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Mediterranean Challenge: a pilot study on the feasibility, acceptability and preliminary changes in Mediterranean Diet literacy of an educational board game among first-year university students

Mediterranean Challenge: estudio piloto sobre la viabilidad, la aceptabilidad y los cambios preliminares en la alfabetización en Dieta Mediterránea de un juego de mesa educativo en estudiantes universitarios de primer curso

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ABSTRACT

Introduction: Declining adherence to the Mediterranean Diet (MD) among young Spaniards and the limited application of nutritional knowledge support exploring innovative educational formats. Mediterranean Challenge is a trivia-style board game developed within the PRIMA-Tool4MEDLife project, with content mapped a priori to the Lit-MEDiet framework. This pilot study evaluated its feasibility, acceptability, and preliminary signals of change in perceived MD literacy.

Methods: Quasi-experimental pre-post pilot study with two arms (Mediterranean Challenge and control) among first-year nursing students at Ramon Llull University. The intervention comprised four weekly sessions of 30-45 minutes. Recruitment, retention, and attendance were recorded; acceptability was assessed with the Intrinsic Motivation Inventory (IMI) and perceived MD literacy with Lit-MEDiet before (T0) and after (T1) the intervention.

Results: Of 51 participants, 54.9% completed T1 and 43.1% provided matched data. All 18 intervention participants with available data attended the four sessions. IMI scores were high for Interest/Enjoyment (6.21±0.80) and Value/Usefulness (5.97±1.05). In the full matched intervention sample (n=15), the change in Lit-MEDiet was not significant (p=0.461). In the exploratory sensitivity sample (n=11), after excluding four flagged responses, Lit-MEDiet decreased from 2.04±0.50 to 1.53±0.45 (p=0.010; dz=−0.95), indicating lower perceived difficulty. The control group showed no significant changes.

Conclusions: Mediterranean Challenge was feasible and acceptable in a university classroom, with moderate retention. The change in perceived MD literacy was not significant in the full matched sample; the signal observed in the sensitivity analysis depends on the handling of flagged responses. As a non-randomised pilot, these findings do not support inferences about efficacy and inform the design of a randomised confirmatory trial.

Funding: Partnership for Research and Innovation in the Mediterranean Area (PRIMA), Horizon Europe Programme (Tool4MEDLife project).

Keywords: Nutrition Education; Mediterranean Diet; Health Literacy; Feasibility Studies; Experimental Games.

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RESUMEN

Introducción: El descenso de la adherencia a la Dieta Mediterránea (DM) en jóvenes y la escasa aplicación práctica del conocimiento nutricional justifican explorar formatos educativos innovadores. Mediterranean Challenge es un juego de mesa tipo trivia del proyecto PRIMA-Tool4MEDLife, con contenido mapeado a priori al marco Lit-MEDiet. Este piloto evaluó su viabilidad, su aceptabilidad y las señales preliminares de cambio en la alfabetización percibida en DM.

Métodos: Estudio piloto cuasi-experimental pre-post con dos brazos (Mediterranean Challenge y control) en estudiantes de primer curso de Enfermería (Universidad Ramon Llull). La intervención consistió en cuatro sesiones semanales de 30-45 minutos. Se registraron el reclutamiento, la retención y la asistencia; la aceptabilidad se evaluó con el Intrinsic Motivation Inventory (IMI) y la alfabetización percibida en DM, con Lit-MEDiet antes (T0) y después (T1) de la intervención.

Resultados: De 51 participantes, el 54,9% completó T1 y el 43,1% aportó datos emparejados. Los 18 participantes de intervención con datos disponibles asistieron a todas las sesiones. El IMI mostró puntuaciones elevadas de Interés/Disfrute (6,21±0,80) y Valor/Utilidad (5,97±1,05). En la muestra completa emparejada de intervención (n=15), el cambio en Lit-MEDiet no fue significativo (p=0,461). En la muestra de sensibilidad exploratoria (n=11), tras excluir cuatro respuestas señaladas, disminuyó de 2,04±0,50 a 1,53±0,45 (p=0,010; dz=−0,95), lo que indica menor dificultad percibida. El grupo control no mostró cambios significativos.

Conclusiones: Mediterranean Challenge fue viable y aceptable en el aula universitaria, con una retención moderada. El cambio en la alfabetización percibida no fue significativo en la muestra completa; la señal de mejora del análisis de sensibilidad depende del tratamiento de las respuestas señaladas. Al tratarse de un piloto no aleatorizado, estos resultados no permiten inferir eficacia y orientan el diseño de un ensayo aleatorizado confirmatorio.

Financiación: Partnership for Research and Innovation in the Mediterranean Area (PRIMA), Programa Horizonte Europa (proyecto Tool4MEDLife).

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Palabras clave: Educación alimentaria; Dieta Mediterránea; alfabetización en salud; estudios de factibilidad; juegos experimentales.

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HIGHLIGHTS

- Brief, engaging educational formats that fit within academic routines offer a feasible approach to addressing Mediterranean Diet literacy in university classrooms.
- The *a priori* mapping of game content to the measurement instrument (Lit-MEDiet) allows observed changes to be interpreted in relation to what was actually taught during gameplay.
- In classroom pilot studies, high attendance and acceptability can coexist with potential response quality problems in the post-intervention questionnaire, highlighting the need for explicit quality-control procedures.
- Mediterranean Challenge demonstrates feasibility and acceptability in university classrooms, with moderate retention at follow-up; a confirmatory randomised trial with a larger sample is the logical next step.

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INTRODUCTION

Adherence to the Mediterranean Diet (MD) has declined among young people in Spain: mean KIDMED scores fell from 7.37 in 1998–2000 to 6.96 in 2019–2020[1], while PASOS found a decline from 7.13 to 6.57 over 3.58 years[2]. First-year university students face new autonomy, budgets, routines, and food environments[3,4]; only 29.3% of Spanish university students show high MD adherence[5]. This transition offers an opportunity for classroom-based education.

The MD is a dietary and cultural model that encompasses food selection, culinary practices, seasonality, sustainability, conviviality, and lifestyle[6]. Promoting it requires more than transmitting knowledge: students may know which foods are healthy yet struggle to apply this knowledge when planning meals, interpreting food information, or choosing affordable options. This gap lies at the core of food literacy, the capacity to access, understand, evaluate, and use food-related information in everyday decisions[7,8].

The Lit-MEDiet instrument operationalises MD-related health literacy across four axes (food and Mediterranean Diet composition, food production and sustainability, conviviality, and lifestyle) and four health literacy domains (access, comprehension, evaluation, and application/use)[9]. In the Spanish population, MD-related literacy is associated with MD adherence independently of cooking skills[10], which makes it a distinct educational target, particularly for young adults whose food decisions are increasingly self-directed[3-5,11].

Nutrition education can improve knowledge, but behaviour change after brief university interventions is inconsistent[11,12]. Games support active recall, peer interaction and motivation[13,14]. School-based board games such as Kalèdo have shown encouraging results[15,16], and board games can support health learning more broadly[17]. Yet the relationship between game content and measured outcomes is often unclear.

Mediterranean Challenge was developed within the PRIMA-Tool4MEDLife project as a brief classroom-based board game focused on MD literacy[18]. Although it uses a trivia format, all questions were mapped a priori to the Lit-MEDiet framework, linking the intervention content directly to the outcome measure.

This pilot evaluated Mediterranean Challenge among first-year nursing students. Its objectives were to assess classroom feasibility, acceptability and motivation, and preliminary change in

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perceived MD literacy. Because Lit-MEDiet measures perceived difficulty rather than knowledge or behaviour, this third objective concerns self-perceived literacy rather than efficacy.

METHODS

Study design

The study followed a quasi-experimental pre-post design with two parallel arms (Mediterranean Challenge and control). Allocation was non-random and based on availability: students able to commit to all four weekly sessions were allocated to the intervention arm, and those who wished to participate but could not guarantee attendance were allocated to the control arm. No randomisation, blocking, or stratification was applied. This choice prioritised the organisation of sessions within fixed teaching slots, although these slots did not preclude the methodologically preferable alternative of using availability as an eligibility criterion and then randomising available students; its implications are discussed in the Limitations. Blinding was not feasible, but outcomes were self-reported through anonymised online questionnaires. The study is reported according to the TREND statement[19] (Supplementary Material S5). As a feasibility pilot, no formal sample size calculation was performed and the sample was determined by classroom availability[20]. The study was approved by the Research Ethics Committee of Ramon Llull University (CER URL_2023_2024_014), and all participants provided written informed consent. The protocol and statistical analysis plan were deposited retrospectively in the Open Science Framework (https://osf.io/z2jdc); this record represents retrospective protocol availability rather than prospective preregistration.

Setting and participants

Between 30 April and 26 May 2026, first-year nursing students at Ramon Llull University completed baseline (T0) and post-intervention (T1) assessments. Eligibility required age at least 18 years, ability to complete Spanish questionnaires and no prior formal dietetics or public health nutrition training.

Intervention

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Mediterranean Challenge follows the youth Mediterranean Food Pyramid[6,21]. The board supports up to five players or teams; students played in pairs and took turns answering questions and placing food cards on the board (Supplementary Material S4).

The question cards covered four gameplay areas: food and cooking; Mediterranean culture and conviviality; literacy and lifestyle, including activity and rest; and food skills and production, including shopping, seasonality and labels. These gameplay areas are not identical to the four Lit-MEDiet axes; each question was also mapped to an axis and a health literacy domain for analysis. All 128 trivia questions were mapped a priori to the Lit-MEDiet framework, each linked to one MD axis and one health literacy domain, with 32 questions per domain (Table 1). This mapping, a core methodological feature of the intervention, supports the interpretation of pre-post changes in Lit-MEDiet scores; the item-by-item key is provided in Supplementary Material S3.

Table 1. Mapping of Mediterranean Challenge trivia questions to Lit-MEDiet axes and health literacy domains

Lit-MEDiet axis	Total, n	Access	Compr.	Eval.	Applic.
Food / MD comp.	39	10	11	9	9
Prod. / sustain.	39	10	10	9	10
Lifestyle	33	8	8	9	8
Conviviality	17	4	3	5	5
Total	**128**	**32**	**32**	**32**	**32**

Note. MD: Mediterranean Diet; MD comp.: Mediterranean Diet composition; Prod./sustain.: food production and sustainability; Compr.: comprehension; Eval.: evaluation; Applic.: application/use.

The intervention consisted of four weekly sessions of 30-45 minutes (about two hours in total), delivered in groups of 4 to 8 students per table by trained facilitators following a standardised script. Each session included a brief warm-up, gameplay, peer interaction, and a short guided reflection linking the content to everyday food decisions. The control arm followed its regular curriculum without nutrition-specific content during the four weeks.

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Outcomes and measures

Three types of outcomes were assessed, each with a different source and purpose. Feasibility was assessed through process indicators recorded by the research team[20]: recruitment (consenting participants relative to the eligible class), retention (participants completing the T1 Lit-MEDiet relative to baseline, with matched T0–T1 responses forming the complete-case sample), attendance (intervention participants attending all four sessions), and implementation fidelity (facilitator checklist after each session). Acceptability was assessed with the Intrinsic Motivation Inventory (IMI), completed at T1 by the intervention arm only; it captures enjoyment and perceived value and was not used to assess literacy. Perceived MD literacy was assessed with Lit-MEDiet, completed by both arms at T0 and T1; it measures self-perceived difficulty with MD-related information, not objective knowledge or dietary behaviour, and was the only instrument used to examine pre-post change.

The IMI version used comprised 16 items from two subscales[22]: Interest/Enjoyment (intrinsic motivation) and Value/Usefulness (perceived value), rated from 1 ("not at all true") to 7 ("very true"), with one negatively worded item reverse-coded. Items were administered in Spanish and adapted to refer to the game (Supplementary Material S2).

Lit-MEDiet is a 37-item instrument[9] covering the four axes and four health literacy domains described above. Items are rated for perceived difficulty from 1 ("very easy") to 4 ("very difficult"), so a lower score from T0 to T1 indicates improvement. "I don't know" and blank responses were treated as missing, and total and axis scores were calculated as the mean of the available responses (Supplementary Material S1).

Procedures and statistical analysis

Questionnaires were online. Anonymous study codes allowed confidential T0–T1 matching; identifiable data were stored separately in password-protected files accessible only to the team. Intervention participants completed IMI then Lit-MEDiet at T1; controls completed Lit-MEDiet only.

Feasibility and acceptability were analysed descriptively. Within-group pre-post changes in Lit-MEDiet total scores were examined with paired-samples t-tests, reporting Cohen's dz alongside p-values; axis-level changes were examined with paired comparisons and Holm correction (Table

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4 reports unadjusted p-values, with Holm-adjusted values in parentheses). Internal consistency was assessed with Cronbach's α; for baseline Lit-MEDiet, α was calculated on complete cases across all 37 items, without imputation. An exploratory sensitivity sample excluded intervention participants with invariant T1 responses across all items or an increase in total score exceeding 1.5 points (half of the instrument's 1-4 range). The latter criterion was applied in one direction only and is not a validated cutoff for response invalidity; no control participant met either criterion. According to the authors' recollection, these criteria were modified after inspection of T1 responses and individual score changes, between the retrospective OSF deposit (10 June 2026, after data collection ended on 26 May 2026) and the initial submission (22 July 2026); they should therefore be considered exploratory and data-informed. They also differ from the rule in the deposited analysis plan, which retains participants with a T1 within-subject standard deviation of at least 0.4 and an absolute total-score change below 1.5 points; results under the deposited rule are also reported. During revision, further post hoc checks were conducted in the full matched intervention sample (n = 15) to establish how the estimate varies with the treatment of the four flagged responses; these were not specified in the deposited plan and are described, with full results, in Supplementary Material S6. Analyses were conducted in R version 4.3.

RESULTS

Feasibility indicators

Of the 51 participants who completed the baseline assessment, 28 completed Lit-MEDiet at T1 (18 intervention, 10 control), a retention rate of 54.9%. Matching by anonymous code yielded 22 pre-post pairs (43.1% of baseline): 15 in the intervention arm (15 of 18) and 7 in the control arm (7 of 10). All 18 intervention participants who completed the IMI attended the four sessions. Facilitator checklists showed no relevant deviations from the planned structure, and no adverse events were reported. The participant flow is summarised in Table 2.

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Table 2. Participant flow and analytical samples.

Study phase	n	Notes
Baseline Lit-MEDiet responses recorded	52	T0 assessment
Baseline analytical sample	51	One duplicate removed; most recent response retained
Post-intervention Lit-MEDiet responses recorded	31	T1 assessment
Post-intervention analytical sample	28	Three duplicate T1 responses removed
Mediterranean Challenge arm at T1	18	Completed IMI and Lit-MEDiet; attended all four sessions
Control arm at T1	10	Completed Lit-MEDiet only; no gameplay
Complete-case sample for T0–T1 analysis	22	Participants with matched T0 and T1 Lit-MEDiet data
IMI responses (gameplay arm only)	18	Administered to the intervention arm only
Mediterranean Challenge, full matched sample	15	IMI + matched T0/T1 Lit-MEDiet
Mediterranean Challenge, sensitivity sample	11	After excluding four T1 responses flagged by the exploratory response criteria (see Response quality and exploratory sensitivity sample)
Control	7	Matched T0/T1 Lit-MEDiet, no gameplay

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Acceptability and motivational response

The IMI was completed by 18 intervention participants (Figure 1). The four highest-rated items belonged to the Interest/Enjoyment subscale (means 6.22 to 6.39). Value/Usefulness items spanned a wider range; the lowest mean and highest variability corresponded to “This game could help me improve my eating habits” (5.39 ± 2.15), with several participants giving the lowest possible score while rating the game as highly enjoyable.

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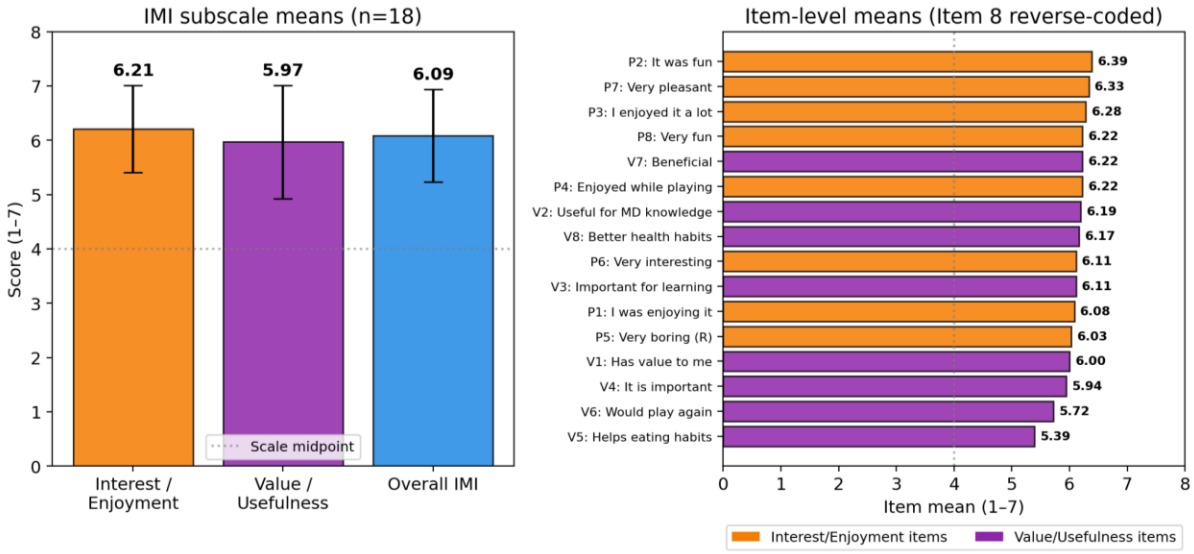


Figure 1. Intrinsic Motivation Inventory after gameplay (n = 18). Left: subscale and overall means with standard deviations. Right: item means in descending order; item 8 (boring) was reverse-coded so higher scores indicate more favourable motivation.

Baseline Mediterranean Diet literacy

Baseline Lit-MEDiet internal consistency was excellent (Cronbach's α = 0.94; n = 35 complete questionnaires). Mean total score was 2.06 ± 0.52. Perceived difficulty was lowest for conviviality (1.90 ± 0.55), followed by food/alimentation (1.98 ± 0.55), lifestyle (2.15 ± 0.66), and food production/sustainability (2.17 ± 0.64).

Response quality and exploratory sensitivity sample

Four intervention participants were flagged for the exploratory sensitivity analysis: three gave the same response to every item (one "very easy", one "very difficult", and one a constant intermediate response), and one showed a total-score increase from 1.92 to 3.70, which alone does not establish response invalidity. Excluding them yielded a sensitivity sample of 11. All flagged cases belonged to the intervention arm; one possible explanation is the heavier assessment burden at T1 (IMI plus Lit-MEDiet immediately after the final session), although this was not assessed directly, and the small matched control sample (n = 7) limits interpretation.

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Preliminary signals of change in Lit-MEDiet

In the full matched intervention sample (n = 15), Lit-MEDiet changed from 2.08 ± 0.46 to 1.90 ± 0.97 (mean Δ = −0.18 ± 0.90; p = 0.461; dz = −0.20), without statistical significance; T1 variability increased. Control participants (n = 7) likewise showed no significant change (2.01 ± 0.44 to 1.86 ± 0.84; Δ = −0.15 ± 0.98; p = 0.698; dz = −0.15).

In the exploratory sensitivity sample (n = 11), Lit-MEDiet decreased from 2.04 ± 0.50 to 1.53 ± 0.45 (mean Δ = −0.51 ± 0.53; 95% CI [−0.86, −0.15]; p = 0.010; dz = −0.95). Pre-post changes are summarised in Table 3.

Table 3. Total Lit-MEDiet change from T0 to T1. Negative values indicate lower perceived difficulty.

Group	n	T0 mean ± SD	T1 mean ± SD	Mean change ± SD	p-value	Cohen's dz	95% CI
Mediterranean Challenge, full matched sample	15	2.08 ± 0.46	1.90 ± 0.97	−0.18 ± 0.90	0.461	−0.20	[−0.67, +0.32]
Mediterranean Challenge, sensitivity sample	11	2.04 ± 0.50	1.53 ± 0.45	−0.51 ± 0.53	0.010	−0.95	[−0.86, −0.15]
Control	7	2.01 ± 0.44	1.86 ± 0.84	−0.15 ± 0.98	0.698	−0.15	[−1.06, +0.76]

Supplementary Material S6 compares the unadjusted paired t-test and Wilcoxon test (n = 15), winsorisation of four flagged T1 scores to the unflagged range (n = 15), replacement by the unflagged mean (n = 15), exclusion under the applied criteria (n = 11), and exclusion under the distinct deposited rule (n = 9). Neither unadjusted test was significant (p = 0.461 and 0.280); the other exploratory analyses were significant (p = 0.001 to 0.031; dz = −0.62 to −1.11). Mean replacement removes the variance of concern and is shown only for completeness. Under the deposited rule, six control participants had no significant change (mean Δ = +0.10 ± 0.80; p =

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0.783), and no axis-level comparison survived Holm correction. Thus, the estimate depends on analytic choices; full results, effect sizes and confidence intervals appear in S6.

In the full matched intervention sample (n = 15), axis-level reductions were small and none was significant (p = 0.291 to 0.695; Table 4). In the exploratory sensitivity sample, scores decreased in all four axes; the reductions were significant for lifestyle, food/alimentation, and conviviality, but not for food production and sustainability. These axis-level results are exploratory.

Table 4. Axis-specific changes in Lit-MEDiet scores from T0 to T1.

Axis	Arm	n	T0 mean ± SD	T1 mean ± SD	Δ ± SD	p (Holm)	95% CI
Food / Alimentation	MC sensitivity	11	1.99 ± 0.60	1.48 ± 0.45	−0.51 ± 0.62	0.021 (0.041)	[−0.92, −0.10]
	MC full matched	15	1.97 ± 0.53	1.87 ± 0.99	−0.11 ± 1.04	0.695 (1.000)	[−0.68, +0.47]
	Control	7	1.99 ± 0.40	1.80 ± 0.85	−0.19 ± 1.00	0.636	[−1.11, +0.74]
Production / Sustainability	MC sensitivity	11	2.10 ± 0.63	1.66 ± 0.55	−0.44 ± 0.76	0.085 (0.085)	[−0.95, +0.07]
	MC full matched	15	2.23 ± 0.62	1.99 ± 0.96	−0.24 ± 0.86	0.304 (1.000)	[−0.71, +0.24]
	Control	7	1.96 ± 0.57	1.96 ± 0.78	−0.00 ± 0.99	0.997	[−0.92, +0.91]
Conviviality	MC sensitivity	11	1.86 ± 0.52	1.36 ± 0.41	−0.50 ± 0.52	0.010 (0.030)	[−0.85, −0.15]
	MC full matched	15	1.93 ± 0.50	1.80 ± 1.05	−0.13 ± 0.96	0.600 (1.000)	[−0.67, +0.40]
	Control	7	1.85 ± 0.45	1.71 ± 0.98	−0.13 ± 1.12	0.767	[−1.17, +0.90]
Lifestyle	MC sensitivity	11	2.14 ± 0.55	1.55 ± 0.47	−0.59 ± 0.56	0.006 (0.023)	[−0.97, −0.21]

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Axis	Arm	n	T0 mean ± SD	T1 mean ± SD	Δ ± SD	p (Holm)	95% CI
	MC full matched	15	2.17 ± 0.53	1.91 ± 0.96	−0.26 ± 0.92	0.291 (1.000)	[−0.77, +0.25]
	Control	7	2.22 ± 0.53	1.93 ± 0.90	−0.29 ± 1.11	0.512	[−1.32, +0.73]

Note. p-values are unadjusted; Holm-adjusted p-values are shown in parentheses for the intervention arm. Intervention results are shown for the exploratory sensitivity sample (n = 11) and for the full matched sample (n = 15); control results use all seven matched participants. 95% CI: 95% confidence interval for the mean pre-post change. Axis assignment of Lit-MEDiet items follows the key reported in Supplementary Material S3.

DISCUSSION

Mediterranean Challenge was implemented in university classrooms with high attendance and acceptability among respondents; 54.9% completed T1 and 43.1% contributed matched data. The pre-post change in the full matched intervention sample (n = 15) was not significant, whereas exclusion of four flagged responses yielded a larger, significant exploratory change (n = 11); the control change was not significant. The sensitivity result must be interpreted alongside the full-sample result. Lit-MEDiet measures perceived difficulty, so these findings establish neither knowledge gain nor dietary change and warrant a larger confirmatory study.

Retention (54.9%) can be considered alongside previous reports for short classroom-based interventions in university students[11]. Complete attendance among the 18 IMI respondents suggests that the four-week format was manageable for them, but barriers among those lost to follow-up cannot be ruled out. Together with the fidelity checklists, these indicators support further evaluation of the game in university teaching, with attention to retention and to the evidence on health-promoting interventions in educational settings[23,24].

IMI scores indicate that participants found the game enjoyable and meaningful, comparing favourably with previous game-based interventions[13,14,17]. The lower and more variable rating of the item on improving eating habits is consistent with the well-documented gap between

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knowledge or perceived competence and dietary behaviour[11,12], supporting the framing of the game as a literacy and engagement tool; influencing behaviour will likely require combining it with strategies such as goal setting, meal planning, or self-monitoring.

Three post-intervention questionnaires showed constant responding, suggesting possible disengaged completion, whereas the fourth flagged response cannot be deemed invalid on the basis of its score change alone. Such response-quality issues are common in classroom self-report assessments among young adults exposed to multiple online surveys[25]; future studies should use shorter batteries, embedded attention checks, or supervised completion.

Standardised estimates ranged from dz = −0.20 in the full matched sample to −0.62 to −1.11 after adjustment or exclusion (−0.95 under applied criteria; S6). Kalèdo studies[15,16] provide context, but their school-aged populations, longer interventions and knowledge or consumption outcomes limit comparison. Broader board-game evidence[17] supports further study, not an efficacy claim from this pilot.

The a priori mapping between game content and Lit-MEDiet helps relate outcomes to what was delivered. Under the applied sensitivity criteria, food/alimentation, conviviality and lifestyle changed most; food production and sustainability changed least despite having as many questions as food/alimentation (Table 1). Complex reasoning about food origin, seasonality and production may contribute. This axis pattern was not significant in the full matched sample and remains exploratory.

The natural next step is a randomised confirmatory evaluation with behavioural outcomes, an active control condition, and stronger response-quality procedures. The content–outcome mapping approach may also be transferable to other game-based interventions targeting health literacy.

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LIMITATIONS

The small, non-randomised sample limits precision and causal inference. No a priori sample-size calculation was undertaken for this feasibility pilot; its effect estimate should not directly power

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a confirmatory trial[20]. Availability-based allocation may have selected students differing in motivation or workload; fixed teaching slots do not justify this choice, and available students should be randomised in a future trial. Table-level clustering was not modelled. The control arm was small (n = 7) and lacked motivation data; the outcome was perceived difficulty, not objective knowledge or behaviour. Sensitivity criteria were modified after T1 inspection and differ from the deposited plan; excluding large increases but not decreases may favour apparent improvement. The short intervention, single university, first-year nursing population and absent baseline demographics limit generalisability and assessment of follow-up loss. Replication with more diverse participants is needed.

CONCLUSIONS

Mediterranean Challenge was feasible and acceptable in first-year university classrooms, with moderate T1 retention (54.9%). Change in perceived MD literacy was not significant in the full matched sample; a preliminary signal in three axes appeared only under the applied exploratory sensitivity criteria (n = 11), whereas none survived Holm correction under the deposited rule (n = 9). This non-randomised pilot provides no evidence of causal efficacy, knowledge gain or dietary change. A larger randomised trial should assess these questions. If the pilot's follow-up (54.9%) and matching (43.1%) rates recur, recruiting approximately 2.3 times the intended analytic sample would be an indicative planning estimate, not a definitive target. Matching should improve. The trial should randomise individuals, report demographics by arm, calculate sample size a priori, use an active control, strengthen response-quality procedures and assess objective dietary behaviour as a co-primary outcome.

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AUTHORS' CONTRIBUTIONS

M.G.C. and E.C.A. conceived the study idea and designed the methodological proposal. M.G.C., M.S., and J.M. conducted the fieldwork and data collection. M.G.C. performed the data analysis. The first draft of the manuscript was written by M.G.C., with support from E.C.A. and M.R.M. All authors critically reviewed this and previous versions of the manuscript and approved the final version for submission.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest in relation to this manuscript.

DATA AVAILABILITY

The study protocol and statistical analysis plan were deposited retrospectively in the Open Science Framework on 10 June 2026, after the end of data collection (30 April–26 May 2026) and before manuscript submission and are available at: https://osf.io/z2jdc. The item-to-axis key and an R script covering record and sample counts, paired total-score and axis-level comparisons, sensitivity analyses and IMI subscale summaries are deposited in the same Open Science Framework project. The anonymised participant-level Lit-MEDiet and Intrinsic Motivation Inventory datasets are available from the corresponding author on reasonable request, subject to ethical and data-protection requirements; the ethics approval obtained for this study does not explicitly cover their public and permanent deposit, and they would be added to the same project only following express confirmation from the Research Ethics Committee or the data protection

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officer. Attendance records, facilitator checklists and the original identity-based matching process are not reproduced from these files.

DATA AVAILABILITY

Artificial intelligence (Claude, Anthropic) was used to assist in the graphical generation and formatting of Figure 1. The underlying data, statistical analyses, and interpretation of results were entirely conducted and verified by the authors. AI was not used for data analysis, writing of the manuscript text, or interpretation of findings.

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