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Chengfang Tao

Tao.Chengfang@phd.uni-mate.hu

Magyar Agrár- és Élettudományi Egyetem

Aznor Qistina Mastura Azri

Magyar Agrár- és Élettudományi Egyetem

Abdul Hannan Zulkarnain

Magyar Agrár- és Élettudományi Egyetem

Balázs Boncsarovszki

Magyar Agrár- és Élettudományi Egyetem

Attila Gere

Magyar Agrár- és Élettudományi Egyetem

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Informed Questioning on NOVA and Nutri-Score Interpretation in Augmented Virtuality Sensory Evaluation

Tao Chengfang[1,*], Aznor Qistina Mastura Azri[1], Abdul Hannan Zulkarnain[1], Balázs Boncsarovszki[1], Attila Gere[1]

[1] Department of Postharvest Science, Trade, Supply Chain and Sensory Science, Institute of Food Science and Technology, Hungarian University of Agriculture and Life Sciences, H-1118 Budapest, Villányi út. 29-31, Hungary

Tao.chengfang@phd.uni-mate.hu, Azri.Aznor.Qistina.Mastura.Binti@stud.uni-mate.hu Zulkarnain.Abdul.Hannan.Bin@phd.uni-mate.hu. Boncsarovszki.Ferenc.Balazs@phd.uni-mate.hu, Gere.attila@uni-mate.hu

*To whom correspondence should be sent: Tao.Chengfang@phd.uni-mate.hu

Abstract

Ultra-processed foods and front-of-pack labelling systems are important in consumer food decision-making, yet processing-related and nutrition-related information may be interpreted differently. This study investigated whether informed questioning using NOVA classification and Nutri-Score information influenced consumer perception and willingness to consume potato-based products in an augmented virtuality sensory setting. Fifty participants evaluated boiled potato, French fries, and mashed potato under NOVA, Nutri-Score, and combined information conditions. Baseline liking, perceived healthiness ranking, willingness to consume, and post-AV experience were collected. Preference ratings did not differ significantly among products ($F = 1.263$, $P = 0.287$), whereas perceived healthiness and willingness to consume differed, with boiled potato generally receiving the most favourable evaluations and French fries the least favourable. The product by information condition interaction was not significant ($P = 0.646$). Post-AV ratings were generally positive, supporting the feasibility of augmented virtuality for sensory and consumer research.

Introduction

Ultra-processed foods (UPFs) have become a major public health concern due to their increasing presence in modern diets and their potential negative effects on health. In Europe,

UPFs also account for a substantial proportion of household food availability, particularly among younger and more socially active consumer groups [1–4]. Based on the definition of the NOVA classification, these products are characterized as industrial formulations made predominantly from processed food ingredients and additives rather than whole foods[5]. Although they are attentive to consumers because of their convenience, palatability, and accessibility, UPFs are often nutritionally imbalanced, with lower amounts of fibre and essential micronutrients [6]. According to the relevant research, higher consumption of UPFs has been linked to an increased risk of various diet-related non-communicable diseases such as elevated risks of cardiovascular diseases, type 2 diabetes, obesity[6–10].

In this background, food labels serve as important informational cues that shape consumer understanding and evaluation of food products[11–13]. In particular, the introduction of front-of-pack nutrition labelling (FOPNL) is intended to provide consumers with more accessible nutritional information, and evidence from eye-tracking studies suggests that simple, colour-coded systems are easier for consumers to understand than monochrome or text-heavy labels [14]. Among these, the NOVA classification and Nutri-Score are particularly relevant, as they capture two different but complementary dimensions of food quality: the level of processing and the overall nutritional profile, respectively[15,16]. Comparing these labelling systems may therefore provide valuable insight into whether consumers respond differently to processing-related versus nutrition-related information. Although FOPNLs increase consumer attention, understanding them remains a challenge, however, when labels convey complex information, consumers' understanding remains limited. This is particularly true for classifications based on the NOVA standard, as consumers may find it difficult to interpret the ingredients and processing characteristics associated with NOVA Category 4 foods.[16]. To add to this confusion, the NOVA system does not always align with nutritional quality, as some UPFs may still be nutritionally beneficial (e.g. fortified breakfast cereals, although minimal ingredients were added, the extrusion process classifies it as NOVA 4) potentially misleading consumers about nutritional value[17]. In this regard, Informed questioning in sensory analysis provides a useful approach to exam how product-related information shapes consumer perceptions and evaluations [18–20].

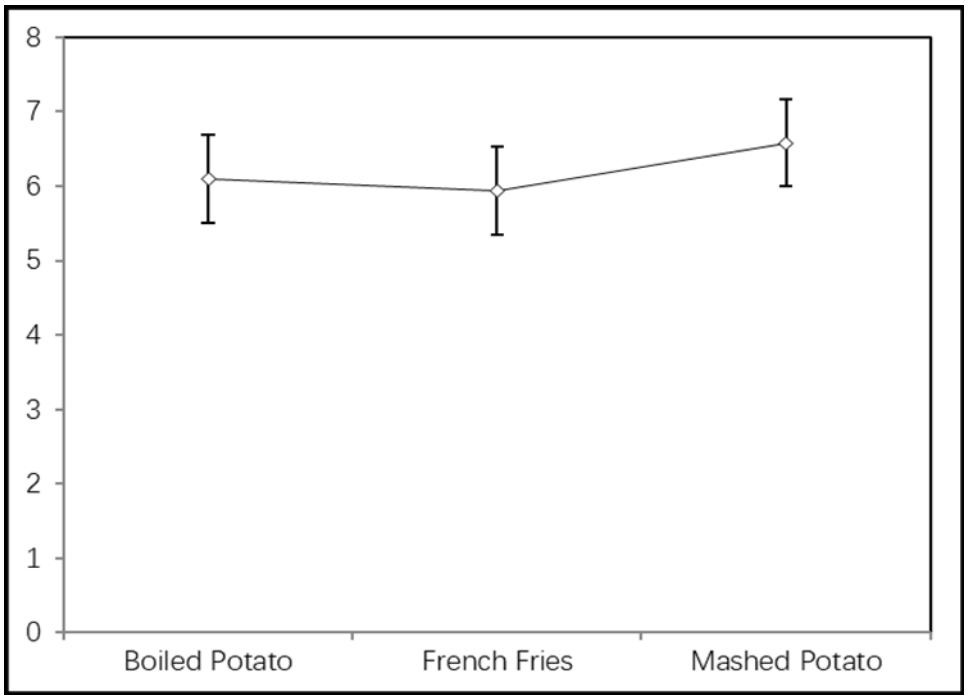
Given the limitations of conventional food labelling in improving consumer understanding, more interactive and immersive approaches to information delivery warrant further investigation. The ongoing digitalization of consumer environments has increased interest in immersive technologies as new tools for communicating food-related information. However, most of the available evidence in this area relates to augmented reality (AR) rather than augmented virtuality (AV). Within the reality-virtuality continuum, AR refers to the overlay of digital information onto the real world, whereas AV involves the incorporation of

real objects into a predominantly virtual environment [21,22]. Recent AR-based studies suggest that interactive digital overlays may improve the communication of food-related information and enhance perceived informativeness, authenticity, and consumer engagement with nutrition and packaging labels [23,24]. Building on these insights, the present study adopts AV as the immersive experimental context for delivering food-related information during sensory evaluation. Although the information-presentation rationale was informed by AR-based research, AV was considered more suitable for the present study because it allows real food samples to be evaluated within a controlled virtual environment. In food sensory science, this approach enables the standardisation of contextual stimuli and the systematic manipulation of experimental variables, while preserving the use of real foods during testing [22,25]. This is particularly relevant in the context of food labelling, where variations in format and limited standardisation may contribute to consumer confusion[26,27]. Therefore, integrating AV technology with informed questioning may offer a promising, repeatable, and scalable approach to enhancing consumer awareness and understanding of front-of-pack nutrition labelling and ultra-processed foods.

This study aims to investigate the effect of informed questioning on consumers' awareness and evaluation of food products differing in NOVA category and Nutri-Score. By providing information related to food processing level and nutritional profile, the study examines whether such cues influence consumer responses during sensory evaluation. In addition, as AV is used as the immersive experimental context, the study also aims to assess the feasibility and tolerability of AV in this experiment through a post-AV questionnaire, including the evaluation of simulation sickness symptoms.

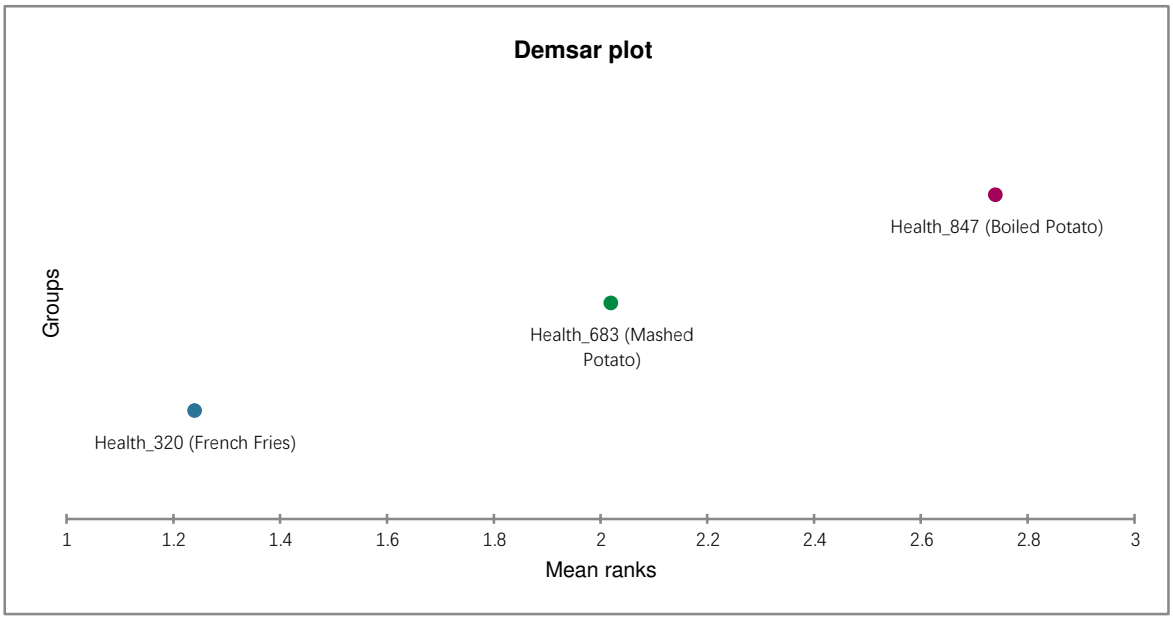
Results

Differences in Preference Ratings Among Samples



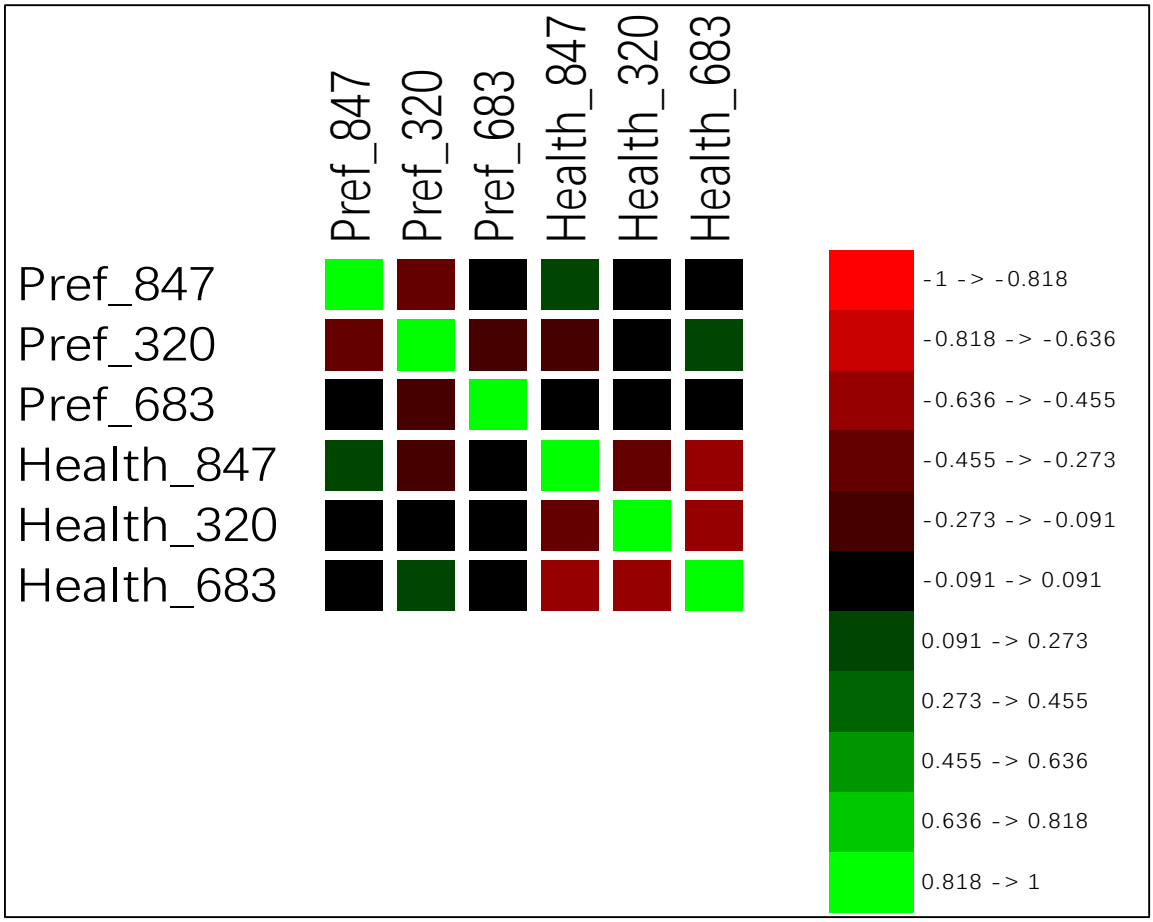
A one-way ANOVA (Fig. 1) was performed to assess the differences in preference ratings across the three potato samples. The analysis revealed that the type of sample did not significantly influence preference ratings ($F = 1.263$, $P = 0.287$). As presented in Table 1 and Fig. 1, mashed potato exhibited the highest least squares mean preference rating (6.58 ± 0.30), succeeded by boiled potato (6.10 ± 0.30), and French fries, which received the lowest mean score (5.94 ± 0.30). The associated 95% confidence intervals were 5.99–7.17 for mashed potato, 5.51–6.69 for boiled potato, and 5.35–6.53 for French fries. Despite the numerically greater preference score for mashed potato, the observed differences among the samples did not reach statistical significance.

Comparison of Healthiness Rankings Among Samples



Perceived healthiness rankings (Fig. 2) differed significantly among the three potato samples according to the Friedman test. As illustrated boiled potato showed the highest mean rank, followed by mashed potato, while French fries showed the lowest mean rank. Post-hoc pairwise comparisons (Table 2) indicated that all pairwise differences were statistically significant. Participants perceived boiled potatoes as healthier than French fries (mean = 1.50, $P < 0.0001$) and mashed potatoes (mean = 0.72, $P = 0.001$), whilst mashed potatoes were perceived as healthier than French fires (mean = 0.78, $P = 0.001$). Overall, in terms of perceived healthiness, these products are always ranked by participants in the order of boiled potatoes, mashed potatoes and French fries.

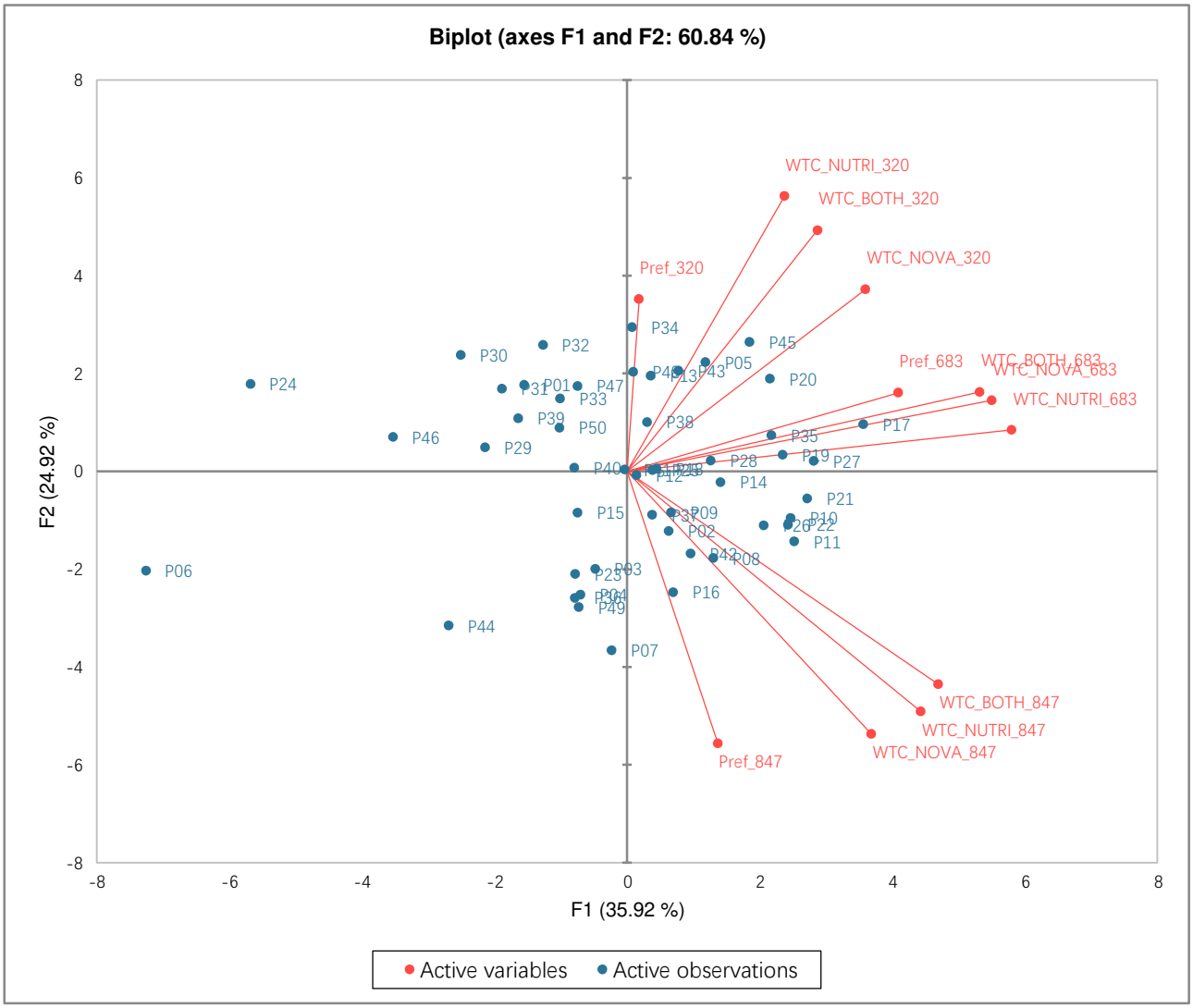
Association Between Preference Ratings and Healthiness Rankings



Spearman correlation analysis was performed to examine the association between preference ratings and perceived healthiness rankings among the three potato samples. As shown in Fig. 3, no significant correlations were found between preference ratings and perceived healthiness rankings across samples (all $P > 0.05$). This suggests that there is no significant association between preference for potato samples and their perceived healthiness of those samples.

Among the preference variables, a significant negative correlation was observed between Pref_847 and Pref_320 ($r = -0.381$, $P = 0.007$), indicating that a higher preference for boiled potatoes is often associated with a lower preference for French fries. Among the healthiness, significant negative correlations were found between Health_847 and Health_683 ($r = -0.579$, $P < 0.0001$) and between Health_320 and Health_683 ($r = -0.536$, $P < 0.0001$). Overall, the results indicate that preference and perceived healthiness rankings are largely independent of one another, while stronger correlations were observed within the healthiness.

Multivariate Relationship Between Preference Ratings and Willingness to Consume (WTC)



Principal component analysis (PCA) was performed to explore the multivariate relationship between preference ratings and willingness-to-consume (WTC) variables across the three potato samples. As shown in Fig. 4, the first two principal components explained 60.84% of the total variance, with F1 accounting for 35.92% and F2 accounting for 24.92%.

The biplot indicates a clear separation of variables according to product type. The variables associated with Sample 320 (French fries) are primarily located in the upper-right quadrant, while those associated with Sample 847 (boiled potatoes) are located in the lower-right quadrant. The variables associated with Sample 683 (mashed potatoes) are clustered on the right side, closer to the x-axis. Variables related to sample 683 (mashed potato) were clustered

on the right side closer to the horizontal axis. This pattern suggests that willingness-to-consume responses and baseline preference ratings differed by product profile.

The close positioning of the WTC variables within each product group suggests consistency among information conditions for the same product. In particular, the WTC variables for each sample tended to cluster near the corresponding preference variable, indicating that WTC was broadly aligned with baseline preference within products. At the same time, the spatial separation among the three product clusters suggests that product type contributed more strongly to the multivariate structure than information format alone.

Comparison of WTC Across Products and Information Conditions

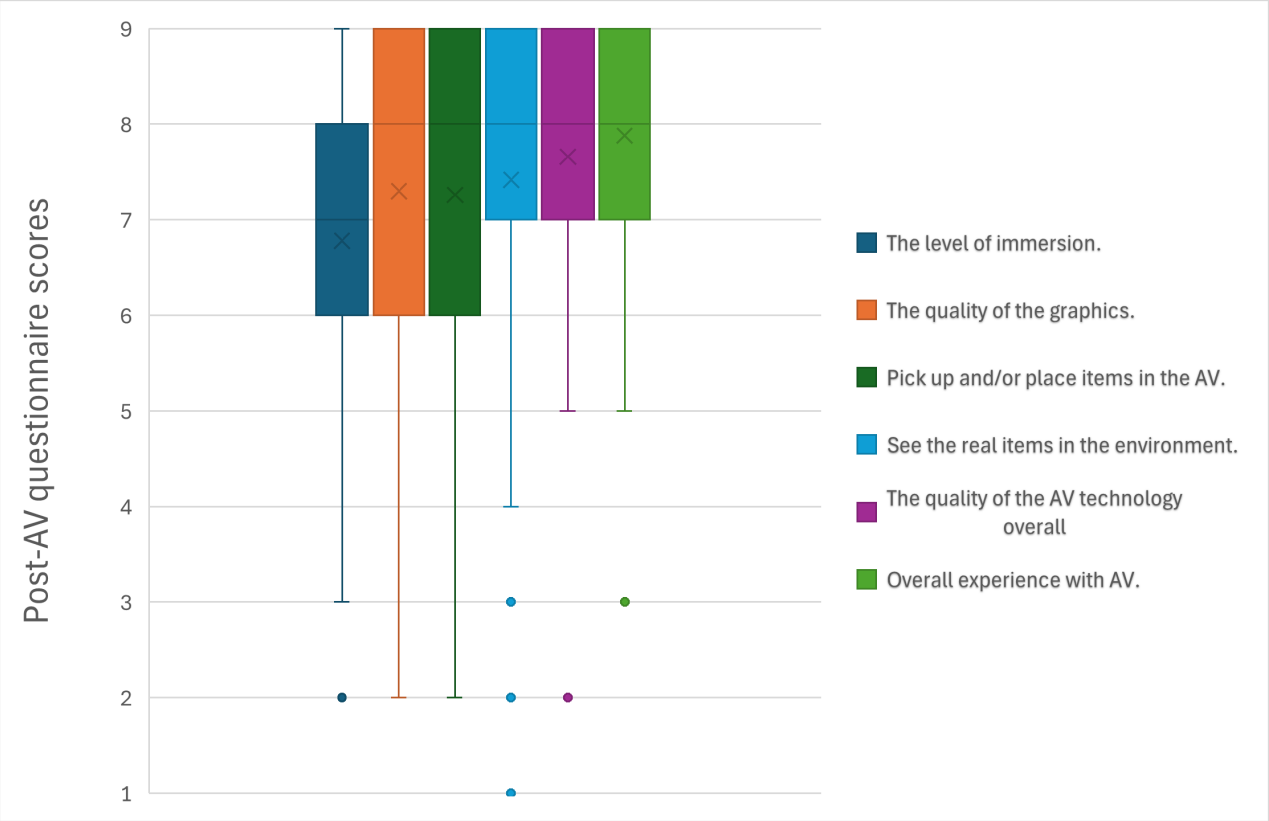
Note. Different letters indicate significant differences among treatment combinations at $P < 0.05$. The overall model was significant ($P < 0.0001$), whereas the interaction between information condition and product was not significant ($P = 0.646$).

WTC differed significantly among the treatment combinations, as indicated by the significant overall model effect ($P < 0.0001$). As shown in Table 3, boiled potato consistently received the highest WTC scores across all information conditions, with LS mean values of 6.94 under Nutri-Score and 6.88 under both NOVA and the combined condition. In contrast, French fries showed the lowest WTC scores, ranging from 5.54 to 5.98, while mashed potato showed intermediate values ranging from 6.20 to 6.40.

The multiple comparison groupings further supported this pattern. All boiled potato treatments belonged to the highest significance group (e), whereas the lowest WTC was observed for × French fries (5.54, group a). The mashed potato treatments were assigned to intermediate groups (d and cd), and the French fries treatments were assigned to the lower groups (bc, ab, and a). Overall, these findings indicate a consistent ranking of boiled potato > mashed potato > French fries in terms of WTC.

However, the interaction between information conditions and product type was not significant ($P = 0.646$), suggesting that the impact of information format on WTC did not vary significantly across different products. In other words, although WTC differed across product categories, the relative effects of Nutri-Score, NOVA, and comprehensive information remained consistent overall.

Post-AV questionnaire results



According to Fig. 5, all mean scores from the post-AV questionnaire were above 6, indicating generally positive evaluations of the AV system. The highest mean score was recorded for overall experience with AV (7.88, min = 3, max = 9), followed by the quality of the AV technology overall (7.66, min = 2, max = 9). Seeing the real items in the environment also received a relatively high rating (7.42, min = 1, max = 9). Slightly lower but still favourable mean scores were observed for the quality of the graphics (7.30, min = 2, max = 9) and picking up and/or placing items in the AV environment (7.26, min = 2, max = 9). The lowest mean score was found for the level of immersion (6.78, min = 2, max = 9). Overall, these findings suggest that participants responded positively to the AV environment, while some variability remained across specific aspects of the experience.

Discussion

The present findings suggest that product type was a stronger determinant of consumer response than information format in the AV sensory setting[11,28]. Although mashed potato showed the highest preference score, no significant differences were found in baseline preference ratings among the three potato samples, indicating a broadly similar level of hedonic acceptance. This may be because all three samples were familiar potato-based foods, for which prior experience and established expectations may limit strong differences in liking[29,30]. In contrast, perceived healthiness differed clearly, with participants consistently ranking boiled potato as the healthiest, followed by mashed potato, while French fries were perceived as the least healthy. This pattern likely reflects common consumer beliefs related to cooking method and degree of processing, as boiled foods are generally perceived as healthier than fried alternatives[31]. Notably, preference ratings were not significantly associated with perceived healthiness rankings, suggesting that liking and health-related judgments were relatively independents[32]. This is consistent with previous research showing that foods perceived as healthier are not necessarily more liked[33]. The PCA further supported a product-driven response structure, with preference and willingness-to-consume (WTC) variables clustering more strongly by sample type than by information condition. Similarly, WTC results showed a stable ranking of boiled potato > mashed potato > French fries across all information conditions, while the non-significant interaction between product and information condition indicated that Nutri-Score, NOVA, and combined information did not substantially alter the underlying product hierarchy. This suggests that, for familiar foods, informational cues may reinforce rather than fundamentally change pre-existing product perceptions[34]. Taken together, these findings indicate that liking, perceived healthiness, and WTC are related but distinct constructs, and that AV sensory testing provides a useful controlled yet immersive approach for examining these dimensions in food evaluation[22]. Several limitations should be acknowledged. The NOVA cues assigned to simple culinary preparations may not fully reflect standardized product-level NOVA classifications. For example, boiled potato with salt may be interpreted as a NOVA 1-based preparation containing a NOVA 2 culinary ingredient, rather

than as a pure NOVA 2 product. Therefore, the displayed NOVA cues should be interpreted as experimental processing-related information stimuli rather than independently validated NOVA classifications. Future research should include a broader range of foods with independently validated NOVA classifications and systematically varied NOVA–Nutri-Score combinations, including cases where processing level and nutritional quality provide congruent or conflicting information. Third, the AV setup showed some practical limitations related to visual clarity, usability, and comfort. Based on participant comments, some participants reported blurred images, small or unclear labels, difficulty using the controller, and minor discomfort such as headache or heaviness of the headset. In addition, some comments suggested that simpler English instructions may improve comprehension. Overall, these findings indicate that although the AV environment was generally feasible and positively received, improvements in visual design, comfort, interaction, and instruction clarity are still needed. Future research should explore the potential of AV in a wider range of sensory and consumer testing settings. AV could be applied in different food evaluation contexts and virtual educational environments to examine whether immersive delivery can further improve consumers' awareness and understanding of food labels, including Nutri-Score and NOVA. Such approaches may also help strengthen public education on nutritional quality, food processing, and healthier food decision-making.

This study showed: in an AV sensory setting, consumer responses to potato products were driven more strongly by product type than by information format. While baseline liking did not show any significant different across samples, perceived healthiness and WTC followed a clear pattern, with boiled potato evaluated more favourably than French fries and mashed potato generally occupying an intermediate position. In addition, the lack of a significant association between liking and perceived healthiness suggests that these dimensions represent distinct aspects of food evaluation. Across products, Nutri-Score, NOVA, and combined information did not substantially alter the underlying response hierarchy, indicating that label-based information alone may have limited power to modify evaluations of familiar foods. At the same time, the post-AV questionnaire showed generally positive ratings across all evaluated

dimensions, supporting the feasibility of AV as a controlled and immersive tool for sensory and consumer research. In additional, AV also offers potential as a virtual educational platform for improving public awareness and understanding of food labels such as Nutri-Score and NOVA, which is increasingly important in the context of ultra-processed foods and healthier food decision-making.

Methods

Environmental Setup

All sessions were conducted in the Digital Sensory Laboratory at the Hungarian University of Agriculture and Life Sciences (MATE), Buda Campus. The laboratory was an enclosed, acoustically controlled room (approximately 3 m × 4 m × 2.8 m) designed to support immersive sensory testing. Environmental conditions were standardized across sessions to minimize non-experimental variability, including consistent ambient lighting, reduced room traffic, removal of unnecessary objects, and maintenance of a comfortable room temperature. Participants were seated within a predefined safe zone during headset initialization and task execution. Because the study employed VR-only visual delivery, the effective perceptual context was determined primarily by the virtual environment rather than the physical laboratory. This approach helped reduce contextual variation and enhance response comparability across participants. Prior to formal data collection, participants completed a brief familiarization period to ensure comfort with the equipment and study procedure. Participants were also informed that they could pause or withdraw from the session at any time in the event of discomfort.

VR Hardware and Software Development



The AV application (Fig. 6) used in this application was developed in Unity Version 6000.2.8fl (Unity Technologies, Unity Software Inc., San Francisco, California, US) and deployed on Meta Quest 3s (Reality Labs, Meta Platforms Inc., Menlo Park, California, US) Head Mounted Displays (HMDs) (Fig. 7). The development objective was to create a stable and reproducible AV protocol that could present product stimuli, deliver label education, collect behavioural responses, and save structured output for statistical analysis. This method follows the concept introduced in the related research article by Zulkarnain et al.[22]. That article explains why augmented virtuality can improve ecological validity in consumer studies.



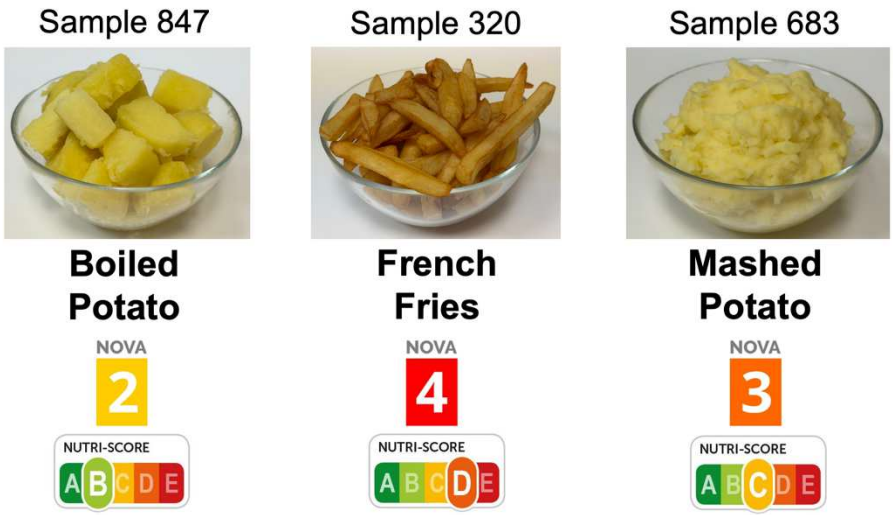
The Unity project can be found at the code repository https://github.com/matedigitalsensorylab/AVLabellingSensory.git. This project includes runtime interaction logic, a panel-driven questionnaire workflow, scene management, and functionality for exporting participant-level records in .CSV format. The deployment goal is independent headset execution, which reduces setup complexity and allows for smooth operation in a controlled lab environment without relying on a wired PC during participant experiments.

The development framework focuses on five technical priorities. First is protocol consistency, ensuring every participant follows the same process. Second is a clear user interface, ensuring participants can easily understand the steps within the headset. Third is data integrity, ensuring all necessary variables are collected in the correct order. Fourth is runtime stability, ensuring scene progress and input processing remain reliable in repeated experiments. Fifth is export compatibility, ensuring the generated file structure can be directly analyzed in Excel and XLSTAT.

In implementation, the product identifier remains constant across all stages, while the information context varies depending on the conditions. This design allows for direct examination of acceptability changes under NOVA, Nutri-Score, and combined frameworks. Therefore, the hardware and software integration supports the methodological goal of isolating information effects while maintaining stimulus continuity. The development process also emphasized portability and maintainability. By building the protocol as modular scene and panel components, visual content or question text can be updated without rewriting the entire application. This supports future repeated studies, expansion into new food categories, and iterative improvements to the audiovisual sensory protocol on the same platform.

Stimuli and Products

Three potato-based samples were used as test products. Each sample was presented as a coded visual card in virtual environment, as shown in Fig. 8.



Boiled potato was prepared using 1 kg of potatoes and 5 g of salt. Based on the experimental product–label framework used in this study; this sample was presented with a NOVA 2 and Nutri-Score B. Although the potato itself may be considered minimally processed, the addition of salt as a culinary ingredient was used to frame the sample within the processing-related information condition.

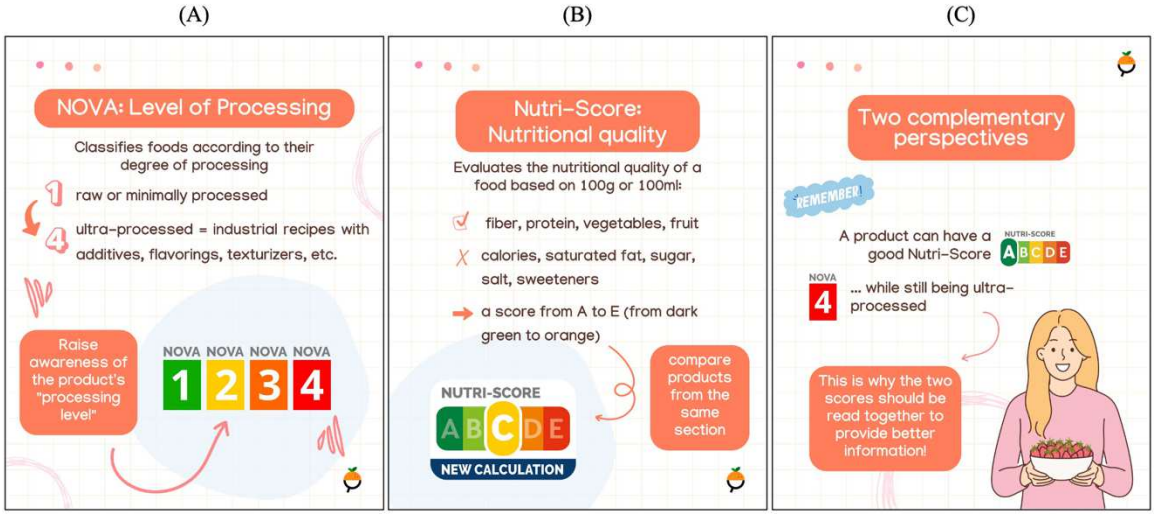
French fries were prepared from a commercial frozen product purchased in Hungary (Farm Frites, Hungary). The product was cooked using an air flyer at 200°C for 15 min prior to serving. In the experimental label display, this sample was assigned a NOVA 4 and Nutri-Score D, reflecting its status as a commercially processed potato product and its comparatively less favourable nutritional profile.

Mashed potato was prepared from 1 kg of potatoes, 1 g of citric acid, 250 mL of milk, 5 g of salt, and 30 g of butter. After preparation, the sample was stored under refrigeration overnight before sensory evaluation. Within the experimental product–label framework, mashed potato was presented with a NOVA 3 and Nutri-Score C. This assignment was based on the use of additional culinary ingredients, acidification, and overnight refrigerated storage as processing-related characteristics relevant to the information condition.

To isolate information framing effects, three different formats were used while retaining the same product stimuli across all displays. In the first format, NOVA and Nutri-Score were shown together. In the second format, only the Nutri-Score was shown. In the third format, only the NOVA classes were shown. This ensured preserving continuity and supported within-participant comparison across the informational contexts.

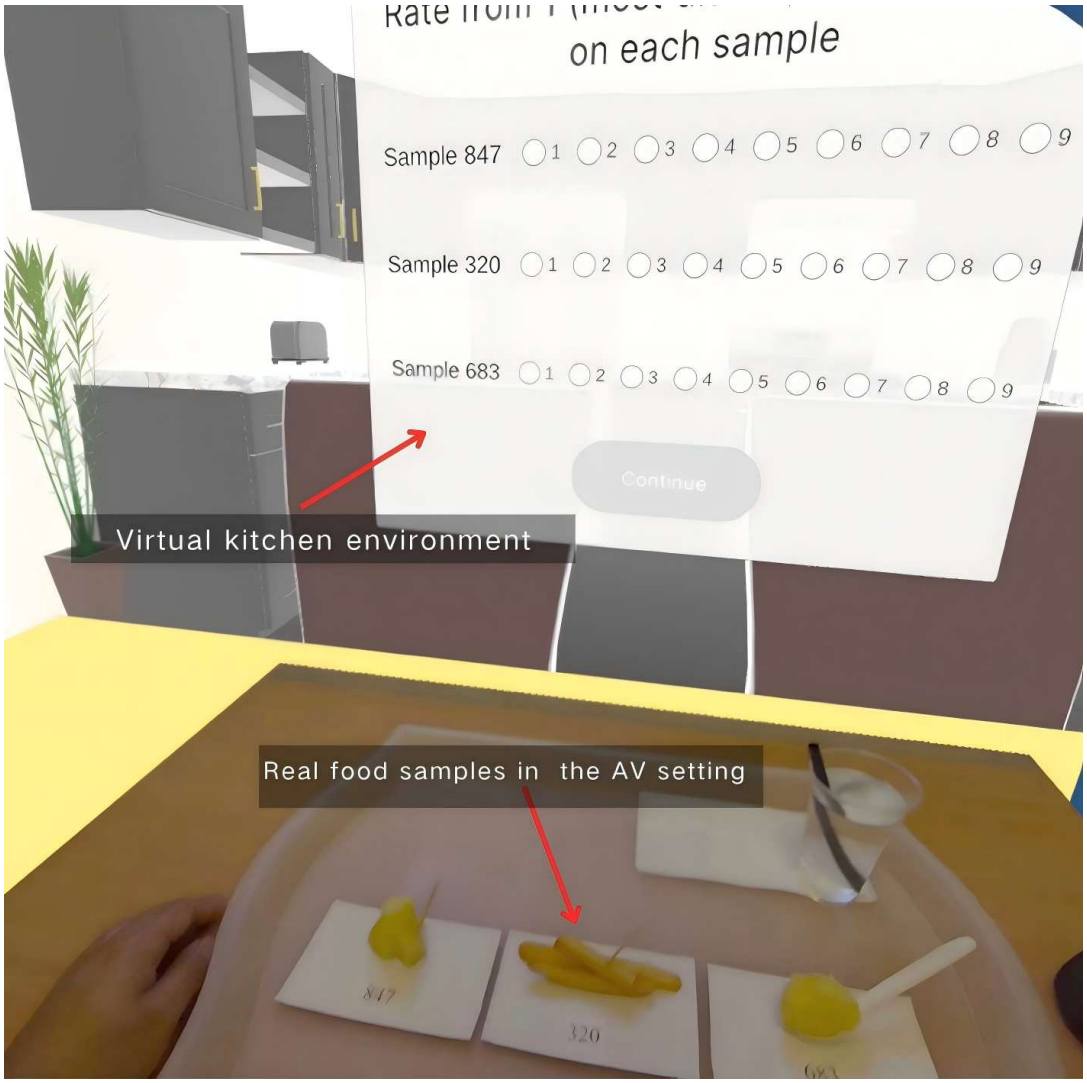
Information Stimuli

Three explanatory panels, consisting of standardized visual information boards, were used to explain the meaning of NOVA and Nutri-Score to participants before the sensory task and to standardize their interpretation of the classification systems. The NOVA panel explains the processing grades from 1 to 4, highlighting that NOVA 1 represents minimal processing, while NOVA 4 corresponds to ultra-processed formulations (Fig. 9a). The Nutri-Score panel explains the nutritional quality grades from A to E and summarizes the beneficial and detrimental nutrients in the grading system (Fig. 9b). The hybrid panel indicates that the two systems are complementary and should be interpreted together, including the possibility that beneficial nutritional grades and high processing grades may coexist (Fig. 9c). As shown in Fig. 9, all panels employ a consistent visual style and concise explanatory language to minimize information overload for the participant.



Study Design

As showed in Fig. 9 and Fig. 10, the study used a within-subject repeated-measures design in an AV sensory setting at the Digital Sensory Laboratory, MATE. Each participant completed the full protocol in a single session and evaluated all samples under all information conditions, allowing direct within-person comparisons while reducing between-subject variability.

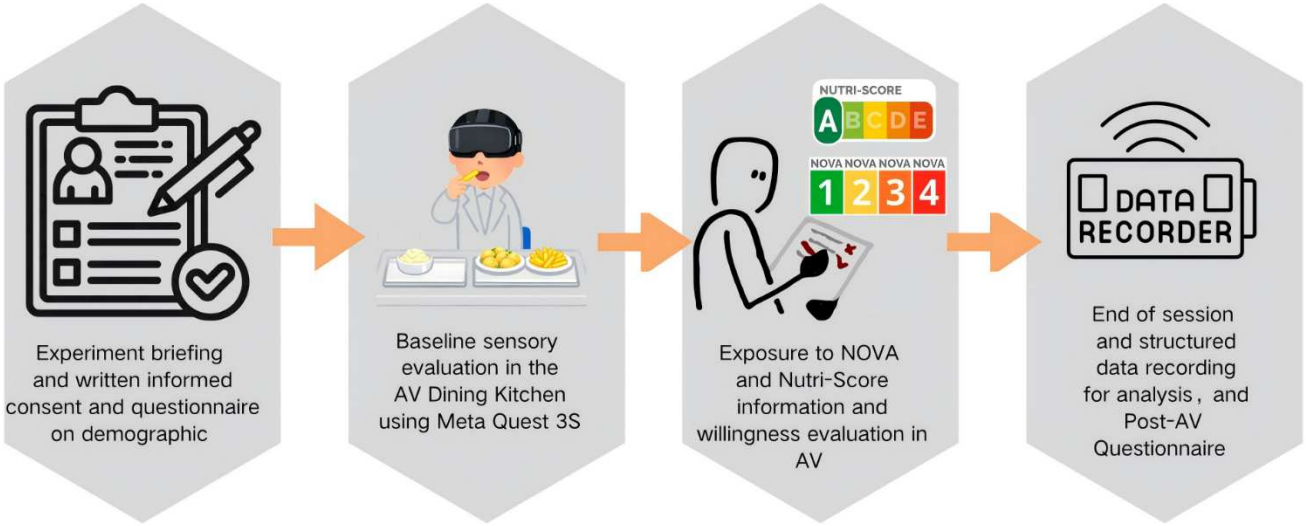


The procedure consisted of five stages. First, participants received a brief explanation of the study and provided written informed consent. Second, they completed pre-immersion questionnaires assessing demographic characteristics were assigned a participant ID. Third, participants entered the AV Dining Kitchen environment using a Meta Quest 3S headset (Fig. 7) and evaluated three coded potato samples: Sample 847 (boiled potato), Sample 320 (French fries), and Sample 683 (mashed potato). Baseline sensory measures included liking ratings and healthiness rankings.

Fourth, participants remained in the headset and completed information-conditioned willingness tasks. They were exposed to educational panels presenting NOVA classification, Nutri-Score interpretation, and the combination of both formats in a controlled sequence. Willingness-to-consume responses were recorded for each sample after each condition. Fifth, participants removed the headset and finished the measurement and completed a post-AV questionnaire to assess the feasibility and subjective experience of the virtual environment,

after which the measurement was concluded. The complete experimental procedure is summarized in Fig. 11.

All responses were recorded in a structured format. Sensory and willingness data were exported from Unity as .CSV files including participant ID, scene trace, and UTC timestamp, and questionnaire responses were merged into the final analytical dataset.



Participants

Participants were recruited from the Hungarian University of Agriculture and Life Sciences, MATE. Participation was voluntary and based on eligibility for immersive tasting and questionnaire completion under the study protocol. The aim of the study was clearly explained to all participants before the start of the experiment to ensure that they fully understood the study objectives, procedures, and the use of VR headsets technology. Participants were informed that their participation was voluntary and that they could withdraw from the experiment at any time without providing a reason or facing any penalties. Written informed consent was obtained from all participants before the study began. The consent form included the statement: **"I am aware that my responses are confidential, and I agree to participate in this experiment."** An affirmative reply was required for participation.

Ethical was granted by the Institute of Food Science and Technology of the Hungarian University of Agriculture and Life Sciences (MATE). Ethical Approval Number: MATE-BC/290-1/2024. The study was conducted in full compliance with the ethical guidelines outlined by the **Declaration of Helsinki** and the research policies of MATE. Participants were debriefed after the experiment and provided with an opportunity to ask questions or clarify concerns. No adverse events were reported during the study.

Inclusion required adult participants able to complete VR exposure and consume the presented potato samples. Participants unable to safely complete immersive testing or tasting tasks were excluded from the final analytical sample.

A total of 50 participants completed the study and were retained for analysis (Table 4). The sample included 15 males and 35 females. Age was recorded in years and reported as mean, standard deviation (SD), minimum, and maximum for the full sample and by gender.

Post-AV Questionnaire

After completing the AV session, participants removed the headset and completed a brief post-AV questionnaire to assess their subjective experience of the immersive environment. The questionnaire included six items related to immersion, graphics quality, interaction with items in the AV environment, visibility of real items, overall AV technology quality, and overall experience with AV. All items were rated on a 9-point scale, ranging from 1 (very low/very difficult/negative) to 9 (very high/very easy/positive), with higher scores indicating more positive evaluations. Responses were analysed descriptively, and boxplots were generated in Microsoft Excel to visualise the distribution of scores.

Data Analysis

Data analysis was performed using the XLSTAT (2025.2.0: Addinsoft, Paris, France) add-in in Microsoft Excel. The analysis workflow included data screening, coding standardization, descriptive statistics, scale scoring, inferential comparisons, and multivariate exploration. One-way ANOVA was used to compare preference scores among three potato samples. Friedman's test was used to analyze differences in health rankings. Spearman's rank correlation test was used to examine the association between preference scores and health rankings. ANOVA-based procedures were used to compare consumer spending intentions under NOVA, Nutri-Score, and comprehensive information conditions. Principal component analysis was performed on preference and spending intention variables to describe the multivariate response structure. The statistical significance level was set at $p < 0.05$. Results were interpreted by integrating the results of descriptive, inferential, and multivariate analyses.

Data Availability

The datasets generated and/or analysed during the current study are not publicly available because they contain participant-level sensory and questionnaire data but are available from the corresponding author on reasonable request.

Code availability

Any analysis code used during the current study is available from the corresponding author upon reasonable request.

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This study received no funding.

Author contributions

T.C. conceived and designed the study, developed the manuscript structure, conducted the experiment, performed data analysis, and wrote the main manuscript text. A.Q.M.A., A.H.Z., and B.B. contributed to the augmented virtuality experimental setup, participant testing, data collection, and preparation of visual materials. A.H.Z. also contributed to the Unity-based AV application and technical implementation. A.G. supervised the study, provided methodological guidance, and reviewed and edited the manuscript. All authors reviewed and approved the final manuscript.

Competing interests

All authors declare no financial or non-financial competing interests.

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Figure legends

Fig. 1 | Mean preference ratings of the three potato samples with error bars.

Fig. 2 | Mean ranks of perceived healthiness for the three potato samples.

Fig. 3 | Spearman correlation heatmap of preference ratings and perceived healthiness.

Fig. 4 | PCA biplot showing the multivariate relationship between preference ratings and willingness-to-consume variables among the three potato samples.

Fig. 5 | Box plot of each post-VR questionnaire results × means average score.

Fig. 6 | Unity Application.

Fig. 7 | Meta Quest 3s HMD.

Fig. 8 | Visual card of used potato samples with NOVA classification and Nutri-Score values.

Fig. 9 | Explanatory panels of NOVA classifications and Nutri-Score.

Fig. 10 | Augmented virtuality design: real food in a virtual setting.

Fig. 11 | Experimental procedure used in this study.

Tables

Table 1 | LS Means for factor.

Category	LS mean	Standard error	Lower bound (95%)	Upper bound (95%)
Boiled Potato	6.100	0.296	5.512	6.688
French Fries	5.940	0.296	5.352	6.528
Mashed Potato	6.580	0.296	5.992	7.168

Table 2 | Pairwise comparison results for perceived healthiness rankings.

Comparison	Mean rank difference	P-value	Significant
Boiled potato vs French fries	1.5	<0.0001	Yes
Boiled potato vs Mashed potato	0.72	0.001	Yes
Mashed potato vs French fries	0.78	0.001	Yes

Table 3 | Least-squares mean willingness-to-consume (WTC) scores by product and information condition.

Category	*WTC*
NUTRI × *Boiled potato*	6.940 e
NOVA × *Boiled potato*	6.880 e
BOTH × *Boiled potato*	6.880 e

NOVA × *Mashed potato*	6.400 d
NUTRI × *Mashed potato*	6.340 cd
BOTH × *Mashed potato*	6.200 cd
NOVA × *French fries*	5.980 bc
NUTRI × *French fries*	5.680 ab
BOTH × *French fries*	5.540 a

Table 4 | Demographic profile of participants.

Variable	Total (n=50)	Male (n=15)	Female (n=35)
Age, mean ± SD (years)	25.44 ± 4.13	27.47 ± 5.15	24.57 ± 3.30
Age, minimum (years)	21	22	21
Age, maximum (years)	42	42	31
Gender, n (%)	50(100.0%)	15 (30.0%)	35 (70.0%)

Supplementary Files

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