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Temporal Distance and the Nutri-Score

Chronic diseases such as diabetes, stroke, cancer, and heart disease are leading causes of death in many countries (e.g., Kaczorowski, Campbell, Duhaney, Mang, & Gelfer, 2016). According to the World Health Organization (2022), chronic diseases are responsible for over 40 million deaths per year globally. Besides the negative impact such a disease has on an individual, the treatment of these diseases often consumes a large proportion of a country's healthcare spending (Kaczorowski et al., 2016). Therefore, trying to study risk factors leading to such diseases and ways to minimize them is crucial. Knowledge about the causes of chronic diseases allows for exploring ways of trying to prevent them. One important factor that increases the risk of developing a chronic disease is an unhealthy diet (Gupta-Smith, 2020).

But what constitutes an unhealthy diet? An unhealthy diet, or poor nutrition, includes foods and beverages that contain large amounts of free sugars, salt, saturated fats, and trans fats (Kaczorowski et al., 2016; Centers for Disease Control and Prevention, 2022). Changing unhealthy habits related to food intake can decrease a person's risk for chronic diseases, and lower related healthcare costs. Governments and policymakers play a key role in promoting healthy eating behavior and nudging the public to make healthier food purchase decisions (Gupta-Smith, 2020).

Nutrition labels are a low-cost and easily implementable option to inform customers about a product's nutritional quality and promote food products with a favorable label (De Temmerman, Heeremans, Slabbinck, & Vermeir, 2021; Egnell, Talati, et al., 2020). National health organizations recommend easily understandable nutrition labeling as a key intervention to reduce the risk of chronic diseases related to diet (Kaczorowski et al., 2016). On top of aiming to influence the consumers' purchase decisions, nutrition labels also set an incentive for food manufacturers to alter their ingredients in such a manner that the products fall into a more favorable label category (De Temmerman et al., 2021). This ideally results in the manufacturers using less salt, saturated or trans fat, and sugars in food products.

The Nutri-Score

One of the nutrition labeling schemes that is already implemented in several countries of the European Union so far is the Nutri-Score (De Temmerman et al., 2021). The trifold intention of the Nutri-Score, according to Chauliac (2018), is to highlight the

nutrition information as an important factor of the purchase decision for the consumer, to promote the production of products with higher nutritional quality, and to help convey professional nutritional advice.

The Nutri-Score is a front-of-pack nutrition label (meaning it is displayed at the front of the food packaging), based on a scale of five different colors and letters, ranging from green to red, and A to E, respectively (Hercberg, Touvier, & Salas-Salvado, 2022). The category to which the product belongs is accentuated. Rather than categorizing products into healthy or unhealthy, it informs about the total relative nutritional content of the food or beverage product, compared to similar products (Hercberg et al., 2022). The score for general foods is calculated based on an algorithm, which adds points for unfavorable ingredients (e.g., energy, sugar, saturated fatty acids, sodium) and subtracts points for favorable ingredients such as fibers, proteins, vegetables, fruits, and nuts (Szabo De Edelenyi et al., 2019). The sum of points yields a score which determines the Nutri-Score label for a certain product (Szabo De Edelenyi et al., 2019). Although the principle of the algorithm remains the same, the calculation differs for beverages, cheeses and trans fats, to better suit their nutritional recommendations (Szabo De Edelenyi et al., 2019).

De Temmerman, Heeremans, Slabbinck, & Vermeir (2021) suggest that the Nutri-Score eases the assessment of a product's healthiness and increases the purchase intention for products with a favorable Nutri-Score label (A and B). Additionally, results of a recent study by Jurkenbeck, Mehlhose, & Zuhlsdorf (2022) suggest that the nutrition label Nutri-Score can prevent health-halo effects, arising from claims on sugar (e.g., 30% less sugar).

Various nutrition labels exist, e.g., Multiple Traffic Lights, Reference Intakes, Warning Symbol, Nutri-Score, and Health Star Rating system (Egnell, Galan, et al., 2020). Many studies comparing the effectiveness of nutrition labels conclude that the Nutri-Score outperforms other Front-of-Pack nutrition labels (e.g., Egnell, Galan, et al., 2020; Egnell, Talati, et al., 2020). Their findings suggest that the Nutri-Score most effectively encouraged the choice of healthier food options and helped in identifying differences in food products' nutritional qualities, in Switzerland (Egnell, Galan, et al., 2020) and other European countries (Egnell, Talati, et al., 2020). Aguenau et al., 2021

found that the Nutri-Score, compared to other front-of-pack labels, was spotted and understood most easily, and further provided quick information.

Therefore, and because the Nutri-Score is already implemented in several countries of the European Union, e.g., France, Belgium, Germany, Netherlands, Switzerland, and Luxembourg (BEUC, n.d.), this study focuses on the nutrition label Nutri-Score. At least in the mentioned countries, the public is assumably most familiar with the Nutri-Score, compared to other nutrition labels. The ongoing implementation of the Nutri-Score underlines the importance of the nutrition label and the relevance of investigating its influence on consumer decisions.

Even though many studies investigating the effect of the Nutri-Score on consumer behavior exist (e.g., De Temmerman et al., 2021; Jurkenbeck et al., 2022), it is important to examine possible factors and circumstances that may change its effect. This study aims to explore the role of temporal psychological distance in the context of the front-of-pack label Nutri-Score.

Psychological Distance and Construal Level Theory

To understand how psychological distance may influence any effect of the nutrition label, it is necessary to explain the constructs of psychological distance and construal level. Psychological distance describes the subjective distance between a stimulus, i.e. an object, and a person's direct experience (Bar-Anan, Liberman, Trope, & Algom, 2007). Psychological distance is egocentric, meaning that the reference point is the self in the here and now (Trope & Liberman, 2010). Thus, a person experiences a psychologically distant object as far away, and a psychologically proximal object as close in reference to the self, here and now (Bar-Anan, Liberman, & Trope, 2006; Trope & Liberman, 2010). Results of Bar-Anan et al. (2007) suggest that this distance between a stimulus and the direct experience of the perceiver is accessed automatically. Further, psychological distance influences how the perceiver mentally construes this stimulus (Bar-Anan et al., 2007). A person might construe the same object differently depending on if the object is psychologically proximal or distal (Liberman & Trope, 2009). As the psychological distance of an object increases, the concrete representation of an object moves to a more abstract representation of such (Trope & Liberman, 2010). In this process, incidental features and concrete details are omitted and the weight of central, goal-relevant features increases (Bar-Anan et al., 2007; Trope & Liberman, 2010). As a

consequence, the perceiver construes the object using a more abstract, higher-level mental representation (Bar-Anan et al., 2007). Findings of the meta-analyses by Soderberg, Callahan, Kochersberger, Amit and Ledgerwood (2015) reveal a medium-sized effect of psychological distance on construal level. The relationship between construal level and psychological distance is reciprocal: activating e.g., high-level construals influences the perceived psychological distance of a stimulus, and in turn, a psychologically distant stimulus is represented on a higher-level construal (Liberman & Trope, 2009).

Construal Level Theory connects psychological distance to mental construal (Liberman & Trope, 2009). The Theory proposes that people use higher-level construals to represent objects that are psychologically distant and lower-level construals to represent psychologically proximal objects (Trope & Liberman, 2010). A higher-level construal is an abstract, decontextualized, schematic representation of an object, that prioritizes core features and neglects subordinate features (Liberman & Trope, 2009). In contrast, a lower-level construal is a concrete and contextualized representation, including details and subordinate features (Liberman & Trope, 2009). Construing an object at a higher-level construal incorporates neglecting secondary features and maintaining essential features (Liberman & Trope, 2009).

Construal Level Theory specifies four dimensions of psychological distance: spatial (distance in space of stimulus and perceiver), temporal (distance in time of stimulus and perceiver's present), social (social distance between stimulus and perceiver, e.g., self vs. stranger) and hypotheticality (distance of between stimulus and perceiver's reality, meaning the likelihood of a stimulus happening) (Bar-Anan et al., 2007; Trope & Liberman, 2010). In this study, I focus on the temporal dimension of psychological distance, i.e., temporal distance, its effect on construal level, and downstream consequences.

Temporal Distance

According to Construal Level Theory, evaluations of distant future stimuli should be predominately based on high-level aspects, compared to the evaluation of near-future stimuli (Trope & Liberman, 2003). The findings of Trope, Liberman and Wakslak (2007) support this assumption. Specifically, in a study investigating time-dependent changes in product preferences, the tendency to evaluate a product based on its primary rather than

secondary functions increased with temporal distance (Trope & Liberman, 2000). In the psychologically distant future condition, a radio with good sound (positive primary feature) and a poor built-in clock (negative secondary feature) was more attractive than a radio with poor sound (negative primary feature) and a good built-in clock (positive secondary feature), compared to the near future condition (Trope & Liberman, 2000). Moreover, Trope & Liberman (2000) found that an event such as eating a cake had a significantly more negative high-level than low-level construal and was rated as more positive in the near compared to the distant future. Therefore, when the value related to the high-level construal of a product is more positive than the value related to the low-level construal, the product's attractiveness should increase with temporal distance (Trope & Liberman, 2003).

Health-related Behavior and Construal Level Theory

The association between health-related behavior and construal level has been investigated in several studies which came to different conclusions. Because health-related behavior is a broad field, these studies mainly only focused on a specific concept and/or specific health-related behavior. For example, some studies suggest that self-control seems to play a role in the connection between construal level and health-related behavior (e.g., Fujita & Carnevale, 2012). For example, the findings of Fujita, Trope, Liberman and Levin-Sagi (2006) found that high-level construals, compared to low-level construals, lead to a stronger intention to exert self-control. Chiou, Wu, & Chang (2013) suggest that a high-level construal mindset can help reduce the cigarette consumption of smokers. Fujita et al. (2006) found that that high-level construals emphasize high-level, goal-related concerns over low-level concerns, thus, temptations, corresponding to low-level considerations, are evaluated as less positive in a high-level construal mindset. A study by Fujita and Han (2009) similarly found that high-level construals facilitated the association between temptation and negativity and increased the preference for a healthy snack over an unhealthy one, even without conscious deliberation.

At first sight, these studies may suggest that high-level construals and in turn, high psychological distance will increase healthy (eating) behavior. However, (Griffioen, Van Beek, Lindhout, & Handgraaf, 2016) conducted a review of different studies investigating psychological distance in the health domain and found opposite effects of psychological distance. For example, studies included in Griffioen et al.'s (2016) review

indicate that psychological proximity raises perceived health risks and leads to healthier choices.

Conflicting findings of effects of construal level in the health domain may stem from different methodological approaches and the investigation of different concepts, e.g., risk perception or self-control. Unfortunately, literature examining the concepts of psychological distance or construal level within the health domain is still scarce. Nevertheless, researchers focusing on the role of psychological distance in a health context can unveil interesting findings and unprecedented effects. In this paper, I want to focus on a specific effect discussed in a paper by Steinhart, Carmon and Trope (2013). The authors investigated how the inclusion of a warning may change the relationship between health behavior and psychological distance and discovered what they called the *ironic effect of warnings* (Steinhart et al., 2013).

The Ironic Effect of Warnings

In four studies, Steinhart et al. (2013) investigate what they describe as the *ironic effect of warnings*: with proximal temporal distance, the presence of a warning in a product advertisement will reduce the appeal of a product, but from a distant time perspective, a warning will, ironically, increase the appeal of a product. Construal Level Theory proposes that as psychological (temporal) distance increases, an object is represented at a higher-level construal and subordinate, secondary features are deemphasized while the focus shifts to central, abstract features (Liberman & Trope, 2009; Trope & Liberman, 2010). Building on this, Steinhart et al. (2013) argue that because side effects are secondary in nature and reflect low-level construal, a warning will reduce the product's appeal from a temporal proximal perspective. However, a warning will increase the product's appeal from a temporal distant perspective, because the warning elevates the message's trustworthiness, which reflects high-level construal (Steinhart et al., 2013). The *ironic effect of warnings* is related to the *sleeper effect*, which describes that when communication is associated with a discounting cue, people are more persuaded later in time than they are directly after exposure (Tarcn Kumkale & Albarracín, 2004).

Steinhart et al. (2013) demonstrated the *ironic effect of warnings* on evaluation and purchase decisions using advertisements of four different products. Pilot studies of these advertisements indicated that for each advertisement, message trustworthiness

was rated as more central to product judgment than potential side effects (Steinhart et al., 2013). This forms the theoretical basis for the discovered effect, suggesting that when psychological distance is high, message trustworthiness is emphasized because is represented on a high-level construal, and potential side effects are deemphasized because they are represented on a lower-level construal.

In Steinhart et al.'s (2013) first study, the effect of temporal distance and the presence of a warning of smoking risks in an advertisement promoting a cigarette brand was examined. In a 2 (advertisement presented with warning vs. without) x 2 (proximal vs. distant temporal distance) study design, smokers had the chance to purchase cigarette packs. Participants were told they would receive their purchased cigarette packs three months later in the distant-future condition, versus within 24 hours in the near-future condition. Participants in the distant-future condition who viewed the advertisement with the warning ordered more packs than those who viewed the advertisement without the warning. On the contrary, participants in the near-future condition who viewed the advertisement with the warning ordered fewer packs than participants who viewed the advertisement without the warning.

In Steinhart et al.'s (2012) second study with the same 2 x 2 design, participants had the chance to buy artificial sweetener, either immediately after viewing the advertisement (proximal temporal distance) or two weeks after viewing the advertisement (distant temporal distance). The authors found the same interaction effect of temporal distance and the presence of a warning on purchase decisions.

In Steinhart et al.'s (2013) third study, all participants viewed an advertisement about erectile-dysfunction medication including a warning of potential side effects, and only temporal distance was manipulated. In the near-future condition, the product was advertised to be launched soon, in the distant-future condition, it was advertised to be launched the following year. Results showed that the product was rated more attractive by participants in the distant-future condition than by participants in the near-future condition. Further, the advertisement was rated as more trustworthy and concerns with potential side effects were rated lower in the distant-future condition than in the near-future condition. A mediation analysis revealed a mediation effect of message trustworthiness on the relationship between temporal distance and product evaluation.

In a fourth study, Steinhart et al. (2013) further investigated the perceived advertisement trustworthiness using the same 2 x 2 design as in their first and second study. In the temporal proximal condition, participants evaluated product attractiveness and advertisement trustworthiness immediately after seeing the advertisement, in the temporal distant condition, participants were asked to evaluate the product's attractiveness and the advertisement's trustworthiness 2 weeks after viewing the advertisement. For the product's attractiveness, results showed the expected interaction effect of temporal distance and the presence of a warning on product evaluation. The authors further found an interaction effect on advertisement trustworthiness. Advertisement trustworthiness only differed in the temporally distant condition; in this condition, participants rated the advertisement as more trustworthy if a warning was present. Analogous to study three, moderated mediation analyses showed that advertisement trustworthiness acted as a mediator on the effect of temporal distance on evaluation, when a warning was present.

In these studies, the Steinhart et al. (2013) demonstrated the *ironic effect of warnings*, revealing that including a warning in an advertisement can promote risky behavior later in time. Although including a warning in an advertisement seems to decrease the product's appeal, it can also increase the advertisement's trustworthiness, which, with increasing temporal distance, becomes more relevant for evaluation and purchase decisions than the warning itself. Follow-up studies, using the advertisements of the second, third, and fourth studies, revealed that recollections of the advertisement participants made minutes after seeing it were rated as less high-level by independent judges than recollections participants made days after seeing the advertisement, supporting the theoretical foundation of the effect (Steinhart et al., 2013).

Psychological Distance and Nutrition Labels

Based on the findings of Steinhart et al. (2013), the question arises whether this ironic effect of warnings, which may increase adverse health-related behavior in a high temporal distance setting, could also apply to other contexts. Could including a Nutri-Score on the packaging of an 'unhealthy' food or beverage item likewise lead to such an effect? An unfavorable Nutri-Score (label E) may be perceived as secondary and construed on a lower level, like a warning. According to the findings of Steinhart et al. (2013), this could lead to a decreased product attractiveness and purchase intention in a

close temporal distance setting but may lead to an increased appeal in a high temporal distance setting, due to the possibly increased, high-level trustworthiness, that would be expected when a warning is included.

Though other front-of-pack labels are more clearly made to look like a warning or even called such, as the Warning symbol (see e.g., Egnell, Galan, et al., 2020), I argue that an adverse Nutri-Score label on a product (specifically, label E) can be perceived as a warning as well. Even without knowing how exactly the Nutri-Score category is calculated, this label can be perceived as a warning sign, as the color red indicates greater hazard than other colors (Wogalter et al., 1998). All warnings in Steinhart et al.'s (2013) study stated health risks. Similarly, an adverse Nutri-Score label signals unhealthy ingredients (Szabo De Edelenyi et al., 2019), though this 'warning' may be more indirect and not formulated concretely.

Present study

Steinhart et al.'s (2013) findings suggest that including a warning of health risks in an advertisement may even make the advertised product more attractive, with increased psychological distance. Steinhart et al. (2013) found that the effect of psychological distance and the effect of including a warning in an advertisement both influenced the product's attractiveness, the consumer buying behavior, and the perceived trustworthiness of the advertisement. The purpose of this study is to investigate whether a similar *ironic effect of warnings* could be observed in the context of front-of-pack labels on food and beverage products, specifically the Nutri-Score.

To examine this, the influence of psychological distance and the influence of including the Nutri-Score label E in advertisements of food and beverage products on purchase intention, product attractiveness, and trustworthiness of advertisements are tested. Most importantly, a possible interaction between psychological distance and the presence of a Nutri-Score label E is studied and discussed in this paper. Further, it is investigated whether trustworthiness acts as a mediator in the relationship between temporal distance and product evaluation, which was suggested by Steinhart et al. (2013).

Hypotheses

The following four hypotheses are reviewed in this study.

Hypothesis I. The findings of the first study by Steinhart et al. (2013) revealed that

the presence of a warning in an advertisement led participants to buy more cigarettes when the temporal distance was high, compared to when a warning was not included in the advertisement. But when the temporal distance was low, participants who saw a warning in the advertisement bought fewer cigarettes compared to participants who saw the advertisement without a warning (Steinhart et al., 2013). In the second study, Steinhart et al. (2013) further found the same interaction effect of temporal distance and the presence or absence of a warning on purchase behavior, but with artificial sweetener as the advertised product. Based on these findings, I expect that including the Nutri-Score label E in advertisements will increase purchase intention in a high temporal distance setting but decrease purchase intention in a low temporal distance setting.

Hypothesis II. In a third study, advertising erectile-dysfunction medication including a warning, Steinhart et al. (2013) found that participants rated the product as more attractive when the temporal distance was high versus low. Steinhart et al.'s (2013) fourth study revealed an interaction between the time of evaluation and the presence or absence of a warning in an advertisement for hair loss medication on product attractiveness. Therefore, I expect that including the Nutri-Score label E in advertisements will increase product attractiveness in a high temporal distance setting but decrease product attractiveness in a low temporal distance setting.

Hypothesis III. Only manipulating temporal distance in their third study, Steinhart et al. (2013) showed that when the temporal distance was high, the advertisement of erectile-dysfunction medication was perceived as more trustworthy compared to when the temporal distance was low. When temporal distance varied and a warning was either present or absent in a hair loss medication advertisement, trustworthiness did not differ in near-future conditions regardless of the presence or absence of a warning in the advertisement (Steinhart et al., 2013). In distant-future conditions, however, participants who saw the warning rated the advertisement as more trustworthy than participants who did not see the warning (Steinhart et al., 2013). Because the present study intends to alter both temporal distance and the presence or absence of the Nutri-Score label, an interaction effect on advertisement trustworthiness, as in Steinhart et al.'s (2013) fourth study, is expected.

Hypothesis IV. As previously mentioned, the results of Steinhart et al.'s third and fourth studies suggest that trustworthiness mediates the effect that temporal distance

has on product evaluation when a warning was included in the advertisement. Hence, I hypothesize that advertisement trustworthiness mediates the relationship between temporal distance and product evaluation when the Nutri-Score label E is included in the advertisement.

Method

Design

A 2x2 design was selected to investigate the interaction effect of temporal distance and the Nutri-Score label on purchase intention (hypothesis I), product attractiveness (hypothesis II), and advertisement trustworthiness (hypothesis III). The temporal distance was either manipulated to be high or low, and the Nutri-Score label on the packaging of the food or beverage product was either absent or present. Thus, participants were randomly but evenly assigned to one of four conditions: high temporal distance with the Nutri-Score label present on the packaging (HTD-NSP), high temporal distance with the Nutri-Score label absent (HTD-NSA), low temporal distance with the Nutri-Score label present (LTD-NSP), and low temporal distance with the Nutri-Score label absent (LTD-NSA).

In all four conditions, participants were randomly shown nine advertisements for food and drink products. Since all food and beverage items had to fit into the Nutri-Score label category E, unhealthy foods and drinks were chosen. Specifically, three kinds of each sweet food products (two kinds of chocolate cookies, and butter waffles), savory food products (Chips, Grissini, and savory biscuits), and soft drinks (Cola, peach flavored Ice Tea, Ginger Ale) were chosen to be presented in the advertisements. The categories sweet as well as savory snacks and soft drinks were selected to offer a variety of different food and drink products to minimize the influence of individual preferences on product attractiveness and purchase intention.

For creating the advertisements, pictures of food and drinks were taken from the websites of two Dutch supermarkets. Only store-brand products were used to avoid any brand-related effects. Further, the logo of the store brand was removed from the products. A colored frame was added, and, since the products were marketed to a German-speaking audience, a slogan highlighting the product's appeal was added in the German language.

The advertisements included either a description indicating a high temporal

distance scenario or a low temporal distance scenario. Further, they either included the Nutri-Score label E on the product packaging or not. This Nutri-Score label was retrieved from Sante Publique France (2022). For every product shown to participants in all conditions, purchase intention, product attractiveness, and trustworthiness of the advertisement were assessed. Additionally, familiarity with the Nutri-Score was assessed (in all conditions). In the conditions in which the Nutri-Score was present in the advertisements, a manipulation check was included to evaluate whether participants noticed the Nutri-Score on the food or drink packaging. Moreover, participants in the LTD-NSP condition evaluated the centrality of both the Nutri-Score and the trustworthiness of the advertisements for product judgments. Also, an attention check was included, exclusion criteria were inquired, and demographical data was collected. Details are explained in the following section.

In addition to the examination of hypotheses I to III, this study design further enabled the examination of a possible mediation effect of advertisement trustworthiness on the relationship between temporal distance and product evaluation, in conditions in which a Nutri-Score label was present in advertisements (hypothesis IV). To further explore possible findings, it was also assessed whether participants (of all conditions) have heard of the Nutri-Score label before, how familiar they were with it and if they perceived the Nutri-Score (of category E) as a warning.

Measures

Independent Variables

Temporal Distance. The operationalization of temporal distance was imitated from Steinhart et al.'s (2013) third study, in which the authors told participants the advertised product would launch soon (near-future condition) or the following year (distant-future condition). Participants allocated to a high temporal distance condition were shown a text above the advertisements that this product would launch next year ('Dieses Produkt wird nächstes Jahr auf den Markt gebracht.'), whereas the text in the low temporal distance conditions implied that the product would launch soon ('Dieses Produkt wird demnächst auf den Markt gebracht.'). This manipulation of temporal distance was chosen because it did not require deceiving participants to think they are purchasing products, and did not require contacting participants more than once, which can result in high drop-out rates and bias (see e.g., Dettori, 2011).

Nutri-Score Label. Further, the Nutri-Score label was either present or absent, depending on the condition. In the conditions in which the Nutri-Score label was present, all food and beverage products in the advertisements shown to participants included a Nutri-Score label E on the bottom of either the left or right corner of the packaging. In conditions in which the Nutri-Score label was absent, no Nutri-Score was shown in any of the advertisements.

Dependent Variables

After looking at the product, participants should indicate their answer for the dependent variables purchase intention, product attractiveness, and advertisement trustworthiness by moving a slider on an eleven-point scale with -5 as a minimum and +5 as the maximum score, and 0 as the neutral answer ('Bitte schauen Sie das Produkt an und beantworten anschließend die folgenden Fragen, indem Sie den Schieber bewegen.').

Purchase Intention. To indicate their purchase intention, participants were asked how likely they would buy the product ('Wie wahrscheinlich würden Sie dieses Produkt kaufen?'), referring to the product shown in the advertisement on the same page above. The lower limit for this scale was described as *not likely at all* ('gar nicht wahrscheinlich') and the upper limit as *very likely* ('sehr wahrscheinlich').

Product Evaluation. To measure the attractiveness of the product, participants had to indicate how much they like the product ('Wie gefällt Ihnen dieses Produkt?'). The scale reached from *I do not like it at all* ('gefällt mir gar nicht') to *I like it very much* ('gefällt mir sehr gut').

Advertisement Trustworthiness. Trustworthiness of the advertisement was measured via the question of how trustworthy participants find the advertisement ('Wie vertrauenswürdig finden Sie die Werbung?'). Limits for this scale were *not trustworthy at all* ('gar nicht vertrauenswürdig') and *very trustworthy* ('sehr vertrauenswürdig').

Other Assessed Measures

Centrality of the Nutri-Score and Advertisement Trustworthiness. For both trustworthiness of the advertisement ('Die Vertrauenswürdigkeit der Werbung') and the Nutri-Score label ('Die Nutri-Score-Beschriftung'), centrality for product judgment was indicated on a 7-point scale, reaching from *not central at all* ('überhaupt nicht zentral') to *very central* ('sehr zentral'). Specifically, participants were asked how central these two

aspects were for their product judgment ('Wie zentral für die Produktbeurteilung sind für Sie die folgenden Aspekte'). This question intends to mimic the pilot studies of Steinhart et al. (2013), in which they investigated if message trustworthiness was perceived as more central than potential side effects for product judgment. In this study, the question aims to examine if advertisement trustworthiness is perceived as more central than the Nutri-Score label for product judgment. Similar to Steinhart et al. (2013), this question assessed whether the precondition, that the trustworthiness of the advertisement is more central to the product judgment than the Nutri-Score label, is met. Only when this is the case, an interaction effect can be expected, because this difference in centralities builds the theoretical foundation for it.

Perception of the Nutri-Score as a Warning. Participants further indicated whether they perceived the Nutri-Score label E as a warning on a 7-point scale spanning from *I do not perceive this label as a warning* ('Ich nehme diese Beschriftung nicht als Warnhinweis wahr') to *I do perceive this label as a warning* ('Ich nehme diese Beschriftung als Warnhinweis wahr'). Because Steinhart et al. (2013) used warnings in their advertisements, this question was included in the present study to ensure that participants perceived the Nutri-Score label E as a warning, and thus the effects found by Steinhart et al. (2013) can be expected for this study as well.

Knowledge of the Nutri-Score. To assess whether participants generally know the Nutri-Score, they were asked if they have heard of the nutrition label "Nutri-Score", or the name often used in the German language, "Lebensmittelampel" ('Haben Sie schon von der Lebensmittelkennzeichnung "Nutri-Score" (siehe Bild), auch unter "Lebensmittelampel" bekannt, gehört?'). An image of the Nutri-Score was provided below the question. Participants could respond either with *yes* ('Ja') or *no* ('Nein').

Familiarity with the Nutri-Score. In order to measure how well participants know the Nutri-Score, participants indicated on a 7-point scale how familiar they are with the nutrition labeling scheme ('Wie vertraut sind Sie mit der Lebensmittelkennzeichnung "Nutri-Score"?'). The minimum of the scale indicated they were *not at all familiar* with it ('Gar nicht vertraut'), and the maximum indicates they were *very familiar* with it ('Sehr vertraut').

Manipulation Check

A manipulation check tested if participants in the condition in which the Nutri-Score was present on product packaging noticed the Nutri-Score label. Participants could respond to the question if they recognized the Nutri-Score label on the products ('Haben Sie die Lebensmittelkennzeichnung "Nutri-Score" auf den Produkten erkannt?') with *I recognized the Nutri-Score* ('Ich habe den Nutri-Score erkannt') or *I did not recognize it* ('Ich habe den Nutri-Score nicht erkannt').

Attention Check

Further, participants were asked what was portrayed in the advertisements ('Was wurde auf den gezeigten Werbungen dargestellt?') to secure high data quality. Participants who correctly indicated that *groceries* ('Lebensmittel') were portrayed were included in the analysis, and participants who incorrectly answered *cosmetics* ('Kosmetik'), *bikes* ('Fahrräder'), or *plants* ('Pflanzen') were excluded.

Exclusion Criteria

To prevent that participants were influenced in their product judgment because they followed a specific diet, had allergies or intolerances, participants were asked whether they are currently on a diet ('Machen Sie derzeit eine Diät?'), whether they are vegan ('Sind Sie vegan?') and whether they have food intolerances or allergies that would keep them from consuming one or more of the shown products ('Haben Sie Lebensmittelunverträglichkeiten und / oder Allergien, die Sie daran hindern würden, eines oder mehrere der gezeigten Produkte zu konsumieren?'). All these aspects likely affect both the attractiveness and the purchase intention of products. Therefore, only participants who answered *no* ('Nein') to all questions were included in the analysis, participants who answered *yes* ('Ja') to at least one of the three questions were excluded from the analysis.

Demography

Participants were asked questions regarding their demography. Specifically, participants indicated their sex ('Welches Geschlecht haben Sie?'), with *male* ('männlich'), *female* ('weiblich'), or *diverse* ('divers') as possible answer categories. Further, they were asked about their citizenship ('Welche Staatsangehörigkeit haben Sie?') and could answer either with *Germany* ('Deutschland'), *Austria* ('Österreich'), *Switzerland* ('Schweiz'), another *EU country* ('Anderes EU-Land') or another non-EU country ('Anderes Nicht-EU-Land'). Participants also indicated how well they speak

German ('Wie gut sprechen Sie Deutsch?'), the answer categories being *native/first language since childhood* ('Erstsprache (Sprache seit der Kindheit)'), *very well* ('Sehr gut'), *well* ('Gut'), *moderately* ('Mäßig'), *poorly* ('Schlecht'), or *very poorly* ('Sehr schlecht'). Age was entered by participants in a free text field. Further, participants were asked what their highest educational degree was ('Was ist Ihr höchster Schulabschluss?'). Possible answer options were *no educational degree* ('Ich habe keinen Schulabschluss'), *finished statutory education or comparable* ('Ich habe die Pflichtschule abgeschlossen (Hauptschule oder Vergleichbares)'), *secondary school certificate or comparable* ('Ich habe einen Realschulabschluss (oder Vergleichbares)'), *finished vocational school* ('Ich habe einen Abschluss einer berufsbildenden Schule'), *higher education entrance qualification* ('Ich habe die allgemeine oder fachgebundene Hochschulreife ('Abitur / Matura oder Vergleichbares)'), *university/polytechnic degree* ('Ich habe einen Universitäts- oder Fachhochschulabschluss') or *another degree* which they could enter in a free text field ('Ich habe einen anderen Abschluss, und zwar').

Procedure

Participant data were collected from the 17th of June 2021 until the 28th of March 2022. Participants were recruited via the author's social network, social media (Facebook), and the Laboratory Administration for Behavioral Sciences (LABS) of the Faculty of Psychology of the University of Vienna. To launch the study in LABS, key points of the study design were assessed and approved by the Institutional Review Board of the Department of Work, Economy and Social Psychology. It was determined that no further approval from the Ethics Committee University of Vienna was required. The study was conducted as an online questionnaire hosted on Qualtrics, and participants could take part in the study via their mobile phone or computer. The study was conducted in German. All participants were informed that their participation is voluntary and that they could stop participating in the study without reason at any time. Furthermore, participants were informed that their data would be stored and analyzed anonymously and only for scientific purposes. To be included in the study, participants had to be at least 18 years old. Before starting the online study, participants gave their informed consent.

Participants were shown nine advertisements including pictures of food and drink items. Depending on the condition participants were assigned to, a text next to the

advertisement indicated that the shown food or beverage item would be launched to the market either soon (low temporal distance) or next year (high temporal distance). Further, depending on the assigned condition, a Nutri-Score label E was either included on the packaging of the food or beverage item (Nutri-Score present) or no Nutri-Score was depicted (Nutri-Score absent). Participants rated their purchase intention, the product's attractiveness, and the trustworthiness of the advertisement. Afterward, participants indicated if they have heard about the Nutri-Score label and how familiar they are with it. Participants in conditions in which the Nutri-Score was present in advertisements were asked if they recognized the label on the products. Furthermore, participants in the LTD-NSP condition were asked to indicate how central the trustworthiness of the advertisement and how central the Nutri-Score label was for their product judgement. All participants were asked if they perceived the Nutri-Score label E as a warning of health risks. Next, to check if participants paid attention during the study, they had to select what was portrayed in the shown advertisements out of 4 options. Afterwards, participants had to indicate whether they are currently on a diet, follow a vegan diet or have food intolerances and/or allergies, which would prevent them from consuming one or more of the shown products. Afterwards, participants had to answer questions about their demographics. At the end of the study, participants could write what they thought the hypothesis of the study was, to check whether participants guessed the purpose of the study. Subsequently, participants were debriefed about the goal of the study and its hypotheses. Lastly, participants had the option to give feedback or write a comment. The survey took approximately 7 minutes to complete.

Participants

Steinhart et al. (2013) reported effect sizes of $\eta^2 = .12$ and $\eta^2 = .13$ for the observed interaction effect on purchased products, an effect size of $\eta^2 = .16$ for the interaction effect on product evaluation and an effect size of $\eta^2 = .07$ for the interaction effect on advertisement trustworthiness. A power analysis using the effect size of the smallest observed effect ($\eta^2 = .07$) indicated a sample size of 107 participants is required for this study.

Out of 207 who clicked on the survey link, 199 participants consented to filling out the survey, 8 were removed due to not consenting to participate. 29 participants did not complete the survey. All were excluded because none of them answered questions

concerning the excluding criteria. 166 of the remaining participants passed the attention check (correctly answered that grocery items were shown in the advertisements). Participants who were on a diet ($N = 7$), followed a vegan diet ($N = 11$) or had any food allergies or intolerances to shown food items ($N = 13$) were excluded from analysis. One participant who indicated to be able to moderately speak German was also excluded from analysis, all other participants ($N = 136$) indicated they speak German at least very well. Participants who were shown the Nutri-Score label but indicated that they did not see it on the items ($N = 12$) were not excluded from analysis, since they might have subconsciously processed the shown labels. Furthermore, the participants who claimed to not have seen the label were distributed evenly amongst both the low temporal distance and high temporal distance conditions in which the Nutri-Score was presented (see results section).

Of those 136 participants remaining for analysis, 43 identified as male and 93 as female, none as diverse. Participants were between 19 and 58 years old ($M_{age} = 25.632$, $SD_{age} = 5.325$). 93 participants had a university or college level degree; 41 graduated high school and 2 had a degree from a vocational school. 98 participants indicated their citizenship was German, 31 Austrian, 2 Swiss and 5 indicated their citizenship was from another EU country. 130 participants expressed German is their first language or language since childhood, and 6 responded that they speak German very well. None of the participants guessed the hypotheses of the study correctly, thus none were excluded from analysis for this reason. 36 participants were allocated to the HTD-NSP condition, 28 to the HTD-NSA, 36 to the LTD-NSP and 36 to the LTD-NSA condition.

Analysis

As previously mentioned, 136 participants were included in the analysis. To investigate the first hypothesis, a two-factor ANOVA was performed, with temporal distance and the presence of the Nutri-Score label as independent variables, and purchase intention as the dependent variable. The second hypothesis was examined in a similar manner; with a two-factor ANOVA with the same independent variables but with product evaluation as the dependent variable. Likewise, the third hypothesis was investigated with a two-factor ANOVA with the same independent variables, but advertisement trustworthiness as the dependent variable. For all performed ANOVAs, the focus was on a possible interaction effect of temporal distance and presence or

absence of the Nutri-Score on each purchase intention, product evaluation and advertisement trustworthiness. A mediation analysis was conducted to investigate the fourth hypothesis, with temporal distance as the independent variable, advertisement trustworthiness as the mediator variable, and product evaluation as the dependent variable. Additionally, assumptions for each model were assessed. After the intended analyses were calculated, some exploratory analyses were performed, which will be further explained in the following section.

Results

Preliminary Analysis

Centrality of Advertisement Trustworthiness and the Nutri-Score Label

Before conducting the main analyses, it was examined whether advertisement trustworthiness was more central than the Nutri-Score label for product judgment. Participants in the LTD-NSP condition ($N = 36$) indicated a higher centrality of advertisement trustworthiness ($M = 4.250$, $SD = 1.592$) than of the Nutri-Score label ($M = 3.639$, $SD = 1.775$) for product judgment. Assumption of normality was investigated via a histogram (see Figure 6), and a Shapiro-Wilk normality test, $W = .972$, $p < .494$, which indicated that the difference in ratings of centrality was normally distributed. Further, no outliers were detected. Therefore, a paired t-test was chosen to compare the centrality of advertisement trustworthiness and the centrality of the Nutri-Score label. The t-test revealed that there is no significant difference in the centrality of the advertisement trustworthiness and the Nutri-Score label for product judgment, $t(35) = 1.701$, $p = .098$, 95% CI $[-.12, 1.34]$. Boxplots of each centrality of advertisement trustworthiness and of the Nutri-Score label for product judgment are displayed in Figure 1. Even though the prerequisite of advertisement trustworthiness being significantly more central than the Nutri-Score label was not met, the data was further analyzed to investigate the hypotheses.

Figure 1

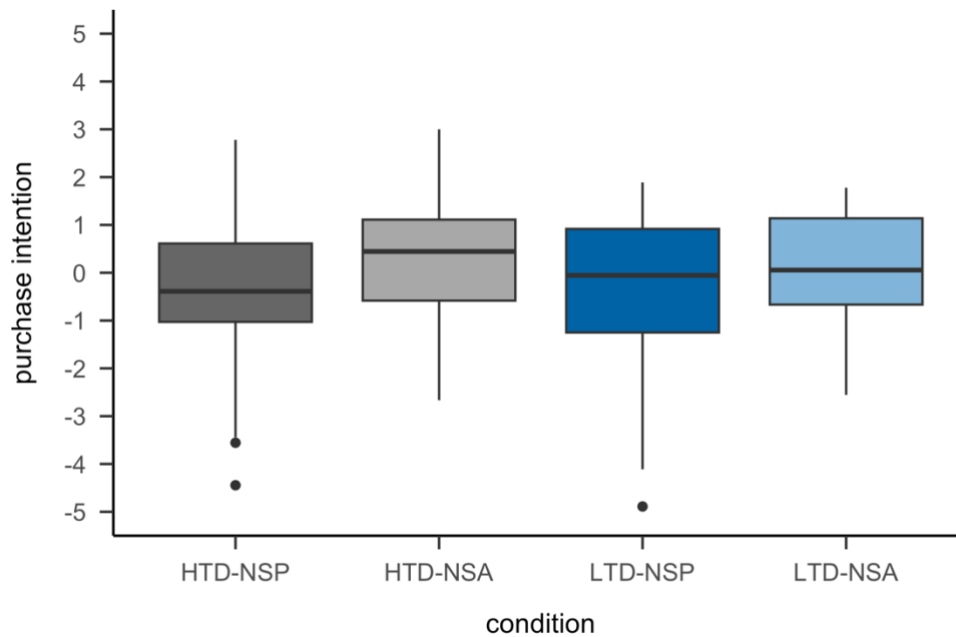
Boxplots of Centrality of Advertisement Trustworthiness and the Nutri-Score Label for Product Judgment



Main Analysis

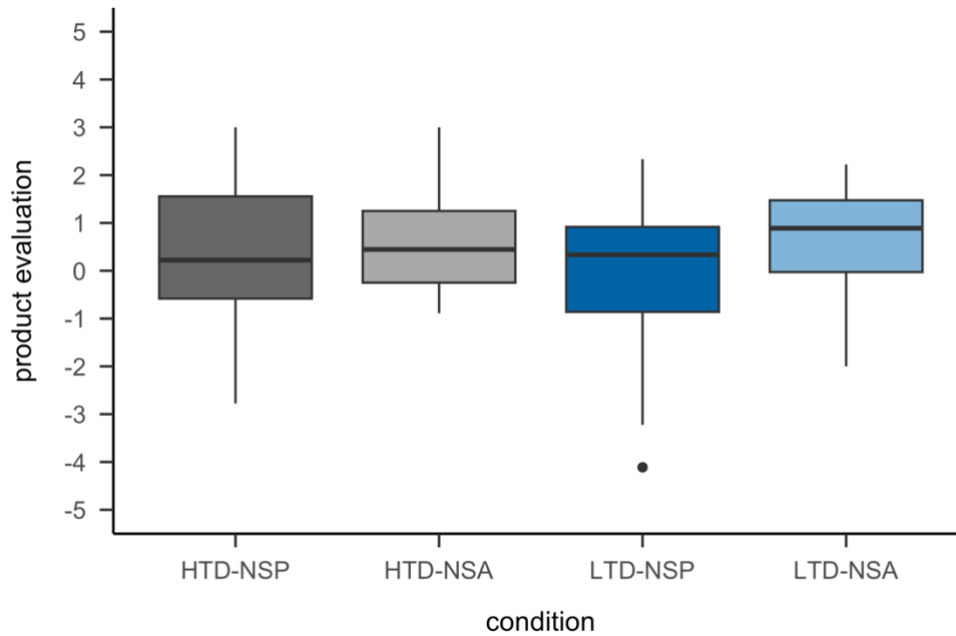
Purchase Intention

To investigate hypothesis I, a two-way ANOVA was performed. First, distributions of residuals were checked for normality via a Normal Q-Q plot (see Figure 7). It revealed that the data may not be normally distributed. A significant Shapiro-Wilk normality test confirmed this, $W = .974$, $p = .012$. Although the residuals showed non-normality, an ANOVA was still considered adequate due to its robustness to Type I error (Blanca, Alarcón, Arnau, Bono, & Bendayan, 2017). A Levene's Test was not significant, $F(3, 132) = 1.222$, $p = .304$, indicating that the prerequisite of homogenous variances was given in this case. This was supported by a residual plot (Figure 8). The ANOVA revealed that there is no significant interaction effect of the presence of the Nutri-Score label and temporal distance on purchase intention, $F(1, 132) = .093$, $p = .761$. Also, no significant main effect of temporal distance on purchase intention could be found, $F(1, 132) = 0.068$, $p = .794$. There was, however, a significant main effect of presence of the Nutri-Score label on purchase intention, $F(1, 132) = 4.559$, $p = .035$, $\eta^2 = .034$. Figure 2 shows boxplots of purchase intention ratings per condition. As you can see in Table 1, buying intention was significantly lower in groups in which the Nutri-Score label was present on the product packaging, compared to the groups which did not see a Nutri-Score label on the products. As also visible in Figure 2, three outliers were identified (observations 16, 38, 118).

Figure 2*Boxplots of Purchase Intention Ratings for Every Condition***Product Evaluation**

To examine hypothesis II, a two-way ANOVA was carried out in a similar manner. Prerequisites were checked. A Normal Q-Q plot (Figure 9) and a non-significant Shapiro-Wilk normality test, $W = .984$, $p = .126$ supported the assumption of normally distributed residuals. Further, a non-significant Levene's Test showed homogeneity of variances, $F(3, 132) = 1.563$, $p = .202$, which was supported by a residual plot (Figure 10). The ANOVA showed that there is no interaction effect of temporal distance and the presence of the Nutri-Score label on product evaluation, $F(1, 132) = 1.380$, $p = .242$. Further, no main effect of temporal distance on product evaluation was found, $F(1, 132) = 0.396$, $p = .530$. Also no main effect of the presence of the Nutri-Score label on product evaluation was found, $F(1, 132) = 3.558$, $p = .062$. Figure 3 illustrates boxplots of product evaluation ratings per condition. Table 1 shows means and standard deviations of product evaluation for every condition. Figure 3 shows one outlier (data point 24), which was included for analysis.

Figure 3*Boxplots of Product Attractiveness Ratings for Every Condition*

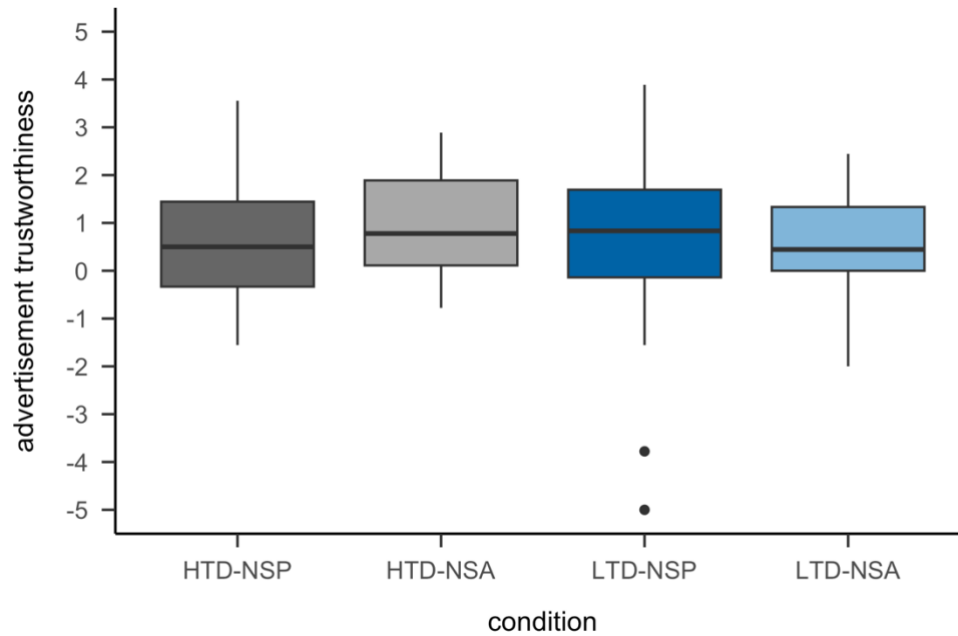


Advertisement Trustworthiness

Furthermore, a two-way ANOVA was performed to investigate hypothesis III. A Normal Q-Q plot showed that the residuals may not be normally distributed (Figure 11). A Shapiro-Wilk normality test supported this suspicion of non-normal distribution, $W = .963$, $p < .01$. Again, it was assumed that an ANOVA is able to tolerate this violation. Moreover, a residual plot (Figure 12) and a Levene's Test revealed homogenous variances among the groups, $F(3, 132) = 1.747$, $p = .161$. The ANOVA revealed no significant interaction effect of temporal distance and the presence of the Nutri-Score label on advertisement trustworthiness, $F(1, 132) = .625$, $p = .431$. Further, no significant main effect of temporal distance on advertisement trustworthiness could be found, $F(1, 132) = .452$, $p = .503$. The ANOVA also showed a no significant main effect of the presence of the Nutri-Score label on advertisement trustworthiness, $F(1, 132) = .246$, $p = .621$. Boxplots of product ratings of advertisement trustworthiness per condition are illustrated in Figure 4, which depicts two outliers (data points 17 and 24), which were included in the analysis.

Figure 4

Boxplots of Advertisement Trustworthiness Ratings for Every Condition

**Table 1**

Mean and Standard Deviation of Purchase Intention, Product Evaluation and Advertisement Trustworthiness for Each Condition

Dependent variables	HTD-NSP (N = 36)		HTD-NSA (N = 28)		LTD-NSP (N = 36)		LTD-NSA (N = 36)	
	M	SD	M	SD	M	SD	M	SD
Purchase intention	-.347	1.690	.286	1.286	-.340	1.684	.136	1.151
Product evaluation	.398	1.282	.540	.917	.031	1.500	.673	1.098
Advertisement trustworthiness	.605	1.343	.921	1.003	.620	1.758	.574	.986

Mediation Analysis

For investigating the fourth hypothesis, only data from groups which saw a Nutri-Score in the advertisements were used ($N = 72$). The expected model in hypothesis IV can be seen below (Figure 5). First, a linear regression was performed to examine the relationship between temporal distance and product evaluation (Figure 5, c). A Q-Q plot showed residuals were slightly left-skewed (Figure 13). However, Knief

and Forstmeier (2021) suggest that even if the normality assumption is violated, Gaussian models are still adequate to use. A non-constant Variance Score Test confirmed the assumption of homoscedasticity, $c^2(1, N = 72) = 0.873, p > .05$. A Durbin Watson Test confirmed the independence of residuals, $p > .05$. Results of the linear regression indicated no significant effect of advertisement trustworthiness on product evaluation, $c = .367, R^2 = .018, t(70) = 1.117, p = .268$.

Likewise, to investigate the relationship between temporal distance and advertisement trustworthiness (Figure 5, a), a linear regression was conducted. A Q-Q plot showed residuals were approximately normally distributed (Figure 14). The assumption of homoscedasticity was confirmed by a non-constant Variance Score Test, $c^2(1, N = 72) = 2.492, p > .05$. A Durbin Watson Test suggested independence of residuals, $p > .05$. Linear regression revealed no significant effect of temporal distance on product evaluation, $a = -.015, t(70) = -.042, R^2 < .001, p = .967$.

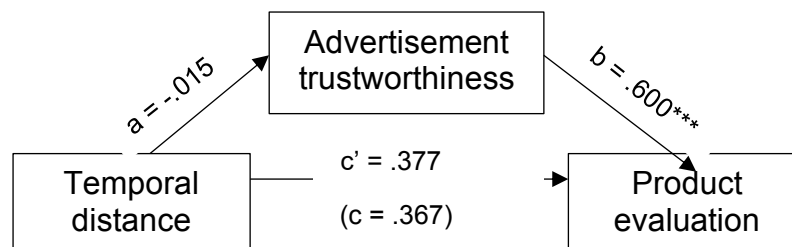
Although temporal distance had no significant effect on either advertisement trustworthiness or product evaluation, a linear regression was still performed to investigate the effect of temporal distance on product evaluation when advertisement trustworthiness is added to the model. The distribution of residuals appeared slightly left-skewed (Figure 15), but the linear regression was carried out regardless. Even though a residual plot (Figure 16) and a Scale location plot (Figure 17) showed that the assumption of homoscedasticity might be violated, a non-constant Variance Score Test revealed that homoscedasticity can be assumed. A Durbin Watson Test indicated independence of residuals, $p > .05$. The linear regression showed that there was no significant effect of temporal distance on product evaluation, $c' = .377, t(69) = 1.536, p = .129$, but it showed a significant effect of advertisement trustworthiness on product evaluation, $b = .600, t(69) = 7.549, p < .001$. This model including advertisement trustworthiness was able to explain more variance in product evaluation, $R^2 = .462$, than the model only including temporal distance, $R^2 = .018$. The indirect effect of temporal distance on product evaluation through advertisement trustworthiness can be calculated, $a*b = -.010$.

To confirm the estimates, a causal mediation analysis was performed with non-parametric bootstrap Confidence Intervals using the percentile method (5000 draws). It showed no significant indirect effect (Average Causal Mediation Effect) of temporal

distance and advertisement trustworthiness on product evaluation, $a*b = -.010$ 95% CI $[-.39, .48]$. The analysis confirmed that there is no significant total effect of temporal distance on product evaluation, $c = .367$, 95% CI $[-.27, 1.01]$. Further, it confirmed that after including advertisement trustworthiness into the model, the average direct effect of temporal distance on product evaluation remained non-significant, $c' = .377$, 95% CI $[-.10, .86]$. Figure 5 displays the mediation model including regression coefficients.

Figure 5

Mediation Diagram



Note. $^{***}p < .001$, a and b regression coefficients from linear regression models, c and c' regression coefficients are identical for linear regression models and causal mediation analysis.

Manipulation Check

As a manipulation check, participants in conditions in which the Nutri-Score was present in the advertisements were asked whether they noticed the label on the products. Of the participants in the conditions in which the Nutri-Score was present ($N = 72$), 83.3% ($N = 60$) reported having noticed the label on the products, 16.7% ($N = 12$) reported having not noticed the label on the products. In the HTD-NSP condition, 30 participants noticed the label and 6 did not ($M = 1.167$, $SD = .378$). In the LTD-NSP condition, also 30 participants indicated to have seen the label and 6 did not ($M = 1.167$, $SD = .378$). As already mentioned, no participants were excluded for this failing the manipulation check.

Exploratory Analyses

Knowledge of the Nutri-Score

Participants were asked to indicate (with agreeing or disagreeing) if they have heard about the Nutri-Score before. 85% ($N = 116$) of participants answered that they have heard about it, and 15% said they did not ($N = 20$). In the HTD-NSP condition, 32 participants agreed, 4 disagreed, in the HTD-NSA condition, 22 agreed and 6 disagreed,

in the LTD-NSP condition, 29 agreed and 7 disagreed, in the LTD-NSA condition 33 agreed and 3 disagreed. Table 3 depicts group means and standard deviations.

Familiarity with the Nutri-Score

Furthermore, all participants indicated how familiar they were with the Nutri-Score at the time of participation. Mean familiarity was $M = 4.199$ (scale 1;7), with a standard deviation of $SD = 1.853$. Group means and standard deviations are displayed in Table 3.

Perception of Nutri-Score as a Warning

Further, to investigate whether participants perceived the Nutri-Score as a warning, again, means, and standard deviations were calculated. The overall mean (all conditions) was $M = 4.529$ on a 7-point, with a standard deviation of $SD = 1.977$. Means and standard deviations per condition can be viewed in Table 3.

Correlations between Dependent Variables and Other Study Variables

A correlation matrix showed that familiarity with the Nutri-Score significantly correlated with knowledge of the Nutri-Score and with the perception of the Nutri-Score label E as a warning (Table 2). Participants who have heard of the Nutri-Score were more familiar with it, and participants who were more familiar with it perceived the Nutri-Score label E more as a warning. Knowledge of and familiarity with the Nutri-Score label E did not correlate significantly with any dependent variables, but perception of the Nutri-Score label E as a warning did correlate significantly with product evaluation and advertisement trustworthiness (see Table 2).

The correlation matrix displayed in Table 2 also shows that all dependent variables are significantly correlated with each other. Purchase intention strongly correlated with product evaluation and with advertisement trustworthiness. Product evaluation also strongly correlated with advertisement trustworthiness.

Table 2

Correlations between Dependent Variables and Exploratory Variables

Variables ($N = 136$)	1	2	3	4	5	6
1. Knowledge of Nutri-Score	-					
2. Familiarity with Nutri-Score	-.60***	-				

3. Perception of Nutri-Score as warning	-.15	.32***	-			
4. Purchase intention	-.10	.11	.12	-		
5. Product evaluation	-.15	.17	.20*	.84***	-	
6. Advertisement trustworthiness	-.08	.11	.23**	.61***	.67***	-

Note. * $p < .05$. ** $p < .01$, *** $p < .001$.

Exploratory Analyses for the Perception of Nutri-Score as a Warning

Exploratory analyses were performed to investigate if an exclusion of participants who did not see the Nutri-Score as a warning would change the results regarding hypotheses I to III. After excluding participants who did not see the Nutri-Score as a warning (answered 4 or below in the question), $N = 81$ participants were left for analysis ($N = 23$ for HTD-NSP condition, $N = 13$ for HTD-NSA, $N = 20$ for LTD-NSP, $N = 25$ for LTD-NSA). Mean and standard deviations for each condition are depicted in Table 4.

The interaction effect examined in hypothesis I remained non-significant, $F(1, 77) = .355$, $p = .553$, and neither the main effect of temporal distance, $F(1, 77) = .223$, $p = .638$, nor the main effect of the presence of the Nutri-Score label, $F(1, 77) = .223$, $p = .638$, were significant. The interaction effect investigated in hypothesis II, $F(1, 77) = 1.372$, $p = .245$, the effect of temporal distance, $F(1, 77) = .262$, $p = .610$, and the effect of the presence of the Nutri-Score label, $F(1, 77) = 3.304$, $p = .073$, were all not significant. The interaction effect examined in hypothesis III revealed that neither the interaction effect, $F(1, 77) = 3.442$, $p = .067$, nor the effect of temporal distance, $F(1, 77) = .051$, $p = .822$, nor the effect of the presence of the Nutri-Score label on advertisement trustworthiness, $F(1, 77) = .001$, $p = .981$, were significant.

All assumptions were checked and confirmed, except for the assumption of normal distribution of residuals in the model for hypothesis I, but the ANOVA was still considered adequate and performed regardless (assumption checks including plots can be found in the R script).

Discussion

This study aimed to investigate if an *ironic effect of warnings* discovered by Steinhart et al. (2013), which suggests that including a warning in advertisements can have harmful effects depending on the temporal distance, can also be found in the context of a Nutri-Score label E on food and beverage items. No evidence for the existence of such an effect in this context was found. Further, contrary to Steinhart et al. (2013), trustworthiness did not act as a mediator in the relationship between temporal distance and product evaluation in this context either. Details for each of the hypotheses, other findings, and implications are discussed hereafter.

Purchase Intention

In hypothesis I, it was expected that the presence of the Nutri-Score label E in advertisements would increase purchase intention when temporal distance was high and decrease purchase intention if temporal distance was low. Concretely, participants in the distant future condition who saw the advertisement with the Nutri-Score were expected to rate the likelihood of purchasing the products higher than participants who saw the advertisement without the Nutri-Score. Further, participants in the near future condition who saw the advertisement with the Nutri-Score were expected to rate the likelihood of buying the products as lower than participants who saw the advertisement without the Nutri-Score. This expected interaction effect of temporal distance and the presence of the Nutri-Score label on purchase intention could not be found. The results also showed no effect of temporal distance on purchase intention but revealed a significant effect of the presence of the Nutri-Score label on purchase intention. Participants who were shown the Nutri-Score label in advertisements indicated a lower likelihood of purchase of the shown products compared to participants who did not see the label.

Product Evaluation

In hypothesis II, it was assumed that including a Nutri-Score label E in advertisements increases a product's appeal in a temporal distant context but decreases a product's appeal in a temporal proximal context. Thus, in the distant future condition, participants were expected to evaluate the product's attractiveness as higher when the Nutri-Score label E was present in the advertisements, while in the near future condition, participants were expected to rate the products as more attractive when the Nutri-Score label was absent. This expectation could not be confirmed, as no such interaction effect

of the presence of the Nutri-Score label and temporal distance on product evaluation could be found. No effect of temporal distance on product evaluation was found. Also, no effect of the presence of the Nutri-Score label on product evaluation was found either.

Advertisement Trustworthiness

Expected for hypothesis III was an interaction effect of the presence of the Nutri-Score label E and temporal distance on advertisement trustworthiness. However, results showed no significant interaction effect. Further, no effect of the presence of the Nutri-Score label on advertisement trustworthiness could be found. Results also showed that there was no significant effect of temporal distance on advertisement trustworthiness. Contrary to the expectations based on Steinhart et al.'s (2013) findings in their fourth study, participants in the high temporal distance condition rated the advertisement as less trustworthy when the Nutri-Score label was present in the advertisements compared to when it was absent (see Table 2).

Mediation Analysis

In hypothesis IV, it was examined whether advertisement trustworthiness mediates the relationship between temporal distance and product evaluation when the Nutri-Score label is included in the advertisement. According to Baron and Kenny (1986), complete mediation requires a significant effect of the predictor on both the outcome and on the mediator, a significant effect of the mediator on the outcome, and lastly, a reduction to non-significance of the effect of the predictor on the outcome if the mediator is considered in their relationship. In partial mediation, the direct effect of the predictor is still significant when the mediator is added to the model (Baron & Kenny, 1986).

No significant effect of temporal distance (predictor) on product evaluation (outcome) could be found for participants in conditions in which the Nutri-Score label was included in advertisements. Further, no significant effect of temporal distance (predictor) on advertisement trustworthiness (mediator) was found in the groups included in the mediation analysis. Although these prerequisites for a possible mediation were not met, a mediation analysis was still conducted. It revealed, to no surprise, that the mediation effect is not significant ($a*b = -.010$). However, a significant effect of advertisement trustworthiness on product evaluation could be found.

Centrality of Advertisement Trustworthiness and the Nutri-Score Label

Even though advertisement trustworthiness was rated as more central to product evaluation than the Nutri-Score, a paired t-test showed that this difference was not significant. This is one possible explanation for the unexpected results regarding the hypotheses. Construal Level Theory argues that increased (temporal) psychological distance emphasizes the high-level features and deemphasizes the low-level features of an object (Trope & Liberman, 2003). Specifically, Steinhart et al. (2013) explain that warnings of side effects are represented on a low-level construal, which leads to a less attractive product from a psychological proximal point of view. On the other hand, a warning of side effects also increases the trustworthiness of the advertisement and in turn increases the product's appeal in a psychologically distant setting. Thus, theoretically, with increased temporal psychological distance, the high-level feature, which was expected to be the advertisement trustworthiness, should be accentuated, while the low-level features, which was expected to be the Nutri-Score label E, should be de-emphasized. Steinhart et al. (2013) verified in pilot studies that for their advertisements, message trustworthiness is perceived as more central than potential side effects to product judgments. However, because the centrality of the advertisement trustworthiness did not significantly differ from the centrality of the Nutri-Score label, it is possible that in this study, high temporal distance did not emphasize advertisement trustworthiness for product judgment, and low temporal distance did not emphasize the Nutri-Score label for product judgment. Thus, the manipulation of temporal distance may not have affected the perception of the products, or the dependent variables.

Exploratory Analyses

Knowledge of and Familiarity with the Nutri-Score Label

Furthermore, familiarity with the Nutri-Score was assessed. Most participants ($N = 116$) indicated that they have heard about the Nutri-Score before. However, mean familiarity was only slightly above the median ($M = 4.199$ on a 7-point scale). None of the participants who indicated either that they have not heard about the Nutri-Score before or rated their familiarity with it as low were excluded from the analysis, as the Nutri-Score label is made to be intuitive (Jurkenbeck et al., 2022), and it can be assumed that those participants still understood that the red Nutri-Score label indicated unfavorable ingredients. Nonetheless, there still seems to be a lack knowledge and

familiarity, at least for some, which demonstrates a need to publicly promote and explain the Nutri-Score label further.

Perception of Nutri-Score as a Warning

Participants also indicated whether they perceived the Nutri-Score label E as a warning. Overall, the Nutri-Score label E was more perceived as a warning than not ($M = 4.529$, 7-point scale). A correlation matrix (Table 2) showed that participants who are more familiar with the Nutri-Score label perceive the Nutri-Score label E significantly more as a warning. It also showed that the perception of the Nutri-Score label E as a warning significantly and positively correlated with both product evaluation and advertisement trustworthiness. Because of this, it was relevant to examine if the absence of interaction effects in this study may stem from the fact that not all participants perceived the Nutri-Score label as a warning. Therefore, an exploratory analysis was conducted.

ANOVAs on purchase intention, product evaluation, and advertisement trustworthiness (hypotheses I-III) were recalculated, only including data of participants who indicated they perceived the Nutri-Score label E as a warning (selected >4 for answering the question). Only including those participants did not change the results for the interaction effects expected in the hypotheses. The main effect of presence of the Nutri-Score on purchase intention could not be found in this sample. All other effects remained non-significant. However, these results should be cautiously interpreted, as group sizes differ considerably (see Table 4). Nonetheless, they indicate that including participants who did not perceive the Nutri-Score label E as a warning did not distort the investigated interaction effects of temporal distance and Nutri-Score presence on purchase intention, product evaluation, and advertisement trustworthiness.

Correlations of Dependent Variables

Although not part of the main analysis, the correlation matrix (Table 2) revealed that all dependent variables were positively and significantly correlated with one another. Participants which rated the advertisements as more trustworthy rated the products as more attractive, which is consistent with the found significant effect of advertisement trustworthiness on product evaluation. Participants which rated the advertisements as more trustworthy also indicated a higher likelihood of purchase intention for the shown items. These findings support existing literature that indicates an association between

purchase intention, product evaluation, and trustworthiness (e.g., Wang, Shahzad, Ahmad, Abdullah, & Hassan, 2022).

Integrating the Results

The Nutri-Score Label

The presence of the Nutri-Score label E on product packages in advertisements had a significant effect on purchase intention. Participants who saw the Nutri-Score label in advertisements indicated a lower likelihood of purchase compared to participants who did not see the Nutri-Score label in advertisements. This suggests that including a Nutri-Score label on products that would receive an unfavorable Nutri-Score label (such as E) may result in a decreased likelihood of purchase for the product. Some studies (Egnell, Galan, et al., 2020; Egnell, Talati, et al., 2020) argue that when given the choice between foods of the same category with different Nutri-Score labels, participants tend to choose the healthier options. De Temmerman et al. (2021) found in their study that the presence of the Nutri-Score on products increases the sales of healthy options while not affecting the sales of unhealthy options. The current study suggests that sales of unhealthy options may be affected after all. The difference in findings might be due to methodical differences, as in the present study, participants could not choose between healthy and healthy products, but instead only indicated their purchase intention for products with an unfavorable Nutri-Score.

Still, this finding has relevant implications for manufacturers, governments, and institutions responsible for such policies which focus on promoting healthy eating behavior. On one hand, it supports the effectiveness of the Nutri-Score in nudging people to make healthier food and drink choices. On the other hand, in countries in which the Nutri-Score label is voluntary, manufacturers may see this finding as a threat to product sales, and refrain from putting a Nutri-Score label on a product packaging if the product falls in an unfavorable category. Ideally, though, this scenario should provoke manufacturers to alter ingredients, reducing unhealthy ingredients and therefore improving the Nutri-Score labels.

An effect of the Nutri-Score on product evaluation could not be found. Though means of conditions (Table 1) point in the same direction – including the Nutri-Score label E tends to decrease product attractiveness, this effect was not significant. The larger influence of the Nutri-Score label on purchase intention compared to product

evaluation could suggest that some participants perceive products with an adverse Nutri-Score label as still attractive but are less likely to buy the item with the said score. Even though no participants included in the analysis followed a diet, temptation, and self-control may have played a role in their response behavior, though this is only speculation and would need to be tested in a new study with a different design. The Nutri-Score did not significantly affect advertisement trustworthiness.

Temporal Distance

Studies investigating the role of psychological distance in health domain indicated different findings about the direction of the effect of psychological distance, as some suggest that high-level construals may lead to healthier choices (e.g., Fujita and Han, 2009), while others suggest the opposite (Griffioen et al., 2016). No main effect of temporal distance on any dependent variable was found in this study. One possible reason for this discrepancy may be the different methodologies – the mentioned studies mainly focused on a specific aspect, e.g., the role of risk perception or self-control. Steinhart et al.'s (2013) found a significant main effect of temporal distance on both product evaluation and advertisement trustworthiness.

The Ironic Effect of Warnings

Based on the findings of Steinhart et al. (2013), interaction effects of temporal distance and the Nutri-Score label E on purchase intention, product evaluation, and advertisement trustworthiness were expected. In this study, however, no significant effect of temporal distance on either dependent variable could be found. Results indicate that no such *ironic effect of warnings*, as found by Steinhart et al. (2013), exists in the context of Nutri-Score label E on food and beverage products.

Furthermore, temporal distance had neither a significant effect on advertisement trustworthiness in testing hypothesis III, nor a significant effect on product evaluation in testing hypothesis II. Thus, it comes without surprise that the mediation analysis for investigating hypothesis IV revealed no mediation of advertisement trustworthiness on the relationship between temporal distance and product evaluation occurred. Steinhart et al. (2013) argued that such mediation through advertisement trustworthiness results in interaction effects of the presence of warnings and temporal distance.

As already mentioned, a potential reason that these effects were not found is that the centrality of advertisement trustworthiness did not significantly differ from the

centrality of the Nutri-Score label for product judgment. Consequently, altering temporal distance may have not affected the perception of the products and thus not affected the dependent variables.

Limitations

Some limitations could have led to the absence of the expected interaction effects and mediation. In retrospect, it would have been a better choice to measure the centrality of advertisement trustworthiness and the centrality of the Nutri-Score label to product judgment in a pilot study, instead of including these questions in the main study. Since advertisement trustworthiness was not significantly more central to product judgment than the Nutri-Score label, the theoretical basis of the ironic effect of warnings is not given in this context, to begin with. With measuring the centralities in a pilot study, some alterations may have been possible to the study design to make sure this prerequisite is fulfilled. Even though the advertisement's trustworthiness was not significantly more central to product judgment than the Nutri-Score label, it still was at more central to product judgment than the Nutri-Score label. Thus, it is important to mention that a significant difference in centralities may not change the results for the hypotheses after all.

Moreover, no manipulation check for temporal distance was implemented. The part of the text which indicated temporal distance or proximity was made italic and bold, and thus highlighted compared to the rest of the text. Yet, this manipulation check might still have been insightful for exploring possible reasons for the absence of expected effects.

Lastly, even though different food and beverage items were included to accommodate various individual preferences, some participants may dislike most products, which likely affects all dependent variables. This is evident when inspecting the outliers in the boxplots for purchase intention, product attractiveness, and advertisement trustworthiness (Figures 3-5). Nonetheless, through randomization, these differences in individual preferences should be equally distributed amongst groups, at least to some extent.

Outlook

All four hypotheses had to be rejected, still, results allowed valuable insights into the relationship of the investigated variables. The significant main effect of the presence of

the Nutri-Score label on purchase intention suggests that people are less likely to purchase items with an unfavorable Nutri-Score. Moreover, mediation analysis showed that advertisement trustworthiness influences product evaluations and a correlation matrix further revealed that all dependent variables are significantly correlated with one another.

Generally, the literature on the effects of psychological distance in the health domain is still scarce, and there are many interesting aspects left to investigate. More confined to the topic of the present study, future studies could replicate Steinhart et al.'s (2013) study as it is, examining the validity of their findings, or investigate if the ironic effect of warnings applies to other contexts than those investigated so far, e.g., including a warning in gambling advertisement.

Conclusion

The findings of this study suggest that an *ironic effect of warnings*, which Steinhart et al. (2013) found in the context of hair loss and erectile dysfunction medication, cigarettes, and artificial sweetener, cannot be found in the context of including an Nutri-Score label E on food and beverage products in advertisements. This could, perhaps, be due to the centrality of the Nutri-Score label not being significantly different from the centrality of advertisement trustworthiness for product judgment. Considering the *ironic effect of warnings* is something undesirable and harm-causing, this non-significance of investigated interaction effects of temporal distance and the presence of the Nutri-Score label on purchase intention and product evaluation is ultimately a pleasant discovery. Both this and the found main effect of Nutri-Score presence on purchase intention suggest that the Nutri-Score works as intended – it decreases the likelihood of purchase of products with an adverse Nutri-Score label.

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Level Perceptions of Warning Components and Configurations. *Article in International Journal of Cognitive Ergonomics*, 2(2), 123–143. Retrieved from <https://www.researchgate.net/publication/284634659>

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Appendix

Abstract

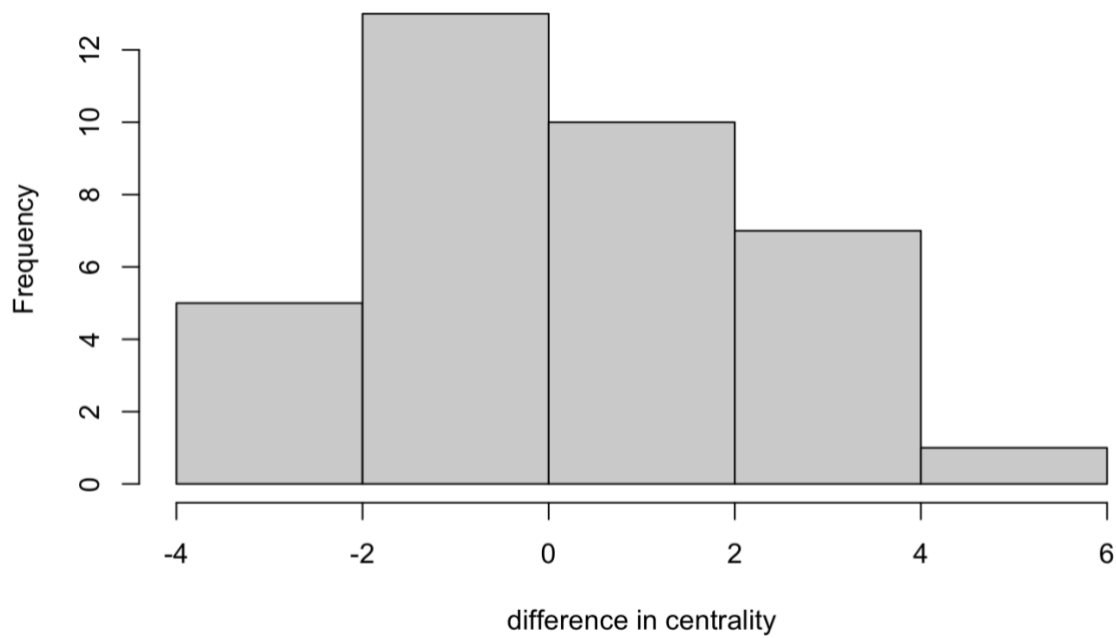
This study investigates whether including an unfavorable Nutri-Score label in advertisements of food and beverage items may increase the products' attractiveness, purchase likelihood, and advertisement trustworthiness with temporal distance. In a 2 x 2 design, participants (N = 136) either viewed product advertisements with or without a Nutri-Score label E, and either were told that the shown product would launch soon (low temporal distance) or next year (high temporal distance). Results revealed that none of the expected interaction effects of temporal distance and the presence of the Nutri-Score label on purchase intention, product evaluation, and advertisement trustworthiness could be found. Furthermore, advertisement trustworthiness did not mediate the relationship between temporal distance and product evaluation. The findings of this study did uncover a significant effect of the presence of the Nutri-Score label on purchase intention. Including a Nutri-Score label E in advertisements negatively affected purchase intention for the advertised products. Exploratory analyses also revealed significant correlations between purchase intention, product evaluation, and advertisement trustworthiness.

Keywords: temporal distance, Nutri-Score, purchase intention, product evaluation, trustworthiness

Zusammenfassung

In dieser Studie wird untersucht, ob eine ungünstige Nutri-Score-Kennzeichnung in Werbungen für Lebensmittel und Getränke die Attraktivität der Produkte, die Kaufwahrscheinlichkeit und die Vertrauenswürdigkeit der Werbung mit zeitlichem Abstand erhöhen kann. In einem 2 x 2 Design sahen sich die Teilnehmer ($N = 136$) entweder Produktwerbung mit oder ohne Nutri-Score-Kennzeichnung E an und bekamen entweder gesagt, dass das gezeigte Produkt bald (geringe zeitliche Distanz) oder im nächsten Jahr (hohe zeitliche Distanz) auf den Markt kommen würde. Die Ergebnisse zeigten, dass keiner der erwarteten Interaktionseffekte zwischen der zeitlichen Distanz und dem Vorhandensein des Nutri-Score-Labels auf die Kaufabsicht, die Produktbewertung und die Vertrauenswürdigkeit der Werbung gefunden werden konnte. Darüber hinaus wirkte die Vertrauenswürdigkeit der Werbung nicht als Mediator in der Beziehung zwischen zeitlicher Distanz und Produktbewertung. Die Ergebnisse dieser Studie zeigten einen signifikanten Effekt des Nutri-Score-Labels auf die Kaufabsicht. Eine Nutri-Score-Kennzeichnung E in Werbungen wirkte sich negativ auf die Kaufabsicht für die beworbenen Produkte aus. Explorative Analysen ergaben außerdem signifikante Korrelationen zwischen der Kaufabsicht, der Produktbewertung und der Vertrauenswürdigkeit der Werbung.

Schlüsselwörter: Zeitliche Distanz, Nutri-Score, Kaufabsicht, Produktbewertung, Vertrauenswürdigkeit

Figure 6*Histogram of Difference in Centrality (N = 36)*

Note. The difference is the centrality of advertisement trustworthiness subtracted by the centrality of the Nutri-Score label for product judgment.

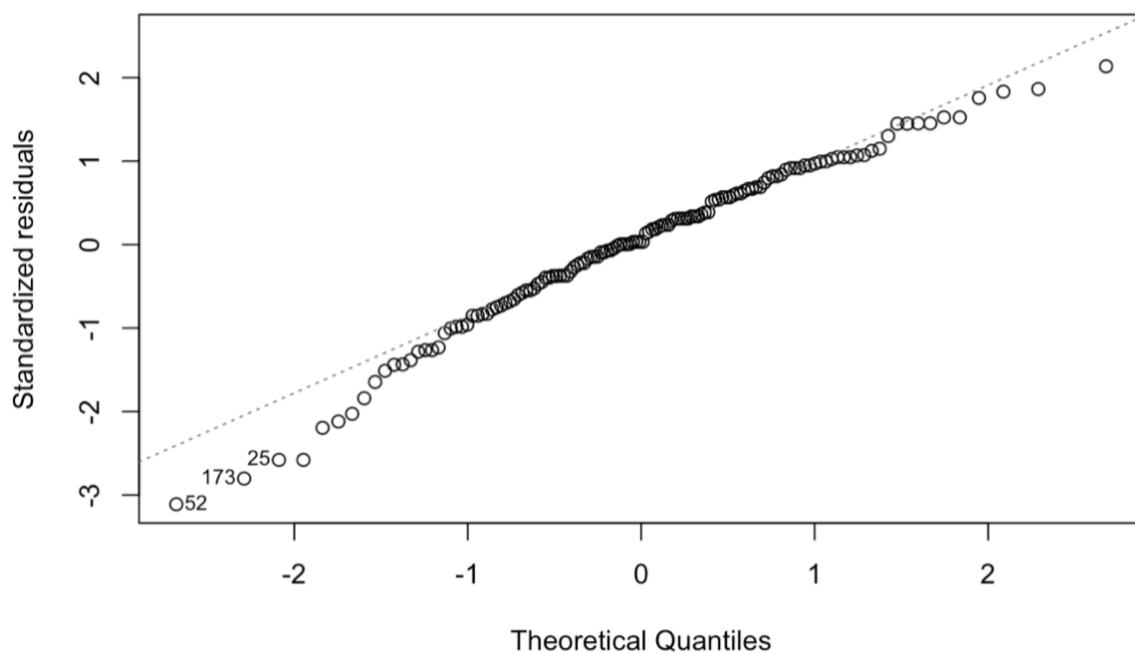
Figure 7*Normal Q-Q Plot of Model for Hypothesis I (N = 136)*

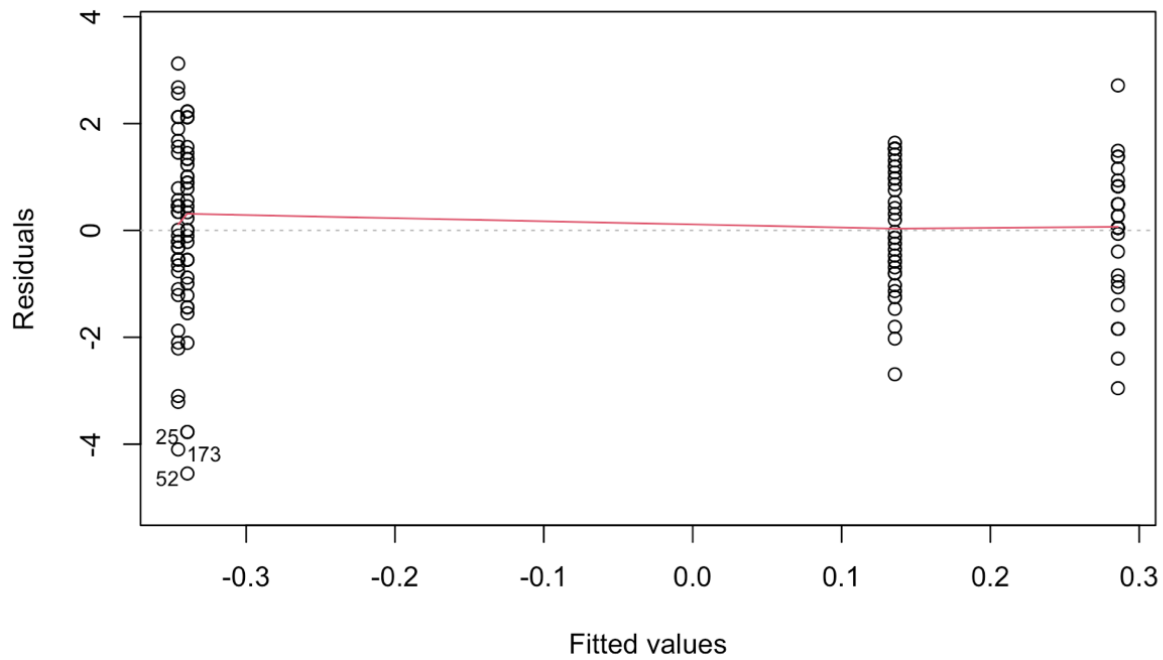
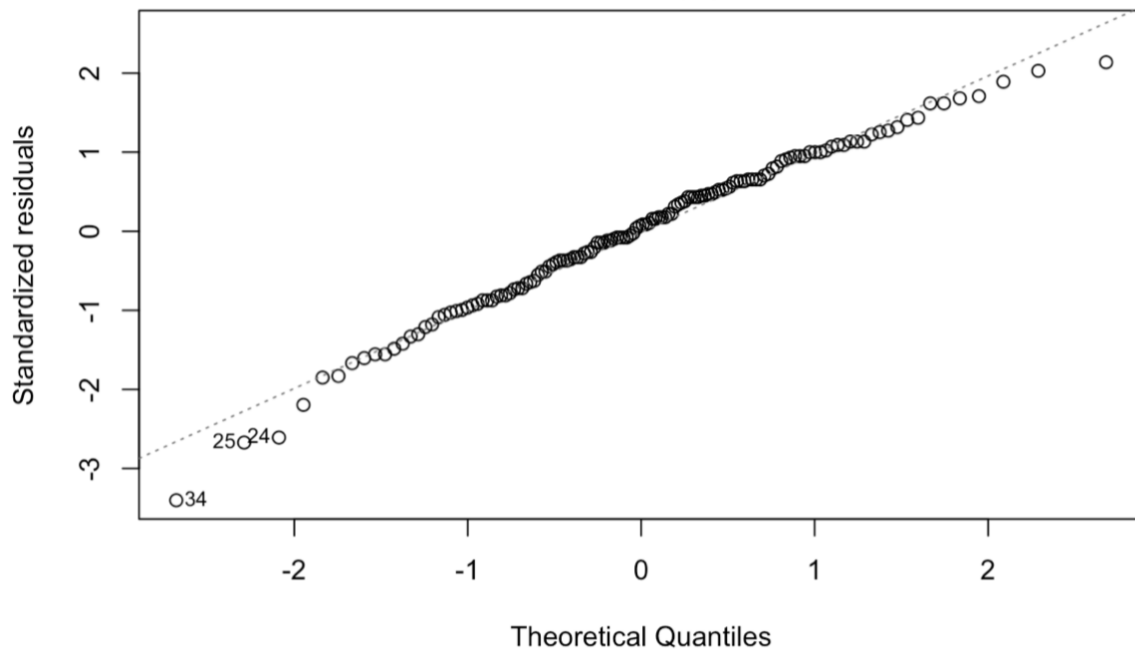
Figure 8*Residual Plot of model for hypothesis I (N = 136)***Figure 9***Normal Q-Q Plot of Model for Hypothesis II (N = 136)*

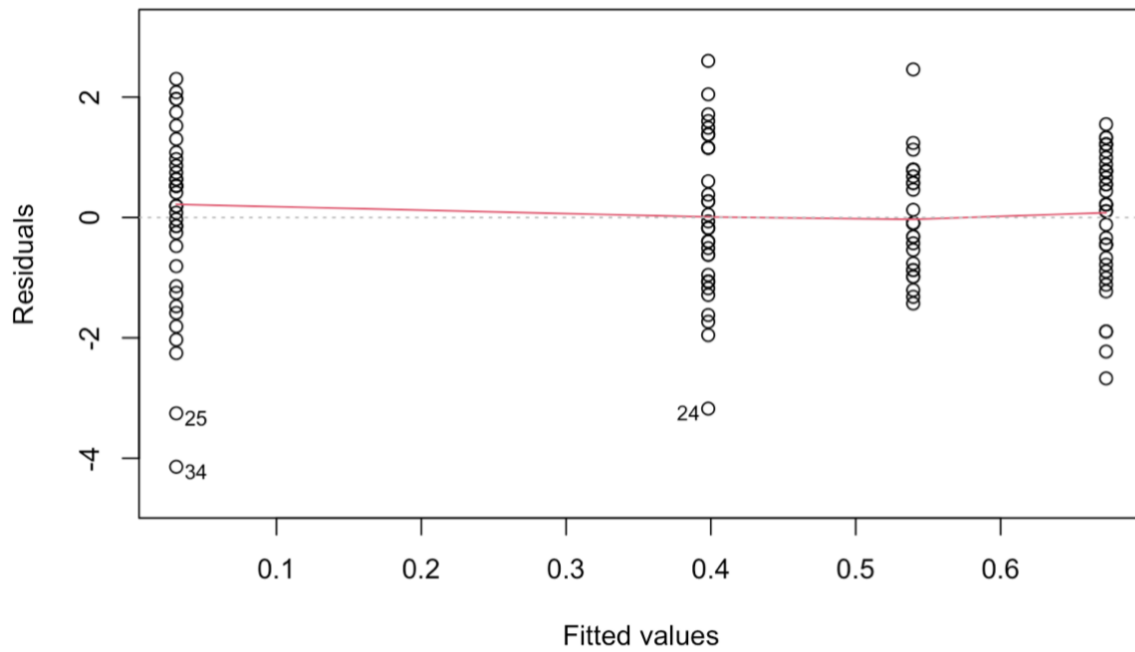
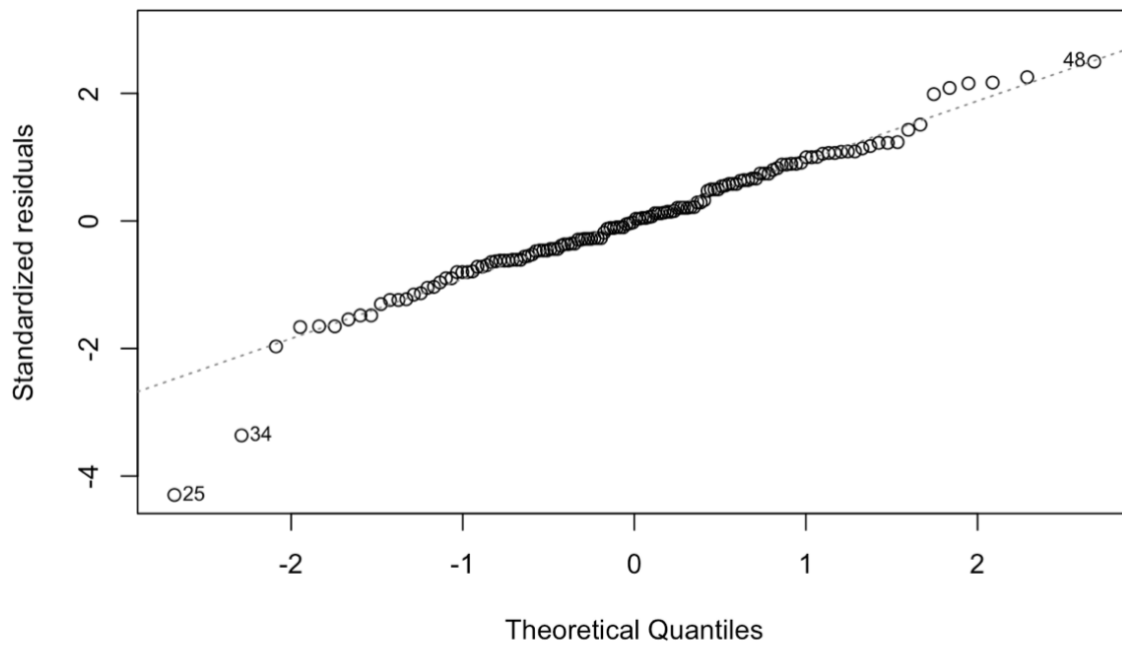
Figure 10*Residual Plot of Model for Hypothesis II (N = 136)***Figure 11***Normal Q-Q Plot of Model for Hypothesis III (N = 136)*

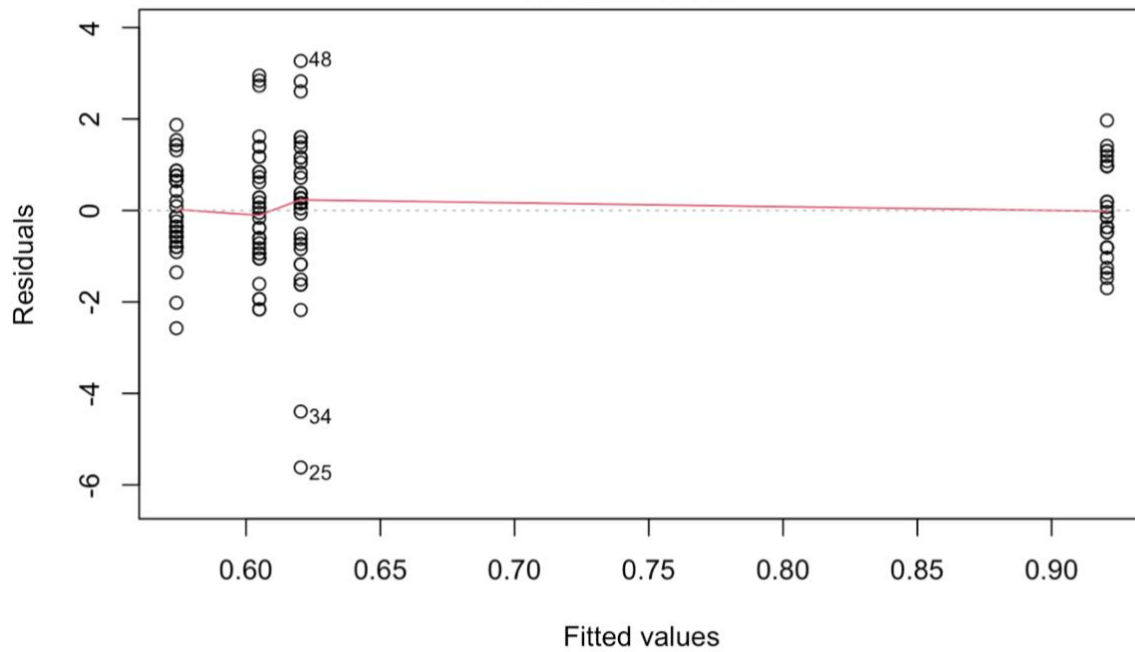
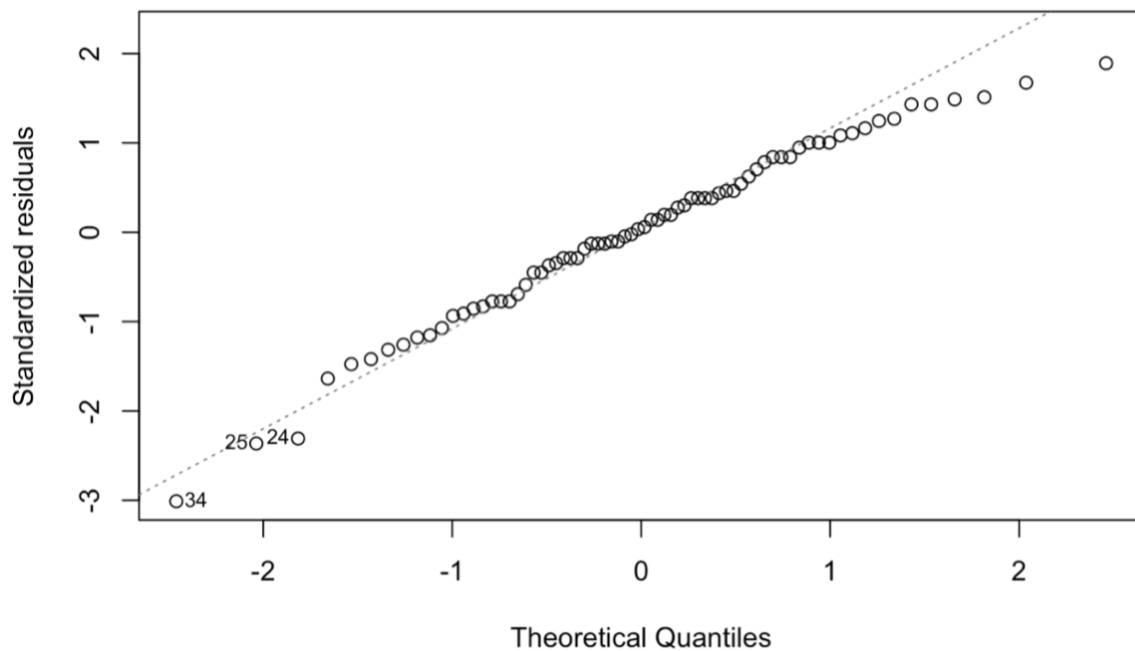
Figure 12*Residual Plot of Model for Hypothesis III (N = 136)***Figure 13***Normal Q-Q Plot of Model c, Hypothesis IV (N = 72)*

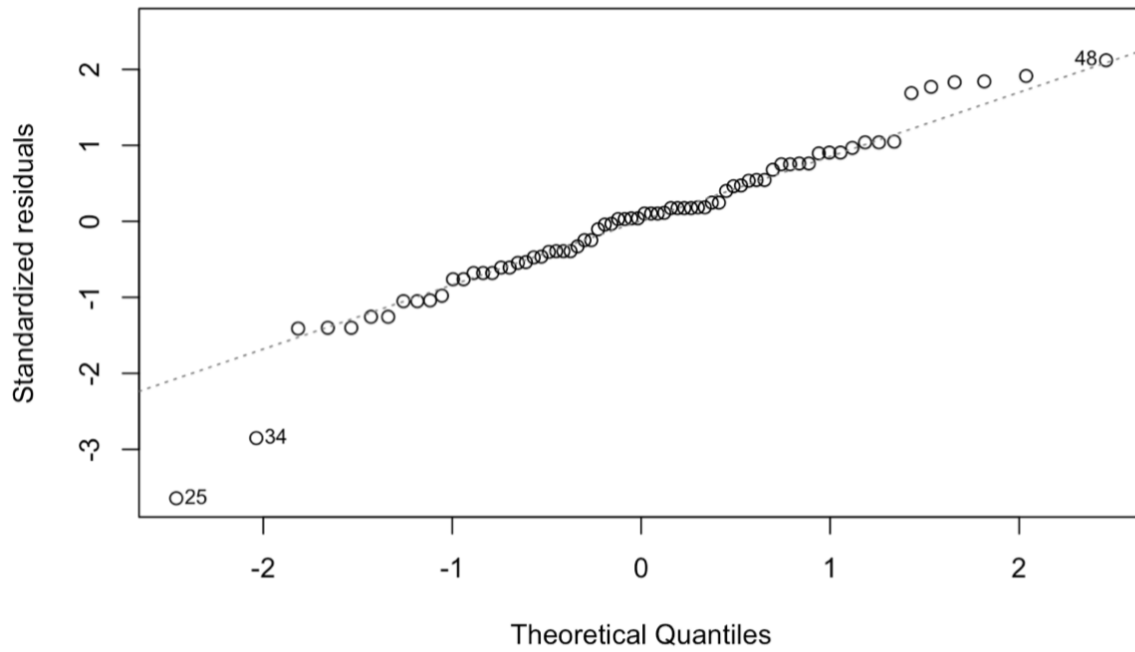
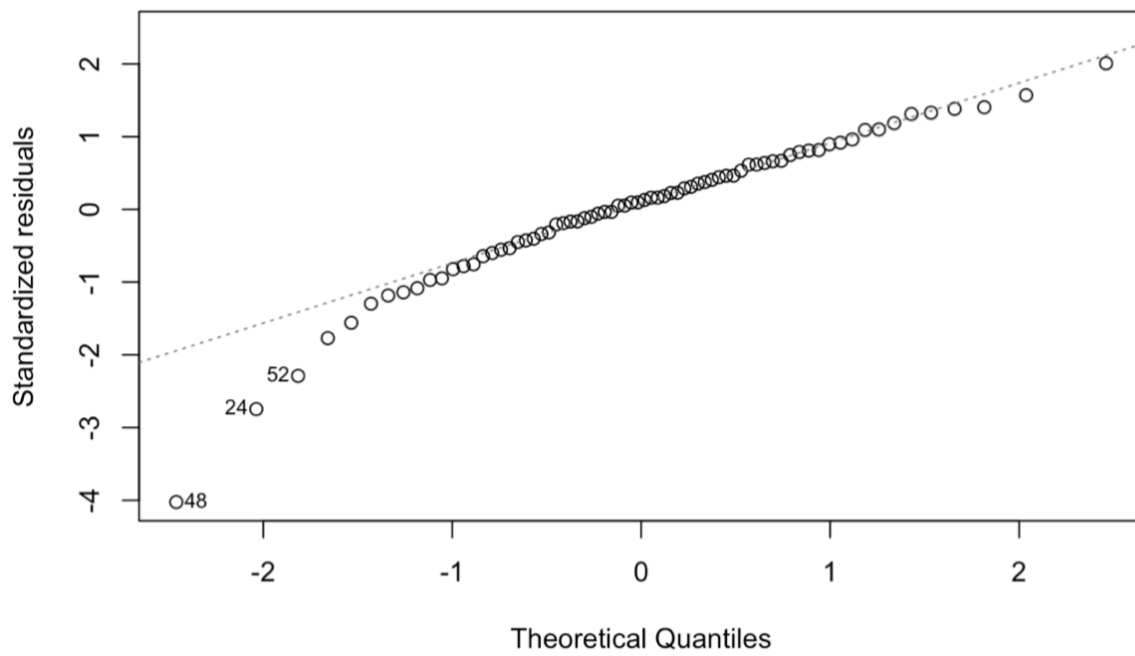
Figure 14*Normal Q-Q Plot of Model a, Hypothesis IV (N = 72)***Figure 15***Normal Q-Q Plot of Model c', Hypothesis IV (N = 72)*

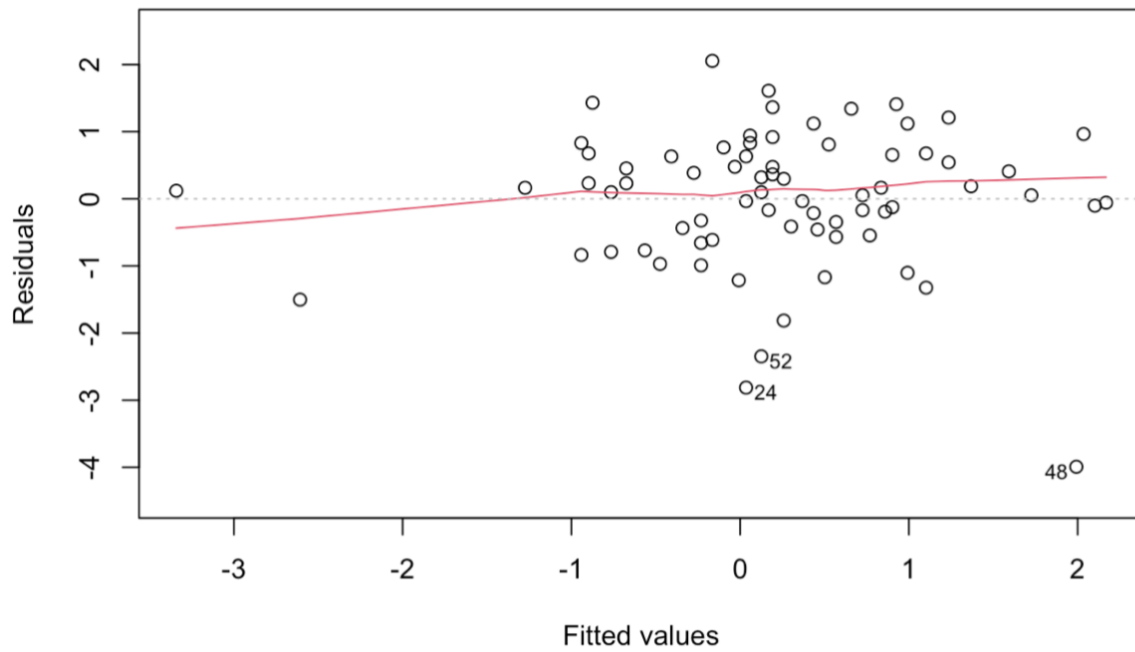
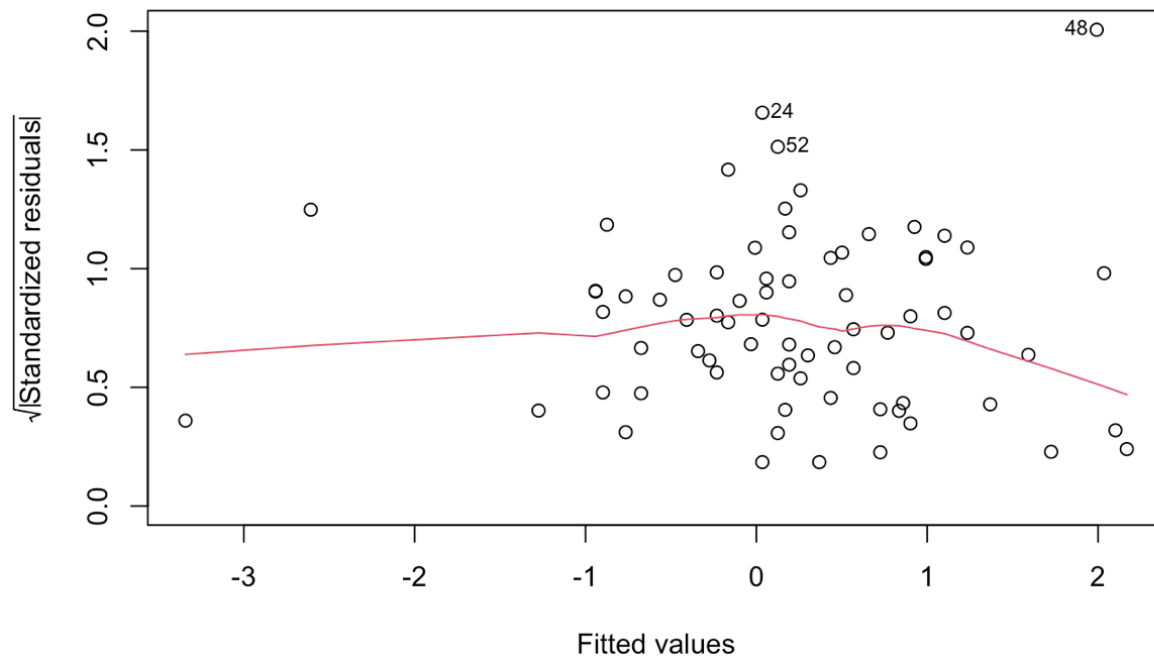
Figure 16*Residual Plot of Model c' , Hypothesis IV ($N = 72$)***Figure 17***Scale-Location Plot of Model c' , Hypothesis IV ($N = 72$)*

Table 3*Mean and Standard Deviation of Exploratory Variables for Each Condition*

Nutri-Score	HTD-NSP (N = 36)		HTD-NSA (N = 28)		LTD-NSP (N = 36)		LTD-NSA (N = 36)	
	M	SD	M	SD	M	SD	M	SD
Knowledge	1.111	.319	1.214	.418	1.194	.401	1.083	.280
Familiarity	4.333	1.836	3.929	1.942	4.111	1.909	4.361	1.791
Perception as warning	4.806	1.737	3.964	1.895	4.250	2.273	4.972	1.874

Table 4*Exploratory Analysis: Mean and Standard deviation of Purchase Intention, Product Evaluation and Advertisement Trustworthiness for Each Condition*

Dependent variables	HTD-NSP (N = 23)		HTD-NSA (N = 13)		LTD-NSP (N = 20)		LTD-NSA (N = 25)	
	M	SD	M	SD	M	SD	M	SD
Purchase intention	-.121	1.470	.085	1.420	-.139	1.330	.422	1.010
Product evaluation	.430	1.280	.513	.831	.294	1.300	.973	.869
Advertisement trustworthiness	.652	1.340	1.200	1.070	1.160	1.430	.711	.752

Note. Only includes participants who view the Nutri-Score label E as a warning.