



Sinergie SIMA
Management Conference



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Management of sustainability and well-being for individuals and society

Conference Proceedings

Short Papers

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Short Papers

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To the reader,

this volume contains the long papers of the Sinergie-SIMA 2024 Management Conference, hosted by the University of Parma on June 13th and 14th 2024.

Theory and practice in the field of management have been challenged by the emergence of sustainability and well-being as major global policy priorities. Both sustainability and well-being are complex, value-laden, and strongly interconnected; however, they tend to exist in separate realms.

Sustainability literature has recorded an evolution in the way the concept of sustainable development is understood, leading to the articulation of sustainable development as human “well-being” and “flourishing”, rather than “needs”. Nevertheless, some scholars have pointed out a lack of clarity in the conceptualization, which causes some ambiguity in terms of definition (Ronen & Kerret, 2020). Kjell (2011) observed that human needs and well-being are poorly understood, characterized, and developed by sustainability research. Along the same vein, Helne & Hirvilammi (2015) observed that the overarching goal of sustainable development (i.e., well-being) has often been narrowly interpreted, mainly in economic terms, while connections between the natural environment and human flourishing have been overlooked. More recently, O’Mahony (2022) remarked that the literature conceptualizing human well-being continues to exist largely outside sustainable development. Hence, placing well-being more clearly within the sustainability framework could be highly beneficial to sustainability.

Concurrently, the literature on well-being is almost entirely dissociated from the contributions of nature or the relationships with ecological and planetary systems (Roberts et al., 2015), and the importance of social dimensions is an emergent conclusion. Therefore, the rationale of contextual systems inherent to sustainability research (incorporating views of times, society, and biosphere) could significantly enrich well-being research, fostering a more holistic perspective on well-being and an increased awareness of the limits of individual well-being pursuits (Kjell, 2011).

In brief, though well-being has major implications for sustainable development and vice versa, the body of literature that effectively integrates sustainability and well-being remains in an embryonic stage.

The above considerations aim to act as catalysts for an interdisciplinary debate within the field of management. Enriching the conception of flourishing well-being in sustainability and the contribution of nature to well-being can produce impactful scientific research, as O’Mahony (2022) points out. Equally important is the analysis of the links between sustainability and well-being, encompassing synergies and trade-offs at the organizational level, in value chains, and in interactions with stakeholders across various industries.

The Sinergie-SIMA 2024 Management Conference welcomed contributions based on different theories, methodological approaches, and units of analysis with the potential to empower a transformation for flourishing individuals, society, and the natural world alike. More precisely, the Conference was a great occasion to discuss the research efforts of our research community within tracks related to the:

- Conference theme (Management of sustainability and well-being for individuals and society),
- SIMA thematic groups (Entrepreneurship, Innovation & Technology Management, Intelligenza manageriale nel management, International Business, Marketing, Purpose-driven Businesses, Retailing & Service Management, Small & Family Business, Strategic Communication, Strategy & Governance, Supply Chain Management, Logistics & Operations, Sustainability, and Tourism & Culture Management),
- special tracks (Examining the social and environmental relevance of sustainable digital business models: Impact on business practices and consumers, Growing resilient Italian SMEs, and Perspectives on grand challenges in international business and implications for companies),

- Management Case Studies.

The Conference call for papers gave the opportunity to submit either short and long papers. Overall, the editorial staff received 277 submissions of which 215 short papers and 62 long papers.

For the *short and long papers*, the evaluation followed the peer review process, with a double-blind review performed by, respectively, one or two referees - university lecturers and experts about the topic - selected among SIMA and the community of Sinergie members.

In detail, the referees applied the following criteria to evaluate the submissions:

- clarity of the research aims,
- accuracy of the methodological approach,
- contribution in terms of originality/innovativeness,
- theoretical and practical contribution,
- clarity of communication,
- significance of the bibliographical basis.

The *peer review* process resulted in full acceptance or rejection of the submissions. In the case of disagreement among reviewers' evaluations, the decision was taken by the Chairs of the SIMA thematic groups or conference track. Each work was then sent back to the Authors together with the referees' reports. The suggestions received by the referees were used by the Authors during the presentation of their research works at the Conference.

The evaluation process ended with the acceptance of 211 short papers and 58 long papers. This volume proposes the papers whose Authors have authorized their publication.

All the long papers published in this volume were presented and discussed during the Conference and published online on the web portal of Sinergie-SIMA Management Conference (<https://www.sijmsima.it/>).

While thanking all the Authors, Chairs, and participants, we hope that this volume will contribute to advance knowledge about the management of sustainability and well-being for individuals and society.

The Conference Chairs

Guido Cristini, Beatrice Luceri, Arabella Mocciano Li Destri, and Marta Ugolini

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The strength of Nutriscore in improving sustainable eating habits and well-being: bad and good news

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LEOPOLDO TRIESTE⁵

Abstract

This study represents the initial assessment of Nutriscore's efficacy in shaping perceptions of food healthiness in consumers. Nutritional labels are becoming increasingly common for effectively conveying messages to consumers and are adopted by institutions to develop policy strategies aimed improving collective awareness of healthy dietary habits. The efficacy of a nutrlabel is defined as the capability of Nutriscore to guide judgments and perceptions of food healthiness, overcoming barriers generated by personal characteristics and education.

To assess the evocative strength of Nutriscore versus the associated characteristics of the product, we conducted a laboratory experiment wherein we manipulated visual stimuli by misrepresenting Nutriscore labels on both healthy and unhealthy foods.

Our findings revealed a significant propensity for errors in assessing product healthiness, with half of the sample committing more than four errors out of six tests. Interestingly, these errors did not correlate with the type of food, consumers' education level, or food literacy. However, gender was a significant factor, with males making more errors than females (p-value: 0.021).

Consequently, it appears that consumers are more influenced by Nutriscore than by inherent product characteristics, underscoring the label's strong comprehensibility. However, this influence can have negative implications as Nutriscore's algorithm is built on criteria that generate paradoxical associations between scores and dietary guidelines. For instance, Nutriscore standardizes nutrient quantities based on 100g portions rather than considering consumption frequency. Future food labels should reflect healthiness relative to consumption frequency, employing simple yet effective designs akin to Nutriscore.

Methodologically, this paper proposes a straightforward approach for managing and evaluating the efficacy of both current and prospective food labeling systems.

Keywords: nutrition label; food choice; healthiness perception; public eating habits

Abbreviations

FL: food literacy

HP: Healthiness Perception

MD: Mediterranean Diet

NS: Nutriscore

Framing of the research. *Institutions are addressing the promotion of a healthy lifestyle to mitigate modifiable risk factors associated with non-communicable diseases, which account for 80% of the disease burden in Europe, totaling €1,179 billion in 2021 (Eurostat, n.d.). Encouraging well-being in Europe could potentially lead to a reduction of up to 70%, significantly alleviating social burdens, reallocating funds to other welfare initiatives, and bolstering economic productivity and growth through a healthier workforce (Public Health - European Commission, n.d.).*

Dietary patterns play a crucial role in influencing lifestyle and well-being, prompting institutions to develop policy strategies aimed at enhancing collective awareness among citizens. Although citizens' healthy eating habits are influenced

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by various internal and external factors (Marcelino et al., 2001; Remick, 2009), institutions can enhance public knowledge by adopting policies that convey messages to promote healthy food choices.

Since 2011, the European Commission has mandated the inclusion of nutritional tables on product packaging to display quantitative product characteristics, such as the amount of carbohydrates, protein, fat, saturated fat, and salt. However, subsequent studies have shown that this instrument may not be accessible to everyone, particularly those without expertise in the field (Storcksdieck genannt Bonsmann, 2020). Consequently, front-of-pack nutritional labels have gained importance, with many countries adopting logos on a voluntary basis. In Europe, 63% of member states have implemented various logos, with Nutriscore being commonly adopted by Belgium, France, Germany, Spain, Luxembourg, and the Netherlands (European Commission, 2020).

Front-of-pack nutritional labels are categorized into three classes: "directive," "semi-directive," and "non-directive," each providing consumers with varying levels of interpretation regarding the healthiness of the product (Donini et al., 2023). Nutriscore, belonging to the directive category, utilizes a color-coded system accompanied by alphabetic letters from A (green) to E (red) to indicate the product's nutritional quality. Despite its graphical clarity, the algorithm used to generate Nutriscore scores has sparked controversy, as it may yield paradoxical scores compared to national guidelines based on frequency advice, potentially leading to consumer misinterpretation.

Despite the contentious nature of the scoring algorithm, the Nutriscore logo effectively communicates nutritional information in a clear and straightforward manner, making it accessible across different socio-economic statuses (Talati et al., 2019). This characteristic is crucial for disseminating nutritional information to the entire population.

Since the nutritional label is presented on the front of packaging, a lot of researchers have investigated how changing the position of nutritional label changes the visual attention of consumers (Dan J & Robert W, 2011). The same methodology has been adopted to compare which nutritional label was more effective in catching the consumer attention (Siegrist et al., 2015). Although from the literature we know that internal characteristics can also play a role in shaping dietary habits. For example, being female increases the probability of having higher food literacy and paying more attention to nutritional characteristics than men (Trieste et al., 2020). Also, the personal propensity to be more active at a certain time of the day (chronotype) can change eating habits; indeed, evening types appear more inclined to adopt an unhealthy diet (Teixeira et al., 2022).

Purpose of the Paper. This study aims to investigate the effectiveness of Nutriscore in shaping consumers' perceptions of food healthiness.

The relevance of this investigation stems from two main objectives: firstly, the widespread adoption of Nutriscore may influence the food perceptions of many citizens, especially if it were to be adopted by additional states. Secondly, the controversial algorithm used to calculate Nutriscore often produces scores misaligned with Mediterranean dietary guidelines, which have proven to be a preventive measure against non-communicable diseases (Tsigalou, 2020).

We examine three dimensions to evaluate the efficacy of the Nutriscore logo: (i) visual attention, (ii) influence on perception or judgment of food healthiness, and (iii) independence from personal characteristics such as education level, food literacy, and other consumer traits.

To guide our study, we formulate the following research questions:

1. Can personal characteristics such as age, sex, BMI, chronotype, adherence to the Mediterranean diet, probability of developing eating disorders, and declarative approach to choosing the healthiness of logos influence visual attention?
2. Does visual attention to the logo affect error rates?
3. Are error rates influenced by personal characteristics?
4. Does the Nutriscore logo impact error rates?

To the best of our knowledge, this paper represents the first attempt to assess the efficacy of Nutriscore in influencing perceptions of food healthiness.

Methodology. In our study the effectiveness of a nutritional label has been measured using three different criteria:

1. Visual attention.
2. The ability to influence judgment or perception of the healthiness of the associated food.
3. Independence of 1-2 from educational level, food literacy and, in general, the personal characteristics of the consumer. Indeed, beyond the confines of nutrients tables, the added value of a nutritional label lies in its ability to be understood by both educated and non-skilled consumers.

To assess visual attention, we employed eye-tracking technology, a neuroscientific tool used to measure how often and for how long participants' gazes were drawn to the Nutriscore logo. The adoption of this neuroscientific tool was crucial to assess if the consumers were attracted differently based on their profiling characteristics and also to ensure they saw the Nutriscore logo on the product packaging we showed them. This methodology has been previously utilized to investigate the logo's impact on consumer attention (Gastón Ares, 2013; Laura Bix, 2015).

The eye tracker Tobii tracks the gaze of the eye on a visual stimulus. The tool is non-invasive, and the participant does not even notice it since the black bar of eye tracker is positioned at the bottom margin of the computer screen and it blends with the color of the computer.

The derived variables were the total number of fixations on the label and product, and the total duration of fixations on the Nutriscore and product. Since the fixation area is significantly smaller for the logo than for the product, we considered the average per-fixation duration of the logo and the product when comparing attention to the logo and the product, respectively.

Since one the potential strength of a nutritional label is its ability to influence the perception of product healthiness, we detected whether the principal driver of perception was the label or the characteristics of the product by modifying the nutritional labels to induce incorrect judgments. The strength of Nutriscore is represented by the overall percentage of mistakes.

We selected 8 food packaging items, considering 4 healthy and 4 non-healthy products (defined as “healthy” those foods with a recommended daily frequency and “unhealthy” those with a recommended frequency of 1-2 times per week, according to the Guidelines of the Mediterranean Diet (MD), see Willett, 1995). Once we obtained the correct Nutriscore scores (ranking from A to E) using the related algorithm, we modified them, shifting each score by two positions: from B to D, in the case of healthy products, and from D to B in the case of non-healthy foods. We did not select products that were originally scored as A, E, and C.

The third criterion for evaluating the strength of Nutriscore involves correlating the percentage of errors obtained with personal characteristics. A lower correlation indicates a stronger performance of the nutrition label.

Experimental design

The study comprises two parts.

In the first session, we profiled consumers who consented to participate in the study through an online survey. The survey lasted for 13 minutes and requested anthropometric variables and validated questionnaire essential for understanding if personal characteristics could be linked to attitude towards packaging (visual attention) and personal characteristics. The survey was articulated into:

A) a series of validated questionnaires aiming to assess:

- declarative or substantial food literacy (SFLQ), (Corinna Gréa Krause et al., 2018)
- risk of developing eating disorder (SCOFF), (Francesca Solmi et al., 2015), adopted to screen for eating disorders, as niche literature has investigated the link between eating disorders and the differing attitudes towards food labels (K. E. Giel et al., 2011).
- Short Morning Evening Questionnaire (RMEQ) (Vincenzo et al., 2006), since literature suggests that evening-chronotypes are more likely to prefer unhealthy dietary pattern (Teixeira et al., 2022).
- adherence to the Mediterranean Diet (MEDAS) (Schröder H et al., 2011)

B) a set of additional items: height and weight (used to calculate BMI), sex, age, education (), and weekly frequency of food shopping, knowledge of NS.

In the second session, we examined visual attention and quantified the influence of Nutriscore on food perception.

To study visual attention, we conducted an eye-tracking experiment displaying eight Nutriscore-labeled food items on a computer screen. These items comprised three healthy products scored as B and three unhealthy products scored as D. Recognizing that the definition of “healthy food” varies depends on dietary patterns (Plasek Brigitta et al., 2020), we categorized the items based on the frequency of Mediterranean diet definition. We manipulated the scores by changing B scores to D and D scores to B. To minimize the likelihood of subjects detecting the programmed errors, two images with the correct labels were provided.

After each presentation, participants rated the healthiness of the foods shown on a 1-5 Likert scale. At the end of the experiment, each participant provided feedback on whether the product or the label guided their evaluation better. The discrepancy between the healthiness assessed by participants and the real value attributed by the Mediterranean diet represented the error in perception. Manipulating the logo was essential to verify the logo’s strength in shaping food perception. A higher percentage of error indicated greater trust that consumers had in the Nutriscore logo.

Results. Data analysis was conducted using R, version 4.2.2.

The independency of gaze metrics and the percentage of errors from personal profiling was assessed by comparing the medians of the total number of fixations and total fixation duration associated with Nutriscore and the product across different groups stratified by the profiling variables that defined the study population.

Independency of error percentage in the different groups was determined through a χ^2 test.

A p.value >0.05 for the Kruskal-Wallis tests and the χ^2 test, respectively, indicates that gaze metrics and the percentage of errors do not depend on consumer’s skills and education.

We collected a sample of 57 subjects with a mean age of 26.08 (SD= +7.65) with a balanced representation of 54% female and 46% male.

From the first session of the study, we had the opportunity to profile our sample, as summarized in Tabel 1 and Table 2.

Tab. 1: discrete variable of personal profiling

	Number (%)
Sex	
• Woman	31 (54%)
• Man	26 (46%)
Education	
• High school	22 (38,6%)
• Degree	30 (52,6%)
• Post-degree	5 (8,8%)
Driver:	
• Personal knowledge	30 (52,6%)
• Nutriscore logo	27 (47,4%)
Prior knowledge of the Nutri-Score	
• Yes	18 (31,6%)
• Not	39 (68,4%)

Tab. 2: continue variable of personal profiling

	Mean (\pm SD)	Max.	Min.	Median
Age	26.2 (\pm 7.8)	62	19	24
MEDAS	7.5(\pm 2.05)	12	4	7
SCOFF	2.1 (\pm 1.4)	5	0	2
BMI	22.3(\pm 3.16)	33.6	17.36	22.1
rMEQ	14.5(\pm 2.97)	20	7	15
SFLQ	34.7(\pm 6.43)	47.4	17.6	34

MEDAS: assesses the adherence to mediterranean diet. From 0 (lower score of adherences) to 14 (higher score of adherences)

SCOFF: measure the probability of being more likely to develop eating disorders. From 0 to 5.

BMI: set the range of normal weight and non-norm weight. From 18.5 to 24.9 is normal weight, under 18.5 is underweight, over 25 is overweight, over 30 is obesity.

rMEQ: set the range of chronotype: 4–10 evening-type; 11–18 intermediate-type; 19–25 morning-type

We investigated the relationship between individual differences and sample characteristics.

Interestingly, women were more likely to adhere to the Mediterranean diet (p -value=0.02). On one hand, this result should be interpreted as females being more conscientious about their diet, thus adhering more closely to Mediterranean concepts. On the other hand, it suggests that this conscientiousness can sometimes manifest as excessive concern, potentially laying the groundwork for eating disorders; indeed, women also exhibited a higher probability of developing eating disorders (p -value=0.0025), as extensively documented in the literature (Hsu, 1989).

Additionally, individuals with high adherence to the Mediterranean diet (highest level of MEDAS) reported judging products based on their own knowledge (p =0.005) and being familiar with the Nutriscore logo (p =0.034).

To address the research questions, we divided the results into three sections: firstly, the relationship between personal characteristics and visual attention; secondly, the relationship between personal characteristics and the rate of errors committed in evaluating the healthiness of products; and finally, the rate of errors and visual attention.

Overall, the product received a higher number of fixations and longer duration of fixation, as shown in Table 3.

Tab. 3. Description of the number/duration of fixation for product and for logo:

Gaze metrics	Logo	Product
Average number of total fixations	44.88 (\pm 21.95)	159.9 (\pm 35.34)
Average of total fixation duration (ms)	296.7 (\pm 175.11)	1785 (\pm 2365.24)
Average number of fixations on 8 stimuli	5.61 (\pm 2.74)	159.8772 (\pm 35.34527)
Average fixation duration on 8 stimuli	1657.064 (\pm 1086.077)	6106.154 (\pm 1915.872)

Attention and personal characteristics

We also assessed if personal characteristics (e.g., age, sex, education, Body Mass Index, etc.) could influence the duration of gaze spent on the Nutriscore logo or on the food product image, both displayed on the front of the packaging.

We found a statistically significant relationship between individuals who reported judging the product based on their own knowledge and those who did not. Specifically, individuals who judged the product based on their own knowledge looked at the product image several times more frequently (p -value: 0.04) and for longer durations (p -value: 0.009). Additionally, the data indicates that individuals with higher levels of education (undergraduate and postgraduate) spent more time (p -value= 0.02) looking at the logo compared to those with lower levels of education (high school).

Errors and attention

Comparing attention and errors, subjects who made numerous errors, as expected, had a lower total fixation count (p -value: 0.005) and shorter duration of fixation (p -value: 0.0278) on the food stimuli images than subjects who made fewer errors.

Attributed to incorrect labels, the frequency of judgment errors regarding the healthiness of products was significantly higher in males than in females (p -value of the Kruskal-Wallis test = 0.021). Subjects adhering to a Mediterranean diet (i.e., with a high MEDAS score) made fewer errors (p -value of t -test = 0.06). Individuals who claimed to make choices based on their own knowledge made fewer errors (p -value of Kruskal test = 0.000).

BMI (p -value = 0.994), propensity for developing eating disorders (p -value = 0.513), chronotype (p -value = 0.759), education (p -value = 0.540), and the level of acquired food literacy (p -value = 0.467) did not correlate with the number of errors. These data highlight the effectiveness of Nutriscore in influencing judgments about product healthiness, regardless of certain personal characteristics relevant in traditional nutritional labeling, such as food literacy and education. If the goal of Nutriscore is to mitigate personal differences and educational barriers, it has indeed achieved its objective.

Research limitations. The study's findings are indicative of a digital environment, such as online shopping. Our future objectives include exploring outcomes in a physical setting to compare consumer reactions. Regarding the sample demographics, the mean age of 26.2 suggests that the results are representative of a specific demographic within the population. We aim to enhance the sample to obtain results that encompass a broader population. The research is work-in-progress.

Managerial implications. Nutriscore appears to be highly intuitive and effectively conveys the perceived healthiness or unhealthiness of food. However, despite its apparent simplicity, the algorithm underlying Nutriscore can inadvertently create paradoxes that consumers may not readily discern. These misunderstandings have the potential to lead to unhealthy dietary choices, undermining the label's intended purpose and leaving the challenge of promoting nutritional awareness unresolved.

Based on the findings of the study, it is imperative to address the gaps inherent in the algorithm, considering various aspects. For instance, the algorithm should consider the food category to which a product belongs, aligning with dietary principles such as the Mediterranean diet. Otherwise, foods from vastly different categories may receive the same score, leading to confusion. For example, a vegetable pizza, zero-calorie Coca-Cola, and chips might all receive a B grade, despite their disparate nutritional profiles and consumption frequencies.

The present study also highlights the urgency to revise the algorithm behind the logo and lays the foundation for investigating how to implement the algorithm to create an updated version that avoids the production of paradoxical scores. The innovation of the algorithm should take in account that the final score of the product should align with the Mediterranean diet, as it is currently, the most studied dietary pattern and has been revealed to be the most successful in combating Non-Communicable Diseases. If the new algorithm of Nutriscore aligns with these indications, it would be a very effective logo.

Originality of the paper. To the best of our knowledge, this paper represents the first investigation into the strength of NutriScore, offering a general prospective by testing the effectiveness of nutriscore on stratified target groups.

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