situations (Olafsdottir & Berg, 2016) and even got higher enthusiastic endorsements (Radnitz et al., 2009).

Finally, the present study wanted to provide an incentive for future research and generally wanted to draw attention to the fact that children indeed pay their attention toward food cues – especially when they are shown in interaction with or being consumed by the main character. Thus, the author appeals for a reduction of unhealthy food cues in children's media content, or at least for placing healthy food products more in the foreground and showing them in more active patterns.

"Hopefully we are able to teach children to direct their attention and become less responsive to food advertisements"

Folkvord et al., 2015, p. 257

12. References

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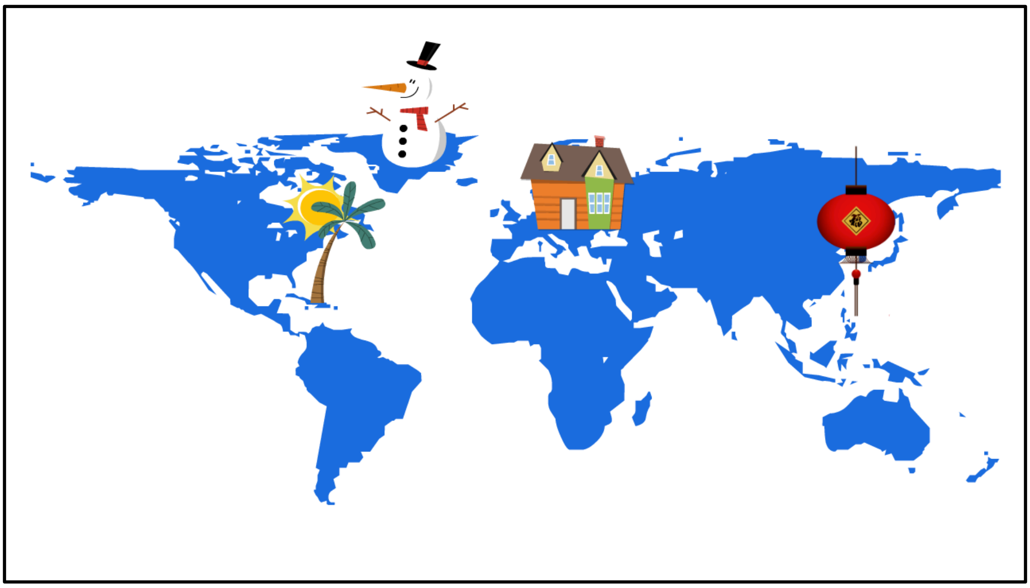
13. Appendix

13.1. Appendix A: Stimulus material

Introduction (German)

Du wirst jetzt eine Bildergeschichte sehen. Die Geschichte heißt: Zweimal um die ganze Welt. Der Peppino – ein Pandabär – macht eine Weltreise. Peppino ist ganz aufgeregt und kann es kaum erwarten die Reise zu starten. Seine Mama kann ihn leider nicht begleiten und bleibt zu Hause. Dafür darf sein kleiner Bruder Rondo mitkommen. Zusammen haben sie viel Spaß, erleben tolle Abenteuer und lernen auch neue Freunde kennen. Sie treffen auf Luna den Delfin, Claudius den Eisbären und ein Wesen, das sie zuvor noch nie gesehen haben. Das ist eine Weltkarte. Hier sind Peppino und Rondo zu Hause (*draufzeigen*). Zuerst zieht es die beiden auf eine tropische Insel mit ganz blauem Meer und weißen Stränden (*draufzeigen*). Dann wird es ihnen zu heiß und sie suchen an einem ganz kalten Platz Abkühlung – an einem Ort, wo es ganz viel Eis und Schnee gibt. Doch dann wird es ihnen zu kalt und sie fliegen weiter in das Land des Kung Fu's (*draufzeigen*). Als Peppino und Rondo wieder nach Hause kommen, fällt Peppino auf, dass sie gar keine Geschenke mitgenommen haben. Also gehen die beiden erneut auf Reise, besuchen ihre Freunde noch ein zweites Mal und nehmen überall ein Geschenk mit. Danach fällt Peppino ganz erschöpft ins Bett.

Figure 8. World map for introduction



Manipulated picture story

Figure 9. Slide 1 (not manipulated)

Figure 10. Slide 2 (randomization group a)

Figure 11. Slide 3 (not manipulated)

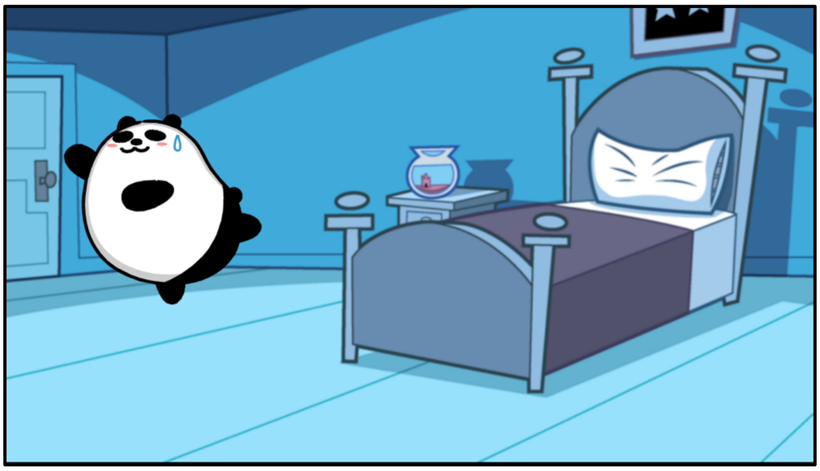


Figure 12. Slide 4 (randomization group b)

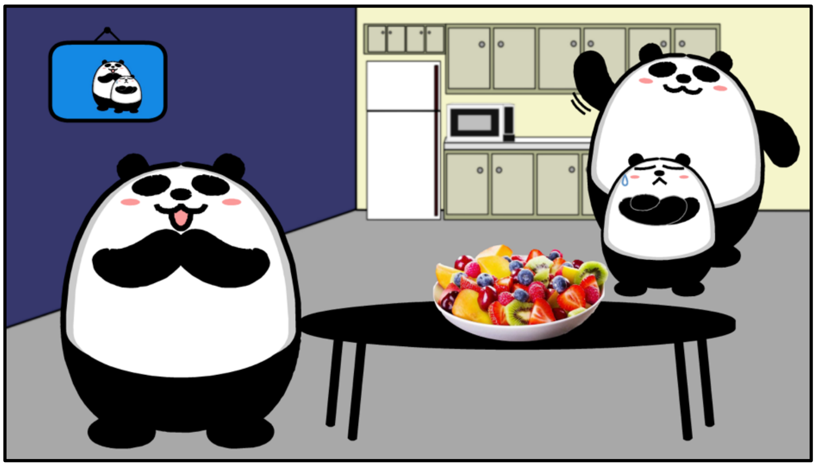


Figure 13. Slide 5 (not manipulated)

Figure 14. Slide 6 (not manipulated)

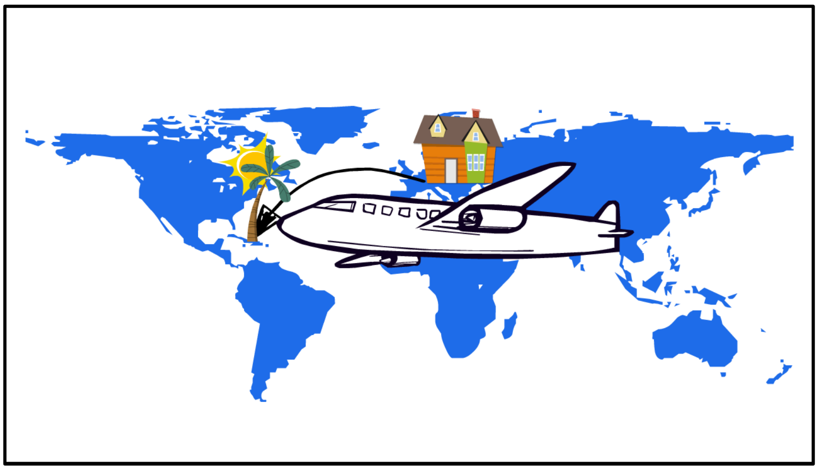


Figure 15. Slide 7 (randomization group c)

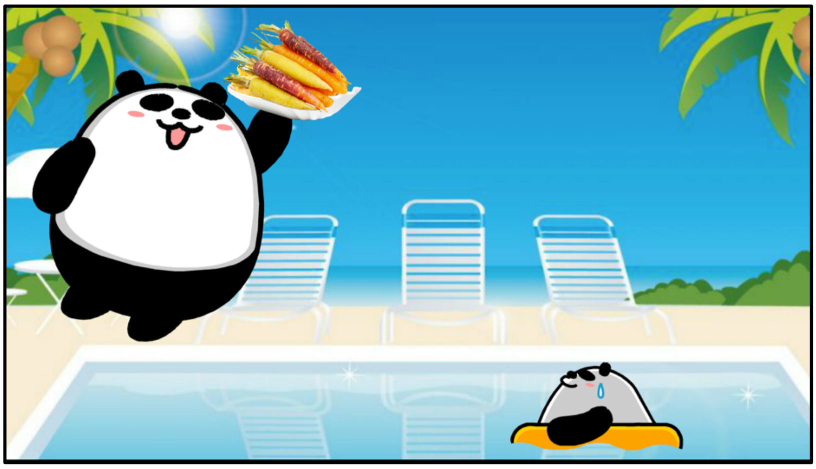


Figure 16. Slide 8 (not manipulated)

Figure 17. Slide 9 (randomization group d)

Figure 18. Slide 10 (not manipulated)

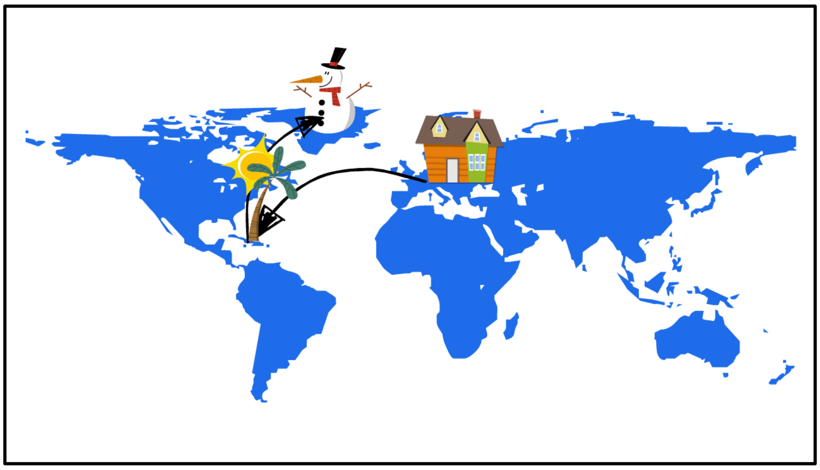


Figure 19. Slide 11 (randomization group e)

Figure 20. Slide 12 (not manipulated)

Figure 21. Slide 13 (randomization group f)

Figure 22. Slide 14 (not manipulated)

Figure 23. Slide 15 (randomization group g)

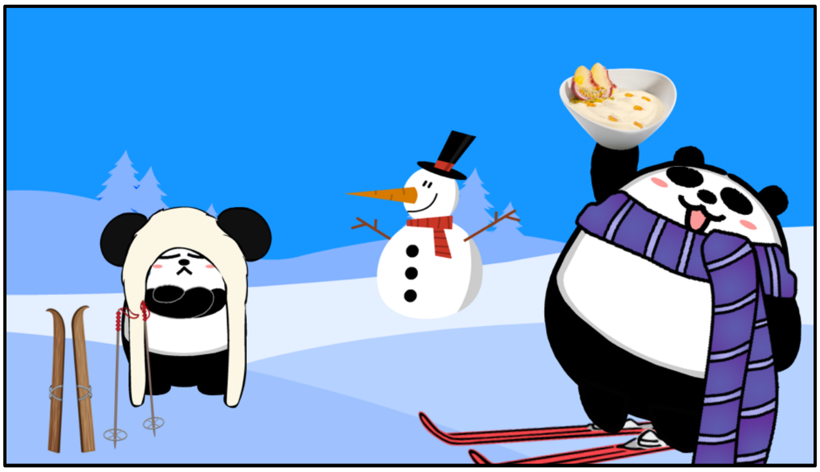


Figure 24. Slide 16 (not manipulated)

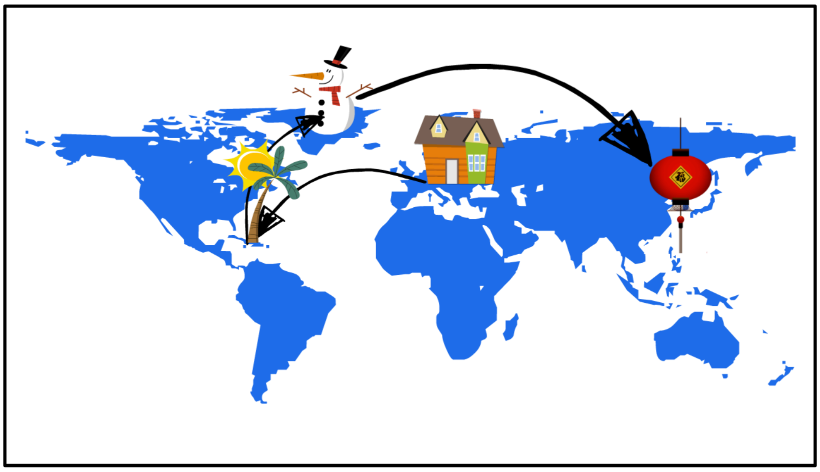


Figure 25. Slide 17 (randomization group h)

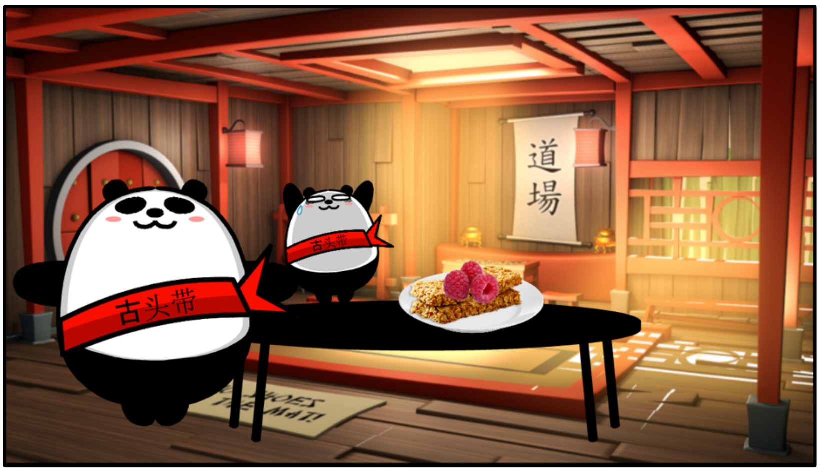


Figure 26. Slide 18 (not manipulated)

Figure 27. Slide 19 (randomization group i)

Figure 28. Slide 20 (not manipulated)

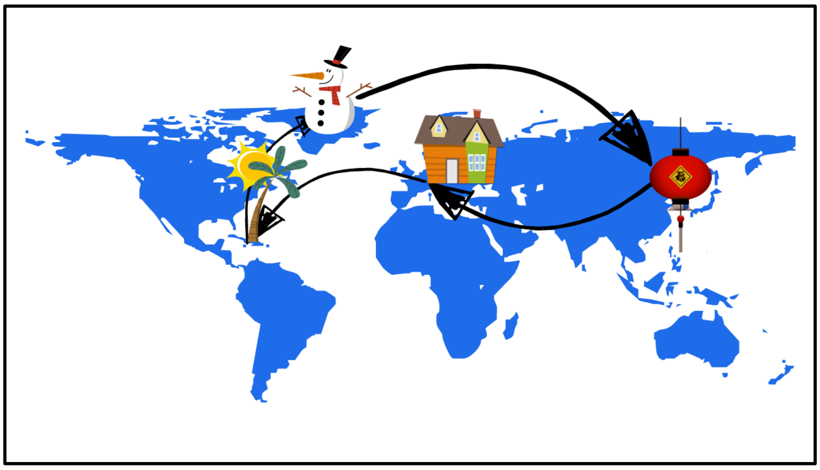


Figure 29. Slide 21 (not manipulated)

Figure 30. Slide 22 (not manipulated)

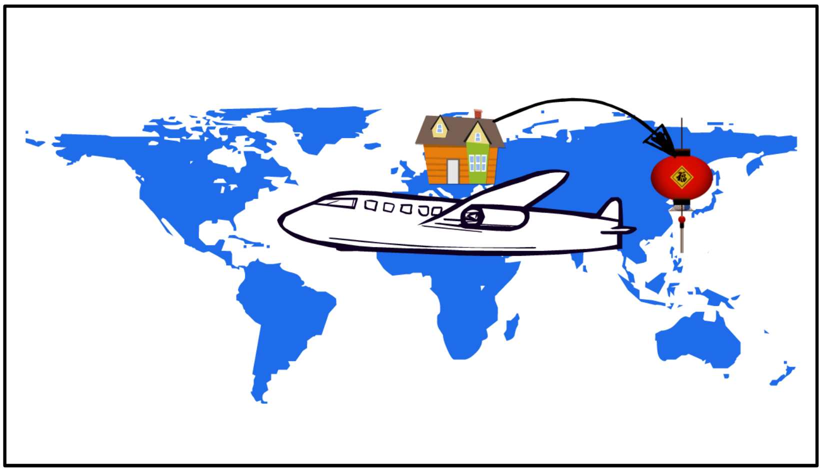


Figure 31. Slide 23 (randomization group i)

Figure 32. Slide 24 (not manipulated)

Figure 33. Slide 25 (randomization group h)

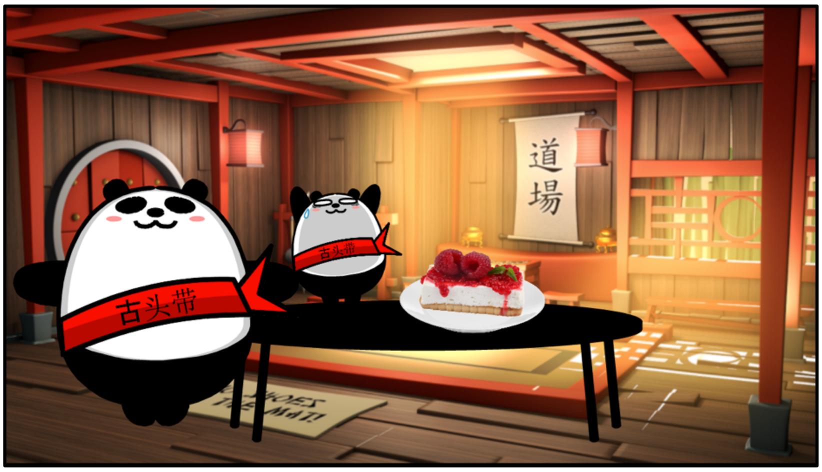


Figure 34. Slide 26 (not manipulated)

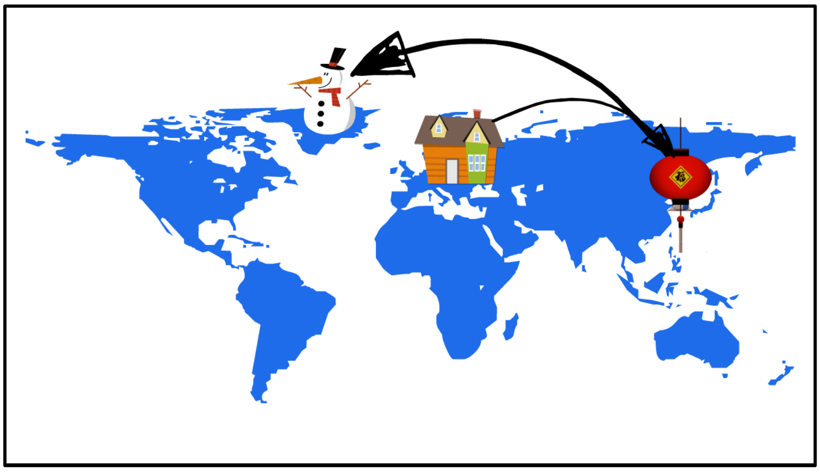


Figure 35. Slide 27 (randomization group g)

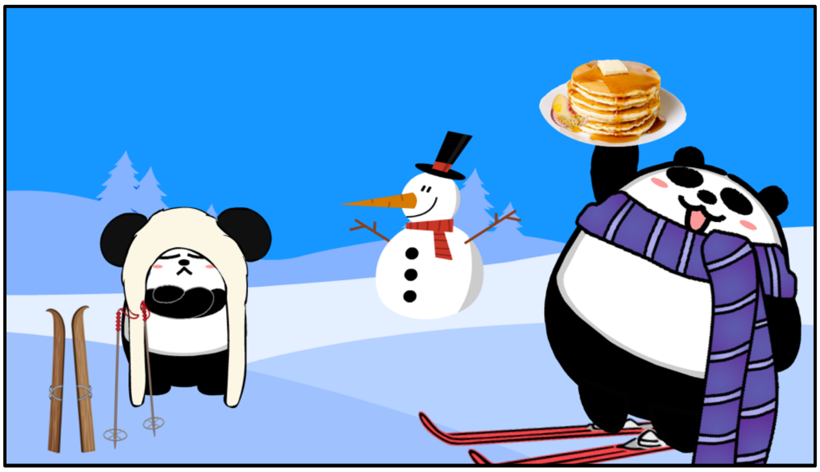


Figure 36. Slide 28 (not manipulated)

Figure 37. Slide 29 (randomization group f)

Figure 38. Slide 30 (not manipulated)

Figure 39. Slide 31 (randomization group e)

Figure 40. Slide 32 (not manipulated)

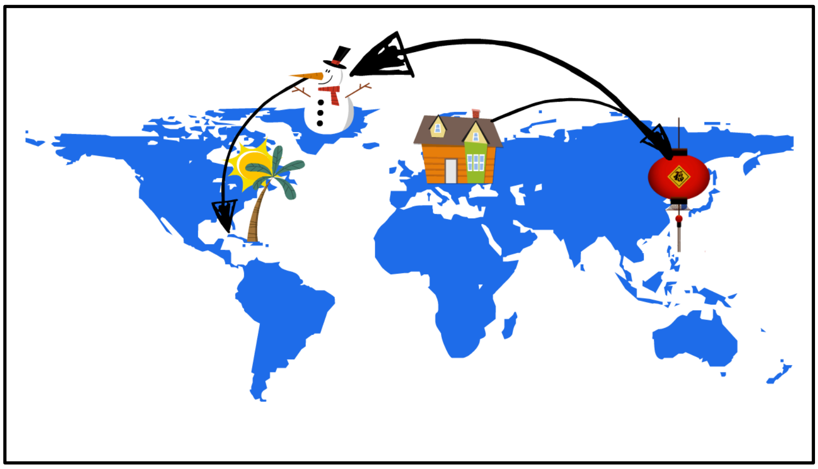


Figure 41. Slide 33 (randomization group d)

Figure 42. Slide 34 (not manipulated)

Figure 43. Slide 35 (randomization group c)

Figure 44. Slide 36 (not manipulated)

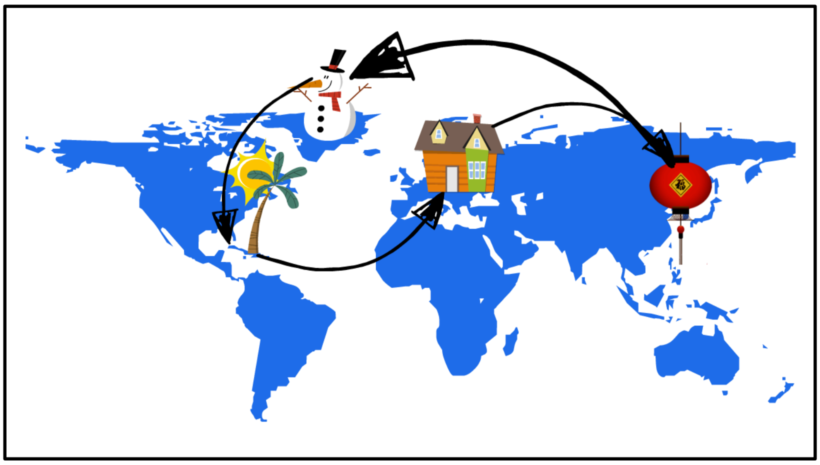


Figure 45. Slide 37 (not manipulated)

Figure 46. Slide 38 (randomization group b)

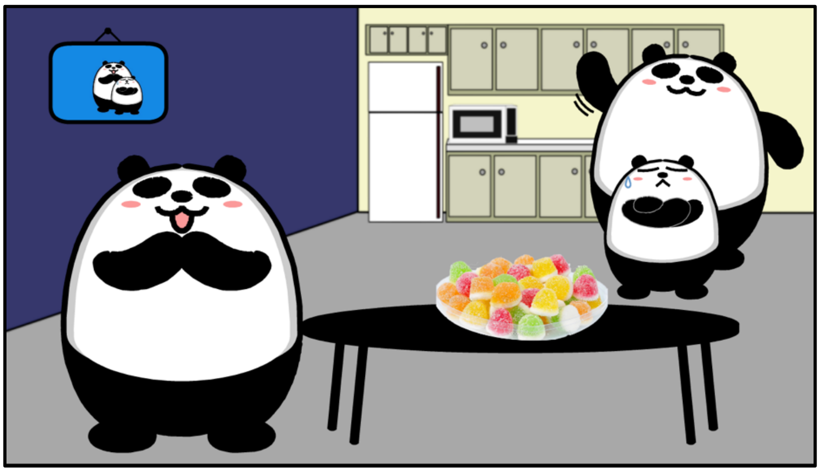


Figure 47. Slide 39 (not manipulated)

Figure 48. Slide 40 (randomization group a)

Food pairs sorted by randomization group

Figure 49. Food pair randomization group a

Figure 50. Food pair randomization group b

Figure 51. Food pair randomization group c

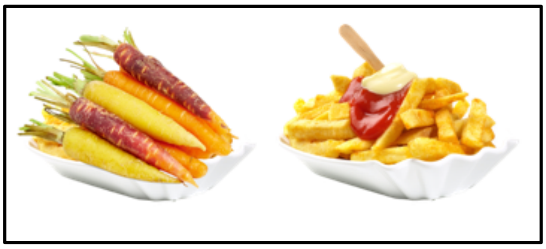


Figure 52. Food pair randomization group d

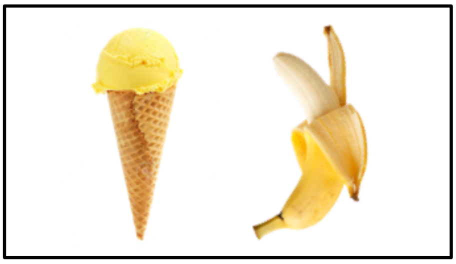


Figure 53. Food pair randomization group e

Figure 54. Food pair randomization group f

Figure 55. Food pair randomization group g

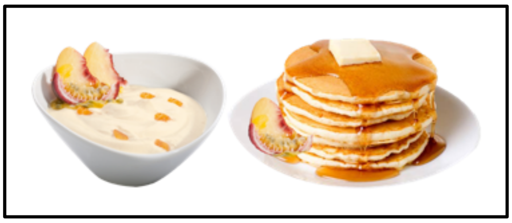


Figure 56. Food pair randomization group h

Figure 57. Food pair randomization group i

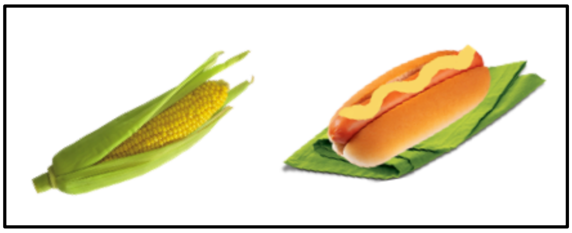


Figure 58. First 4x3 card of unhealthy and healthy food cues used as stimulus and alternative food products (encircled)

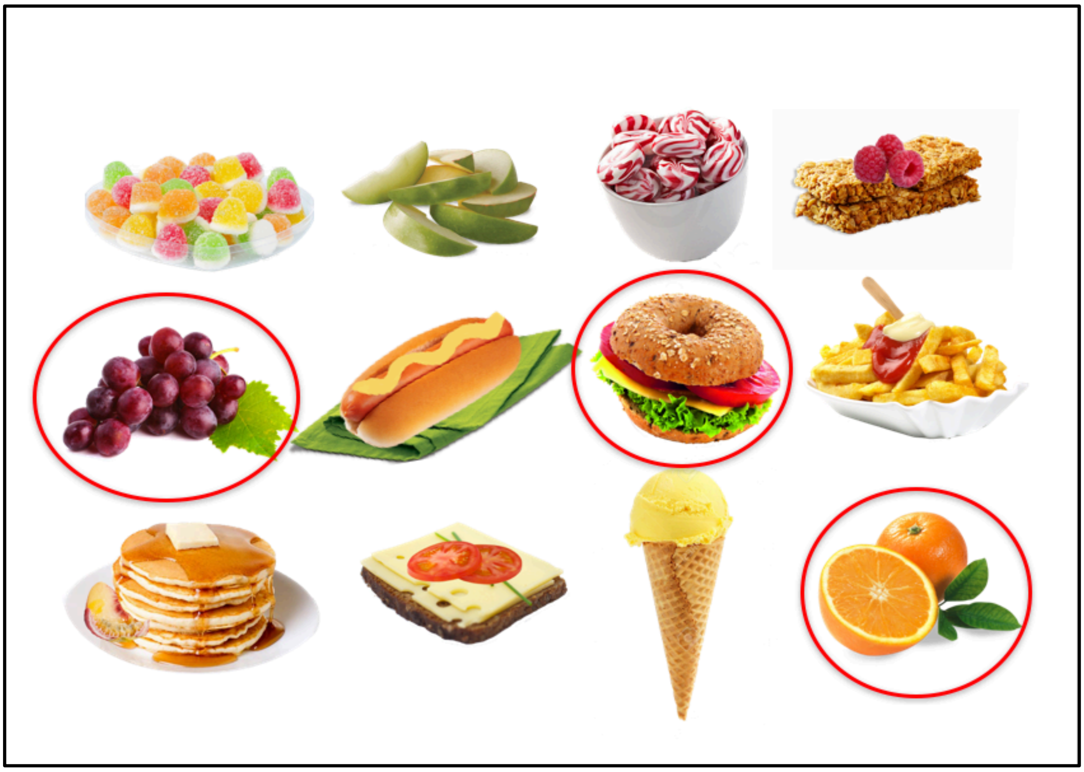


Figure 59. Second 4x3 card of unhealthy and healthy food cues used as stimulus and alternative food products (encircled)

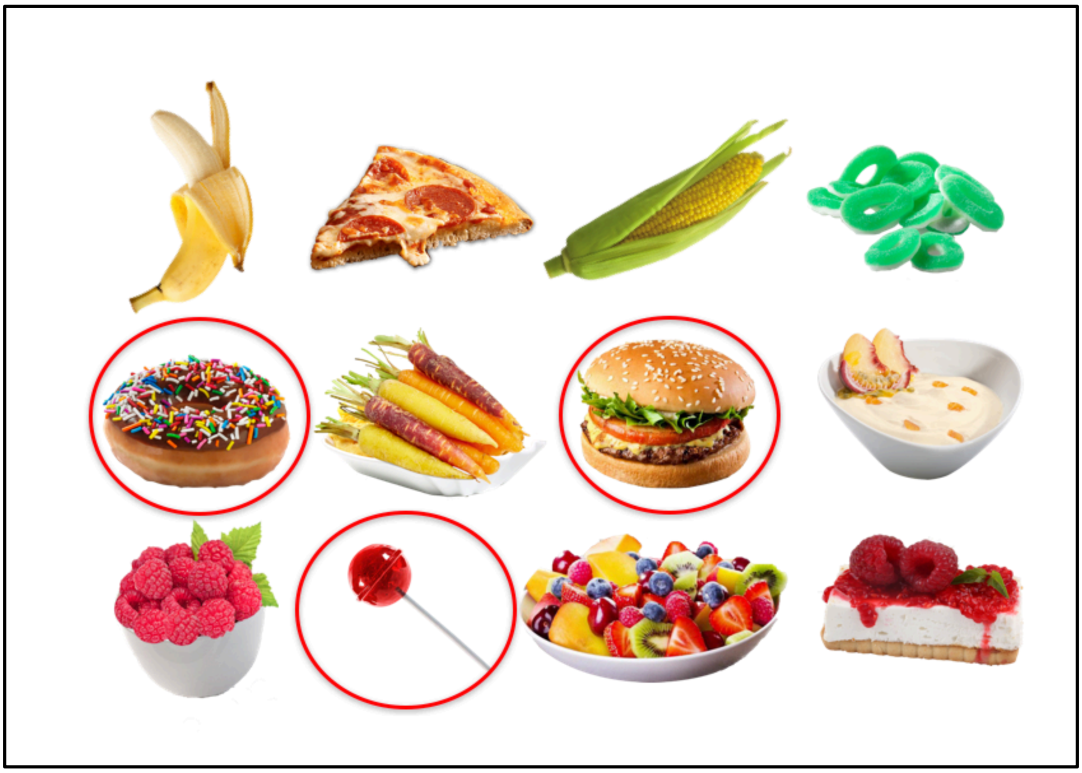


Figure 60. 4x3 card of unhealthy food products

Figure 61. 4x3 card of healthy food products

Plotline (German)

Slide 1 (5sek): *no manipulation*
Peppino stellt sich vor
Slide 2 (5sek): *manipulation*
Peppino liegt im Bett, schläft tief und fest und träumt von der Reise; Am Nachtkästchen steht ein Lebensmittel; Kontext: keine Interaktion
Slide 3 (5sek): *no manipulation*
Peppino steht auf und verlässt sein Zimmer
Slide 4 (5sek): *manipulation*
Peppino kommt in die Küche und trifft auf seine Mama und seinen kleinen Bruder Rondo; Am Esstisch steht ein Lebensmittel; Kontext: keine Interaktion
Slide 5 (5sek): *no manipulation*
Peppino und Rondo verlassen das Haus und machen sich gemeinsam auf den Weg
Slide 6 (5sek): *no manipulation*
Landkarte mit Flugzeug und Pfeil für den Zielort: Karibik
Slide 7 (5sek): *manipulation*
Peppino und Rondo sind am Pool; Rondo schwimmt im Pool; Peppino trägt ein Lebensmittel; Kontext: Interaktion
Slide 8 (5sek): *no manipulation*
Peppino und Rondo sind tauchen und treffen auf einen Delfin
Slide 9 (5sek): *manipulation*
Peppino und Rondo sind am Strand; Rondo lässt sich sonnen; Peppino hält einen Schirm und isst ein Lebensmittel; Kontext: Konsumation
Slide 10 (5sek): *no manipulation*
Landkarte mit Pfeil für den nächsten Zielort: Grönland
Slide 11 (5sek): *manipulation*
Peppino und Rondo sind gemeinsam paragleiten; Peppino isst währenddessen ein Lebensmittel; Kontext: Konsumation
Slide 12 (5sek): *no manipulation*
Peppino und Rondo sind mit dem Hundeschlitten zu einem Iglo gefahren
Slide 13 (5sek): *manipulation*
Peppino und Rondo sind im Iglo drinnen; Rondo wärmt sich beim Kamin auf; Peppino hält Lebensmittel in der Hand; Kontext: Interaktion
Slide 14 (5sek): *no manipulation*

Peppino und Rondo sind auf dem Polarmeer und treffen auf einen Eisbären

Slide 15 (5sek): *manipulation*

Peppino und Rondo sind Skifahren; Peppino hält Lebensmittel in der Hand; Kontext: Interaktion

Slide 16 (5sek): *no manipulation*

Landkarte mit Pfeil für den nächsten Zielort: China

Slide 17 (5sek): *manipulation*

Peppino und Rondo machen Kung Fu; Am Esstisch steht ein Lebensmittel; Kontext: keine Interaktion

Slide 18 (5sek): *no manipulation*

Peppino und Rondo sind in einem chinesischen Garten und treffen auf einen Drachen

Slide 19 (5sek): *manipulation*

Peppino und Rondo sitzen auf einer Bank; Peppino isst ein Lebensmittel; Kontext: Konsumation

Slide 20 (5sek): *no manipulation*

Landkarte mit Pfeil für den nächsten Zielort: zu Hause

Slide 21 (5sek): *no manipulation*

Peppino und Rondo kommen zu Hause an, wo ein Unwetter herrscht; Peppino kommt drauf, dass sie keine Geschenke mitgenommen haben

Slide 22 (5sek): *no manipulation*

Landkarte mit Flugzeug und Pfeil für den Zielort: China

Slide 23 (5sek): *manipulation*

Peppino und Rondo sitzen auf einer Bank; Peppino isst ein Lebensmittel; Kontext: Konsumation

Slide 24 (5sek): *no manipulation*

Peppino und Rondo sind in einem chinesischen Garten und treffen auf einen Drachen; der Drache übergibt ihnen ein Geschenk

Slide 25 (5sek): *manipulation*

Peppino und Rondo machen Kung Fu; Am Esstisch steht ein Lebensmittel; Kontext: keine Interaktion

Slide 26 (5sek): *no manipulation*

Landkarte mit Pfeil für den nächsten Zielort: Grönland

Slide 27 (5sek): *manipulation*

Peppino und Rondo sind Skifahren; Peppino hält Lebensmittel in der Hand; Kontext: Interaktion

Slide 28 (5sek): *no manipulation*

Peppino und Rondo sind auf dem Polarmeer und treffen auf einen Eisbären; der Eisbär übergibt ihnen ein Geschenk

Slide 29 (5sek): *manipulation*

Peppino und Rondo sind im Iglo drinnen; Rondo wärmt sich beim Kamin auf; Peppino hält Lebensmittel in der Hand; Kontext: Interaktion

Slide 30 (5sek): *no manipulation*

Peppino und Rondo sind mit dem Hundeschlitten zu einem Iglo gefahren

Slide 31 (5sek): *manipulation*

Peppino und Rondo sind gemeinsam paragleiten; Peppino isst währenddessen ein Lebensmittel; Kontext: Konsumation

Slide 32 (5sek): *no manipulation*

Landkarte mit Pfeil für den nächsten Zielort: Karibik

Slide 33 (5sek): *manipulation*

Peppino und Rondo sind am Strand; Rondo lässt sich sonnen; Peppino hält einen Schirm und isst ein Lebensmittel; Kontext: Konsumation

Slide 34 (5sek): *no manipulation*

Peppino und Rondo sind tauchen und treffen auf einen Delfin; der Delfin übergibt ihnen ein Geschenk

Slide 35 (5sek): *manipulation*

Peppino und Rondo sind am Pool; Rondo schwimmt im Pool; Peppino trägt ein Lebensmittel; Kontext: Interaktion

Slide 36 (5sek): *no manipulation*

Landkarte mit Pfeil für den nächsten Zielort: zu Hause

Slide 37 (5sek): *no manipulation*

Peppino und Rondo machen sich gemeinsam auf den Weg nach Hause

Slide 38 (5sek): *manipulation*

Peppino und Rondo kommen Zuhause an und begrüßen die Mama in der Küche; Am Esstisch steht/liegt ein Lebensmittel; Kontext: keine Interaktion

Slide 39 (5sek): *no manipulation*

Peppino geht in sein Zimmer und Richtung Bett

Slide 40 (5sek): *manipulation*

Peppino liegt im Bett, schläft tief und fest und träumt von der Reise; Am Nachtkästchen steht ein Lebensmittel; Kontext: keine Interaktion

13.2. Appendix B: Post-treatment interview

Version 1 (German)

Datum: ________ Klasse: __________ Laufnummer: __________
Uhrzeit Beginn Eyetracking: ___________

Uhrzeit Beginn Befragung: ___________

1. Geschlecht: ☐ männlich ☐ weiblich
2. BMI: ◻ NormalG ◻ leichtÜG ◻ starkÜG

Danke, dass du heute mitmachst. Ich stelle dir nur noch ein paar Fragen, dann sind wir fertig.

3. Wie alt bist du? ____

4. Du hast ja gerade eine Bildergeschichte gesehen. Kannst du dich erinnern, was es alles zum Essen gab? (*offene Fragestellung, insgesamt 3x nachfragen: „Was noch? Nenne mir bitte alle Sachen, die dir einfallen.“ „Sonst noch etwas?“*)

☐ zuerst ungesundes Lebensmittel erwähnt
☐ zuerst gesundes Lebensmittel erwähnt
☐ gar kein Lebensmittel erwähnt

Beim ersten Mal nachfragen genannte Lebensmittel:
…………………………………………………………………………………………..........................

…………………………………………………………………………………………..........................

Beim zweiten Mal nachfragen genannte Lebensmittel:
…………………………………………………………………………………………..........................

Beim dritten Mal nachfragen genannte Lebensmittel:
…………………………………………………………………………………………..........................

5. Ich zeige dir nun noch ein paar Bilder. Sag mir doch bitte, welche Sachen du vorhin gesehen hast. (*beide LM-Karten herzeigen, Reihenfolge nummerieren)*

☐ weiß nicht

6. Jetzt stellen wir uns vor, deine Eltern sind weg und haben mich gebeten, auf dich aufzupassen. Ich weiß aber leider nicht, was du gerne isst. Sag mir doch bitte, welche vier Sachen du jetzt gerne essen würdest. (Reihenfolge <u>nummerieren</u>)

☐ weiß nicht

7. Und welche vier Sachen würdest du deiner Freundin/deinem Freund gerne mit-nehmen? (Reihenfolge <u>nummerieren</u>)

☐ weiß nicht

8. **Gibt es hier Bilder, die du sehr schön (O) findest?**

9. **Gibt es hier Bilder, die du gar nicht schön (X) findest?**

☐ weiß nicht

10. Wie sehr gefällt dir denn der Peppino aus der Bildergeschichte? (*Bild + Skala)*

gar nicht	ein bisschen	gut	sehr gut	weiß nicht
☐	☐	☐	☐	☐

11. Und wie sehr gefällt dir sein kleiner Bruder Rondo?

gar nicht	ein bisschen	gut	sehr gut	weiß nicht
☐	☐	☐	☐	☐

11. Wie gesund findest du alle Bilder zusammen, die du hier siehst? (*<u>ungesunde</u> LM-Sammelkarte herzeigen)*

sehr ungesund	eher ungesund	gesund	sehr gesund	weiß nicht
☐	☐	☐	☐	☐

12. Und wie gesund findest du alle Bilder zusammen, die du hier siehst? (*<u>gesunde</u> LM-Sammelkarte herzeigen)*

sehr ungesund	eher ungesund	gesund	sehr gesund	weiß nicht
☐	☐	☐	☐	☐

Würdest du sagen die folgenden Sätze stimmen?

13. Wenn ich ein Lebensmittel nicht kenne, dann esse ich es auch nicht.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

14. Ich probiere gerne neues Essen aus.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

15. Ich esse nur das, was ich schon gut kenne.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

16. Und jetzt noch die letzte Frage: Wie hungrig bist du denn gerade? *(Panda-Skala)*

sehr hungrig	mittelhungrig	ein wenig hungrig	gar nicht hungrig	weiß nicht
☐	☐	☐	☐	☐

(ergänzend: sehr hungrig = mein Bauch fühlt sich ganz leer an und knurrt; mittelhungrig = mein Bauch fühlt sich nur wenig leer an; ein wenig hungrig = ich bin ziemlich voll, aber da ist noch etwas Platz in meinem Bauch; gar nicht hungrig = mein Bauch fühlt sich ganz voll an und ich kann nichts mehr essen)

Erzähle bitte den anderen Kindern nichts, damit es eine Überraschung bleibt.

ANMERKUNGEN

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Gab es während dem Eyetracking/Interview Störungen? O nein O ja

Wenn ja, welche Störungen?

…………………………………………………………………………………..…….............................

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…………………………………………………………………………………..…….............................

Version 2 (German)

Datum: ________ Klasse: __________ Laufnummer: __________

Uhrzeit Beginn Eyetracking: ___________

Uhrzeit Beginn Befragung: ___________

1. Geschlecht: ☐ männlich ☐ weiblich

2. BMI: ▫ NormalG ▫ leichtÜG ▫ starkÜG

Danke, dass du heute mitmachst. Ich stelle dir nur noch ein paar Fragen, dann sind wir fertig.

3. Wie alt bist du? ____

4. Du hast ja gerade eine Bildergeschichte gesehen. Kannst du dich erinnern, was es alles zum Essen gab? (*offene Fragestellung, insgesamt 3x nachfragen: „Was noch? Nenne mir bitte alle Sachen, die dir einfallen.“ „Sonst noch etwas?“*)

☐ zuerst ungesundes Lebensmittel erwähnt

☐ zuerst gesundes Lebensmittel erwähnt

☐ gar kein Lebensmittel erwähnt

Beim ersten Mal nachfragen genannte Lebensmittel:

……

……

Beim zweiten Mal nachfragen genannte Lebensmittel:

……

Beim dritten Mal nachfragen genannte Lebensmittel:

……

5. Ich zeige dir nun noch ein paar Bilder. Sag mir doch bitte, welche Sachen du vorhin gesehen hast. (*beide LM-Karten herzeigen, Reihenfolge nummerieren)*

☐ weiß nicht

6. Jetzt stellen wir uns vor, deine Eltern sind weg und haben mich gebeten, auf dich aufzupassen. Ich weiß aber leider nicht, was du gerne isst. Sag mir doch bitte, welche vier Sachen du jetzt gerne essen würdest. (Reihenfolge nummerieren)

☐ weiß nicht

7. Und welche vier Sachen würdest du deiner Freundin/deinem Freund gerne mit-nehmen? (Reihenfolge <u>nummerieren</u>)

☐ weiß nicht

8. Gibt es hier Bilder, die du sehr schön (O) findest?

9. Gibt es hier Bilder, die du gar nicht schön (X) findest?

☐ weiß nicht

10. Wie sehr gefällt dir denn der Peppino aus der Bildergeschichte? *(Bild + Skala)*

gar nicht	ein bisschen	gut	sehr gut	weiß nicht
☐	☐	☐	☐	☐

11. Und wie sehr gefällt dir sein kleiner Bruder Rondo?

gar nicht	ein bisschen	gut	sehr gut	weiß nicht
☐	☐	☐	☐	☐

11. Wie gesund findest du alle Bilder zusammen, die du hier siehst? (*ungesunde LM-Sammelkarte herzeigen)*

sehr ungesund	eher ungesund	gesund	sehr gesund	weiß nicht
☐	☐	☐	☐	☐

12. Und wie gesund findest du alle Bilder zusammen, die du hier siehst? (*gesunde LM-Sammelkarte herzeigen)*

sehr ungesund	eher ungesund	gesund	sehr gesund	weiß nicht
☐	☐	☐	☐	☐

Würdest du sagen die folgenden Sätze stimmen?

13. Wenn ich ein Lebensmittel nicht kenne, dann esse ich es auch nicht.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

14. Ich probiere gerne neues Essen aus.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

15. Ich esse nur das, was ich schon gut kenne.

stimmt gar nicht	stimmt ein bisschen	stimmt	stimmt total	weiß nicht
☐	☐	☐	☐	☐

16. Und jetzt noch die letzte Frage: Wie hungrig bist du denn gerade? *(Panda-Skala)*

sehr hungrig	mittelhungrig	ein wenig hungrig	gar nicht hungrig	weiß nicht
☐	☐	☐	☐	☐

(ergänzend: sehr hungrig = mein Bauch fühlt sich ganz leer an und knurrt; mittelhungrig = mein Bauch fühlt sich nur wenig leer an; ein wenig hungrig = ich bin ziemlich voll, aber da ist noch etwas Platz in meinem Bauch; gar nicht hungrig = mein Bauch fühlt sich ganz voll an und ich kann nichts mehr essen)

Erzähle bitte den anderen Kindern nichts, damit es eine Überraschung bleibt.

ANMERKUNGEN

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Gab es während dem Eyetracking/Interview Störungen? O nein O ja

Wenn ja, welche Störungen?

……

……

……

13.3. Appendix C: SPSS analysis

13.3.1. Paired-samples *t*-tests

Table 12. Dwell time unhealthy vs. healthy: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	Idx_dwelltime_unhealthy	15818,8231	52	3847,07516	533,49334
	Idx_dwelltime_healthy	14473,5154	52	3109,26216	431,17708

Table 13. Dwell time unhealthy vs. healthy: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	Idx_dwelltime_unhealthy & Idx_dwelltime_healthy	52	,577	,000

Table 14. Dwell time unhealthy vs. healthy: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	95% Konfidenzintervall der Differenz Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	Idx_dwelltime_unhealthy – Idx_dwelltime_healthy	1345,30769	3265,94387	452,90493	436,06311	2254,55227	2,970	51	,005

Table 15. Entry time unhealthy vs. healthy: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	Idx_mean_entrytime_unhealthy	711,9050	52	266,16059	36,90983
	Idx_mean_entrytime_healthy	706,9024	52	237,21111	32,89526

Table 16. Entry time unhealthy vs. healthy: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	Idx_mean_entrytime_unhealthy & Idx_mean_entrytime_healthy	52	,002	,988

Table 17. Entry time unhealthy vs. healthy: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	95% Konfidenzintervall der Differenz Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	Idx_mean_entrytime_unhealthy – Idx_mean_entrytime_healthy	5,00261	356,15949	49,39043	-94,15282	104,15805	,101	51	,920

Table 18. Dwell time interaction level: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	ldx_dwelltime_no_interaction	7247,4885	52	2365,95043	328,09829
	ldx_dwelltime_interaction	10705,8558	52	2594,73689	359,82527
Paaren 2	ldx_dwelltime_interaction	10705,8558	52	2594,73689	359,82527
	ldx_dwelltime_consumption	12338,9942	52	2926,01325	405,76503
Paaren 3	ldx_dwelltime_no_interaction	7247,4885	52	2365,95043	328,09829
	ldx_dwelltime_consumption	12338,9942	52	2926,01325	405,76503

Table 19. Dwell time interaction level: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	ldx_dwelltime_no_interaction & ldx_dwelltime_interaction	52	,422	,002
Paaren 2	ldx_dwelltime_interaction & ldx_dwelltime_consumption	52	,348	,011
Paaren 3	ldx_dwelltime_no_interaction & ldx_dwelltime_consumption	52	,499	,000

Table 20. Dwell time interaction level: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
					95% Konfidenzintervall der Differenz				
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	ldx_dwelltime_no_interaction - ldx_dwelltime_interaction	-3458,3673	2674,31830	370,86122	-4202,9023	-2713,8323	-9,325	51	,000
Paaren 2	ldx_dwelltime_interaction - ldx_dwelltime_consumption	-1633,1385	3163,31807	438,67329	-2513,8118	-752,46509	-3,723	51	,000
Paaren 3	ldx_dwelltime_no_interaction - ldx_dwelltime_consumption	-5091,5058	2692,32916	373,35888	-5841,0550	-4341,9565	-13,637	51	,000

Table 21. Entry time interaction level: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	ldx_mean_entrytime_no_interaction	921,7759	52	492,43874	68,28897
	ldx_mean_entrytime_interaction	654,9517	52	197,80741	27,43095
Paaren 2	ldx_mean_entrytime_interaction	654,9517	52	197,80741	27,43095
	ldx_mean_entrytime_consumption	570,9226	52	239,21671	33,17339
Paaren 3	ldx_mean_entrytime_no_interaction	921,7759	52	492,43874	68,28897
	ldx_mean_entrytime_consumption	570,9226	52	239,21671	33,17339

Table 22. Entry time interaction level: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	Idx_mean_entrytime_no_interaction & Idx_mean_entrytime_interaction	52	-,081	,569
Paaren 2	Idx_mean_entrytime_interaction & Idx_mean_entrytime_consumption	52	-,063	,657
Paaren 3	Idx_mean_entrytime_no_interaction & Idx_mean_entrytime_consumption	52	-,025	,862

Table 23. Entry time interaction level: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
					95% Konfidenzintervall der Differenz				
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	Idx_mean_entrytime_no_interaction - Idx_mean_entrytime_interaction	266,82417	545,30026	75,61954	115,01161	418,63673	3,529	51	,001
Paaren 2	Idx_mean_entrytime_interaction - Idx_mean_entrytime_consumption	84,02910	319,88012	44,35939	-5,02609	173,08430	1,894	51	,064
Paaren 3	Idx_mean_entrytime_no_interaction - Idx_mean_entrytime_consumption	350,85327	552,75710	76,65362	196,96471	504,74183	4,577	51	,000

Table 24. Dwell time unhealthy vs. healthy + interaction level: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	Idx_dwelltime_no_interaction_unhealthy	3811,2423	52	1536,65578	213,09582
	Idx_dwelltime_no_interaction_healthy	3436,2462	52	1283,18081	177,94516
Paaren 2	Idx_dwelltime_interaction_unhealthy	5609,9692	52	1853,41002	257,02173
	Idx_dwelltime_interaction_healthy	5095,8865	52	1509,39657	209,31564
Paaren 3	Idx_dwelltime_consumption_unhealthy	6397,6115	52	1805,56089	250,38625
	Idx_dwelltime_consumption_healthy	5941,3827	52	1607,58673	222,93217

Table 25. Dwell time unhealthy vs. healthy + interaction level: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	Idx_dwelltime_no_interaction_unhealthy & Idx_dwelltime_no_interaction_healthy	52	,403	,003
Paaren 2	Idx_dwelltime_interaction_unhealthy & Idx_dwelltime_interaction_healthy	52	,182	,196
Paaren 3	Idx_dwelltime_consumption_unhealthy & Idx_dwelltime_consumption_healthy	52	,468	,000

Table 26. Dwell time unhealthy vs. healthy + interaction level: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	95% Konfidenzintervall der Differenz Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	ldx_dwelltime_no_interaction_unhealthy - ldx_dwelltime_no_interaction_healthy	374,99615	1554,99406	215,63888	-57,91696	807,90927	1,739	51	,088
Paaren 2	ldx_dwelltime_interaction_unhealthy - ldx_dwelltime_interaction_healthy	514,08269	2166,59962	300,45331	-89,10249	1117,26788	1,711	51	,093
Paaren 3	ldx_dwelltime_consumption_unhealthy - ldx_dwelltime_consumption_healthy	456,22885	1768,39389	245,23211	-36,09516	948,55285	1,860	51	,069

Table 27. Entry time unhealthy vs. healthy + interaction level: paired samples statistics

Statistik bei gepaarten Stichproben

		Mittelwert	N	Standardabweichung	Standardfehler des Mittelwertes
Paaren 1	ldx_mean_entrytime_no_interaction_unhealthy	875,9087	52	614,94637	85,27772
	ldx_mean_entrytime_no_interaction_healthy	927,4679	52	688,61828	95,49417
Paaren 2	ldx_mean_entrytime_interaction_unhealthy	703,4497	52	375,86342	52,12288
	ldx_mean_entrytime_interaction_healthy	601,2260	52	215,75998	29,92053
Paaren 3	ldx_mean_entrytime_consumption_unhealthy	541,3804	52	330,85588	45,88146
	ldx_mean_entrytime_consumption_healthy	604,2737	52	355,13558	49,24844

Table 28. Entry time unhealthy vs. healthy + interaction level: paired samples correlations

Korrelationen bei gepaarten Stichproben

		N	Korrelation	Signifikanz
Paaren 1	ldx_mean_entrytime_no_interaction_unhealthy & ldx_mean_entrytime_no_interaction_healthy	52	,245	,080
Paaren 2	ldx_mean_entrytime_interaction_unhealthy & ldx_mean_entrytime_interaction_healthy	52	-,208	,139
Paaren 3	ldx_mean_entrytime_consumption_unhealthy & ldx_mean_entrytime_consumption_healthy	52	,004	,975

Table 29. Entry time unhealthy vs. healthy + interaction level: paired samples test

Test bei gepaarten Stichproben

		Gepaarte Differenzen							
		Mittelwert	Standardabweichung	Standardfehler des Mittelwertes	95% Konfidenzintervall der Differenz Untere	Obere	T	df	Sig. (2-seitig)
Paaren 1	ldx_mean_entrytime_no_interaction_unhealthy - ldx_mean_entrytime_no_interaction_healthy	-51,55929	803,03945	111,36154	-275,12691	172,00832	-,463	51	,645
Paaren 2	ldx_mean_entrytime_interaction_unhealthy - ldx_mean_entrytime_interaction_healthy	102,22372	470,65809	65,26853	-28,80833	233,25577	1,566	51	,123
Paaren 3	ldx_mean_entrytime_consumption_unhealthy - ldx_mean_entrytime_consumption_healthy	-62,89327	484,28285	67,15795	-197,71848	71,93194	-,936	51	,353

13.3.2. Factorial repeated measures ANOVA

Table 30. Dwell time factor calorific value + interaction level: within-subjects factors

Innersubjektfaktoren

Maß: MEASURE_1

calorific_value	interaction_degree	Abhängige Variable
1	1	Idx_mean_dwelltime_no_interaction_unhealthy
	2	Idx_mean_dwelltime_interaction_unhealthy
	3	Idx_mean_dwelltime_consumption_unhealthy
2	1	Idx_mean_dwelltime_no_interaction_healthy
	2	Idx_mean_dwelltime_interaction_healthy
	3	Idx_mean_dwelltime_consumption_healthy

Table 31. Dwell time factor calorific value + interaction level: descriptive statistics

Deskriptive Statistiken

	Mittelwert	Standardabweichung	N
Idx_mean_dwelltime_no_interaction_unhealthy	1270,4141	512,21859	52
Idx_mean_dwelltime_interaction_unhealthy	1869,9897	617,80334	52
Idx_mean_dwelltime_consumption_unhealthy	2132,5372	601,85363	52
Idx_mean_dwelltime_no_interaction_healthy	1145,4154	427,72694	52
Idx_mean_dwelltime_interaction_healthy	1698,6288	503,13219	52
Idx_mean_dwelltime_consumption_healthy	1980,4609	535,86224	52

Table 32. Dwell time factor calorific value + interaction level: Mauchly's test of sphericity

Mauchly-Test auf Sphärizität[a]

Maß: MEASURE_1

					Epsilon[b]		
Innersubjekteffekt	Mauchly-W	Approx. Chi-Quadrat	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Untergrenze
calorific_value	1,000	,000	0	.	1,000	1,000	1,000
interaction_degree	,947	2,719	2	,257	,950	,985	,500
calorific_value * interaction_degree	,862	7,422	2	,024	,879	,908	,500

Prüft die Nullhypothese, daß sich die Fehlerkovarianz-Matrix der orthonormalisierten transformierten abhängigen Variablen proportional zur Einheitsmatrix verhält.

a. Design: Konstanter Term
Innersubjektdesign: calorific_value + interaction_degree + calorific_value * interaction_degree

b. Kann zum Korrigieren der Freiheitsgrade für die gemittelten Signifikanztests verwendet werden. In der Tabelle mit den Tests der Effekte innerhalb der Subjekte werden korrigierte Tests angezeigt.

Table 33. Dwell time factor calorific value + interaction level: tests of within-subjects effects

Tests der Innersubjekteffekte

Maß: MEASURE_1

Quelle		Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Sphärizität angenommen	1742821,20	1	1742821,20	8,823	,005	,147
	Greenhouse-Geisser	1742821,20	1,000	1742821,20	8,823	,005	,147
	Huynh-Feldt	1742821,20	1,000	1742821,20	8,823	,005	,147
	Untergrenze	1742821,20	1,000	1742821,20	8,823	,005	,147
Fehler(calorific_value)	Sphärizität angenommen	10073812,2	51	197525,729			
	Greenhouse-Geisser	10073812,2	51,000	197525,729			
	Huynh-Feldt	10073812,2	51,000	197525,729			
	Untergrenze	10073812,2	51,000	197525,729			
interaction_degree	Sphärizität angenommen	39048992,3	2	19524496,2	86,394	,000	,629
	Greenhouse-Geisser	39048992,3	1,899	20557853,2	86,394	,000	,629
	Huynh-Feldt	39048992,3	1,971	19812747,7	86,394	,000	,629
	Untergrenze	39048992,3	1,000	39048992,3	86,394	,000	,629
Fehler (interaction_degree)	Sphärizität angenommen	23051240,6	102	225992,554			
	Greenhouse-Geisser	23051240,6	96,873	237953,478			
	Huynh-Feldt	23051240,6	100,516	229329,015			
	Untergrenze	23051240,6	51,000	451985,109			
calorific_value * interaction_degree	Sphärizität angenommen	28206,035	2	14103,018	,076	,927	,001
	Greenhouse-Geisser	28206,035	1,758	16048,577	,076	,906	,001
	Huynh-Feldt	28206,035	1,815	15537,546	,076	,912	,001
	Untergrenze	28206,035	1,000	28206,035	,076	,784	,001
Fehler (calorific_value*interaction_degree)	Sphärizität angenommen	18937757,1	102	185664,285			
	Greenhouse-Geisser	18937757,1	89,635	211277,309			
	Huynh-Feldt	18937757,1	92,583	204549,657			
	Untergrenze	18937757,1	51,000	371328,570			

Table 34. Dwell time factor interaction level: estimates

Schätzer

Maß: MEASURE_1

interaction_degree	Mittelwert	Standardfehler	95%-Konfidenzintervall	
			Untergrenze	Obergrenze
1	1207,915	54,683	1098,134	1317,696
2	1784,309	59,971	1663,913	1904,706
3	2056,499	67,628	1920,731	2192,267

Table 35. Dwell time factor interaction level: pairwise comparisons

Paarweise Vergleiche

Maß: MEASURE_1

(I)interaction_degree	(J)interaction_degree	Mittlere Differenz (I-J)	Standardfehler	Sig.[b]	95% Konfidenzintervall für die Differenz[b]	
					Untergrenze	Obergrenze
1	2	-576,395*	61,810	,000	-729,407	-423,383
	3	-848,584*	62,226	,000	-1002,627	-694,542
2	1	576,395*	61,810	,000	423,383	729,407
	3	-272,190*	73,112	,001	-453,180	-91,199
3	1	848,584*	62,226	,000	694,542	1002,627
	2	272,190*	73,112	,001	91,199	453,180

Basiert auf den geschätzten Randmitteln

*. Die mittlere Differenz ist auf dem ,05-Niveau signifikant.

b. Anpassung für Mehrfachvergleiche: Bonferroni.

Table 36. Dwell time factor interaction level: tests of within-subjects contrasts

Tests der Innersubjektkontraste

Maß: MEASURE_1

Quelle	calorific_value	interaction_degree	Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Niveau 1 vs. Niveau 2		1161880,80	1	1161880,80	8,823	,005	,147
Fehler(calorific_value)	Niveau 1 vs. Niveau 2		6715874,80	51	131683,820			
interaction_degree		Niveau 1 vs. Niveau 3	37444955,9	1	37444955,9	185,969	,000	,785
		Niveau 2 vs. Niveau 3	3852537,34	1	3852537,34	13,860	,000	,214
Fehler (interaction_degree)		Niveau 1 vs. Niveau 3	10268901,4	51	201351,008			
		Niveau 2 vs. Niveau 3	14175990,0	51	277960,589			
calorific_value * interaction_degree	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	38126,113	1	38126,113	,077	,782	,002
		Niveau 2 vs. Niveau 3	19338,612	1	19338,612	,020	,888	,000
Fehler (calorific_value*interaction_degree)	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	25150095,0	51	493139,118			
		Niveau 2 vs. Niveau 3	49431880,3	51	969252,556			

Table 37. Dwell time factor calorific value + interaction level, BMI as covariate: descriptive statistics

Deskriptive Statistiken

	Mittelwert	Standardabweichung	N
Idx_mean_dwelltime_no_interaction_unhealthy	1266,0616	549,63062	33
Idx_mean_dwelltime_interaction_unhealthy	1971,1707	625,99470	33
Idx_mean_dwelltime_consumption_unhealthy	2169,8859	582,54528	33
Idx_mean_dwelltime_no_interaction_healthy	1198,2333	421,42956	33
Idx_mean_dwelltime_interaction_healthy	1751,4081	521,50368	33
Idx_mean_dwelltime_consumption_healthy	1909,5717	501,82684	33

Table 38. Dwell time factor calorific value + interaction level, BMI as covariate: Mauchly's test of sphericity

Mauchly-Test auf Sphärizität[a]

Maß: MEASURE_1

Innersubjekteffekt	Mauchly-W	Approx. Chi-Quadrat	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Untergrenze
calorific_value	1,000	,000	0	.	1,000	1,000	1,000
interaction_degree	,984	,491	2	,782	,984	1,000	,500
calorific_value * interaction_degree	,824	5,817	2	,055	,850	,923	,500

Prüft die Nullhypothese, daß sich die Fehlerkovarianz-Matrix der orthonormalisierten transformierten abhängigen Variablen proportional zur Einheitsmatrix verhält.

a. Design: Konstanter Term + BMI_WHO_SD
Innersubjektdesign: calorific_value + interaction_degree + calorific_value * interaction_degree

b. Kann zum Korrigieren der Freiheitsgrade für die gemittelten Signifikanztests verwendet werden. In der Tabelle mit den Tests der Effekte innerhalb der Subjekte werden korrigierte Tests angezeigt.

Table 39. Dwell time factor calorific value + interaction level, BMI as covariate: tests of within-subjects effects

Tests der Innersubjekteffekte

Maß: MEASURE_1

Quelle		Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Sphärizität angenommen	2032100,00	1	2032100,00	8,016	,008	,205
	Greenhouse-Geisser	2032100,00	1,000	2032100,00	8,016	,008	,205
	Huynh-Feldt	2032100,00	1,000	2032100,00	8,016	,008	,205
	Untergrenze	2032100,00	1,000	2032100,00	8,016	,008	,205
calorific_value * BMI_WHO_SD	Sphärizität angenommen	383345,745	1	383345,745	1,512	,228	,047
	Greenhouse-Geisser	383345,745	1,000	383345,745	1,512	,228	,047
	Huynh-Feldt	383345,745	1,000	383345,745	1,512	,228	,047
	Untergrenze	383345,745	1,000	383345,745	1,512	,228	,047
Fehler(calorific_value)	Sphärizität angenommen	7858477,51	31	253499,275			
	Greenhouse-Geisser	7858477,51	31,000	253499,275			
	Huynh-Feldt	7858477,51	31,000	253499,275			
	Untergrenze	7858477,51	31,000	253499,275			
interaction_degree	Sphärizität angenommen	20592074,0	2	10296037,0	44,682	,000	,590
	Greenhouse-Geisser	20592074,0	1,968	10463144,2	44,682	,000	,590
	Huynh-Feldt	20592074,0	2,000	10296037,0	44,682	,000	,590
	Untergrenze	20592074,0	1,000	20592074,0	44,682	,000	,590
interaction_degree * BMI_WHO_SD	Sphärizität angenommen	292191,239	2	146095,620	,634	,534	,020
	Greenhouse-Geisser	292191,239	1,968	148466,788	,634	,531	,020
	Huynh-Feldt	292191,239	2,000	146095,620	,634	,534	,020
	Untergrenze	292191,239	1,000	292191,239	,634	,432	,020
Fehler (interaction_degree)	Sphärizität angenommen	14286515,8	62	230427,674			
	Greenhouse-Geisser	14286515,8	61,010	234167,573			
	Huynh-Feldt	14286515,8	62,000	230427,674			
	Untergrenze	14286515,8	31,000	460855,349			
calorific_value * interaction_degree	Sphärizität angenommen	128003,690	2	64001,845	,336	,716	,011
	Greenhouse-Geisser	128003,690	1,700	75282,729	,336	,681	,011
	Huynh-Feldt	128003,690	1,847	69311,804	,336	,699	,011
	Untergrenze	128003,690	1,000	128003,690	,336	,566	,011
calorific_value * interaction_degree * BMI_WHO_SD	Sphärizität angenommen	117507,405	2	58753,703	,309	,736	,010
	Greenhouse-Geisser	117507,405	1,700	69109,556	,309	,700	,010
	Huynh-Feldt	117507,405	1,847	63628,246	,309	,718	,010
	Untergrenze	117507,405	1,000	117507,405	,309	,582	,010
Fehler (calorific_value*interaction_degree)	Sphärizität angenommen	11799155,9	62	190308,966			
	Greenhouse-Geisser	11799155,9	52,709	223852,585			
	Huynh-Feldt	11799155,9	57,250	206098,087			
	Untergrenze	11799155,9	31,000	380617,932			

Table 40. Dwell time factor interaction level, BMI as covariate: estimates

Schätzer

Maß: MEASURE_1

interaction_degree	Mittelwert	Standardfehler	95%-Konfidenzintervall	
			Untergrenze	Obergrenze
1	1232,147[a]	70,328	1088,712	1375,582
2	1861,289[a]	73,691	1710,996	2011,582
3	2039,729[a]	81,800	1872,897	2206,561

a. Die Kovariaten im Modell werden anhand der folgenden Werte berechnet: BMI_WHO_SD = ,67.

Table 41. Dwell time factor interaction level, BMI as covariate: pairwise comparisons

Paarweise Vergleiche

Maß: MEASURE_1

(I)interaction_degree	(J)interaction_degree	Mittlere Differenz (I-J)	Standardfehler	Sig.[b]	95% Konfidenzintervall für die Differenz[b] Untergrenze	Obergrenze
1	2	-629,142*	83,072	,000	-839,391	-418,893
	3	-807,581*	79,097	,000	-1007,771	-607,392
2	1	629,142*	83,072	,000	418,893	839,391
	3	-178,439	88,265	,156	-401,831	44,952
3	1	807,581*	79,097	,000	607,392	1007,771
	2	178,439	88,265	,156	-44,952	401,831

Basiert auf den geschätzten Randmitteln

*. Die mittlere Differenz ist auf dem ,05-Niveau signifikant.

b. Anpassung für Mehrfachvergleiche: Bonferroni.

Table 42. Dwell time factor interaction level, BMI as covariate: tests of within-subjects contrasts

Tests der Innersubjektkontraste

Maß: MEASURE_1

Quelle	calorific_value	interaction_degree	Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Niveau 1 vs. Niveau 2		1354733,33	1	1354733,33	8,016	,008	,205
calorific_value * BMI_WHO_SD	Niveau 1 vs. Niveau 2		255563,830	1	255563,830	1,512	,228	,047
Fehler(calorific_value)	Niveau 1 vs. Niveau 2		5238985,01	31	168999,516			
interaction_degree		Niveau 1 vs. Niveau 3	18321424,0	1	18321424,0	88,740	,000	,741
		Niveau 2 vs. Niveau 3	697544,006	1	697544,006	2,713	,110	,080
interaction_degree * BMI_WHO_SD		Niveau 1 vs. Niveau 3	136855,176	1	136855,176	,663	,422	,021
		Niveau 2 vs. Niveau 3	24446,652	1	24446,652	,095	,760	,003
Fehler (interaction_degree)		Niveau 1 vs. Niveau 3	6400281,26	31	206460,686			
		Niveau 2 vs. Niveau 3	7969844,45	31	257091,756			
calorific_value * interaction_degree	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	449104,765	1	449104,765	,950	,337	,030
		Niveau 2 vs. Niveau 3	13891,233	1	13891,233	,014	,908	,000
calorific_value * interaction_degree * BMI_WHO_SD	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	443009,261	1	443009,261	,937	,341	,029
		Niveau 2 vs. Niveau 3	36266,849	1	36266,849	,035	,852	,001
Fehler (calorific_value*interaction_degree)	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	14659998,9	31	472903,190			
		Niveau 2 vs. Niveau 3	31768304,6	31	1024784,02			

Table 43. Dwell time factor calorific value + interaction level, hunger as covariate: descriptive statistics

Deskriptive Statistiken

	Mittelwert	Standardabweichung	N
Idx_mean_dwelltime_no_interaction_unhealthy	1275,0431	516,21576	51
Idx_mean_dwelltime_interaction_unhealthy	1863,4745	622,14398	51
Idx_mean_dwelltime_consumption_unhealthy	2117,1595	597,43601	51
Idx_mean_dwelltime_no_interaction_healthy	1145,9569	431,96503	51
Idx_mean_dwelltime_interaction_healthy	1684,5562	497,69554	51
Idx_mean_dwelltime_consumption_healthy	1977,2039	540,67427	51

Table 44. Dwell time factor calorific value + interaction level, hunger as covariate: Mauchly's test of sphericity

Mauchly-Test auf Sphärizität[a]

Maß: MEASURE_1

Innersubjekteffekt	Mauchly-W	Approx. Chi-Quadrat	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Untergrenze
calorific_value	1,000	,000	0	.	1,000	1,000	1,000
interaction_degree	,934	3,269	2	,195	,938	,994	,500
calorific_value * interaction_degree	,852	7,708	2	,021	,871	,919	,500

Prüft die Nullhypothese, daß sich die Fehlerkovarianz-Matrix der orthonormalisierten transformierten abhängigen Variablen proportional zur Einheitsmatrix verhält.

a. Design: Konstanter Term + hunger
Innersubjektdesign: calorific_value + interaction_degree + calorific_value * interaction_degree

b. Kann zum Korrigieren der Freiheitsgrade für die gemittelten Signifikanztests verwendet werden. In der Tabelle mit den Tests der Effekte innerhalb der Subjekte werden korrigierte Tests angezeigt.

Table 45. Dwell time factor calorific value + interaction level, hunger as covariate: tests of within-subjects effects

Tests der Innersubjekteffekte

Maß: MEASURE_1

Quelle		Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Sphärizität angenommen	407597,433	1	407597,433	1,988	,165	,039
	Greenhouse-Geisser	407597,433	1,000	407597,433	1,988	,165	,039
	Huynh-Feldt	407597,433	1,000	407597,433	1,988	,165	,039
	Untergrenze	407597,433	1,000	407597,433	1,988	,165	,039
calorific_value * hunger	Sphärizität angenommen	29424,085	1	29424,085	,144	,706	,003
	Greenhouse-Geisser	29424,085	1,000	29424,085	,144	,706	,003
	Huynh-Feldt	29424,085	1,000	29424,085	,144	,706	,003
	Untergrenze	29424,085	1,000	29424,085	,144	,706	,003
Fehler(calorific_value)	Sphärizität angenommen	10044288,1	49	204985,471			
	Greenhouse-Geisser	10044288,1	49,000	204985,471			
	Huynh-Feldt	10044288,1	49,000	204985,471			
	Untergrenze	10044288,1	49,000	204985,471			
interaction_degree	Sphärizität angenommen	5694342,93	2	2847171,46	12,454	,000	,203
	Greenhouse-Geisser	5694342,93	1,876	3034597,56	12,454	,000	,203
	Huynh-Feldt	5694342,93	1,988	2863789,15	12,454	,000	,203
	Untergrenze	5694342,93	1,000	5694342,93	12,454	,001	,203
interaction_degree * hunger	Sphärizität angenommen	101220,759	2	50610,379	,221	,802	,004
	Greenhouse-Geisser	101220,759	1,876	53942,004	,221	,788	,004
	Huynh-Feldt	101220,759	1,988	50905,770	,221	,801	,004
	Untergrenze	101220,759	1,000	101220,759	,221	,640	,004
Fehler (interaction_degree)	Sphärizität angenommen	22404593,4	98	228618,300			
	Greenhouse-Geisser	22404593,4	91,947	243667,985			
	Huynh-Feldt	22404593,4	97,431	229952,644			
	Untergrenze	22404593,4	49,000	457236,600			
calorific_value * interaction_degree	Sphärizität angenommen	174095,453	2	87047,727	,462	,631	,009
	Greenhouse-Geisser	174095,453	1,742	99962,119	,462	,605	,009
	Huynh-Feldt	174095,453	1,837	94762,146	,462	,615	,009
	Untergrenze	174095,453	1,000	174095,453	,462	,500	,009
calorific_value * interaction_degree * hunger	Sphärizität angenommen	194627,587	2	97313,794	,517	,598	,010
	Greenhouse-Geisser	194627,587	1,742	111751,259	,517	,573	,010
	Huynh-Feldt	194627,587	1,837	105938,021	,517	,583	,010
	Untergrenze	194627,587	1,000	194627,587	,517	,476	,010
Fehler (calorific_value*interaction_degree)	Sphärizität angenommen	18450535,6	98	188270,772			
	Greenhouse-Geisser	18450535,6	85,339	216202,605			
	Huynh-Feldt	18450535,6	90,022	204955,867			
	Untergrenze	18450535,6	49,000	376541,543			

Table 46. Dwell time factor interaction level, hunger as covariate: estimates

Schätzer

Maß: MEASURE_1

interaction_degree	Mittelwert	Standardfehler	95%-Konfidenzintervall	
			Untergrenze	Obergrenze
1	1210,500[a]	55,649	1098,669	1322,331
2	1774,015[a]	59,931	1653,580	1894,451
3	2047,182[a]	68,867	1908,788	2185,575

a. Die Kovariaten im Modell werden anhand der folgenden Werte berechnet: hunger = 2,75.

Table 47. Dwell time factor interaction level, hunger as covariate: pairwise comparisons

Paarweise Vergleiche

Maß: MEASURE_1

(I)interaction_degree	(J)interaction_degree	Mittlere Differenz (I-J)	Standardfehler	Sig.[b]	95% Konfidenzintervall für die Differenz[b]	
					Untergrenze	Obergrenze
1	2	-563,515*	62,235	,000	-717,793	-409,238
	3	-836,682*	62,792	,000	-992,339	-681,024
2	1	563,515*	62,235	,000	409,238	717,793
	3	-273,166*	75,048	,002	-459,206	-87,127
3	1	836,682*	62,792	,000	681,024	992,339
	2	273,166*	75,048	,002	87,127	459,206

Basiert auf den geschätzten Randmitteln

*. Die mittlere Differenz ist auf dem ,05-Niveau signifikant.

b. Anpassung für Mehrfachvergleiche: Bonferroni.

Table 48. Dwell time factor interaction level, hunger as covariate: tests of within-subjects contrasts

Tests der Innersubjektkontraste

Maß: MEASURE_1

Quelle	calorific_value	interaction_degree	Quadratsumme vom Typ III	df	Mittel der Quadrate	F	Sig.	Partielles Eta-Quadrat
calorific_value	Niveau 1 vs. Niveau 2		271731,622	1	271731,622	1,988	,165	,039
calorific_value * hunger	Niveau 1 vs. Niveau 2		19616,057	1	19616,057	,144	,706	,003
Fehler(calorific_value)	Niveau 1 vs. Niveau 2		6696192,04	49	136656,980			
interaction_degree		Niveau 1 vs. Niveau 3	5650673,91	1	5650673,91	28,101	,000	,364
		Niveau 2 vs. Niveau 3	1015223,16	1	1015223,16	3,534	,066	,067
interaction_degree * hunger		Niveau 1 vs. Niveau 3	40129,546	1	40129,546	,200	,657	,004
		Niveau 2 vs. Niveau 3	98730,535	1	98730,535	,344	,560	,007
Fehler (interaction_degree)		Niveau 1 vs. Niveau 3	9853058,32	49	201082,823			
		Niveau 2 vs. Niveau 3	14074730,2	49	287239,391			
calorific_value * interaction_degree	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	695860,863	1	695860,863	1,438	,236	,029
		Niveau 2 vs. Niveau 3	190844,759	1	190844,759	,195	,661	,004
calorific_value * interaction_degree * hunger	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	750012,597	1	750012,597	1,550	,219	,031
		Niveau 2 vs. Niveau 3	335487,105	1	335487,105	,342	,561	,007
Fehler (calorific_value*interaction_degree)	Niveau 1 vs. Niveau 2	Niveau 1 vs. Niveau 3	23703379,6	49	483742,442			
		Niveau 2 vs. Niveau 3	48069462,5	49	981009,439			

13.3.3. Regression

Table 49. Stepwise multiple linear regression recall: model summary

Modellzusammenfassung

Modell	R	R-Quadrat	Korrigiertes R-Quadrat	Standardfehler des Schätzers	Statistikwerte ändern: Änderung in R-Quadrat	Änderung in F	df1	df2	Sig. Änderung in F
1	,428[a]	,183	,149	1,772	,183	5,390	2	48	,008
2	,439[b]	,193	,142	1,780	,010	,567	1	47	,455
3	,453[c]	,205	,116	1,806	,012	,331	2	45	,720

a. Einflußvariablen : (Konstante), age, gender

b. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec

c. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec, character_evaluation, hunger

Table 50. Stepwise multiple linear regression recall: ANOVA

ANOVA[a]

Modell		Quadratsumme	df	Mittel der Quadrate	F	Sig.
1	Regression	33,851	2	16,925	5,390	,008[b]
	Nicht standardisierte Residuen	150,738	48	3,140		
	Gesamt	184,588	50			
2	Regression	35,646	3	11,882	3,750	,017[c]
	Nicht standardisierte Residuen	148,942	47	3,169		
	Gesamt	184,588	50			
3	Regression	37,804	5	7,561	2,318	,059[d]
	Nicht standardisierte Residuen	146,784	45	3,262		
	Gesamt	184,588	50			

a. Abhängige Variable: recall_total_amount

b. Einflußvariablen : (Konstante), age, gender

c. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec

d. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec, character_evaluation, hunger

Table 51. Stepwise multiple linear regression recall: coefficients

Koeffizienten[a]

Modell		Nicht standardisierte Koeffizienten: RegressionskoeffizientB	Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
1	(Konstante)	-1,525	1,599		-,954	,345
	gender	-,183	,501	-,048	-,365	,716
	age	,505	,158	,419	3,189	,003
2	(Konstante)	-2,249	1,872		-1,202	,236
	gender	-,152	,505	-,040	-,301	,765
	age	,469	,166	,389	2,820	,007
	Idx_mean_dwelltime_total_sec	,578	,769	,104	,753	,455
3	(Konstante)	-2,623	2,329		-1,126	,266
	gender	-,199	,516	-,052	-,385	,702
	age	,494	,172	,410	2,877	,006
	Idx_mean_dwelltime_total_sec	,440	,801	,079	,549	,586
	hunger	,197	,243	,112	,813	,421
	character_evaluation	-,018	,354	-,007	-,051	,959

a. Abhängige Variable: recall_total_amount

Table 52. Stepwise multiple linear regression recall: excluded variables

Ausgeschlossene Variablen[a]

Modell		Beta In	T	Sig.	Partielle Korrelation	Kollinearitätsstatistik Toleranz
1	Idx_mean_dwelltime_total_sec	,104[b]	,753	,455	,109	,904
	hunger	,128[b]	,972	,336	,140	,975
	character_evaluation	,004[b]	,031	,976	,004	,997
2	hunger	,112[c]	,821	,416	,120	,928
	character_evaluation	-,004[c]	-,028	,978	-,004	,991

a. Abhängige Variable: recall_total_amount

b. Einflußvariablen im Modell: (Konstante), age, gender

c. Einflußvariablen im Modell: (Konstante), age, gender, Idx_mean_dwelltime_total_sec

Table 53. Stepwise multiple linear regression recognition: model summary

Modellzusammenfassung

Modell	R	R-Quadrat	Korrigiertes R-Quadrat	Standardfehler des Schätzers	Statistikwerte ändern: Änderung in R-Quadrat	Änderung in F	df1	df2	Sig. Änderung in F
1	,234[a]	,055	,015	3,661	,055	1,385	2	48	,260
2	,260[b]	,067	,008	3,675	,013	,646	1	47	,426
3	,363[c]	,131	,035	3,624	,064	1,661	2	45	,201

a. Einflußvariablen : (Konstante), age, gender

b. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec

c. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec, character_evaluation, hunger

Table 54. Stepwise multiple linear regression recognition: ANOVA

ANOVA[a]

Modell		Quadratsumme	df	Mittel der Quadrate	F	Sig.
1	Regression	37,128	2	18,564	1,385	,260[b]
	Nicht standardisierte Residuen	643,382	48	13,404		
	Gesamt	680,510	50			
2	Regression	45,846	3	15,282	1,132	,346[c]
	Nicht standardisierte Residuen	634,664	47	13,503		
	Gesamt	680,510	50			
3	Regression	89,477	5	17,895	1,363	,256[d]
	Nicht standardisierte Residuen	591,032	45	13,134		
	Gesamt	680,510	50			

a. Abhängige Variable: Idx_recognition_total_amount

b. Einflußvariablen : (Konstante), age, gender

c. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec

d. Einflußvariablen : (Konstante), age, gender, Idx_mean_dwelltime_total_sec, character_evaluation, hunger

Table 55. Stepwise multiple linear regression recognition: coefficients

Koeffizienten[a]

Modell		Nicht standardisierte Koeffizienten: Regressionskoeffizient B	Nicht standardisierte Koeffizienten: Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
1	(Konstante)	4,525	3,303		1,370	,177
	gender	,429	1,036	,059	,414	,681
	age	,541	,327	,234	1,652	,105
2	(Konstante)	2,930	3,864		,758	,452
	gender	,497	1,043	,068	,477	,636
	age	,461	,343	,199	1,342	,186
	Idx_mean_dwelltime_total_sec	1,275	1,586	,119	,804	,426
3	(Konstante)	-1,338	4,673		-,286	,776
	gender	,608	1,036	,083	,586	,560
	age	,468	,344	,202	1,358	,181
	Idx_mean_dwelltime_total_sec	1,143	1,607	,107	,711	,481
	hunger	-,126	,487	-,037	-,259	,797
	character_evaluation	1,285	,709	,253	1,811	,077

a. Abhängige Variable: Idx_recognition_total_amount

Table 56. Stepwise multiple linear regression recognition: excluded variables

Ausgeschlossene Variablen[a]

Modell		Beta In	T	Sig.	Partielle Korrelation	Kollinearitätsstatistik: Toleranz
1	Idx_mean_dwelltime_total_sec	,119[b]	,804	,426	,116	,904
	hunger	-,003[b]	-,023	,982	-,003	,975
	character_evaluation	,259[b]	1,893	,065	,266	,997
2	hunger	-,030[c]	-,201	,841	-,030	,928
	character_evaluation	,252[c]	1,823	,075	,260	,991

a. Abhängige Variable: Idx_recognition_total_amount

b. Einflußvariablen im Modell: (Konstante), age, gender

c. Einflußvariablen im Modell: (Konstante), age, gender, Idx_mean_dwelltime_total_sec

Abstract

Current research indicates that children are exposed to a great deal of television food advertising. Thus, it is alarming that food that is high in fat, sugar, and salt is especially advertised. Recent findings of content analyses also demonstrated that unhealthy food products are well-presented in active situations like consumption patterns. These circumstances raise health-related questions. There is ample evidence that food advertising and its effects can lead to cognitive, affective, and conative responses in the youth audience. The question arises as to whether attention to unhealthy food advertising is a requirement for negative health outcomes. To date, very few studies have investigated the role of children's attention to unhealthy food products in either traditional food advertisements or in non-traditional and new forms of food advertising, like the so-called advergames. One more study concentrated on the influence of media characters on children's attention to food products. However, no study to date has explored children's visual attention toward diverse food products in television entertainment. Hence, this lack of empirical evidence underlines the importance of further research on children's perception of food advertising, especially in television entertainment content, because television watching remains a high priority for children's leisure time.

Consequently, the mainly purpose of this Master's thesis is to provide an empirical contribution by examining children's attention within media content toward unhealthy and healthy food cues in different interaction levels—(I) no interaction, (II) interaction with the media character, or (III) consumption by the media character. While children were exposed to a self-created example of television entertainment, eye movements were recorded through an eye tracking device. After viewing, a post-treatment pictured interview of products used as stimulus as well as alternative food products was used to collect data on explicit memory.

According to the premise that a visual stimulus can have an impact on gaze behavior, two significant main effects can be derived, but there is no significant interaction effect between the food-calorific value (unhealthy vs. healthy) and the interaction level. Findings showed that children paid significantly more, but not earlier, attention to unhealthy rather than healthy food cues and furthermore were more likely to gaze significantly longer and earlier at food products shown with interaction rather than in passive situations. The highest dwell time score was achieved by food products that were consumed by the character. Additionally, children did not pay more attention to unhealthy food product cues in every level of interaction. When controlling the model with children's BMI, the

significant main effect of the food-calorific value remained. However, controlling with hunger reduced the main effect to non-significant. According to the main effect of the interaction level, in the case of hunger as covariate, a significant level remained, also when regarding the post hoc tests. However, when controlling with BMI and regarding the post hoc tests and its comparison of each interaction level, the significant difference between the second and third level of interaction disappeared.

As for the premise that gaze behavior can affect subsequent outcomes such as explicit memory-related measures like recall and recognition, the analyses found no association between these variables.

The results of the master thesis include a discussion about the current embedment of unhealthy and healthy food cues within children's media environment, reference to a possible priming effect, and highlight the important role of the interaction level, because children indeed pay their attention toward food cues, especially when they are shown in interaction with or being consumed by a favored main character, irrespective of the food-calorific value.

Keywords: food cues, children, media content, unhealthy, healthy, level of interaction, eye tracking, visual attention, gaze behavior, memory

Kurzfassung

Aktuelle Forschungsergebnisse weisen darauf hin, dass Kinder einem sehr hohen Anteil von Lebensmittelwerbung ausgesetzt sind. Dabei ist alarmierend, dass insbesondere fett-, zucker- und salzreiche Nahrungsmittel beworben werden. Inhaltsanalytische Studien konnten überdies nachweisen, dass ungesunde Lebensmittel sehr häufig in aktiven Szenarien zu sehen sind. Diese Umstände führen dazu, dass gesundheitliche Aspekte kritisch hinterfragt werden. Es gibt einige Nachweise dafür, dass die Effekte von Nahrungsmittelwerbungen bei Kindern zu kognitiven, affektiven und konativen Reaktionen führen können. In jüngster Forschung kam die Frage auf, ob visuelle Aufmerksamkeit gegenüber ungesunder Lebensmittelwerbung eine Voraussetzung für negative gesundheitliche Auswirkungen ist. Jedoch haben bis jetzt nur wenige Studien die Rolle der visuellen Aufmerksamkeit von Kindern gegenüber ungesunden beworbenen Nahrungsmitteln untersucht. Es existieren zwei nennenswerte Studien, die auf der einen Seite den Effekt von traditioneller und auf der anderen Seite von nicht traditioneller Lebensmittelwerbung, in so genannten Advergames, auf die visuelle Aufmerksamkeit überprüften. Eine weitere Studie konzentrierte sich auf die Auswirkungen von Mediencharakteren auf die visuelle Wahrnehmung von Lebensmitteln bei Kindern. Jedoch gibt es bis dato keine Belege für die visuelle Aufmerksamkeit von jungen Heranwachsenden gegenüber diversen Nahrungsmittelhinweisen in unterhaltenden Fernsehangeboten. Dabei stellt das Fernsehen bei Kindern stets noch eine der beliebtesten Freizeitaktivitäten dar, weshalb dem Mangel an empirischen Beweisen nachgegangen werden sollte, indem zukünftige Forschung die Wahrnehmung des jungen Publikums von Lebensmittelplacements in unterhaltenden Fernsehangeboten ins Auge fasst.

Demzufolge war das primäre Ziel der vorliegenden Magisterarbeit, einen empirischen Beitrag zu leisten, indem sie die visuelle Aufmerksamkeit von Kindern gegenüber sowohl ungesunden als auch gesunden Lebensmittelhinweisen in kinderfreundlichen Medieninhalten untersuchte. Bei der durchgeführten Studie wurden auch drei diverse Interaktionsgrade mit dem Mediencharakter ins Auge gefasst. Es wurde zwischen (I) keiner Interaktion, (II) Interaktion mit dem Mediencharakter und (III) Konsumation durch den Mediencharakter unterschieden. Während die Kinder einem selbstkreierten Beispiel für ein kinderfreundliches TV-Unterhaltungsangebot ausgesetzt waren, wurde der Blickverlauf der ProbandInnen mit einem Eyetracker aufgenommen. Nach der Betrachtung wurde ein Interview mit Bildern von Lebensmitteln durchgeführt, welche zum Großteil die im

Stimulus verwendeten Nahrungsmitteln und überdies alternative essbare Produkte visualisierten.

Im Hinblick auf die Prämisse, dass visuelle Stimuli einen Einfluss auf das Blickverhalten haben können, ließen sich Haupteffekte, jedoch kein Interaktionseffekt, von dem Kalorienwert der Lebensmittel-Cues (ungesund versus gesund) und von dem Interaktionsgrad, in welchem die Lebensmittelplatzierungen jeweils eingebettet waren, ableiten. Die Ergebnisse zeigten, dass die Kinder im Gegensatz zu gesunden den ungesunden Nahrungsmitteln signifikant länger, aber nicht früher Aufmerksamkeit schenkten und zudem dazu neigten, Lebensmittel in Interaktion signifikant länger und früher anzusehen, als es bei Lebensmitteln in passiven Situationen der Fall war. Die höchste Verweildauer erlangten Nahrungsmittel, die von dem Mediencharakter konsumiert wurden. Die Resultate konnten darüber hinaus aufzeigen, dass die Kinder nicht dazu neigten, ungesunden Lebensmitteln anhaltende Beachtung in jedem Interaktionsgrad zu schenken. Während die Kontrolle des Modells mit dem BMI der Kinder dazu führte, dass der signifikante Haupteffekt des Kalorienwerts der Lebensmittel-Cues bestehen blieb, schmälerte die Kontrolle mit dem jeweiligen Hungerstatus den Haupteffekt zu nicht signifikant. Im Hinblick auf den Haupteffekt des Interaktionsgrads lässt sich festhalten, dass der Signifikanzwert bei der Kontrolle mit dem Hungerstatus als Kovariate erhalten blieb. Bei der Kontrolle mit dem BMI erwies sich jedoch bei dem Post-hoc Test der Vergleich zwischen dem zweiten und dritten Interaktionsgrad als nicht signifikant.

Im Hinblick auf die Prämisse, dass das Blickverhalten eine Voraussetzung für anschließende kognitive Wirkungen in der Form von expliziten Erinnerungsmessungen wie Recall oder Recognition sein kann, weisen die Ergebnisse auf keine Beziehung zwischen diesen Variablen hin.

Die Resultate der vorliegenden Magisterarbeit stellen die derzeitige Einbettung von ungesunden und gesunden Lebensmittelplatzierungen in kinderfreundlichen Medieninhalten auf den Prüfstand, verweisen auf einen möglichen Priming-Effekt und demonstrieren die Bedeutsamkeit des Interaktionsgrads, da Kinder in der Tat diversen Lebensmitteln Aufmerksamkeit zollen – primär, wenn diese in Interaktion mit oder vor allem in Konsumation von einem sympathischen Hauptcharakter unabhängig von deren Kalorienwert dargestellt werden.

Stichwörter:

Lebensmittelhinweise, Kinder, Medieninhalte, ungesund, gesund, Interaktionsgrad, Eyetracking, visuelle Aufmerksamkeit, Blickverhalten, Erinnerung