Food Quality and Preference 130 (2025) 105520

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

Translation, cultural adaptation, and validation of the Hebrew version of the Leeds Food Preference Questionnaire

Shiri Sherf-Dagan [a,b,*], Roni Aviram-Friedman [a], Vital Bahar [b], Gal Churi [b], Assaf Buch [a,c], Tali Sinai [d,e], Vered Kaufman-Shriqui [a], Ilanit Mahler [f], Netalie Shloim [g], Graham Finlayson [h]

[a] Department of Nutrition Sciences, School of Health Sciences, Ariel University, Ariel, Israel
[b] Department of Nutrition, Assuta Medical Center, Tel Aviv, Israel
[c] Institute of Endocrinology, Metabolism and Hypertension, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel
[d] Israel Center for Disease Control, Israel Ministry of Health, Ramat Gan, Israel
[e] School of Nutritional Sciences, The Robert H. Smith Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem, Rehovot, Israel
[f] Assuta Bariatric Center, Assuta Hospitals, Israel
[g] School of Healthcare, University of Leeds, Leeds, UK
[h] Appetite Control and Energy Balance Research Group, School of Psychology, Faculty of Medicine and Health, University of Leeds, Leeds, UK

ARTICLE INFO

Keywords:
Leeds food preference questionnaire
Food preferences
Food reward
Cross-cultural validation

ABSTRACT

Background and aims: The Leeds Food Preference Questionnaire (LFPQ) is a computerized task assessing liking, wanting, and preferences for foods categorized by fat content and taste into four groups; high-fat savory (HFSA), low-fat savory (LFSA), high-fat sweet (HFSW), and low-fat sweet (LFSW). This study aimed to translate, culturally adapt, and validate a Hebrew LFPQ (LFPQ-He) version.

Methods: The study included two phases. Phase one involved translating the task into Hebrew, selecting and photographing food images, and validating them among 153 participants from the general population (50 % women, mean age and BMI of 43.0 ± 14.3 years and 26.2 ± 4.8 kg/m^2). Phase two evaluated the psychometric properties of the LFPQ-He with 20 metabolic bariatric surgery candidates (70 % women, mean age and BMI of 43.8 ± 13.9 years and 44.5 ± 6.2 kg/m^2) and 39 healthy medical center employees (79.5 % women, mean age and BMI of 40.5 ± 10.0 years and 21.7 ± 1.9 kg/m^2). Data collection included demographics, anthropometrics, the Power of Food Scale (PFS), and the LFPQ-He task, which was re-completed by the medical center employees after a week.

Results: Convergent validity showed low to moderate positive correlations between the PFS total and its subscale score and HFSA-related variables, and low negative correlations with LFSW-related and LFSA-related variables. Known-group validity results were non-significant, but trends aligned with expected preferences. Test-retest reliability demonstrated intraclass correlation coefficients ranging from 0.451 (95 %CI: 0.153, 0.674) to 0.901 (95 %CI: 0.817, 0.948), reflecting moderate to good reliability.

Conclusion: The LFPQ-He showed acceptable psychometric properties, supporting its use for assessing food preferences and hedonic food-reward in future studies.

1. Introduction

Hedonic hunger is the craving for palatable foods driven by external sensory cues, information, feelings, and emotions (Berthoud, 2006). Food reward can be divided into “liking” (i.e., the pleasurable response to food) and “wanting” (i.e., the motivation to consume palatable foods that have previously provided pleasure) (Berridge, 2009). Food reward is assessed through various methods including questionnaires, visual analog scales (VAS), grip force tasks, and computer tasks (Oustric et al., 2020). Among these methods, the Leeds Food Preference Questionnaire (LFPQ) is a well-established tool that is widely used in the scientific field (Oustric et al., 2020). The LFPQ is a computerized behavioral task designed to assess liking, wanting, and relative preference for common foods that can be categorized as high-fat savory (HFSA), low-fat savory

* Corresponding author at: Department of Nutrition Sciences, Ariel University, Kiryat H’mada 3, Ariel ZIP 40700, Israel.
E-mail addresses: shiris@ariel.ac.il (S. Sherf-Dagan), roniaf@ariel.ac.il (R. Aviram-Friedman), assafb@ariel.ac.il (A. Buch), tali.sinai@moh.gov.il (T. Sinai), veredks@ariel.ac.il (V. Kaufman-Shriqui), ilanit@drmahler.co.il (I. Mahler), n.shloim@leeds.ac.uk (N. Shloim), g.s.finlayson@leeds.ac.uk (G. Finlayson).

https://doi.org/10.1016/j.foodqual.2025.105520
Received 2 February 2025; Received in revised form 19 March 2025; Accepted 20 March 2025
Available online 26 March 2025

(LFSA), high-fat sweet (HFSW), and low-fat sweet (LFSW) (Oustric et al., 2020).

The genetic, cultural, and environmental variations in food preferences between different populations increase the importance of the cross-cultural validity of food preference instruments (Alkahtni et al., 2016). The LFPQ has been validated across various appetite-related contexts (Oustric et al., 2020) and has been translated and culturally adapted into several languages (Alkahtni et al., 2016; Arumäe et al., 2019; Carvalho-Ferreira et al., 2019; Hiratsu et al., 2022; Hyldelund et al., 2022; Martins et al., 2017; Nunes et al., 2022; Oustric et al., 2020; Pedersen et al., 2022; Ranasinghe et al., 2018; Schamarek et al., 2023; Thivel et al., 2023; Zhou et al., 2019). Nevertheless, a Hebrew version of the LFPQ does not currently exist. As food preferences are shaped by cultural and dietary habits, adapting the task for the Israeli population ensures alignment with local dietary preferences and cultural norms. The development of a Hebrew version of the LFPQ would provide a concise, standardized, and user-friendly computerized tool for assessing food preferences and reward in Israel, addressing the current reliance on self-report questionnaires in this field. This study aimed to translate, culturally adapt, and validate a Hebrew LFPQ (LFPQ-He) based on standardized purposed procedures to improve the comparability of food reward studies across different cultures (Oustric et al., 2020).

2. Methods

This study comprised two phases; the first phase involved the translation of the LFPQ into Hebrew along with the cultural adaptation of food photo stimuli, while the second phase focused on the validation of the LFPQ-He version. These phases adhered to established recommendations for translation and cultural adaptations of the LFPQ (Oustric et al., 2020) and other recommendations for the validation of research tools (Arora et al., 2017; Artino et al., 2014; Boateng et al., 2018; Bujang et al., 2022; Morgado et al., 2017; Phillips et al., 2021; Tsang et al., 2017).

2.1. The LFPQ task

The LFPQ comprises two sub-tasks presented in random order and takes approximately 6–8 min to complete. The first sub-task involves an explicit evaluation of “wanting” by asking “How much do you want some of this food now?” and “liking” by asking “How pleasant would it be to taste some of this food now?”, for 16 single food images presented randomly and scored on a 100-mm VAS ranging from “not at all” to “extremely”. Aggregated scores are computed for each of the four categories, while a higher score indicates stronger preferences for that food category in this sub-task. The second sub-task requires participants to make rapid forced choices to 96 paired combinations of food images from different categories presented randomly to assess implicit “wanting” by asking “Which food do you most want to eat now?”. A frequency-weighted algorithm, considering both the speed and frequency of choosing or avoiding foods in each category, is calculated for this sub-task. Scores for implicit “wanting” typically range from −100 to +100, with a positive score indicating a greater preference for a specific food category; a negative score indicating the opposite; and a score of zero indicating equal preference between categories. For both sub-tasks, participants were instructed to think about the food itself and imagine that they could receive either a large or small amount of it according to their preference (Oustric et al., 2020).

2.2. Translation of the LFPQ into Hebrew and cultural adaptation

This phase consisted of four components; a. translation of the task into Hebrew; b. selection and validation of the food images; c. professional photography of the selected photos, and d. validation of the food images with the general population in Israel (Oustric et al., 2020). Upon completion of this phase, the Hebrew version of the task was integrated into the *E*-Prime software (Psychology Software Tools, Pittsburgh, PA) with the assistance of the original developer of the LFPQ (GF).

2.2.1. Translation of the task

Forward and backward translations were conducted independently by two bilingual translators; one performed the forward translation (SSD), and another, who was blinded to the original text, conducted the backward translation (RAF). An expert committee, comprising of translators, an expert familiar with the construct of interest, and a methodologist (SSD, RAF, NS, AB) reviewed all translated versions to ensure both linguistic and conceptual equivalence with the original version. Any discrepancies were resolved through consensus, and if necessary, the translation process was repeated to refine accuracy (Bujang et al., 2022). The final Hebrew translation of the task content is presented in **Supplementary Table 1**.

2.2.2. Selection and validation of food images

To create a culturally adapted LFPQ, the first step is to assemble a set of culturally relevant food images that are easily recognized, widely accepted, and classified into four categories (HFSA, LFSA, HFSW, and LFSW). To choose and verify the suitability of food images, two focus group sessions that lasted two hours each were conducted via the Zoom platform with five research-active registered dietitians (SSD, RAF, TS, VKS, and AB). The group selected and evaluated 44 food items, 11 in each food category (HFSA, LFSA, HFSW, and LFSW) ensuring cultural and habitual relevance by considering traditional dietary patterns, commonly consumed foods, and market availability in Israel. Additionally, selection was guided by pre-specified criteria that included food items diversity, food that is not tightly related to a certain time or meal of the day, ‘ready to eat’ foods, and food that complies with the percentages cutoffs of energy from fat (i.e., HFSA and HFSW items as containing at least 40 % of their energy from fat; LFSA and LFSW items as containing less than 20 % of their energy from fat) (Oustric et al., 2020). Any differences in opinion among the experts were addressed and resolved through an iterative process of expert deliberation until a final consensus was reached. The nutritional composition of all food items was determined by utilizing the NutRatio software or nutrition information provided on the packaging’s food labels, when applicable.

2.2.3. Professional photography of the selected food images

Images of the 44 pre-selected food items were taken by a professional photographer with a NIKON D800 camera. Food items were placed on a standard 26-diameter white plate with or without a 16-diameter bowl (Corelle®, USA) to ensure a similar visual appearance, arranged unpacked, and reflected a typical presentation of each item. A light grey placement was chosen to ensure a neutral background and ample contrast between the plate and background (Charbonnier et al., 2016). Moreover, the homogeneity of the images in terms of the photograph angle and image resolution was kept throughout (Charbonnier et al., 2016; Toet et al., 2019).

2.2.4. Validation of the food images among the general population

To validate and select the most suitable food images for the final task, a survey was conducted using a representative probability sample, employing a ‘stratified sampling’ method based on gender and ethnic affiliation. The surveys were administered using the ‘Qualtrics’ software and distributed online via email through the services of a survey company (“SekerNet”). Inclusion criteria for respondents included age of ≥18 years and the ability to read and write Hebrew, while exclusion criteria included working in the field of nutrition and residing outside of Israel in the last five years. The survey conveyed data on demographics, food preferences, dieting, and anthropometric measures [i.e., self-reported weight and height for the calculation of body mass index (BMI)]. For each food image, respondents were asked to provide graded responses on food identification, frequency of consumption, perceived taste, fat content, liking, and time appropriate for consumption

(Blechert et al., 2014; Oustric et al., 2020; Toet et al., 2019). In cases where the image was not recognized, the image was skipped, and the next image was shown. In each survey, 30 food images were randomly presented, totaling approximately 100 respondents (ranging between 98 and 106) who rated each food image. Participants were requested to complete the survey in the morning (i.e., 5:00–12:00 am) to promote metabolic uniformity as much as possible (Stockburger et al., 2009). Before the survey was distributed, it was tested for quality assurance in a pilot study with 20 participants. A total of 153 individuals participated in the survey with mean age and BMI of 43.0 ± 14.3 years and 26.2 ± 4.8 kg/m^2, of whom 50.0 % were women, 91.5 % omnivores, and 24.9 % reported being in the process of losing weight. Adequate selection of the final food images to be included in the LFPQ-He followed the proposed criteria (Oustric et al., 2020). Based on these criteria, four images in each food category (HFSA, LFSA, HFSW, and LFSW) were chosen, totaling 16 food images (Fig. 1). The nutritional composition of the 16 selected food images for the LFPQ-He is presented in Table 1, and the normative rating for each food image based on the population validation survey is depicted in Table 2. All selected food images met the suggested selection criteria (Oustric et al., 2020), except for rice cakes, which fell below the cut-off for 'liking' (Table 2). Additionally, achieving a diverse selection of food images within a category suitable for consumption at the same time of day proved challenging.

2.3. Validation of the LFPQ-He

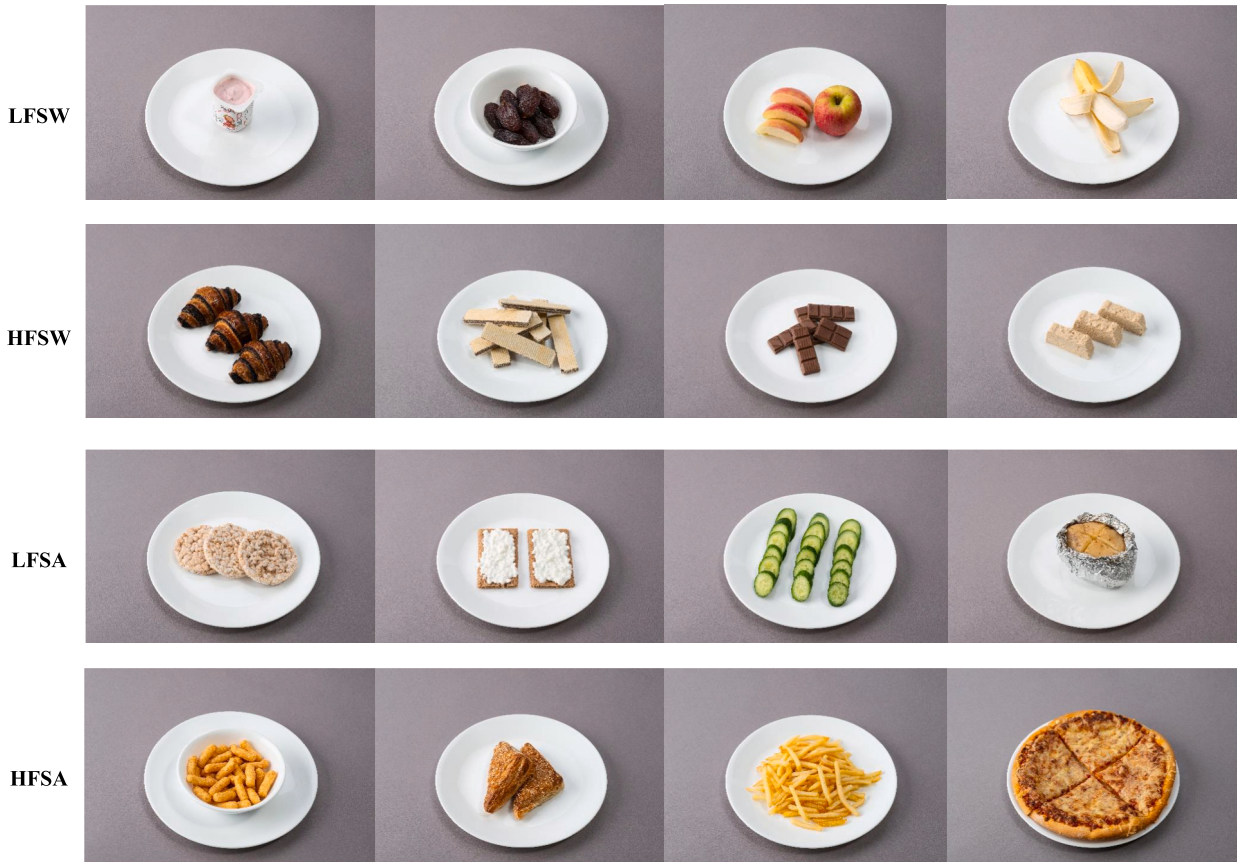
The validation process followed the recommended steps (Arora et al., 2017; Artino et al., 2014; Boateng et al., 2018; Bujang et al., 2022; Morgado et al., 2017; Phillips et al., 2021; Tsang et al., 2017), which are detailed below.

Table 1
The Nutritional composition of the final 16 food images for the Hebrew version of the LFPQ.

	Food	Kcal/ 100 gr	% Pro[1]	% Carb[1]	% Fat[1]	Fibers (gr)
LFSW	Yogurt 0% fat with fruits	39	44.1	31.8	0	1.6
	Dates	277	2.6	98.6	0.6	6.7
	Apple	46.8	1.7	87.2	3.8	2.2
	Banana	57	4.9	90.5	3.2	1.7
Mean		**105.0**	**13.3**	**77.0**	**1.9**	**3.1**
HFSW	Rugelach	413	6.1	47.4	43.6	3.1
	Chocolate waffles	514	3.6	53.7	42.0	1
	Milk chocolate	553	4.8	37.5	55.3	2.2
	Halvah	469	10.7	47.8	41.3	4.5
Mean		**487.3**	**6.3**	**46.6**	**45.6**	**2.7**
LFSA	Rice cakes	392	7.2	78.5	9.9	4.2
	Patit (cracker) with cottage	199.5	22.5	51.8	17.6	3.4
	Cucumber	14.6	16.4	82.2	6.2	0.5
	Backed potato	93	10.8	81.7	1.0	2.2
Mean		**174.8**	**14.2**	**73.6**	**8.7**	**2.6**
HFSA	Bamba	534	13.1	25.5	57.3	5.5
	Cheese bourkas	373.5	11.1	23.7	61.9	1.2
	French fries	323	4.2	47.9	43.2	3.9
	Pizza	298	16.5	34.5	45.6	2.5
Mean		**382.1**	**11.2**	**32.9**	**52.0**	**3.3**

Abbreviation: low-fat sweet (LFSW), high-fat sweet (HFSW), low-fat savory (LFSA), high-fat savory (HFSA).

[1] % Pro is the percentage of total energy from protein, % Carb is the percentage of total energy from carbohydrates excluding fibers, and % fat is the percentage of total energy from fat.



Abbreviation: low-fat sweet (LFSW), high-fat sweet (HFSW), low-fat savory (LFSA), high-fat savory (HFSA).

Fig. 1. Food images included in the Hebrew version of the LFPQ (LFPQ-He).

Table 2
Normative ratings for each food image included in the Hebrew version of the LFPQ[1,**].

	Food Name	Recognition[2]	Naming correctly[3]	Frequency[4]	Liking[5]	Taste[6]	Fat[7]	Morning[8]	Afternoon[8]	Evening[8]
LFSW	Yogurt 0% fat with fruits (n=103)	95.1%	100%	3.7	69.8	12.6	32.8	86.8	39.2	77.1
	Dates (n=104)	93.3%	100%	3.9	72.1	13.7	30.1	77.8	64.6	73.0
	Apple (n=106)	100%	100%	4.8	80.3	18.6	13.1	67.7	73.6	74.4
	Banana (n=101)	100%	100%	5.0	82.1	20.8	28.2	74.7	65.5	71.6
Mean		**97.1%**		**4.4**	**76.1**	**16.4**	**26.1**	**76.8**	**60.7**	**74.0**
HFSW	Rugelach (n=100)	97.0%	100%	3.6	74.4	11.7	80.0	65.5	30.2	52.1
	Chocolate waffles (n=99)	97.0%	100%	3.7	68.8	10.6	71.3	57.6	41.3	59.8
	Milk chocolate (n=98)	98.0%	100%	4.9	90.3	9.0	74.0	46.8	47.3	62.7
	Halvah (n=105)	81.9%	98.8%	3.2	75.8	9.2	73.6	61.5	44.2	60.1
Mean		**93.5%**		**3.9**	**77.3**	**10.1**	**74.7**	**57.9**	**40.8**	**58.7**
LFSA	Rice cakes (n=106)	84.0%	97.8%	3.0	39.3	70.1	21.0	75.0	52.9	73.9
	Patit (cracker) with cottage (n=99)	83.8%	100%	3.3	59.7	75.9	37.6	82.5	40.0	81.9
	Cucumber (n=101)	100%	100%	5.6	72.2	60.9	11.6	86.6	85.7	89.8
	Baked potato (n=103)	80.6%	96.4%	4.1	73.8	71.5	38.7	24.7	75.4	67.1
Mean		**87.1%**		**4.0**	**61.3**	**69.6**	**27.2**	**67.2**	**63.5**	**78.2**
HFSA	Bamba (peanut puffs) (n=99)	99.0%	99.0%	3.9	70.2	73.0	70.3	25.3	46.1	59.0
	Cheese bourkas (n=101)	96.0%	99.0%	3.4	74.5	86.7	90.6	62.3	42.8	56.8
	French fries (n=100)	96.0%	99.0%	4.1	82.6	86.5	85.0	10.7	73.9	54.3
	Pizza (n=105)	98.1%	100%	3.9	80.8	78.5	81.6	31.7	60.0	72.8
Mean		**97.3%**		**3.8**	**77.0**	**81.2**	**81.9**	**32.5**	**55.7**	**60.7**

Abbreviation: low-fat sweet (LFSW), high-fat sweet (HFSW), low-fat savory (LFSA), high-fat savory (HFSA).
[1] Approximately 100 respondents rated each food item.
[2] Recognition was defined by asking: "Do you recognize this food?" (Yes /No); marked if >80 % of the participants recognized the food.
[3] The portion of participants correctly identified a specific food item by free text out of those who recognized it.
[4] Frequancy was defined by asking "How often do you consume this food"? [never (1), once a year (2), every few months (3), once a month (4), once a week (5), almost every day (6)]; marked if ranked >2 (i.e., eat more than several times a year).
[5] Linking was defined by asking: "How pleasant does this food typically taste? [VAS labeled from "not at all pleasant" (0) to "very pleasant" (100)]; marked if ranked >60 (i.e., can be considered as a high liking when compared with the liking mean).
[6] Taste was defined by asking: "Is this food more sweet or savory?" [VAS labeled from "sweet" (0) to "savory" (100)]; marked sweet if the mean value of the VAS is <40 and savory if >60.
[7] Fat was defined by asking: "Is this food low or high in fat?" [VAS labeled from "low in fat" (0) to "high in fat" (100)]; marked low-fat if the mean value of the VAS is <40 and high-fat if >60.
[8] Time appropriateness was defined by asking: "How appropriate is it to consume this food in the morning/afternoon/evening?" [VAS labeled from "not at all appropriate" (0) to "very appropriate" (100)]; marked as considered to be appropriate for the specific time of day if the mean value of the VAS is > 60.
** Cells highlighted in yellow indicate results that meet the selection criteria cut-offs.

2.3.1. Study population

A total of 59 participants were recruited for the 'field study' and consisted of two groups; $n = 20$ metabolic bariatric surgery (MBS) candidates (i.e., group 1), and $n = 39$ employees of the Tel-Aviv Assuta Medical Center (i.e., group 2). These groups were selected to validate the LFPQ-He across diverse populations; MBS candidates, characterized by a higher weight status and potentially altered eating behaviors, and medical center employees, representing a generally healthier population with a lower weight status. MBS candidates were recruited from bariatric committees and clinics involved in the preparation processes for MBS at the Tel-Aviv Assuta Medical Center. Employees of the Tel-Aviv Assuta Medical Center were recruited through advertisements distributed via workplace WhatsApp groups. Inclusion criteria for both study groups included age $\geq$ 18 years, not having eaten in the last hour, and the ability to read and write Hebrew. Furthermore, individuals in 'group 1' had to be potential candidates for primary MBS of any type, while individuals in 'group 2' had to have a BMI in the healthy range (Salmón-Gómez et al., 2023). Exclusion criteria for both groups encompassed previous MBS or *endo*-bariatric procedures, taking drugs with major effects on appetite, presence of implantable electronic device (i.e., pacemakers), current major illness that may affect eating (e.g., active cancer, transplant organ, inflammatory bowel disease), uncontrolled mental illness or significant cognitive deterioration, current pregnancy or breastfeeding, diagnosis of food allergy, and adherence to a vegan diet pattern.

2.3.2. Data collection

Data collection was conducted between 7:00 AM and 2:00 PM, with informed written consent obtained from all participants before participation. Data collection involved interviews to gather information on demographics, height measurements using a stadiometer, weight measurements using a digital scale, and body composition assessment using

multi-frequency bioelectrical impedance analysis (Inbody370S®, InBody Co., Ltd.). Participants were asked to complete a Food Frequency Questionnaire (FFQ) via tablet, based on the national version, which includes 115 food items and references for the past 3 months to assess habitual dietary patterns. The energy and macronutrient content of the reported food items was analyzed using an Israeli nutritional software ('Zameret').

Participants then were asked to complete an online trial of the LFPQ-He task on a computer in a private room, ensuring all personal electronic devices are switched off. The study team provided general explanations and allowed participants to practice the LFPQ-He tasks before undertaking the official trial. Afterward, participants were asked to complete the Power of Food Scale (PFS) (Cappelleri et al., 2009; Lowe et al., 2009) via tablet to assess convergent validity. The PFS consists of 15 items categorized into three subcategories: "food available", "food present", and "food tasted". Each item is rated on a five-level Likert scale (1="don't agree at all" to 5 = "strongly agree"), with higher mean scores indicating greater hedonic hunger (Cappelleri et al., 2009; Lowe et al., 2009). The PFS was translated into Hebrew according to the recommended steps (Bujang et al., 2022) after permission for usage and translation from the original developer of the tool.

To assess known-group validity, the LFPQ-He scores were compared between the two study groups. Following a one-week interval, the Tel-Aviv Assuta Medical Center employees (i.e., group 2) were invited to re-complete the LFPQ-He for test-retest reliability assessment.

The first phase of the study was approved by the Institutional Review Board of Ariel University (*AU-HEA-SS-20231015*), and the second phase was approved by the Institutional Review Board of the Assuta Medical Centers (*ASMC #0093–23*). As a participation reward, participants of the Tel-Aviv Assuta Medical Center employees group who completed the study were invited to a one-hour healthy eating workshop, while participants of the MBS candidates group received access to a recorded one-hour workshop on nutritional preparation for MBS.

2.4. Statistical Analyses

Statistical analyses were performed using SPSS software version 29. The significance level for all analyses was set at $p < 0.05$ (two-sided), with False Discovery Rate (FDR) correction applied to adjust for multiple comparisons. For continuous variables, tests of normality distribution were used (Shapiro-Wilk test, skewness and kurtosis indices, and Q-Q Plot). Continuous variables were presented as means with standard deviation (SD) or medians with interquartile ranges (IQR), as appropriate, while categorical variables were presented as proportions.

To assess differences in continuous variables between the two groups, an independent-sample *t*-test or Mann-Whitney *U* test was used. For the comparison of dichotomous variables, the Chi-Square test or Fisher's exact test was employed. Associations between continuous variables were analyzed using Pearson or Spearman correlation tests, as indicated. Values of 0–0.3 indicate negligible correlation, 0.3–0.5 low correlation, 0.5–0.7 moderate correlation, 0.7–0.9 high correlation, and 0.9–1.0 very high correlation (Mukaka, 2012). To evaluate the test-retest reliability of the LFPQ-He, the intraclass correlation coefficient (ICC) with its 95 % confidence intervals (CI) was used. Values <0.5 indicate poor reliability, 0.5–0.75 indicate moderate reliability, 0.75–0.9 indicate good reliability, and > 0.9 indicate excellent reliability (Koo & Li, 2016). The internal consistency of the PFS was assessed using Cronbach's alpha, with values of ≥0.70 considered satisfactory for internal consistency (Bland & Altman, 1997).

2.5. Sample size calculation

Sample size for the validation phase was calculated with the G*power software version 3.1.9.7 to test differences between two independent means, considering 80 % power, a 0.05 two-sided α level, and a 1:2 ratio between group 1 and group 2, while applying a large effect size (Cohen d = 0.8) (Kim, 2015) to find differences between group means. A total sample size of 58 participants was calculated. Therefore, $n = 20$ MBS candidates (i.e., group 1) and $n = 39$ Tel-Aviv Assuta Medical Center employees (i.e., group 2) were recruited.

3. Results

3.1. Characterization of the participants

A total of n = 20 participants were recruited to group 1 (i.e., MBS candidates), of whom 70.0 % were women. Their mean age, BMI, and fat mass percentage were 43.8 ± 13.9 years, 44.5 ± 6.2 kg/m^2, and 50.4 ± 5.4 %, respectively. Their habitual median (IQR) daily dietary intake included 2212 (1815, 2715) kcal, 194 (153, 285) gr carbohydrates, 124 (89, 137) gr protein, and 96 (76, 112) gr fats. Their total PFS score was 3.41 ± 0.71, with subscale scores of 3.22 ± 0.82 for "food available," 3.56 ± 0.81 for "food present," and 3.53 ± 0.83 for "food tasted." The PFS total score had a high level of internal consistency within group 1 (Cronbach's α = 0.874).

A total of n = 39 participants were recruited to group 2 (i.e., Tel-Aviv Assuta Medical Center employees), of whom 79.5 % were women. Their mean age, BMI, and fat mass percentage were 40.5 ± 10.0 years, 21.7 ± 1.9 kg/m^2, and 26.2 ± 7.5 %, respectively. Their habitual median (IQR) daily dietary intake included 1919 (1595, 2706) kcal, 205 (132, 287) gr carbohydrates, 86 (73, 107) gr protein, and 75 (62, 108) gr fats. Their total PFS score was 2.71 ± 0.74, with subscale scores of 2.44 ± 0.93 for "food available," 2.79 ± 1.03 for "food present," and 2.98 ± 0.69 for "food tasted." The PFS total score had a high level of internal consistency within group 2 (Cronbach's α = 0.891).

Significant differences between the study groups were observed for BMI and fat mass percentage ($P < 0.001$), whereas no significant differences were found for age or gender proportion. MBS candidates exhibited a significantly higher daily protein intake ($p = 0.029$) and a trend toward higher daily caloric and fat intake, though these differences did not reach statistical significance. MBS candidates exhibited significantly higher total PFS score ($p = 0.001$), "food available" subscale score ($p = 0.003$), "food present" subscale score ($p = 0.005$), and "food tasted" subscale score ($p = 0.010$), as expected.

3.2. Validity establishment of the LFPQ-He

No associations were observed between BMI or gender and the choice frequency, explicit liking, explicit wanting, or implicit wanting for the four food categories in the LFPQ-He. In contrast, low negative correlations were found between age and HFSA-related and HFSW-related variables and low positive correlations between age and LFSW-related variables (**Supplementary Table 2**).

3.2.1. Convergent validity of the LFPQ-He

Associations between choice frequency, explicit liking, explicit wanting, and implicit wanting for the four food categories with the PFS total score and its three subscales ("food available", "food present", and "food tasted") among all participants are presented in Table 3. Low to moderate positive correlations were observed between the PFS total score and its subscales with HFSA-related variables, including choice frequency, implicit wanting, explicit wanting, and explicit liking. Conversely, low negative correlations were identified between the PFS total score and specific subscales (e.g., "food available" and "food present") with LFSW-related variables such as choice frequency, implicit wanting, explicit liking, and explicit wanting, as well as with LFSA-related variables including choice frequency and implicit wanting.

3.2.2. Known-group validity assessment

Choice frequency, explicit liking, explicit wanting, and implicit wanting for the four food categories within each study group are presented in Table 4. No significant differences were found between the

Table 3
Associations between choice frequency, explicit liking, explicit wanting, and implicit wanting for the four food categories with the PFS total score and its three subcategories ("food available", "food present", and "food tasted") among both study groups.[1,2,3]

Food Category	PFS total score				Food available				Food present				Food tasted			
	CF	EL	EW	IW	CF	EL	EW	IW	CF	EL	EW	IW	CF	EL	EW	IW
LFSW	−0.387**	−0.361**	−0.294	−0.383**	−0.480**	−0.366**	−0.318**	−0.477**	−0.340**	−0.285	−0.213	−0.335**	−0.242	−0.270	−0.210	−0.234
HFSW	0.097	0.201	0.223	0.103	0.121	0.230	0.268	0.118	0.154	0.226	0.289	0.167	−0.043	0.042	0.021	−0.033
LFSA	−0.331**	−0.205	−0.174	−0.296	−0.353**	−0.188	−0.153	−0.318**	−0.290	−0.163	−0.139	−0.285	−0.192	−0.182	−0.163	−0.140
HFSA	0.503**	0.346**	0.425**	0.487**	0.572**	0.413**	0.489**	0.564**	0.376**	0.284	0.321**	0.379**	0.380**	0.276	0.339**	0.338**

Abbreviation: Low-Fat Sweet (LFSW), High-Fat Sweet (HFSW), Low-Fat Savory (LFSA), High-Fat Savory (HFSA), Choice Frequency (CF), Explicit Liking (EL), Explicit Wanting (EW), Implicit Wanting (IW), Power of Food Scale (PFS).

[1] Data was available for $n = 59$ participants.

[2] The associations were assessed using Pearson or Spearman correlation coefficient (r).

[3] Correlations were classified as negligible (0–0.3), low (0.3–0.5), moderate (0.5–0.7), high (0.7–0.9), and very high (0.9–1.0). Statistically significant correlations after FDR adjustment ($P < 0.05$) are indicated by **.

groups; however, trends indicated that Tel-Aviv Assuta Medical Center employees exhibited higher implicit wanting for LFSW and LFSA, while MBS candidates showed higher explicit liking and wanting for HFSW, as well as higher implicit wanting and explicit liking and wanting for HFSA. Additionally, MBS candidates demonstrated a trend toward higher choice frequency for HFSA and HFSW, whereas Tel-Aviv Assuta Medical Center employees exhibited a trend toward higher choice frequency for LFSA and LFSW.

3.3. Reliability establishment of the LFPQ-He

3.3.1. Test-retest reliability assessment

Test-retest reliability over a one-week interval for choice frequency, explicit liking, explicit wanting, and implicit wanting across the four food categories was assessed among Tel-Aviv Assuta Medical Center employees (i.e., group 1) and is presented in Table 5. The ICC ranges from 0.451 (95 %CI: 0.153, 0.674) to 0.901 (95 %CI: 0.817, 0.948). The great majority of results fell into the moderate to good reliability range.

4. Discussion

This study aimed to translate, culturally adapt, and validate a Hebrew version of the LFPQ for future research use in Israel. Establishing the psychometric properties of a translated scale is crucial for enabling reliable comparisons of results across studies using the same measurement instrument (Bujang et al., 2022). The psychometric properties of an assessment tool are primarily shaped by its validity and reliability. Validity reflects how well the instrument measures what it is designed to measure, whereas reliability evaluates the consistency of its results (Polit, 2015).

To establish the validity of the LFPQ-He, both convergent validity and known group validity assessments were performed. Convergent validity was assessed by comparing the LFPQ-He scores to the PFS total and its subscales scores. The PFS is a useful measure for evaluating the hedonic trigging effect of environments rich in palatable foods, with higher scores indicating greater psychological responsiveness to food (Cappelleri et al., 2009; Lowe et al., 2009). Interestingly, low to moderate positive correlations were observed between PFS and its subscale scores and both automatic (i.e., implicit) and conscious (i.e., explicit) preferences for the HFSA food category. In contrast, low negative correlations were found with automatic (i.e., implicit) and conscious (i.e., explicit) preferences for the LFSW food category. These results are expected, as the hedonic appeal of HFSA foods (i.e., peanut puffs, cheese bourkas, french fries, pizza) is likely higher than that of LFSW foods (i.e., Yogurt 0 % fat with fruits, dates, apple, banana) (Hopkins et al., 2016).

Known-group validity was evaluated by comparing the LFPQ-He scores between two groups with differing anthropometric characteristics (i.e., MBS candidates and Tel-Aviv Assuta Medical Center employees). While the differences were not statistically significant, trends indicated that Tel-Aviv Assuta Medical Center employees exhibited higher automatic preferences for LFSW and LFSA. In contrast, MBS candidates showed higher conscious preferences for HFSW and both higher automatic and conscious preferences for HFSA. These results are consistent with the literature, indicating that individuals with obesity tend to exhibit higher hedonic appetite compared to individuals without obesity (Aukan et al., 2022). Nevertheless, the lower-than-expected results may plausibly reflect the recommendation for patients to begin changing their eating behaviors prior to MBS (Sherf-Dagan et al., 2021), which might influence food preferences. Additionally, a tendency among MBS candidates to portray themselves in an overly favorable light ("fake good") to obtain institutional approval for surgery could also contribute to these results (Sogg et al., 2016).

To establish the reliability of the LFPQ-He, a test-retest assessment was conducted, with the majority of results demonstrating moderate to good reliability. These results highlight the consistency of the instrument across repeated measurements under stable conditions, further

Table 4
Choice frequency, explicit liking, explicit wanting, and implicit wanting scores for the four food categories in each study group[1,**].

Food Category	MBS candidates ($n = 20$)				Assuta Medical Center employees ($n = 39$)			
	CF	EL	EW	IW	CF	EL	EW	IW
LFSW	25.35 ± 11.11	52.29 ± 23.16	52.38 ± 23.24	2.38 ± 30.65	30.54 ± 10.81	53.19 ± 22.88	51.91 ± 21.46	18.59 ± 32.50
HFSW	24.50 (15.00, 28.75)	44.65 ± 24.93	42.75 ± 25.86	−10.63 ± 27.89	20.05 ± 10.79	39.64 ± 25.66	34.25 (13.25, 53.00)	−11.60 ± 29.29
LFSA	18.00 (11.25, 35.25)	40.15 ± 16.35	42.39 ± 15.80	−16.42 (−37.43, 35.26)	23.18 ± 9.48	41.13 ± 19.86	40.03 ± 20.62	−3.22 ± 27.65
HFSA	28.9 ± 14.35	51.24 ± 31.12	51.36 ± 31.86	12.67 ± 40.57	22.23 ± 13.02	41.04 ± 27.79	35.25 (8.75, 52.75)	−4.85 (−34.02, 22.33)

Abbreviation: Low-Fat Sweet (LFSW), High-Fat Sweet (HFSW), Low-Fat Savory (LFSA), High-Fat Savory (HFSA), Choice Frequency (CF), Explicit Liking (EL), Explicit Wanting (EW), Implicit Wanting (IW), Metabolic Bariatric Surgery (MBS).
[1] Data are presented as mean ± SD or median and IQR, as appropriate.
[**] No significant differences between groups ($P < 0.05$) were found for any of the variables.

Table 5
Test-retest reliability between choice frequency, explicit liking, explicit wanting, and implicit wanting across the four food categories among Assuta Medical Center employees[1].

Food Category	ICC (95 % CI)[2,3]			
	CF	EL	EW	IW
LFSW	0.896 (0.808, 0945)**	0.493 (0.205, 0.702)**	0.451 (0.153, 0.674)**	0.830 (0.695, 0.909)**
HFSW	0.813 (0.666, 0.899)**	0.818 (0.675, 0.902)**	0.761 (0.583, 0.869)**	0.755 (0.574, 0.866)**
LFSA	0.901 (0.817, 0.948)**	0.738 (0.547, 0.856)**	0.673 (0.450, 0.817)**	0.873 (0.767, 0.933)**
HFSA	0.822 (0.681, 0.904)**	0.686 (0.469, 0.825)**	0.710 (0.505, 0.840)**	0.702 (0.493, 0.835)**

Abbreviation: Low-Fat Sweet (LFSW), High-Fat Sweet (HFSW), Low-Fat Savory (LFSA), High-Fat Savory (HFSA), Choice Frequency (CF), Explicit Liking (EL), Explicit Wanting (EW), Implicit Wanting (IW), Intraclass Correlation Coefficient (ICC), Confidence Intervals (CI).
[1] Data was available for $n = 37$ for this analysis.
[2] ICC values are presented with their 95 % confidence intervals in parentheses.
[3] Values <0.5 indicate poor reliability, 0.5–0.75 indicate moderate reliability, 0.75–0.9 indicate good reliability, and > 0.9 indicate excellent reliability.
[**] Significant ICC result ($P < 0.05$).

reinforcing its psychometric robustness.

The main strengths of this study include the rigorous and straightforward methodology applied for translating, culturally adapting, and validating the LFPQ-He. In addition, the final food images selected for each food category exhibit sufficient variability to capture diverse preferences and eating patterns, while also considering dietary restrictions stemming from religious practices. Nevertheless, several limitations should be noted. First, the sample size for the validation phase was relatively small, potentially limiting the statistical power of the analysis. However, it is worth noting that the sample size aligns with those used in previous culturally adapted LFPQ studies conducted in other countries (Alkahtni et al., 2016; Carvalho-Ferreira et al., 2019; Hiratsu et al., 2022; Schamarek et al., 2023; Thivel et al., 2023). Second, all selected food images met the suggested criteria, except for rice cakes, which fell below the cut-off for 'liking.' However, it was retained as it met all other criteria and provided a better overall balance in meeting the criteria than alternative options considered for this food category (i.e., LFSA), similar to the inclusion of rye crackers in the original LFPQ adaptation (Oustric et al., 2020). Third, the task included specific food images, so strong dislikes for specific foods could influence results. However, this bias is unlikely to differ between the study groups. Moreover, as per other LFPQ culturally adapted instruments, the task in its current form is not suitable for participants who practice veganism (Schamarek et al., 2023). Fourth, while previous culturally adapted LFPQ studies in other countries assessed sensitivity to change between fasted and fed states (Alkahtni et al., 2016; Carvalho-Ferreira et al., 2019; Hiratsu et al., 2022; Schamarek et al., 2023; Thivel et al., 2023), this study did not address this aspect. Rather, it focused on establishing the critical psychometric properties of validity and reliability (Polit, 2015). Lastly, the LFPQ-He task, PFS, and FFQ rely on self-report measures, making social desirability bias a potential concern. Nonetheless, the study methodologies were applied consistently across both study groups, ensuring comparability of results.

In conclusion, this study details the translation, cultural adaptation, and validation of the Hebrew version of the LFPQ, demonstrating its suitability for assessing food preferences in the Israeli population. The findings indicate that the LFPQ-He presents adequate psychometric properties, including construct validity and test-retest reliability, supporting its use in future research.

CRediT authorship contribution statement

Shiri Sherf-Dagan: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Roni Aviram-Friedman:** Writing – review & editing, Methodology, Conceptualization. **Vital Bahar:** Data curation. **Gal Churi:** Data curation. **Assaf Buch:** Methodology. **Tali Sinai:** Methodology. **Vered Kaufman-Shriqui:** Methodology. **Ilanit Mahler:** Data curation. **Netalie Shloim:** Methodology. **Graham Finlayson:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Conceptualization.

Ethical approval

The first phase of the study was approved by the Institutional Review Board of Ariel University (*AU-HEA-SS-20231015*), and the second phase was approved by the Institutional Review Board of the Assuta Medical Centers (*ASMC #0093–23*). Informed consent was obtained from all participants.

Funding

This research did not receive a specific grant from any funding source.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

We would like to thank Limor Mardy-Tilbor for her assistance with the recruitment of participants.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2025.105520.

Data availability

Data will be made available on request.

References

Alkahtni, S. A., Dalton, M., Abuzaid, O., Obeid, O., & Finlayson, G. (2016). Validation of the Leeds food preference questionnaire in Arabs. *Asia Pacific Journal of Clinical Nutrition, 25*(2), 257–264. https://doi.org/10.6133/apjcn.2016.25.2.07

Arora, C., Sinha, B., Malhotra, A., & Ranjan, P. (2017). Development and validation of health education tools and evaluation questionnaires for improving patient Care in Lifestyle Related Diseases. *Journal of Clinical and Diagnostic Research, 11*(5), Je06–je09. https://doi.org/10.7860/jcdr/2017/28197.9946

Artino, A. R., Jr., La Rochelle, J. S., Dezee, K. J., & Gehlbach, H. (2014). Developing questionnaires for educational research: AMEE guide no. 87. *Medical Teacher, 36*(6), 463–474. https://doi.org/10.3109/0142159x.2014.889814

Arumäe, K., Kreegipuu, K., & Vainik, U. (2019). Assessing the overlap between three measures of food reward. *Frontiers in Psychology, 10*, 883. https://doi.org/10.3389/fpsyg.2019.00883

Aukan, M. I., Brandsaeter, I., Skårvold, S., Finlayson, G., Nymo, S., Coutinho, S., & Martins, C. (2022, Oct). Changes in hedonic hunger and food reward after a similar weight loss induced by a very low-energy diet or bariatric surgery. *Obesity (Silver Spring), 30*(10), 1963–1972. https://doi.org/10.1002/oby.23535

Berridge, K. C. (2009). "Liking" and "wanting" food rewards: Brain substrates and roles in eating disorders. *Physiology & Behavior, 97*(5), 537–550. https://doi.org/10.1016/j.physbeh.2009.02.044. , Jul 14.

Berthoud, H. R. (2006). Homeostatic and non-homeostatic pathways involved in the control of food intake and energy balance. *Obesity (Silver Spring), 14 Suppl 5*, 197s–200s. https://doi.org/10.1038/oby.2006.308. , Aug.

Bland, J. M., & Altman, D. G. (1997). Cronbach's alpha. *Bmj, 314*(7080), 572. https://doi.org/10.1136/bmj.314.7080.572

Blechert, J., Meule, A., Busch, N. A., & Ohla, K. (2014). Food-pics: An image database for experimental research on eating and appetite. *Frontiers in Psychology, 5*, 617. https://doi.org/10.3389/fpsyg.2014.00617

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health, 6*, 149. https://doi.org/10.3389/fpubh.2018.00149

Bujang, M. A., Khee, H. Y., & Yee, L. K. (2022). *A step-by-step guide to questionnaire validation research.* NIH, Malaysia: Institute for Clinical Research.

Cappelleri, J. C., Bushmakin, A. G., Gerber, R. A., Leidy, N. K., Sexton, C. C., Karlsson, J., & Lowe, M. R. (2009). Evaluating the power of food scale in obese subjects and a general sample of individuals: Development and measurement properties. *International Journal of Obesity, 33*(8), 913–922. https://doi.org/10.1038/ijo.2009.107. , Aug.

Carvalho-Ferreira, J. P., Finlayson, G., da Cunha, D. T., Caldas, G., Bandoni, D., & de Rosso, V. V. (2019). Adiposity and binge eating are related to liking and wanting for food in Brazil: A cultural adaptation of the Leeds food preference questionnaire. *Appetite, 133*, 174–183. https://doi.org/10.1016/j.appet.2018.10.034

Charbonnier, L., van Meer, F., van der Laan, L. N., Viergever, M. A., & Smeets, P. A. M. (2016). Standardized food images: A photographing protocol and image database. *Appetite, 96*, 166–173. https://doi.org/10.1016/j.appet.2015.08.041

Hiratsu, A., Thivel, D., Beaulieu, K., Finlayson, G., Nagayama, C., Kamemoto, K., … Miyashita, M. (2022). Development of the Leeds food preference questionnaire in Japanese: Sensitivity and reproducibility of liking and wanting for food in fasted and fed states. *Food Quality and Preference, 102*, Article 104677.

Hopkins, M., Gibbons, C., Caudwell, P., Blundell, J. E., & Finlayson, G. (2016). Differing effects of high-fat or high-carbohydrate meals on food hedonics in overweight and obese individuals. *The British Journal of Nutrition, 115*(10), 1875–1884. https://doi.org/10.1017/s0007114516000775. , May 28.

Hyldelund, N. B., Dalgaard, V. L., Byrne, D. V., & Andersen, B. V. (2022). Why being "Stressed" is "Desserts" in reverse-the effect of acute psychosocial stress on food pleasure and food choice. *Foods, 11*(12). https://doi.org/10.3390/foods11121756. , Jun 15.

Kim, H. Y. (2015). Statistical notes for clinical researchers: Effect size. *Restor Dent Endod, 40*(4), 328–331. https://doi.org/10.5395/rde.2015.40.4.328. , Nov.

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting Intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012. , Jun.

Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., … Halford, J. (2009). The power of food scale. A new measure of the psychological influence of the food environment. *Appetite, 53*(1), 114–118. https://doi.org/10.1016/j.appet.2009.05.016. , Aug.

Martins, C., Aschehoug, I., Ludviksen, M., Holst, J., Finlayson, G., Wisloff, U., … Kulseng, B. (2017). High-intensity interval training, appetite, and reward value of food in the obese. *Medicine and Science in Sports and Exercise, 49*(9), 1851–1858. https://doi.org/10.1249/mss.0000000000001296. , Sep.

Morgado, F. F. R., Meireles, J. F. F., Neves, C. M., Amaral, A. C. S., & Ferreira, M. E. C. (2017). Scale development: Ten main limitations and recommendations to improve future research practices. *Psicol Reflex Crit, 30*(1), 3. https://doi.org/10.1186/s41155-016-0057-1. , Jan 25.

Mukaka, M. M. (2012). Statistics corner: A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal, 24*(3), 69–71. , Sep.

Nunes, C. L., Carraça, E. V., Jesus, F., Finlayson, G., Francisco, R., Silva, M. N., … Silva, A. M. (2022, May). Changes in food reward and intuitive eating after weight loss and maintenance in former athletes with overweight or obesity. *Obesity (Silver Spring), 30*(5), 1004–1014. https://doi.org/10.1002/oby.23407

Oustric, P., Thivel, D., Dalton, M., Beaulieu, K., Gibbons, C., Hopkins, M., … Finlayson, G. (2020). Measuring food preference and reward: Application and cross-cultural adaptation of the Leeds food preference questionnaire in human experimental research. *Food Quality and Preference, 80*, Article 103824.

Pedersen, H., Beaulieu, K., Finlayson, G., Færch, K., Jørgensen, M. E., Lewis, J. I., … Quist, J. S. (2022). Food reward after a traditional Inuit or a westernised diet in an Inuit population in Greenland. *Nutrients, 14*(3). https://doi.org/10.3390/nu14030561

Phillips, A. W., Durning, S. J., & Artino, A. R., Jr. (2021). *Survey methods for medical and health professions education-E-book: A six-step approach.* Elsevier Health Sciences.

Polit, D. F. (2015). Assessing measurement in health: Beyond reliability and validity. *International Journal of Nursing Studies, 52*(11), 1746–1753. https://doi.org/10.1016/j.ijnurstu.2015.07.002. , Nov.

Ranasinghe, C., Hills, A. P., Constantine, G. R., Finlayson, G., Katulanda, P., & King, N. A. (2018). Study protocol: A randomised controlled trial of supervised resistance training versus aerobic training in Sri Lankan adults with type 2 diabetes mellitus: SL-DART study. *BMC Public Health, 18*(1), 176. https://doi.org/10.1186/s12889-018-5069-6. , Jan 24.

Salmón-Gómez, L., Catalán, V., Frühbeck, G., & Gómez-Ambrosi, J. (2023). Relevance of body composition in phenotyping the obesities. *Reviews in Endocrine & Metabolic Disorders, 24*(5), 809–823. https://doi.org/10.1007/s11154-023-09796-3. , Oct.

Schamarek, I., Richter, F., Tönjes, A., Stumvoll, M., Blüher, M., Rohde-Zimmermann, K., & Finlayson, G. (2023). The German Leeds food preference questionnaire (LFPQ-G): A validation study. *Food Quality and Preference, 112*, Article 105035.

Sherf-Dagan, S., Sinai, T., Goldenshluger, A., Globus, I., Kessler, Y., Schweiger, C., & Ben-Porat, T. (2021). Nutritional assessment and preparation for adult bariatric surgery candidates: Clinical practice. *Advances in Nutrition, 12*(3), 1020–1031. https://doi.org/10.1093/advances/nmaa121

Sogg, S., Lauretti, J., & West-Smith, L. (2016). Recommendations for the presurgical psychosocial evaluation of bariatric surgery patients. *Surgery for Obesity and Related Diseases, 12*(4), 731–749. https://doi.org/10.1016/j.soard.2016.02.008

Stockburger, J., Schmälzle, R., Flaisch, T., Bublatzky, F., & Schupp, H. T. (2009). The impact of hunger on food cue processing: An event-related brain potential study. *Neuroimage, 47*(4), 1819–1829. https://doi.org/10.1016/j.neuroimage.2009.04.071. , Oct 1.

Thivel, D., Oustric, P., Beaulieu, K., Moore, H., Bonjean, L., Loglisci, J., … Finlayson, G. (2023). Development, sensitivity and reliability of a French version of the Leeds food preference questionnaire (LFPQ-fr) for the evaluation of food preferences and reward. *Physiology & Behavior, 267*, 114187. https://doi.org/10.1016/j.physbeh.2023.114187

Toet, A., Kaneko, D., de Kruijf, I., Ushiama, S., van Schaik, M. G., Brouwer, A. M., … van Erp, J. B. F. (2019). CROCUFID: A cross-cultural food image database for research on food elicited affective responses. *Frontiers in Psychology, 10*, 58. https://doi.org/10.3389/fpsyg.2019.00058

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017). Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi Journal of Anaesthesia, 11*(Suppl. 1), S80–s89. https://doi.org/10.4103/sja.SJA_203_17. , May.

Zhou, Y., Lu, Y., Jin, X., Liu, J., Finlayson, G., & Zhou, C. (2019). Effects of moderate- and high-intensity acute aerobic exercise on food reward and appetite in individuals with methamphetamine dependence. *Physiology & Behavior, 211*, Article 112649. https://doi.org/10.1016/j.physbeh.2019.112649