

A systematic review of recent literature regarding consumer use of
nutrition labels, specifically for Nutri-Score



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Abstract

The aim of this systematic literature review is to provide an answer to the questions how consumers search for nutritional information, how they perceive, understand and use nutrition labels, and what factors influence the consumer decision-making process. Afterwards the paper will conclude with an advice to the Dutch government on how to implement a nutrition label. This article will specifically focus on the French Nutri-Score format, since there is a lot of public support for this format. The systematic literature review gives an answer on the research questions and specifies different label factors and personal characteristics that influence the consumer decision-making process. Based on these characteristics, the advice for the government was formulated, also resulting in some advice for marketers and food producers. The main findings are that a single, consistent, colour-coded nutrition label performs best when placed in a consistent location on the packaging and is twice the standard display size. When implemented, the introduction of the nutrition label should be accompanied by an extensive information campaign.

Contents

Introduction.....	4
Nutri-Score	4
Framework	7
Methods	7
The Literature review	9
Results	9
Summary of findings (systematic literature review)	11
Search and Exposure	11
Perception	12
Understanding.....	12
Use.....	13
Answering the research questions.....	14
Discussion and Conclusion	15
Conclusion	17
Relevance, limitations and future research	17
References.....	19

Introduction

Facing poor dietary choices as being one of the primary reasons for getting noncommunicable diseases, the WHO has recognized in the European food and nutrition action plan 2015-2020 that an "easy-to-understand or interpretative, consumer friendly labelling on the front of packages" is a priority policy tool in encouraging healthier food choices (WHO European region, 2014).

Nutri-Score

Nutri-Score (Figure 1) is a Front-Of-Pack (FOP) nutritional label that reflects the nutritional quality of a food according to the nutritional composition per 100 grams. Scores are given by adding up the scores for the different nutrients. Positive points (0-10) are given for energy (Kj), total sugar (g), saturated fatty acids (g) and sodium (mg) content. Negative points (0-5) are allocated for fruits, vegetables, nuts, fibre and protein (Julia & Hercberg, 2017). The computed scores range from -15 to +40, respectively from the healthiest to the least healthy. The profiling system used for the points allocation is derived from the Food Standards Agency nutrient profiling system (FSA-NPS) developed in the United Kingdom. More detailed information on the computation of the score can be found in the "Nutri-Score Frequently Asked Questions" document published by Santé Publique France (2019).

Nutri-Score was selected by the French authorities in 2017 as the FOP label that can be voluntarily used on pre-packaged foods to inform the consumer of the overall healthiness of the product. The label is a follow up of the 5-colour nutrition label (5-CNL) (Figure 2) with letters added to the colour code to improve legibility. The 5-CNL/Nutri-Score format was chosen after comparing it to other formats (Figure 2). The 5-CNL proved easiest to identify and most likely to be understood compared to the Guideline Daily Amount (GDA), Multiple Traffic Light (MTL) label and the Green Tick (Ducrot et al., 2015a). In a second study done by Ducrot et al. (2015b) the 5-CNL was also found to be the most preferred among the participants, also comparing it with GDA, MTL and the Green Tick. An additional study done in real life conditions compared the Nutri-Score format to the Simplified Nutrient Labelling System (SENS), the MTL format and a modified version of the GDA format. The research was done in 60 different supermarkets. Of which 20 are controls and the remaining 40 were equally divided among the formats. As in the previous two studies mentioned, 5-CNL/Nutri-Score performed best. It had the biggest impact on the overall decline of the FSA score of the acquired products. It never resulted in an increase of the FSA score in any of the subcategories and was the only one that resulted in a better FSA score when looking specifically at consumers that buy the cheapest products (Ministère des Solidarités et de la Santé, 2017).

The Nutri-Score serves a triple objective. Firstly, it has the objective to enable consumers to easily use the nutritional value of the product in the purchasing decision. For the consumer, Nutri-Score serves the purpose of comparing the nutritional quality of food from different categories, within the same product category and between brands (Ministère des Solidarités et de la Santé, 2018). Secondly, it has the objective to motivate producers to keep improving the nutritional quality of food. The third objective is to facilitate health professionals in their advice to clients.

Currently the label has been adopted by the French government in October 2017 (agribusiness intelligence, 2017), the Belgian government in 2018 (Block, 2018) and in Spain in November 2018 (Agencia Española de Consumo, Seguridad alimentaria y Nutrición, 2018). Since the label is not mandatory on a food label, it relies on the producers or retailers to be willing to put it on their labels. Taking Belgium as an example we can see that some companies have already made the effort to do so. In

a press release in April 2018 Delhaize (Delhaize, 2018), a Belgian supermarket and distributor, stated that they were going to be the first in Belgium to put the Nutri-Score label on their private label. As of August 2018, the first of their home brand products with the label were on their shelves and they aim to have the label on all their products within two years. Additionally, Delhaize, Colruyt and Carrefour present their customers with the opportunity to check the Nutri-Score of most or nearly all products available in their app (Delhaize, nd.; Colruyt, nd.; Carrefour, nd.). Also, Danone has announced in a press release in October 2018 that they will add the Nutri-Score to all their products listed on the website and aim to have the label on all their fresh dairy products sold in Belgian stores by 2020 (Danone, nd.). Even Nestlé, as biggest fast-moving consumer goods company in the world (Manufacturing global, 2019), has proclaimed its support for Nutri-Score (Nestlé, 2019). Moreover, in the Netherlands, food producers and retailers are supportive of Nutri-score. The Centraal Bureau Levensmiddelenhandel (National Foodstuff Retailer Union), has issued a statement saying that they prefer the Nutri-Score label (Expertisecentrum Voedingmiddelenindustrie, 2018). Furthermore, individual retailers and producers have also publicly announced they will introduce the label to their products. Examples are Albert Heijn, who will introduce the label on their online assortment after the summer of 2019, HAK who is going to place the label on their packaging from the 1st of September onwards, Iglo who is going to introduce Nutri-Score on their packaging in fall and Alpro who will introduce it mid-2019. (Albert Heijn, 2019; HAK, 2019; Iglo, 2019, Alpro, 2019).

The Dutch government has shown interest in the use of one, standardized form of nutrition label as stated in the Nationaal Preventieakkoord (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). This accord, made by over 70 parties, presents a number of measures to battle obesity, alcohol use and smoking. One of the measures being a new nutrition label by 2020. With Albert Heijn and also the Dutch consumer union, Consumentenbond, supporting the Nutri-score format (Consumentenbond, 2019), it is a strong contender.

With the increasing use and interest in several EU countries on the use of Nutri-Score, this thesis aims to come to an advice to the Dutch government on how to implement a nutrition label such as Nutri-score. Moreover, this thesis provides a systematic review on the findings in the literature on this topic which can be useful for the policymakers, marketers and retailers. More specifically, this thesis aims to answer the questions of how a nutrition label is perceived, understood and used and what factors influence that process. After those questions are answered, advice for the implementation of the Nutri-score in the Netherlands will be given.

Therefore, we will aim to answer the following research questions:

- Q1. How do consumers search for nutritional information and what are the factors that influence the search?
- Q2. What are the factors that influence consumers' perception of nutrition labels?
- Q3. What are the factors that influence consumers' understanding of nutrition labels?
- Q4. How do consumers use nutrition labels and what are the factors that influence that?

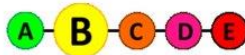


Figure 1: The Nutri-score label (www.duurzaamnieuws.nl)

Content for one serving size:

Energy 66 kcal 3 %	Sugars 0,3 g 0 %	Lipids 5 g 7 %	Saturated fatty acids 2 g 10 %	Sodium 0,28 g 5 %
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Guideline Daily Amounts (GDA)



5-Color Nutrition Label (5-CNL)



Multiple Traffic Lights (MTL)



Green Tick (Tick)

Figure 2: Nutrition label formats. Taken from Ducrot et al. (2015b).

Framework

To assess how consumers perceive and use nutritional labels on food packaging, an adapted version of the framework presented by Grunert and Willis (2007) will be used (Figure 3), with on the left side the factors that influence the process and on the right side the stage in the decision-making process itself.

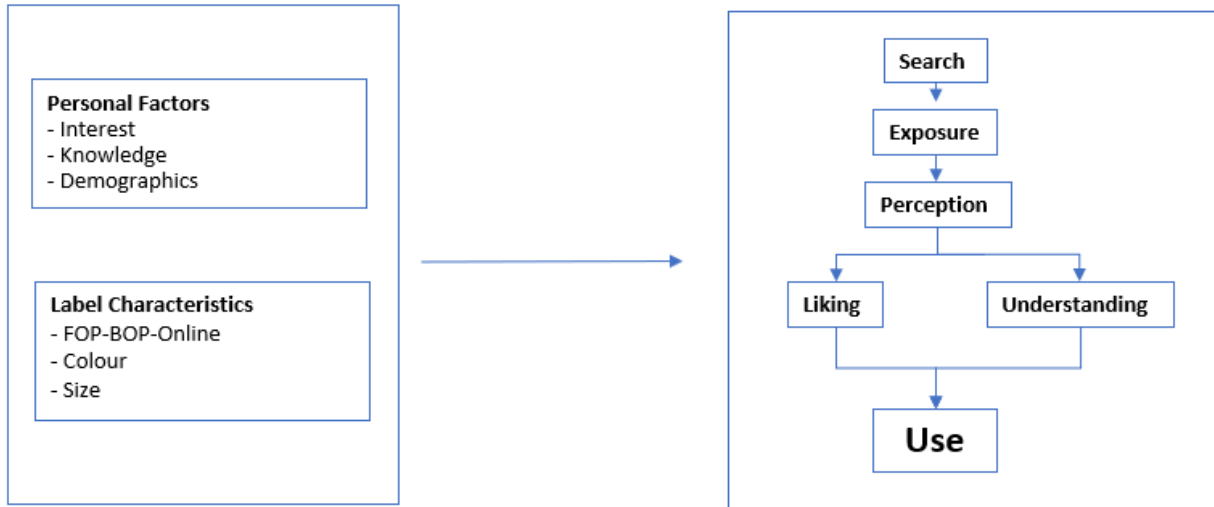


Figure 3: The Consumer decision making process. Adapted from Grunert and Willis (2007)

In the decision-making process the search for information, online and in store, influences the exposure to the information (note that without the label on the packaging, there is no in store exposure to the specific label). After being exposed to the information, a consumer's perception of the label can lead to use of the label via two paths, liking and understanding. A consumer can like the label because it is easy to understand. The decision-making process is influenced by personal factors and label characteristics. For example, a person's interest in healthy eating can result in actively seeking information on the food packaging that can help them with that. If the label is on the front of the pack, in a place where it's easy to spot, perhaps with colours that aid in the understanding of the label, the consumer will most likely see it, hopefully understand it and use it.

The difference between the left track of the model, with liking of the label, and the right track, is that understanding is something that can be concretely measured. First, we have to distinguish objective and subjective understanding. Subjective understanding can be assessed by simply asking a consumer whether they understand it. Objective understanding can be measured by giving consumers a choice between a number of products with a certain nutrition label and asking them which is the healthiest. Liking is very subjective, it can not be objectively measured.

Methods

In order to answer the research question, a systematical literature review was performed using a search query, limiting the language to English. Other than a language requirement, also articles published before 2007 were excluded. The reason being that the article used as the framework (Grunert & Willis, 2007) is a review of the research done in 2003 – 2006. To avoid using the same information, this review will look at articles published from 2007 onwards. As a database, Scopus was used. To be able to answer the research questions, various blocks and search terms were defined (Table 1). The search query will include the terms search, perception, understanding and use. To keep it specific for nutrition labels, the search query will include the terms nutrition label, Nutri-Score, 5-CNL label and traffic light.

Table 1: The search query

Block	Search terms
Nutrition label	((nutrition* AND label*) OR (nutri-score) OR (5-cnl AND label) OR (traffic AND light))
Consumer	AND (Consumer)
Decision making process	AND (search OR perception OR understanding OR use)
Language	AND (LIMIT-TO (LANGUAGE , "English"))
Year of publication	AND PUBYEAR > 2006

The search query gave 479 results and of all articles the abstract was screened, giving 43 articles that were deemed relevant enough to read the full text. Reasons for exclusion are: not related to the subject consumer behaviour (n=189), too specific (n=127), related to consumer behaviour, but not nutrition labels (n=112) and repetitive research (n=8) (Figure 4). After reading all 43 remaining articles, 12 were excluded and the remaining 31 were included in the final literature review, of which the results are presented in Table 2. Reasons for exclusion after the full text reading were that the article only focused on the standard back of pack label (n=2), that it was too specific (n=5), not on the decision-making process (n=4) and one article was not retrievable (Figure 4).

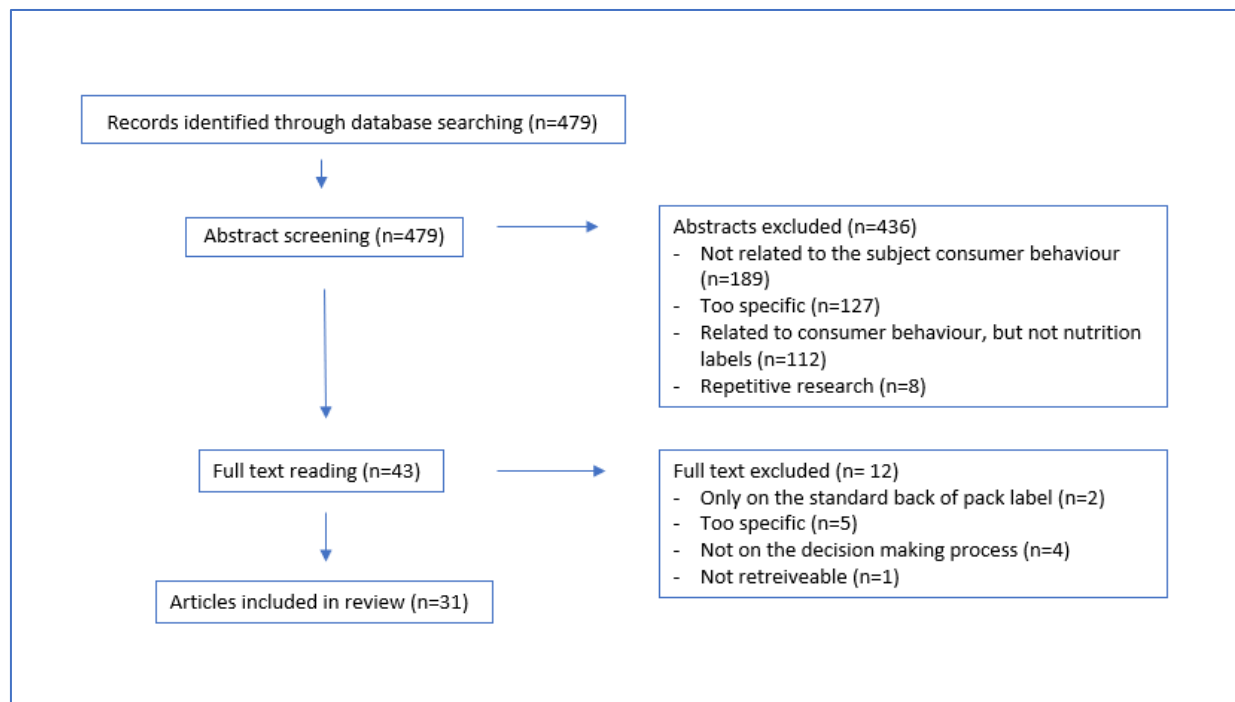


Figure 4: Prisma Statement

The Literature review

Results

Table 2: Literature review results presented per article

Article	Part of process	Findings
Acton et al. (2018)	Perception	With a government approval placed with the logo, participants of the study rated the label more believable and more likely to change their choice of product.
Antúnez et al. (2015)	Search	The response time was much lower for color-coded FOP labels compared to monochromatic ones.
	Understanding	Lowest incorrect answers were given with a color coded and text description label.
Ares et al. (2012)	Perception	The background of a nutrition label does not affect the time consumers need to find the information and to classify the labels.
Ares et al. (2014)	Search/Use	Consumers with an analytic/rational thinking style, compared to intuitive-experimental, went on a more in-depth search and did a more in-depth analysis of the information they found.
Ares et al. (2018)	Use/Perception	Compulsory FOP label with a strong effect on healthfulness perception, processing time and consumer attention is preferred and will have the biggest effect on both consumers and manufacturers.
Becker et al. (2016)	Search	Supports a colour coded label as it increases attentional prioritization.
Berning et al. (2010)	Use	Consumers show a positive preference for nutrition labels displayed on shelves, which are easy to read and well presented.
Bialkova et al. (2013)	Search	Longer reaction times with an increasing number of extra design elements when using a single nutrition label.
Bialkova & van Trijp (2010)	Use	Nutrition logos should be printed in a consistent location on the package, double the standard display size and with monochromatic colouring to have the best performance.
Cannoosamy & Jeewon (2016)	Use	Factors such as age, knowledge, gender, education level, income and household size should be taken into consideration as they affect the use of nutritional labels
Downs, et al. (2015)	Understanding	Consumers are able to correctly identify which snack has the most and which snack has the least calories when using a traffic light nutrition label.
Draper et al. (2013)	Understanding	Consumers would benefit most from a single FOP label, as having to compare different labels causes confusing and can result in consumers not using the label at all.
Ducrot et al. (2015a)	Understanding	The 5-CNL label was found to be the best label for informing nutritionally at-risk consumers about the nutritional quality of a product.
Egnell et al. (2018)	Understanding	Personal characteristics such as gender and age may affect the objective understanding, but the overall effect of the Nutri-Score label outweighs this effect.
Gregori et al. (2014)	Search	European respondents think advertising is the best government instrument to promote healthy eating (28.7%), labeling is preferred by 10.6%.

Gregori et al. (2015)	Perception	The Willingness To Pay (WTP) shows that people with a low income and a low education level, people with self-reported obesity problems, families with over 7 people and people over 45 react positively to a price increase with nutritional labeling. This indicates that they value the information given on the package.
Grunert (2016)	Search (exposure)	The overload of information given in store and the information available on handheld devices, makes shopping a difficult task for consumers, unless a way is found to reduce the information load to what is actually relevant for the consumer.
Hansen et al. (2011)	Search	Situational, choice-based anxiety increases information search. Critical consumers with a less positive attitude towards nutrition claims are more likely to search for more information.
Hodgkins et al. (2012)	Perception	When describing nutrition labels, consumers tend to use terms such as information content, understanding/confusion, healthfulness of food, impact/attractiveness and clarity. The more 'directive' a label is, the less detailed information it contains.
Huang & Lu (2016)	Perception	Healthiness perception outweighs the effects of package color, label and product category when predicting the purchase intention.
Kelly & Jewell (2019)	Use Understanding	To aid in the understanding and use of a nutrition label, a single, consistent Front-of-Pack Label (FOPL) should be used. An interpretative FOPL that also provides information on product unhealthfulness appears to be more effective in supporting consumers to choose the healthier option.
Lundeberg et al. (2018)	Perception Use	Consumers feel more helped by the label if it is accompanied by loss framing or gain + loss framing, although it did not significantly affect product healthiness rating or purchase intention. Consumers with a higher health concern, show a lower purchase intention for the products perceived as least healthy compared to consumers with a lower health concern.
Méjean et al. (2013)	Search (Liking)	Consumers with a preference for a simple traffic light system are more likely to have less nutrition knowledge. Also reporting that the group with less nutrition knowledge pays more attention to price and marketing aspects during purchasing decision making.
Onozaka et al. (2014a)	Use	With a small health involvement, regardless of the FOP label and food category, consumers choose the product they perceive as healthiest. FOP label and product category had a significant effect on consumers not exposed to health involvement.
Onozaka et al. (2014b).	Use	Purchase intention of the labeled product is positively influenced by self-efficacy and liking of the label and larger has a larger effect for people with high Propensity to Self-Reference (SR) compared to low SR. For the need for cognition this only goes for self-efficacy. Healthy eating intentions have no significant effect on the purchasing intention.
Roseman et al. (2018)	Use	Consumers who select food for health reasons, are more likely to use a FOP nutrition label.
Sánchez-García et al. (2018)	Understanding	The colours red, green and yellow have a significant effect on the guilt and fear consumers experience when purchasing a product, but have a

		different impact for high income versus low income consumers. High income having a stronger positive reaction to green and low income having a stronger negative reaction to red.
Schuldt (2013)	Perception	Despite the calories being the same and being displayed in the same way, the colour of the nutrition label changed the consumer healthiness perception. A green label increases the healthiness perception of the product. No difference for personal factors.
Tarabella & Voinea (2013)	Understanding	A nutrition label, should, next to not requiring up-front knowledge, inform consumers on how to integrate the specific product in their diet. For example, by suggesting the appropriate frequency of consumption.
Van Herpen et al. (2012)	Use	Familiarity with a nutrition label only affects the self-reported understanding of the label, the actual use of the label is not affected.
Visschers et al. (2010)	Search	A simple package design with a mainly nutritional information, attracts more attention to the FOP, than a crowded design with a lot of other information on it.

Summary of findings (systematic literature review)

Search and Exposure

When it comes to the search for useful information, to use in the decision-making process, it is important to make sure that the relevant information is easy to find. If there is an overload of information given in store combined with the information available on handheld devices, shopping is a difficult task for consumers (Grunert, 2016). On food packaging, there can be lots of elements aside from a FOP label. As suggested by Visschers et al. (2010) and Bialkova et al. (2013), a simple package design with mainly nutritional information, attracts more attention to the FOP, than a crowded design with a lot of other information on it. Aside from just having no other information than the nutritional information available, we can identify some other factors that might help capture the attention of the consumer when they are shopping. First, we can look at the label characteristics that are looked at in the articles. For example, the background of the FOP label does not affect the time consumers needed to find the information and to classify the labels (Ares, 2012). This implies that no matter the current colour of the packaging, the FOP does not need a specific packaging colour to be most effective. To assess whether the colour in the label itself has any effect, Antúnez et al. (2015) looked at response times and Becker et al. (2016) at attentional prioritization with a change detection method. Both results show that a colour-coded FOP label is preferred. It has a lower response time and colour increases the attentional prioritization.

Aside from the label characteristics, the articles also identified personal factors that influence the search for information. Previously obtained knowledge is important when looking for information. Consumers with less nutrition knowledge pay more attention to price and marketing aspects during purchasing decisions (Méjean et al., 2013). Not only knowledge, which can be obtained, but also thinking style (Ares et al., 2014) influences the search for information. Consumers with an analytic/rational thinking style, compared to intuitive-experimental, went on a more in-depth search for information (Ares et al., 2014). Emotion is a third factor that influences the search for information. Hansen et al. (2011) argues that situational and choice-based anxiety increases the search for information as critical consumers with a less positive attitude towards nutrition claims are more likely to search for more information.

Perception

Within the articles on consumer perception of FOP nutrition labels, most mentioned healthiness perception (Hodgkins et al., 2012; Lundeberg et al., 2018; Schuldt, 2013), with exception of two articles which addressed believability (Acton et al., 2018) and whether the label is of added value (Gregori et al., 2015).

When a government approval is placed with the label, participants of the study rated the label more believable and more likely to change their choice of product (Acton et al., 2018). Whether something is of added value to the overall product can be judged by the consumer Willingness To Pay (WTP). In the case of a FOP nutrition label the WTP shows that people with a low income and a low education level, people with self-reported obesity problems, families with over 7 people and people over 45 react positively to a price increase with nutritional labeling. This indicates that they value the information given on the package (Gregori et al., 2015). Also highlighting the fact that personal factors do affect the perception of a product with a FOP label.

Hodgkins et al. (2012) asked participants to describe nutrition labels in their own words. When describing nutrition labels, consumers tend to use terms such as information content, understanding/confusion, healthfulness of food, impact/attractiveness and clarity. The more 'directive' a label is, the less detailed information it contains (Hodgkins et al., 2012). Lundeberg et al (2018) used nutrition labels accompanied with either no framing, loss framing or gain and loss framing to see if the framing had any effect. Consumers feel more helped by the label if it is accompanied by loss framing or gain and loss framing, although it did not significantly affect product healthiness rating or purchase intention. Moreover, Schuldt (2013) concluded that, despite keeping the exact number of calories the same, the colour of the nutrition label changed the consumer healthiness perception. A green label increases the healthiness perception of the product. This effect did not change for any personal factors.

Understanding

When it comes to understanding the meaning of the nutrition label and/or the given score and the factors that influence it, we can again make a distinction between label characteristics and personal factors. First, the label characteristics. An interpretative FOP label, that also provides information on product unhealthfulness, appears to be more effective in supporting consumers to choose the healthier option (Kelly & Jewell, 2019). Referring to for example a green tick, indicating a product is a healthy option, in comparison to a traffic light system like Nutri-Score. In agreement with that statement: lowest incorrect answers were given with a colour coded and text description label (Antúnez et al., 2015), the 5-CNL label is the best label for informing nutritionally at-risk consumers about the nutritional quality of a product (Ducrot et al., 2015) and consumers are able to correctly identify which snack has the most and which snack has the least calories when using a traffic light nutrition label (Downs et al., 2015). The last thing we can categorise as a label characteristic, but more as a general advice as it does not apply to one specific label. Consumers would benefit most from a single FOP label, as having to compare different labels causes confusion and can result in consumers not using the label at all (Draper et al., 2013). Moreover, a nutrition label should, next to not requiring up-front knowledge, inform consumers on how to integrate the specific product in their diet. For example, by suggesting the appropriate frequency of consumption (Tarabella & Voinea, 2013).

When it comes to the effect that personal factors have on the understanding of a nutrition label, the thinking style and the emotions involved were identified. Consumers with an analytic and rational thinking style did a more in-depth analysis of the information they found (Ares et al., 2014). The

emotions guilt and fear play a role in the understanding of a label. Sánchez-García et al. (2018) found that the colours red, green and yellow have a significant effect on the guilt and fear consumers experience when purchasing a product. However, the colours have a different effect for low-income versus high-income consumers. High-income consumers have a stronger positive reaction to green and low-income consumers have a stronger negative reaction to red (Sánchez-García et al., 2018). The article further talks about how knowledge on the meaning of a nutrition label might explain why there is a difference between low-income and high-income consumers. Note that the authors assume that low-income means low education level and high-income means high education level. A last factor that was looked at is if familiarity has any effect on the understanding of a nutrition label. Van Herpen et al. (2012) found that familiarity with a nutrition label only affects the self-reported understanding of the label, the use of the label is not affected. Egnell et al. (2018) also found that personal characteristics are outweighed by the effect of the Nutri-Score label, even though they may affect the objective understanding of a label.

Use

The effectivity of a nutrition label is dependent on if consumers use the label to make a purchasing decision. Here we will also look at purchasing intention to determine whether a nutrition label has any effect. First, we will look at the personal factors affecting the use of a nutrition label. Cannoosamy & Jeewon (2016) identified that demographics such as age, knowledge, gender, education level, income and household size affect the use of nutritional labels. Lundeberg et al. (2018) find that consumers with a higher health concern, show a lower purchase intention for the products perceived as least healthy compared to consumers with a lower health concern. Related to this, consumers who select food for health reasons, are more likely to use a FOP nutrition label (Roseman et al., 2018). Furthermore, purchase intention for the labeled product is positively influenced by self-efficacy and liking of the label and has a larger effect for people with high Propensity to Self-Reference (SR) compared to low SR. For the Need for Cognition (NFC), which is 'a stable individual difference in people's tendency to engage in and enjoy effortful processing' (Onozaka et al., 2014b). Their results are that the purchase intention for the labeled product is positively influenced by self-efficacy and liking of the label and has a larger effect for people with high SR compared to low SR. The NFC only enlarges the effect for self-efficacy, not for the liking of the label. Additionally, they identified that healthy eating intentions have no significant effect on the purchasing intention (Onozaka et al., 2014b).

While the eating intention does not have a significant effect on the purchasing intention, the healthiness perception does. When looking at different factors, Huang & Lu (2016) concluded that healthiness perception outweighs the effects of package color, label and product category when predicting the purchase intention.

The following results can be seen as general measures that can be taken to aid in the use of a nutrition label. First of all, a single, consistent FOP label should be used (Kelly & Jewell, 2019). It should be compulsory and have a strong effect on healthfulness perception, processing time and consumer attention to have the biggest effect on both consumers and manufacturers (Ares et al., 2018). According to Bialkova & van Trijp (2010) nutrition logos should be printed in a consistent location on the package, double the standard display size and with monochromatic colouring to have the best performance. In research done by Onozaka et al. (2014a), consumers were exposed to a small health involvement. In this case participants were told to choose healthy. With this small health involvement, regardless of the FOP label and food category, consumers choose the product they perceive as healthiest. FOP label and product category had a significant effect on consumers not exposed to health involvement.

Berning et al. (2010) looked at an alternative for placing the label on the packaging, instead they proposed to display them on the shelves. Consumers showed a positive preference for nutrition labels displayed on shelves, which are easy to read and well presented. Taking an even broader perspective than just looking at packaging or shelves, Gregori et al. (2014) asked Europeans what they think is the best government instrument to promote healthy eating. The biggest group, 28.7% of the respondents, said advertising is the best instrument. Labeling as a government instrument is preferred by 10.6%.

Answering the research questions

Following the results, we can answer the research questions. The answers will be presented in table 3, 4, 5 and 6.

Q1. (Table 3) How do consumers search for nutritional information and what are the factors that influence the search?

Q2. (Table 4) What are the factors that influence consumers' perception of nutrition labels?

Q3. (Table 5) What are the factors that influence consumers' understanding of nutrition labels?

Q4. (Table 6) How do consumers use nutrition labels and what are the factors that influence that?

Table 3. The answer for Q1.

The search for information and the exposure are influenced by:

The other elements in the packaging design (Visschers et al., 2010); Bialkova et al., 2013)
Label Characteristics such as colour coding of a nutrition label. A colour coded nutrition label has a lower response time (Antúnez et al., 2015) and increases attentional prioritization (Becker et al., 2016)
Previously obtained knowledge (Méjean et al., 2013)
A person's thinking style (Ares et al., 2014)
Situational and choice based anxiety, because of critical thinking (Hansen et al., 2011)

Table 4. The answer for Q2.

The perception of a nutrition label is influenced by:

A visual sign of government approval on a label (Acton et al., 2018)
Personal factors such as age, family composition, income and education level (Gregori et al., 2015)
The amount of information the label contains (Hodgkins et al., 2012)
By loss framing or gain and loss framing (Lundeberg et al., 2018)
Label characteristics like the colours used in the label (Schuldt, 2013)

Table 5. The answer for Q3.

The factors that influence a consumers' understanding of nutrition labels are:

Label characteristics like the colours used in the label (Kelly & Jewell, 2019; Antúnez et al., 2015; Ducrot et al., 2015; Downs et al., 2015)
If there is only one or multiple different labels used (Draper et al., 2013)
Whether the label is accompanied by recommendation on the appropriate frequency of consumption (Tarabella & Voinea, 2013)
A person's thinking style (Ares et al., 2014)
Education level (Sánchez-García et al., 2018)

Table 6. The answer for Q4.

The factors that influence the use of a nutrition label are:

Demographics such as age, knowledge, gender, education level, income and household size (Cannoosamy & Jeewon, 2016)
Health concern/health reasons (Lundeberg et al., 2018; Roseman et al., 2018)
A personal characteristic, Self-efficacy, and liking of the label (Onozaka et al., 2014b)
Healthiness perception (Huang & Lu, 2016)
Whether a single consistent FOP label is used (Kelly & Jewell, 2019)
A consistent location on the packaging (Bialkova & van Trijp, 2010)
Display size (Bialkova & van Trijp, 2010)
Whether a consumer is instructed to choose healthy (Onozaka et al., 2014a)

Discussion and Conclusion

To come to an advice on implementation of a nutrition label, such as Nutri-Score, we will discuss the results of the literature review to identify the relevant findings.

The results greatly support the framework used, identifying label characteristics and personal factors that influence the decision-making process. If we rearrange the results in two categories, label characteristics and personal factors, we get an overview of the relevant factors that need to be considered when creating and implementing a nutrition label, as presented in table 7 and 8.

Table 7. Label characteristics found in literature review

Packaging design	Visschers et al. (2010) and Bialkova et al. (2013)
Location of label on packaging	Bialkova & van Trijp (2010)
Size of label	Bialkova & van Trijp (2010)
Colours in the label	Antúnez et al. (2015) ; Becker et al. (2016) ; Schuldt (2013) ; Kelly & Jewell (2019) ; Antúnez et al. (2015) ; Ducrot et al. (2015) ; Downs et al. (2015)
Believable	Acton et al. (2018)
Directiveness (amount of information)	Hodgkins et al. (2012)
ONE label for all products	Draper et al. (2013) ; Kelly & Jewell (2019)
Suggest frequency of consumption	Tarabella & Voinea (2013)

Table 8. Personal factors found in literature review

Knowledge and education level	Méjean et al. (2013) ; Gregori et al. (2015) ; Sánchez-García et al. (2018) ; Cannoosamy & Jeewon (2016)
Thinking style, SR, NFC	Ares et al. (2014) ; Onozaka et al. (2014b)
Emotion	Hansen et al. (2011) ; Sánchez-García et al. (2018)
Income level	Gregori et al. (2015) ; Sánchez-García et al. (2018) ; Cannoosamy & Jeewon (2016)
Age	Gregori et al. (2015) ; Cannoosamy & Jeewon (2016)

Household size and composition	Gregori et al. (2015) ; Cannoosamy & Jeewon (2016)
Gender	Cannoosamy & Jeewon (2016)
Personal health focus	Lundeberg et al. (2018) ; Roseman et al. (2018)

Personal factors are difficult to directly affect by either government policy or information campaigns. However, they may affect the objective understanding (Egnell et al., 2018) and therefore these personal characteristics are interesting when deciding or looking into what information should be in a campaign and how it should be presented.

Knowledge on nutrition and healthy eating is something a government can affect by creating a campaign. By giving information on proper nutrition, how often something should be consumed and how consumers can find the information they need, the government can educate people on healthy eating. For example, the Dutch government already provides information for consumers through the website of Voedingscentrum (Voedingscentrum, nd). There they present the Schijf van Vijf (Figure 5), in which they, divided in five nutritional categories, give information on which products are healthy and should be consumed often. They also provide advice on how often to consume products that are not in the Schijf van Vijf.



Figure 5. Schijf van Vijf (www.voedingscentrum.nl)

Emotion, choice-based anxiety, as discussed by Hansen et al. (2011), is an effect of how critical a consumer is on nutrition labels. Emotion, guilt and fear, as discussed by Sánchez-García et al. (2018), is seen as an effect of how a consumer's education level affects their understanding of the nutrition label. Both of these can be affected by a government campaign. We can encourage critical thinking and, as identified before, educate on the meaning of the nutrition label.

The last personal factor to assess is the health focus. Lundeberg et al. (2018) looks at people with a health concern, while Roseman et al. (2018) mentions people who select food for health reasons. By informing people on the effect your diet has on your health, a government can play into the effect where people who select food for health reasons are more likely to use a FOP label.

Looking at the label characteristics and at the Nutri-Score label, we can cross off the effect of colours used in the label and the amount of information it contains since the government does not influence the format of the label. Whether the packaging design should be included in an advice to the government is debatable. It is useful information in maximizing the effectiveness of the Nutri-Score label, however the

government does not make the packaging of the products that the label is used on and strict regulations on packaging design might not be welcome. Therefore, this can be an advice to food producers and packaging designers. If they want to have a positive impact and encourage healthy eating, they can design their packaging accordingly.

In general, Ares et al. (2018) concluded that a compulsory FOP label with a strong effect on healthfulness perception, processing time, and consumer attention is preferred and will have the biggest effect on both consumers and manufacturers. Suggesting that it will not only stimulate consumers to choose healthy, but will also push producers to improve their products. In 2014, Gregori et al. surveyed Europeans to find out what they think is the best instrument to promote healthy eating. The biggest group, 28.7% of the respondents, said advertising is the best instrument. Labeling as a government instrument is preferred by 10.6%. Suggesting that educating people on healthy eating is a more welcomed intervention than labeling, however the effectiveness of the methods was not taken into account. Moreover, there is no imperative to choose either labeling or advertising. A combination can be implemented to have broader reach. Another sidetrack in the literature review was the article of Berning et al. (2010). They suggested placing a label on the shelves in the supermarket and not on the packaging. Which could be suggested as an option for supermarkets if not every producer is willing to place a label directly on the packaging, aside from including it with the online assortment. A combination of placing the label with the assortment online and on the shelves in store, will create a higher exposure.

Conclusion

Following this discussion, we can give the following advice to the Dutch government:

- 1) Make sure that there is ONE single, consistent FOP label.
- 2) Make sure it is always in the same spot on the packaging and twice the standard display size.
- 3) Place a government approval logo with the label, to increase the believability.
- 4) Place a suggestion of the appropriate frequency of consumption with the label, to increase the understanding of the label and proper use of the product.
- 5) Issue an information campaign on nutrition and the importance of healthy eating.
- 6) Encourage consumers to critically assess the nutritional information that is available.
- 7) Make sure that the meaning of the nutrition label is clearly explained, either in a campaign, online or with information leaflets.

The information campaign should include an explanation of how the nutrition label should be used and general information on a healthy diet. Information on the nutrition label can be given online on, perhaps on the website of Voedingscentrum, with accompanying information linked to the Schijf van Vijf and the suggested frequency of consumption. Aside from that, displays can be placed in stores, to give consumers access to the information in the place that they will use it. General information on a healthy diet is already available on the Voedingscentrum website, which can be promoted during the campaign. Possible promotion channels are TV commercials, advertisements in newspapers and magazines and sending all households an information package. Aside from traditional media, also social media should be used for a broader reach. For example, using Youtube and Instagram influencers and actively campaigning through Facebook advertisements

Relevance, limitations and future research

This article contributes to research on the use and understanding of Nutrition labels and can be used for further research. Furthermore, it gives the developers and implementers of a nutrition label useful

insights in the factors that need to be taken into account and provides advice for the government, retailers and producers.

In the systematic literature review, the limitation was that only one researcher assessed all of the articles that were given by the search query. This can be limiting due to a personal bias resulting of cultural background the focus on one nutrition label from the start. This may result in missing relevant articles that should be included and including articles that do not contribute to answering the research question and should be excluded.

To assess the effectiveness of the suggested intervention by the government, consumer research can be done by comparing this ideal form of label position, size, government approval, frequency of consumption and information provision to situations in where some of the factors change or are not there at all. More research can be done to find out what information should be provided in the information campaign and what channels the government should use to provide the information. Additionally, it can be interesting to investigate how a nutrition label influences not only consumer decision-making, but also the producer. Producers will want to keep the scores on their product as good as possible and might therefore improve their formulas.

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