Supplementary File S2

Arabic Translation, Cultural Adaptation, and Psychometric Evaluation of the Food Noise Questionnaire in Saudi Adults: supplementary methods and results

Analyses were performed in R 4.3.3 using lavaan 0.6-17, semTools 0.5-6, and psych 2.4.1. N = 445 unless stated otherwise; EFA subsample n = 222; CFA subsample n = 223

S1. Translation, content validity and pilot testing

Table S1. Translation and content validity (1 = not relevant, 4 = highly relevant)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Experts rating 3–4	I-CVI
FNQ1	4	4	4	4	4	5 /5	1.00
FNQ2	4	4	4	4	4	5/5	1.00
FNQ3	4	3	4	4	4	5 /5	1.00
FNQ4	3	3	4	4	3	5 /5	1.00
FNQ5	3	4	3	4	3	5 /5	1.00
S-CVI/Ave	-	-	-	-	-	-	1.00
S-CVI/UA	-	-	-	-	-	-	1.00

I-CVI = proportion of experts rating the item 3 or 4; S-CVI/Ave = mean of the I-CVIs; S-CVI/UA = proportion of items rated 3 or 4 by all experts. With five experts, I-CVI ≥ 0.78 and S-CVI/Ave ≥ 0.90 are considered excellent (Polit & Beck, 2006).

S2. Reliability

Table S2. Reliability coefficients of the Arabic FNQ (full sample, N = 445).

Coefficient	Estimate	95% CI
Cronbach's alpha (Pearson correlations)	0.867	0.847–0.886 (Feldt)
Ordinal alpha (polychoric correlations)	0.893	—
Omega-hierarchical, ω_h (Model B; FNQ4–FNQ5 shared variance treated as error)	0.825	0.791–0.855 (bootstrap)
Omega-total, ω_t (Model B; FNQ4–FNQ5 shared variance treated as reliable)	0.866	0.842–0.887 (bootstrap)
ω_h / ω_t	0.953	—
Categorical omega (Green & Yang), Model B	0.835	—
Composite reliability, Model B (CFA subsample; standard formula)	0.883	—
Composite reliability, Model B, including residual covariance in the denominator	0.848	—

ω_h and ω_t were computed from Model B estimated by maximum likelihood in the full sample, with 2000 bootstrap resamples. The omega reported in the original submission (0.860) was computed from standardized loadings without the residual covariance term in the denominator, which overstates ω_h; the corrected values are shown above. Alpha (0.867) ≈ ω_t (0.866) because alpha also counts the FNQ4–FNQ5 shared variance as true-score variance.

S3. Exploratory factor analysis

Table S3. Factor-retention criteria and alternative solutions (EFA subsample, n = 222; polychoric correlations).

Criterion	1	2	3	4	5
Observed eigenvalues (full correlation matrix)	3.53	0.80	0.27	0.24	0.16
Parallel analysis, 95th percentile (components)	1.21	1.09	1.00	0.91	0.80
Observed eigenvalues (reduced matrix, common factors)	3.20	0.36	−0.01	−0.13	−0.23
Parallel analysis, 95th percentile (common factors)	0.70	0.11	0.03	−0.03	−0.12
Velicer MAP (average squared partial correlation)	0.163	0.186	0.395	—	—

Parallel analysis based on the full (component) eigenvalues, recommended for ordinal data by Garrido et al. (2013), and the MAP test indicated one factor; parallel analysis on reduced eigenvalues indicated a possible minor second factor.

Item	One factor, minres (main analysis)	One factor, principal axis	Two factors (oblimin): F1	Two factors (oblimin): F2
FNQ1	0.707	0.708	0.902	−0.136
FNQ2	0.900	0.897	0.895	0.074
FNQ3	0.903	0.898	0.696	0.258
FNQ4	0.777	0.780	0.141	0.773
FNQ5	0.687	0.690	−0.045	0.903
Factor correlation	—	—	0.645	

The second factor of the two-factor solution is defined only by FNQ4 and FNQ5 (a two-item factor) and corresponds to the FNQ4–FNQ5 local dependence modelled in the CFA.

Table S4. Principal component analysis of Pearson correlations (EFA subsample, n = 222), as reported in the original submission, re-estimated using the revised analysis workflow.

Item	Component loading	Communality	
FNQ1	0.757	0.573	
FNQ2	0.878	0.771	
FNQ3	0.878	0.771	
FNQ4	0.808	0.653	
FNQ5	0.736	0.542	
Eigenvalues	3.31, 0.84, 0.34, 0.30, 0.21	Variance explained 66.2%	KMO = 0.805; Bartlett $\chi^2(10) = 614.9$

S4. Confirmatory factor analysis: sensitivity analyses

Table S5. Alternative estimators and samples, local fit, and equivalent models.

Model	χ^2	df	p	CFI	TLI	RMSEA (90% CI)	SRMR	Std. loadings FNQ1–5
CFA half, WLSMV, Model A (main)	100.77	5	< 0.001	0.952	0.904	0.294 (0.245–0.345)	0.085	.79/.84/.88/.82/.72
CFA half, WLSMV, Model B (main)	12.55	4	0.014	0.996	0.989	0.098 (0.040–0.162)	0.024	.81/.85/.92/.71/.56
CFA half, MLR, Model A	55.26	5	< 0.001	0.895	0.790	0.226	0.074	.75/.81/.86/.72/.58
CFA half, MLR, Model B	4.99	4	0.288	0.998	0.995	0.036	0.022	.77/.82/.86/.68/.51
EFA half, WLSMV, Model A	143.16	5	< 0.001	0.943	0.887	0.354 (0.305–0.405)	0.092	.76/.91/.87/.81/.75
EFA half, WLSMV, Model B	30.37	4	< 0.001	0.989	0.973	0.173 (0.119–0.232)	0.039	.77/.93/.91/.69/.60
Full sample, WLSMV, Model A	235.45	5	< 0.001	0.947	0.895	0.322 (0.288–0.358)	0.089	.77/.88/.87/.82/.74
Full sample, WLSMV, Model B	45.33	4	< 0.001	0.991	0.976	0.153 (0.114–0.194)	0.031	.79/.90/.91/.70/.58

WLSMV rows report scaled statistics. For Model B in the CFA half, the robust indices were CFI = 0.991, TLI = 0.978, RMSEA = 0.084 (0.000–0.156); the unscaled DWLS statistic was $\chi^2(4) = 4.29$, p = 0.368 (the value reported in the original submission). MLR rows report robust indices.

Residual correlation (Model B, CFA half)	FNQ1	FNQ2	FNQ3	FNQ4	FNQ5
FNQ1	—				
FNQ2	0.030	—			
FNQ3	−0.009	−0.016	—		
FNQ4	−0.031	−0.005	0.017	—	
FNQ5	−0.059	−0.017	0.047	0.000	—

Equivalent models (CFA half): Model B, a bifactor model with a two-item specific factor (FNQ4, FNQ5; equal specific loadings = 0.590) and a correlated two-factor model (FNQ1–3; FNQ4–5) have identical fit (scaled $\chi^2(4) = 12.55$). Bifactor: general loadings 0.806/0.854/0.918/0.710/0.558; ECV = 0.813; PUC = 0.90. Two-factor model: factor correlation = 0.730 (95% CI 0.652–0.807). Modification indices of Model A: FNQ4~~FNQ5 = 58.7; next largest FNQ1~~FNQ5 = 13.9.

S5. Measurement invariance

Table S6. Measurement invariance: RMSEA confidence intervals, group-specific loadings and latent means.

Model	RMSEA (90% CI)	Group	Value
Sex: configural / thresholds / metric / scalar	0.160 (0.121–0.202) / 0.085 (0.055–0.115) / 0.071 (0.042–0.099) / 0.058 (0.028–0.086)	Latent mean, women vs. men (scalar model)	0.184 SD (−0.031 to 0.399), p = 0.094
Obesity: configural / thresholds / metric / scalar	0.153 (0.113–0.195) / 0.090 (0.061–0.121) / 0.092 (0.066–0.120) / 0.080 (0.055–0.106)	Latent mean, obese vs. non-obese (partial scalar model)	0.352 SD (0.144 to 0.560), p = 0.001

Obesity status: tests releasing one loading at a time from the full metric model (each compared with the threshold-invariant model): FNQ1 $\Delta\chi^2(3) = 13.53$, p = 0.004; FNQ2 $\Delta\chi^2(3) = 10.77$, p = 0.013; FNQ3 $\Delta\chi^2(3) = 11.44$, p = 0.010; FNQ4 $\Delta\chi^2(3) = 13.41$, p = 0.004; FNQ5 $\Delta\chi^2(3) = 1.90$, p = 0.594. Only releasing FNQ5 removed the misfit. Standardized loadings in the threshold-invariant model, non-obese / obese: FNQ1 0.774 / 0.826; FNQ2 0.872 / 0.919; FNQ3 0.917 / 0.912; FNQ4 0.667 / 0.738; FNQ5 0.450 / 0.727. With the FNQ5 loading free but all intercepts constrained, $\Delta\chi^2(4) = 2.43$, p = 0.657 (ΔCFI = 0.001) and the latent

mean difference was 0.347 SD (0.141 to 0.552), p = 0.001. The FNQ1–FNQ4 sum score was higher in participants with obesity (7.50 ± 3.80 vs. 6.29 ± 3.67; Welch p < 0.001).

S6. Group comparisons: additional analyses

Table S7. BMI with the underweight and normal-weight categories combined, and complete Games–Howell post hoc results.

BMI group	n	Mean ± SD	Test	Effect size	Trend / post hoc
< 25 kg/m²	111	7.15 ± 4.33	F(2, 430) = 6.19, p = 0.002	$\eta^2 = 0.028$; $\omega^2 = 0.023$	Linear trend p < 0.001; Welch F p = 0.003; Kruskal–Wallis p = 0.003
25–29.9 kg/m²	126	7.80 ± 4.25			≥ 30 vs. < 25: diff 1.79, p = 0.003
≥ 30 kg/m²	196	8.94 ± 4.69			≥ 30 vs. 25–29.9: diff 1.14, p = 0.065; 25–29.9 vs. < 25: diff 0.65, p = 0.478

Comparison (Games–Howell)		Mean difference	p
BMI category	Normal − Underweight	−0.49	0.978
	Overweight − Underweight	0.20	0.998
	Obese − Underweight	1.34	0.695
	Overweight − Normal	0.69	0.630
	Obese − Normal	1.83	0.006
	Obese − Overweight	1.14	0.113
Restaurant/café meals	2–4/month − once a month	1.41	0.096
	2–4/week − once a month	2.23	0.001
	Once daily − once a month	3.52	< 0.001
	≥ twice daily − once a month	2.57	0.127
	2–4/week − 2–4/month	0.82	0.507
	Once daily − 2–4/month	2.11	0.042
	≥ twice daily − 2–4/month	1.16	0.789
	Once daily − 2–4/week	1.29	0.419
	≥ twice daily − 2–4/week	0.34	0.997
	≥ twice daily − once daily	−0.95	0.924
Physical activity	All 10 pairwise comparisons	−0.64 to 0.17	≥ 0.926

S7. Sensitivity analysis: duplicate records removed

Table S8. Key results after removal of the five redundant copies of exact duplicate records (ids 63, 141, 320, 321, 403).

Quantity	Primary analysis (N = 445)	Duplicates removed (N = 440)
CFA subsample n	223	222
Cronbach's alpha	0.867	0.868
Omega-hierarchical (Model B)	0.825	0.827
CFA Model A: CFI / TLI / RMSEA / SRMR	0.952 / 0.904 / 0.294 / 0.085	0.953 / 0.907 / 0.291 / 0.083
CFA Model B: CFI / TLI / RMSEA / SRMR	0.996 / 0.989 / 0.098 / 0.024	0.996 / 0.990 / 0.096 / 0.023
Spearman ϱ, FNQ with BMI	0.186	0.195
Obese vs. non-obese: Hedges' g; p	0.32; 0.001	0.34; < 0.001
BMI-category ANOVA p	0.006	0.004
Restaurant/café meals ANOVA p	< 0.001	< 0.001
Sex, Welch t-test p	0.136	0.124

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