

The Development, Implementation and Evaluation of a Culinary and Nutrition Education Programme

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Abstract: This study involved the development, implementation and evaluation of the *InSajru Ahjar, Nieklu Ahjar (Cooking Better, Eating Better)* SANA programme, a six-week experiential culinary and nutrition education intervention designed to support adults transitioning from structured obesity treatment to independent living. A mixed-methods randomised-control trial was conducted in Malta, with an intervention group (IG, n=12) and a control group (CG, n=9). Pre-post questionnaires assessed cooking and nutrition knowledge, food preparation practices, self-efficacy, self-control and the home food environment. Focus group discussions provided greater insights. Compared with the CG, IG participants demonstrated statistically significant improvements in healthy food preparation and cooking knowledge ($p = .002$), food preparation, cooking and eating practices ($p = .02$), shopping self-efficacy ($p = .016$), cooking self-efficacy ($p = .007$), self-control in healthy eating behaviours ($p = .004$) and availability of prepared vegetables ready for consumption ($p < .022$). Gains were also observed in specific behaviours, including meal planning, preparing meals from basic ingredients, avoiding highly processed foods and consuming vegetables and fruit more regularly. Qualitative findings highlighted increased confidence in food choice, improved cooking skills and enjoyment of healthy food preparation. Despite persistent barriers, such as emotional eating, food costs and family preferences, the SANA programme effectively enhanced food literacy, self-efficacy and sustainable healthy eating practices.

Keywords: Culinary and nutrition education, Experiential learning, Randomised-control trial, Short-term evaluation, After-care for obese adults

Introduction

According to the World Health Organisation (WHO, 2023), the global escalation of obesity continues to pose one of the most pressing public health challenges of the twenty-first century. Overweight and obesity are now responsible for more deaths worldwide than undernutrition, reflecting a significant epidemiological shift (WHO, 2024). Malta has among the highest rates of overweight and obesity in Europe, affecting adults, adolescents and children (OECD and European Observatory on Health Systems and Policies, 2025; WHO, 2025).

The determinants of obesity are complex and multifaceted, encompassing genetic, behavioural and environmental factors (Ahmed & Mohammed, 2025). Increased consumption of ultra-processed foods, a high density of takeaway outlets, and widespread availability of energy-dense confectionery products further exacerbate the issue (Cuschieri, 2020). These environmental influences are compounded by cultural and lifestyle factors, including busy schedules, sedentary behaviours, and social norms surrounding food (Piscopo & Mugliett, in press). In Malta, dietary shifts away from the traditional Mediterranean diet towards more Westernised eating patterns have contributed significantly to the obesity crisis (Cauchi et al., 2017; Cuschieri & Libra, 2021; Treki & Jones, 2021). Taken together, these factors highlight the urgent need for targeted interventions that move beyond information provision to directly address food-related skills, confidence, and behaviours.

Food literacy and culinary skills as public health tools

There is a growing consensus in public health nutrition that knowledge alone is insufficient to foster meaningful and sustained dietary change (Contento & Koch, 2025; Hawkes et al., 2015; Wood et al., 2025). Food literacy – the set of interrelated knowledge, skills, and behaviours needed to plan, manage, select, prepare, and consume food – has emerged as a critical framework for equipping individuals with lifelong competencies (McManus et al., 2025; Vidgen & Gallegos, 2014). Declining cooking confidence and skills, documented in many societies (Lang & Caraher, 2001; Lins et al., 2024; Mills et al., 2017a), have been linked with reduced dietary quality and increased reliance on processed foods. This erosion of home cooking has significant implications for obesity prevention and health promotion, as evidenced by multiple studies where frequent consumption of home-cooked meals was associated with better dietary and health outcomes (Di Costanzo et al., 2025; Mills et al., 2017b; Tiwari et al., 2017).

Interventions that integrate nutrition knowledge with experiential culinary education are increasingly recognised as promising strategies to counteract these trends (Begley et al., 2017; McCloat & Caraher, 2020; Silva et al., 2023; Venkatesh et al., 2025). By teaching participants how to shop, prepare, and cook with healthy ingredients, such programmes translate abstract nutrition concepts into tangible skills. They also foster enjoyment, social connectedness, and empowerment – elements which further support behaviour change (Iacovou et al., 2012; McGowan et al., 2017).

International evidence on the impact of culinary interventions

An extensive review of cooking interventions from around the world undertaken by Calleja (2024) as a first step of this study identified several consistent features and outcomes. Successful interventions tended to share certain characteristics: they were culturally appropriate, delivered in supportive group settings, facilitated by trained educators, and emphasised simple, affordable, and adaptable recipes. Programmes targeting adults, families, and children frequently reported improvements in cooking confidence, self-efficacy, and food-related behaviours. Importantly, interventions embedded in broader community or healthcare settings often showed greater reach and sustainability than those delivered in isolation.

The review by Calleja (2024) also identified significant gaps in research, including limited evaluations of interventions targeted at individuals with overweight or obesity. Most studies focused on general populations or specific subgroups, such as children or university students (Clifford et al., 2009; McMullen & Ickes, 2017; Vaughan et al., 2024). Moreover, while positive short-term outcomes were frequently reported, fewer studies examined medium- or long-term sustainability of behaviour change.

Theoretical underpinnings

Grounding culinary education in behavioural and learning theories strengthens intervention design and interpretation of outcomes (Contento & Koch, 2025). Social Cognitive Theory (Bandura, 1977, 1995) emphasises self-efficacy as a central determinant of behaviour change – the belief in one’s ability to perform specific tasks successfully. Interventions that provide mastery experiences, opportunities for social modelling, and supportive environments are particularly effective in enhancing self-efficacy and, consequently, influencing dietary behaviours (Bouwman et al, 2020).

The Theory of Planned Behaviour (Ajzen, 1991) further highlights the role of attitudes, subjective norms, and perceived behavioural control in shaping intentions and actions. Culinary interventions can shift these constructs by improving attitudes

towards healthy cooking, normalising healthful practices within group contexts, and enhancing individuals' confidence in their ability to prepare nutritious meals despite constraints (Hasan et al, 2019; Mohedo et al, 2026). Ecological models of health behaviour and research which draws upon such models (Buyinza et al, 2025, Eriksson, 2025; Sallis et al., 2008) also remind us that food choices are embedded within broader social, cultural, and economic systems, underscoring the importance of addressing environmental barriers alongside individual skills.

The Maltese context and the rationale for SANA

Despite international progress in food literacy and culinary education, the Maltese context remains under-researched. Very few empirical studies have examined the impact of structured culinary and nutrition programmes among adults, particularly those at high risk of weight regain following treatment for obesity. Individuals who have followed structured programmes at *Dar Kenn għal Saħħtek* (DKghS) – Malta's primary residential and outpatient facility for obesity and eating disorders – represent a critical population group. While they often possess theoretical knowledge gained during treatment, many continue to struggle with applying this knowledge in everyday contexts once they return to independent living. Preliminary scoping research conducted with ex-service users revealed ongoing challenges in meal planning, cooking confidence, and sustaining motivation outside the supportive treatment environment.

This gap provided the impetus for the development of the SANA programme (*InSajru Aħjar, Nieklu Aħjar*; Cooking Better, Eating Better) which is the original educational intervention central to this study. Designed as a six-week experiential course, SANA integrated nutrition education with hands-on cooking and shopping activities tailored to the needs of ex-service users of DKghS. The programme drew upon international evidence, behavioural theories, and insights from a pre-intervention focus group to ensure contextual relevance and responsiveness to participant needs. The programme was delivered by the researcher based on her competencies as a trained Home Economics educator.

Study aim

The present study aimed to evaluate the short-term impact of the SANA programme on multiple dimensions of food literacy and dietary behaviour, including cooking and nutrition knowledge, food-related practices, shopping and cooking self-efficacy, and self-control in relation to healthy eating. Using a mixed-method, randomised controlled design, the research sought not only to measure quantitative outcomes, but

also to capture participant experiences, perceived barriers, and psychosocial benefits through qualitative inquiry.

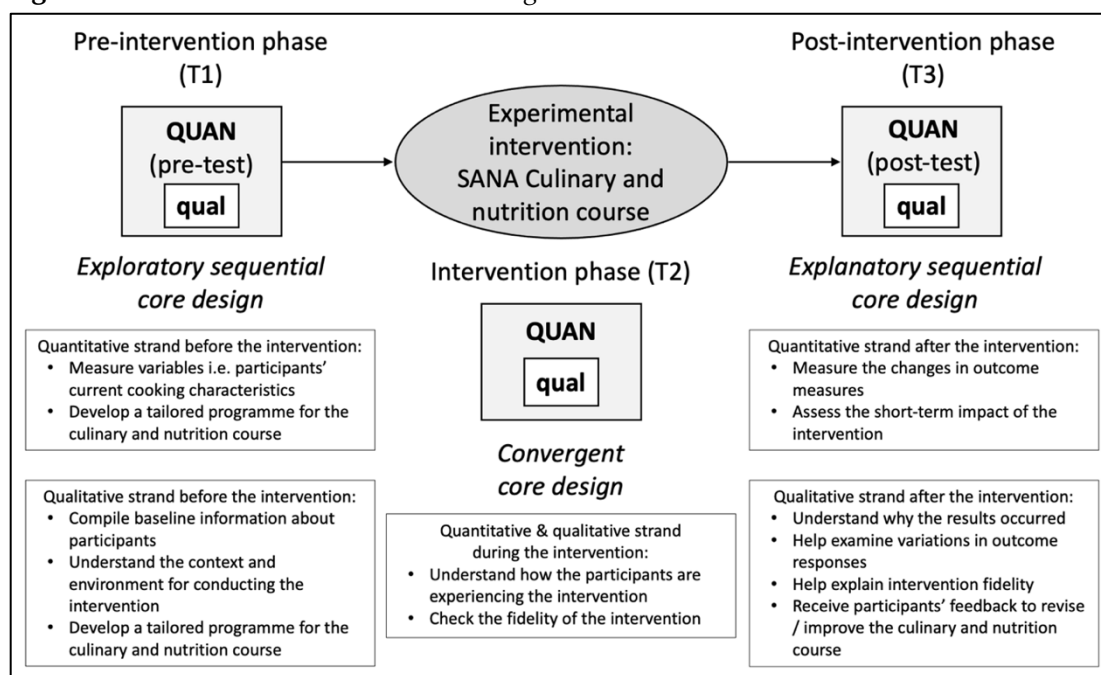
Methodology

Study design

A mixed-method, randomised controlled trial (RCT) design was employed, integrating quantitative and qualitative components to generate a comprehensive evaluation of the original study intervention. The design was guided by a pragmatic research philosophy, acknowledging the complementarity of numerical and experiential data in addressing complex public health questions (Creswell & Plano Clark, 2018).

The design was based on three phases (figure 1). Phase 1 (T1) was the pre-intervention phase where baseline data was collected from participants to uncover their needs and their food and cooking related knowledge, attitudes, skills and practices. This data then also helped inform the design of the intervention. Phase 2 (T2) was the phase where the culinary and nutrition course was delivered and which also included simple process evaluation. Phase 3 (T3) was the post-intervention phase during which assessments were conducted to measure the impact of the course through recorded changes from pre- to post-intervention, as well as other descriptive narratives.

Figure 1 *Mixed-Methods Intervention Design*



Study population and data collection process

Participants were recruited from DKghS. Eligible participants were adults aged 18 years or older who had completed a structured weight-loss or obesity treatment programme at the centre within the previous 12 months. This group was targeted because the transition from structured clinical support to independent living is a critical phase for sustaining healthy behaviours and avoiding relapse. Exclusion criteria included ongoing medical complications requiring intensive care and inability to understand Maltese or English, as the intervention and questionnaires were delivered in these two languages.

Recruitment was coordinated through DKghS staff, who informed eligible ex-service users about the study. Individuals who expressed interest were invited to an in-person information session where the researcher explained the study aims, procedures, and requirements. Eventually 21 people volunteered to join the study. Participants were randomly allocated to the intervention group (IG) or control group (CG) using a simple randomisation procedure. The IG comprised 12 adults who attended the SANA programme, while the CG comprised 9 adults who continued their usual dietary and lifestyle routines without additional support during the study period. Both groups completed baseline assessments (T1, six weeks prior to the intervention) and follow-up assessments (T3, six weeks post-intervention). Written informed consent was obtained from all participants prior to enrolment.

Quantitative data were collected via pre- and post-intervention questionnaires. Qualitative insights were gathered through focus group interviews with IG participants, conducted both before the intervention (to inform programme tailoring) and after the intervention (to capture participants' experiences and perceived outcomes). A process evaluation was embedded across all six sessions to monitor fidelity of delivery, assess participant engagement and capture immediate feedback.

Intervention course design

The SANA programme was designed following a multi-stage process:

1. Literature review: An extensive review of international adult cooking interventions (1995–2019) provided evidence on effective practices, including cultural adaptation, affordability of ingredients, facilitator competence, and the value of group-based delivery.
2. Theoretical grounding: The programme design was underpinned by Social Cognitive Theory (Bandura, 1995), the Theory of Planned Behaviour (Ajzen, 1991), and adult learning theories, particularly Kolb's (1984) experiential learning cycle. These frameworks highlighted the importance of mastery

experiences, social modelling, and reflective practice in supporting behaviour change.

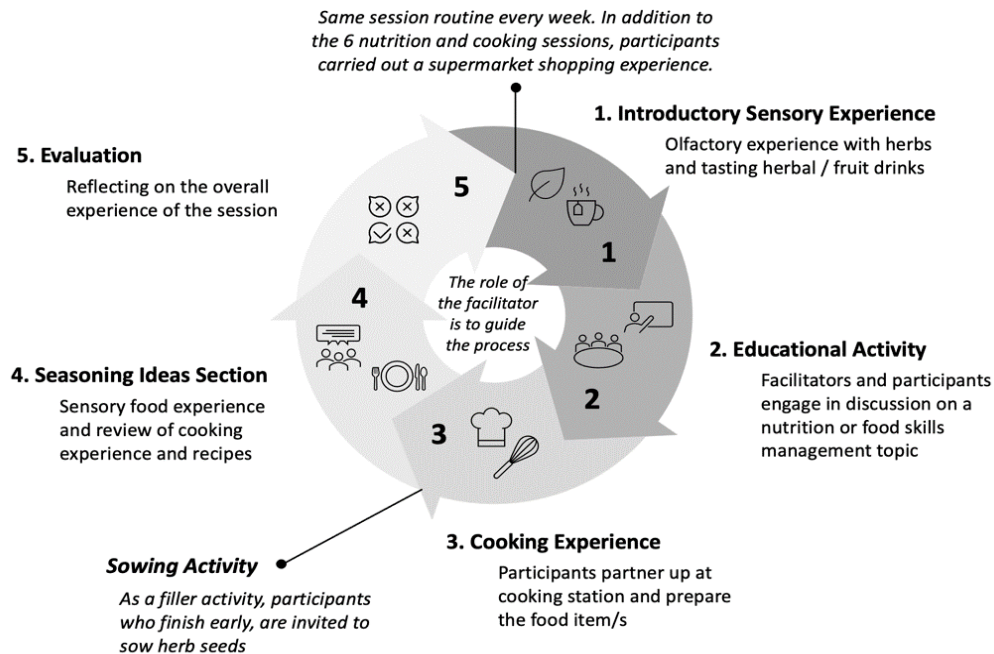
3. Needs assessment: A pre-intervention focus group with IG participants identified barriers and enablers to healthy eating, which informed session themes and recipe selection. Key issues included cost of food, time constraints, family preferences, and limited cooking confidence.

The course consisted of six weekly sessions (T2) of approximately 2.5 hours each. Every session included:

- Theoretical input: A short, interactive presentation on a nutrition or food literacy theme (e.g., balanced meals, portion control, food labelling, meal planning).
- Practical cooking activity: Collaborative preparation of recipes aligned to the theme, emphasising healthy and affordable dishes.
- Reflection and discussion: Structured time to review learning, share experiences and set personal goals.

Figure 2 offers a pictorial explanation of the flow of steps in each session. The sessions were built on five stages with a strong active learning approach mixing theoretical input with more experiential activities. These included an introductory sensory experience, an educational activity, a cooking experience merged with a sowing activity, a concluding sensory experience and a mini-evaluation.

Figure 2 *The Sequence of Steps in Each Session*



Educational resources were developed to reinforce learning, including recipe booklets, pantry guides, meal planners and information packs. These were distributed to the participants to facilitate extending learning to the home. To strengthen real-world application, the final session included a supervised supermarket shopping experience, enabling participants to practise label reading, budgeting and healthy food selection.

The study's intervention planning, design and execution took place between 2019 and 2020 when the Covid-19 pandemic struck. This presented some challenges due to social distancing protocols. Nonetheless, with the cooperation of the participants, these were overcome safely and efficiently.

Measures

Quantitative instruments

Data were collected using a structured questionnaire administered at T1 (pre-intervention) and T3 (post-intervention). The tool contained 104 close-ended items organised into five domains:

1. Cooking and nutrition knowledge – assessed through multiple-choice and confidence-based questions adapted from validated tools (Michaud, 2007; Warmin, 2009).
2. Food-related attitudes and preferences – measured using Likert-scale items on perceptions of healthy eating and cooking.
3. Food-related practices – included meal planning, recipe modification, cooking from scratch, bulk cooking, seasoning practices, and use of fruit and vegetables.
4. Shopping and cooking self-efficacy – adapted from Bandura's (1995) and Rimal's (2000) scales, with items covering confidence in choosing low-salt products, using shopping lists, and preparing balanced meals.
5. Self-control and effort – assessed using self-regulation items reflecting consistency in incorporating healthy foods across meals.

Apart from those already indicated, a number of other validated international instruments were considered (Bernardo et al., 2017; Condrasky et al., 2011; McMullen & Ickes, 2017) and items adapted for cultural relevance to Malta. The potential for bias in the focus and in the specific choice of items for the questionnaire has to be acknowledged as a limitation, given that the tool was developed by the researcher, though it did receive face and content validity from an expert in the field.

Questionnaires were available in Maltese and English to facilitate accessibility and reduce respondent burden. Pilot testing improved clarity, ensured linguistic appropriateness and confirmed feasibility of administration. Minor revisions were made prior to final deployment. To minimise bias from external interference, questionnaires were administered in supervised settings. For participants with lower literacy, the researcher provided neutral assistance by reading questions aloud and recording responses verbatim without interpretation.

Qualitative instruments

Focus groups were conducted with IG participants at two time points. The pre-intervention focus group functioned as a quasi-needs assessment, eliciting participants' dietary habits, cooking practices and barriers to healthy eating. The post-intervention focus group explored participant experiences of the various themes and activities of the course, reflections on learning and perceived changes in attitudes and behaviour.

Both focus groups were semi-structured, guided by an interview schedule with open-ended questions organised in a funnel sequence to encourage depth and reflection (Krueger & Casey, 2015). Sessions lasted between 60 and 90 minutes, were audio-recorded with consent, transcribed verbatim and anonymised for analysis. Pseudonyms were used in the final report.

Process evaluation

Process evaluation was conducted throughout programme delivery. This included researcher observations, informal conversations with participants and structured feedback forms completed at the end of each session. Feedback forms asked about enjoyment, recipe practicality and potential application at home, and used a three-point Likert scale enhanced with smiley-face icons for participants with lower literacy. These complementary measures ensured that immediate reactions were captured alongside more reflective focus group data.

Statistical Analysis

Quantitative data were analysed using IBM SPSS Statistics. Descriptive statistics summarised demographic variables, including age, gender, education and occupation. Within-group changes from T1 to T3 were calculated using mean differences. Paired t-tests and Wilcoxon signed-rank tests were applied to ordinal data, while McNemar tests were used for paired nominal data. Between-group

differences between IG and CG were analysed using Mann-Whitney tests. Statistical significance was set at $p < .05$ for all analyses. (Other levels were provided for insight into orientation of findings).

Qualitative data were analysed thematically following Braun and Clarke's (2006) six-step process. Transcripts were coded deductively according to a priori themes derived from the study objectives, with additional codes generated inductively to capture emergent insights. Triangulation of quantitative and qualitative findings enabled deeper interpretation and validation of outcomes.

Ethical issues

Approval to conduct this study was obtained from the University of Malta Research Ethics Committee in June 2019. All measures were taken to ensure a sound ethical process. Participants were given explanations at different stages about what their involvement would entail. They were also told that participation was voluntary and that they could withdraw from the study, from completing the online survey and from the FGI at any time without any negative repercussions to them. A Consent form was obtained from all participants at initiation of this study. Moreover, all hard copy documents and/or any audio recordings were stored in a secure place accessible only by the researcher. During the intervention and FGI sessions, participants were asked to respect confidentiality. Given the sensitive past experience of the participants at the weight management centre, courtesy and appropriate language was used by the researcher who also requested the participants to do the same.

Results

Sample description

The final analysed sample consisted of 21 participants, with 12 pertaining to the intervention group (IG) and 9 to the control group (CG) (Table 1). The mean age of IG participants was 57.7 years (SD = 14.4) compared with 54.6 years (SD = 11.2) in the CG, reflecting the middle-aged and older adult profile typical of the DKghS population. Both groups were mixed-gender, with a relatively equal female-male distribution. Participants represented varied educational and occupational backgrounds. Baseline comparisons showed no significant differences between the groups in demographic characteristics or outcome measures.

Table 1 *Demographic Characteristics of the Participants*

Demographic characteristics	IG (n=12)	CG (n= 9)
Gender	n (%)	n (%)
Female	7 (58.3)	5 (55.6)
Male	5 (41.7)	4 (44.4)
Age range in years		
30-39	2 (16.7)	1 (11.1)
40-49	1 (8.3)	1 (11.1)
50-59	3 (25)	4(44.4)
60-69	2 (16.7)	1 (11.1)
70+	4 (33.3)	1 (11.1)
Not stated	0 (0)	1 (11.1)
Mean age years (SD)	57.7 (14.4)	54.6 (11.2)
Locality		
South	2 (16.6)	5 (50)
Central	10 (83.3)	3 (33.3)
North	0 (0)	1 (11.1)
Household characteristics		
Couple with adult children (18+) living at home	4 (33.3)	2 (22.2)
Couple without children living at home	2 (16.7)	2 (22.2)
Lone parent with young children (0-17 years old) living at home	1 (8.3)	0 (0)
Live alone	2 (16.7)	4 (44.4)
Live with another 2 flatmates	1 (8.3)	0 (0)
Live with parents	2 (16.7)	0 (0)
Live with daughter's family	0 (0)	1 (11.1)
Level of education		
Primary	2 (16.7)	1 (11.1)
Secondary	7 (58.3)	6 (66.7)
Vocational	1 (8.3)	1 (11.1)
Post-secondary	1 (8.3)	1 (11.1)
Tertiary	1 (8.3)	0 (0)
Employment status		
Full-time	2 (16.7)	1 (11.1)
Part-time	1 (8.3)	0 (0)
Unemployed	2 (16.7)	2 (22.2)
Retired	6 (50)	3 (33.3)
Home duties/ carer	1 (8.3)	3 (33.3)

Table 1 *Demographic Characteristics of the Participants (CONTINUED)*

Net monthly household income		
<€800	2 (16.7)	4 (44.4)
€800 to €1349	3 (25)	3 (33.3)
€1350 to €1849	1 (8.3)	0 (0)
€2950 to €3599	0 (0)	1 (11.1)
Don't know	1 (8.3)	0 (0)
I would rather not say	5 (41.7)	1 (11.1)

Quantitative outcomes

The following sections and tables 2-5 will describe the short-term impact of the SANA intervention, examining within-group and between-group pre- and post-test results and indicating their significance. Presenting both within-group and between-group changes provides a more robust picture of an intervention's efficacy. Within-group change indicates whether an individual group changed over time (e.g., pre- to post-test), while between-group change indicates whether the intervention caused a significantly greater change in the Intervention group than in the Control group.

Of note, confounding variables may have influenced the results. Factors in all the participants' lives during the course of the intervention may have impacted different variables of interest. Another cautionary note is necessary regarding the very low statistical power as there was a risk of both Type I (false positive) and Type II (false negative) errors and the potential for results to be heavily influenced by one or two participants. Therefore, generalisability of results is limited. Finally, as results which are significant at $p < 0.1$ are also highlighted, one needs to be aware that these are just indicative of potential trends, warranting a larger sample size for future research.

Cooking and nutritional knowledge

Analyses showed significant within-group improvements for the IG in overall cooking knowledge ($p = .005$) and nutritional knowledge ($p = .029$). Between-group comparisons confirmed a significant difference for cooking knowledge ($p = .002$), but not for nutritional knowledge.

Table 2

Significant Mean Scores for Outcome Measures 1-3, 6-9 at Pre-Test (T1) and Post-Test (T3) Within the Intervention and Control Groups

Outcome measure/ Questionnaire item	IG (n= 12)			CG (n = 9)		
	Pre-test mean (SD)	Post-test mean (SD)	Change from baseline (T3-T1) P value ^a	Pre-test mean (SD)	Post-test mean (SD)	Change from baseline (T3-T1) P value ^a
1. Healthy Food Preparation & Cooking Knowledge^b	.34 (.25)	.64 (.28)	.005***	.49 (.23)	.51 (.20)	.414
1.2 Olive oil can be used liberally when preparing and cooking food.	-.17 (1.03)	.33 (.98)	.083*	.44 (.88)	.00 (1.00)	.157
1.5 To cook chicken, fish and meat safely, these foods should reach 75°C.	.17 (.72)	.58 (.67)	.025**	.22 (.67)	.22 (.83)	1.000
1.6 Vegetables (except for potatoes) can all be eaten raw.	-.17 (1.03)	.58 (.79)	.034**	.56 (.73)	.56 (.73)	1.000
1.7 Thaw meat chicken, fish and meat at room temperature.	-.25 (.97)	.33 (.98)	.059*	- .11(1.05)	-.11(1.05)	1.000
2. Nutritional Knowledge^b	.71 (.21)	.84 (.21)	.029**	.69 (.24)	.69 (.15)	1.000
2.5 Butter, margarine and olive oil are all types of fat and provide a similar amount of calories.	-.08 (1.00)	.50 (.80)	.059*	-.56 (.88)	-.56 (.88)	1.000
3. Healthy Food Attitudes^c	3.86 (.51)	3.93 (.50)	.496	4.14 (.49)	4.15 (.49)	.317
3.8 Healthy foods take too long to prepare and cook. ^d	3.83 (1.03)	4.08 (.90)	.083*	3.89 (.78)	3.78 (.83)	.317
6. Food Preparation, Cooking & Eating Practices^c	3.21 (.57)	3.44 (.36)	.035**	3.61 (.26)	3.47 (.28)	.285
6.12 I cook in bulk (on weekends or slow weekdays) and store in fridge or freezer for busy days.	2.00(1.13)	2.50 (1.17)	.083*	1.67 (1.00)	1.89 (1.27)	.317

Table 2

Significant Mean Scores for Outcome Measures 1-3, 6-9 at Pre-Test (T1) and Post-Test (T3) Within the Intervention and Control Groups (CONTINUED)

7. Self-Efficacy of Shopping for Healthy Foods^c	3.75 (.93)	4.13 (.62)	.012**	4.15 (.57)	4.10 (.64)	.655
7.2 I can choose foods that are low in salt/sodium.	3.50 (1.24)	4.08 (.79)	.034**	4.67 (.50)	4.67 (.50)	1.000
7.9 I can make a shopping list and stick to it.	3.92 (1.24)	4.58 (.51)	.066*	4.56 (1.01)	4.44 (1.01)	.317
8. Self-Efficacy of Cooking Healthy Meals and Snacks^c	3.75 (1.13)	4.11 (.88)	.027**	4.22 (.50)	4.13 (.55)	.180
8.3 I can prepare meals from ingredients you currently have in your pantry, fridge and freezer.	3.83 (1.27)	4.42 (.67)	.038**	4.44 (.73)	4.33 (.71)	.317
8.8 I can prepare root vegetables.	3.67 (1.07)	3.92 (1.08)	.083*	4.44 (.73)	4.11(1.05)	.180
8.10 I can use the following foods in various recipes:						
8.10.1 Chicken	3.42 (1.73)	4.08 (1.16)	.066*	4.56 (.53)	4.56 (.53)	1.000
8.10.2 Fish	3.42 (1.73)	4.17 (1.11)	.066*	3.89 (1.05)	4.11(.78)	.317
8.10.3 Cereals (such as oats, quinoa and barley)	3.33 (1.50)	3.92 (1.31)	.038**	4.22 (.83)	4.33 (.71)	.317
9. Self-Control in Eating Healthy Meals and Snacks^c	3.45 (1.04)	3.78 (.94)	.018**	4.31 (.48)	4.21 (.42)	.180
9.1 I prepare and cook with fresh, seasonal, local vegetables and fruit.	3.58 (1.51)	4.00 (1.48)	.059*	4.67 (.50)	4.67 (.50)	1.000
9.2 I eat vegetables and fruit at every meal, every day.	3.75 (1.42)	4.42 (.90)	.039**	4.67 (.50)	4.56 (.53)	.317

^aWilcoxon signed rank test; ^bCorrect responses were coded as 1, 'don't know' as 0 and incorrect as -1; ^cItems were measured on a 5-point scale, with higher scores more favourable, unless otherwise indicated for negatively worded questions; ^dScore assignment was reversed. *p < 0.1 **p < 0.05 ***p < 0.01

Table 3 Significant Mean Scores for Outcome Measure 5 at Pre-Test (T1) and Post-Test (T3) Within the Intervention and Control Groups

Outcome measure/ Questionnaire item	IG (n=12)							CG (n=9)						
	Pre-test n (%)			Post-test n (%)			Change from baseline (T3-T1)	Pre-test n (%)			Post-test n (%)			Change from baseline (T3-T1)
Accessibility and Availability of Healthy Foods (AHF)	Yes	No	Don't know	Yes	No	Don't know	P value ^a	Yes	No	Don't know	Yes	No	Don't know	P value ^a
5.1 Were cleaned and portioned fresh fruits at the front of a fridge shelf?	4 (33.3)	8 (66.7)	0 (0)	9 (75)	3 (25)	0 (0)	.063*	3 (33.3)	6 (66.7)	0 (0)	3 (33.3)	6 (66.7)	0 (0)	1.000
5.2 Were cleaned and portioned fresh vegetables at the front of a fridge shelf?	3 (25)	9 (75)	0 (0)	8 (66.7)	4 (33.3)	0 (0)	.063*	5 (55.6)	4 (44.4)	0 (0)	4 (44.4)	5 (55.6)	0 (0)	1.000

^aMcNemar Test; Since the majority of 'Don't know' score was 0, these responses were considered as 'No' responses for the named test to render reliable results. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Table 4 Significant Mean Scores for Outcome Measures 1-2, 6-9 at Pre-Test (T1) and Post-Test (T3) Between the Intervention and Control Groups

Outcome measure/ Questionnaire item	Change from baseline (T3-T1) Mean difference (SD)		Difference between groups in changes from baseline	
	IG (n= 12)	CG (n= 9)	Mann-Whitney U	P value
1. Healthy Food Preparation & Cooking Knowledge^a	.30 (.20)	.02 (.08)	11.500	.002**
1.5 To cook chicken, fish and meat safely, these foods should reach 75°C.	.42 (.51)	.00 (.50)	34.000	.085*
1.6 Vegetables (except for potatoes) can all be eaten raw.	.75 (.97)	.00 (.00)	31.500	.031**
1.7 Thaw meat chicken, fish and meat at room temperature.	.58 (.90)	.00 (.00)	36.000	.061*
2. Nutritional Knowledge^a	.13 (.17)	.00 (.21)	33.000	.106
2.5 Butter, margarine and olive oil are all types of fat and provide a similar amount of calories.	.58 (.90)	.00 (.00)	36.000	.061*
6. Food Preparation, Cooking & Eating Practices^b	.24 (.38)	-.13 (.31)	23.000	.020**
6.1 I plan what to cook before shopping.	.50 (1.00)	-.22 (.67)	36.000	.062*
6.2 I modify recipes to make them healthier.	.17 (.58)	-.22 (.44)	38.500	.070*
6.3 I prepare meals from basic ingredients (e.g. whole fresh produce, raw chicken, etc.)	.25 (.62)	-.22 (.44)	35.000	.049**
6.9 I use salt or stock cubes while cooking. ^c	.50 (1.24)	-.22 (.44)	35.000	.049**

Table 4 Significant Mean Scores for Outcome Measures 1-2, 6-9 at Pre-Test (T1) and Post-Test (T3) Between the Intervention and Control Groups (CONTINUED)

7. Self-Efficacy of Shopping for Healthy Foods^b	.38 (.54)	-.05 (.29)	22.500	.016**
7.2 I can choose foods that are low in salt/ sodium.	.58 (.90)	.00 (.50)	33.500	.080*
7.7 I can choose fresh fish.	.50 (1.17)	-.11 (.33)	36.000	.062*
7.9 I can make a shopping list and stick to it.	.67 (1.23)	-.11 (.33)	32.000	.036**
7.11 I can avoid buying highly processed foods (e.g. chicken nuggets, burgers, ready-prepared meals).	.33 (.65)	-.56 (1.13)	31.500	.032**
8. Self-Efficacy of Cooking Healthy Meals and Snacks^b	.36 (.48)	-.09 (.22)	21.000	.007***
8.2 I can cook a healthy meal without spending a lot of money.	.25 (.62)	-.22 (.44)	35.000	.049**
8.3 I can prepare meals from ingredients you currently have in your pantry, fridge and freezer.	.58 (.79)	-.11 (.33)	28.000	.020**
8.4 I can put together a healthy meal from scratch in 30 mins.	.42 (.79)	-.22 (.44)	31.500	.032**
8.7 I can prepare fresh or frozen green vegetables.	.33 (.65)	-.56 (1.33)	31.500	.032**
8.8 I can prepare root vegetables.	.25 (.45)	-.33 (.71)	31.500	.032**
8.11.6 I can use basic cooking techniques: Sauteing	.42 (.90)	-.22 (.67)	36.000	.062*
9. Self-Control in Eating Healthy Meals and Snacks^b	.33 (.37)	-.10 (.25)	17.500	.004***
9.1 I prepare and cook with fresh, seasonal, local vegetables and fruit.	.42 (.67)	.00 (.00)	36.000	.061*
9.2 I eat vegetables and fruit at every meal, every day.	.67 (.99)	-.11 (.33)	28.000	.020**
9.6 I eat healthy foods even when I am in a rush, or feeling tired.	.25 (.62)	-.22 (.44)	35.000	.049**
9.7 I eat healthy foods even when I am angry, depressed or anxious.	.17 (.58)	-.44 (.88)	38.500	.070*
9.8 I eat healthy foods when I have to prepare meals/ snacks for myself.	.33 (.65)	-.22 (.67)	36.00	.062*

^a Correct response were coded as 1, 'don't know' as 0 and incorrect as -1. ^b Items were measured on a 5-point scale, with higher scores more favourable, unless otherwise indicated for negatively worded questions. ^c Score assignment was reversed. *p < 0.1 **p < 0.05 ***p < 0.01

Table 5 Significant Mean Scores for Outcome Measure 5 at Pre-Test (T1) and Post-Test (T3) Between the Intervention and Control Groups

Outcome measure/ Questionnaire item	Change of 'yes' responses from 'no' or 'don't know' responses n (%)		Difference between groups in changes to 'yes' responses from baseline	
	IG (n= 12)	CG (n= 9)	Mann-Whitney U	P value
5. Accessibility and Availability of Healthy Foods (AHF)	28	8	23.500	.022**
5.9 Were cleaned and portioned fresh vegetables at the front of a fridge shelf?	5 (41.7)	0 (0)	31.500	.030**
5.10 Were vegetables in the fridge or freezer prepared so they readily could be used in a meal / snack?	4 (33.3)	0 (0)	36.000	.060*

*p < 0.1 **p < 0.05

Food-related attitudes and practices

Attitudes towards healthy eating showed only modest increases, which were not statistically significant. However, the IG demonstrated significant improvements in food-related practices. Specifically, availability and accessibility of vegetables ($p = .063$) and fruit ($p = .063$) improved. Compared to the CG, IG participants showed significant improvements in the overall behaviour scale ($p = .020$), which incorporated meal planning ($p = .062$), recipe modification ($p = .070$), cooking from scratch ($p = .049$), and using less salt during cooking ($p = .049$). Combined responses relating to healthful eating practices also indicated a significant overall change ($p = .035$). Cooking in bulk showed a notable change, significant at the 1% level ($p = .083$).

Self-efficacy

Both within- and between-group analyses demonstrated significant improvements in shopping and cooking self-efficacy among IG participants. At follow-up, the IG reported greater confidence in choosing low-salt products ($p = .034$), using a shopping list ($p = .066$), cooking a healthy meal with available food ($p = .038$), preparing root vegetables ($p = .083$), and cooking with chicken ($p = .066$), fish ($p = .066$), and cereals ($p = .038$). Between-group comparisons confirmed significant differences in confidence for cooking a healthy economical meal ($p = .049$), preparing a meal from scratch in 30 minutes ($p = .032$), preparing green vegetables ($p = .032$), and using sautéing as a cooking technique ($p = .062$). These improvements reflected modest increases in IG means which contrasted with slight decreases in the CG.

Self-control and effort

The IG, but not the CG, demonstrated significant increases in self-control between pre- and post-test ($p = .018$). Specific improvements were noted in self-control for preparing and cooking with fresh, seasonal, local vegetables and fruit ($p = .059$), and for including produce at every meal ($p = .039$).

Qualitative findings

Analysis of the qualitative data using the deductive approach yielded five specific broad themes. These were:

1. Enjoyable experiential course experience;
2. Helpful course materials and recipes with long-term use;
3. Self-efficacy in healthy food choices and practices within budget
4. Multiple and supportive social outcomes
5. Persistent barriers to healthy eating for weight management

Within these themes, the focus group discussions corroborated the quantitative findings and offered additional depth.

Participants provided feedback on the overall course experience. They expressed enthusiasm for specific hands-on activities, which were perceived as empowering and encouraged engagement with food preparation. Social benefits were also strongly emphasised, with participants noting peer support, a sense of belonging, and increased enjoyment of cooking through group activities. They also reported barriers to healthy eating for weight management. A selection of verbatim by different individuals attending the post-intervention FGI are presented below to illustrate the key perceptions and assertions of the participants around the five themes.

Theme 1: Enjoyable experiential course experience

Participants appreciated the experiential approach adopted in the sessions, describing them as enjoyable and practical and noting that the variety of recipes, hands-on cooking and supermarket visit contributed to their learning.

"Ma jtikx çans jaqbdek id-dwejjaq" (There's no time to get bored). (Charles, male, 62)

"Hassejtni komdu immens biex insaqsi fejn ma kontx inkun naf" (I felt very comfortable to ask questions when I did not know something). (Joe, male, 77)

"L-atmosfera kienet waħda kalma li hassejniena komdi nsajru u nikkomunikaw bejniatna" (The atmosphere was relaxed so that we felt comfortable cooking and communicating). (Rose, female, 57)

"Kellna għalliema tajba" (We had a good teacher). (Sylvana, female, 50)

The herb-growing activity was particularly well received:

"Issa qiegħda nkabbar il-ħabaq id-dar. Għandi pjaċir nuzah fil-pranzi tiegħi." (I'm now growing basil at home; I enjoy using it in my meals). (Carmen, female, 71)

Theme 2: Helpful course materials and recipes with long-term use

Participants found the resources particularly helpful, especially the nutritional comparison card and magnifying lens:

"Għoġbitni hafna l-card tan-nutritional values u l-lenti ta' magħha; kemm qegħda għal qalbi u kemm qed nuzaha!" (I really liked the nutritional values card with its lens; I really love it and I'm finding it very useful!). (Sylvana, female, 50)

Several participants reported learning new methods for preparing ingredients and using the recipes repeatedly at home:

"Naqqast hafna mill-laħam aħmar għax qlibt għal Quorn." (I'm eating much less red meat since I switched to Quorn). (Ray, male, 72)

"Dak li għidtilna bih flok iz-zokkor [erythritol], sejra tajjeb bih." (The sugar substitute

[erythritol] you recommended is working well for me). (Joyce, female, 56)
“Ma kontx naf li tista’ tagħmel pastard jew sweet potato mash għax-shepherd’s pie minflok patata bajda.” (I didn’t know you can use cauliflower or sweet potato mash for shepherd’s pie instead of white potatoes). (Ray, male, 72)

Theme 3: Self-efficacy in healthy food choices and practices within budget

Participants expressed increased confidence in meal planning and budgeting, critically analysing their food choices based on wellbeing and cost:

“Qed nixtri biżżejjed, bil-qies mhux bħal qabel... Fil-fatt ninnutaha meta nagħmel il-kontijiet għax inżomm l-irċevuti. Qed inħalli €125 fil-gimgha għall-ikel u kulma qed nonfoq €90.” (I’ve been shopping more wisely in a measured manner, not like before... I see this when I add up my costs as I keep the receipts. I used to budget €125 per week, but now I only spend €90). (Ray, male, 72)

“Eżempju ġol-Healthy Shop għand il-PAVI nħobb nixtri dawk iċ-ċikkulatijiet bl-istevia, xi €2 fuqhom il-waħda... Imma għandek vantaġġi għal saħħtek.” (I like buying stevia-sweetened chocolate at PAVI Health Shop even if they cost €2 each... But there’s a benefit for your health.) (Joyce, female, 56)

Theme 4: Multiple and supportive social outcomes

Although social interaction was constrained by COVID-19 protocols, participants still emphasised peer influence, teamwork and mutual support, and they also appreciated the encouraging, motivational atmosphere:

“Mingħalija li ż-żukkini ma joġġbunx imma meta doqthom hawn bil-pesto, kienu għoġbuni.” (I thought I didn’t like zucchini, but when I tasted them here with pesto, I liked them). (Charles, male, 62)

“Ma tantx inħobbhom [legumi]imma hawnhekk kif użajnihom, għoġbuni.” (I don’t really like them [pulses], but I liked how we used them in recipes during the course). (Chantelle, female, 34)

Theme 5: Persistent barriers to healthy eating for weight management

Despite the overall positive impact of the programme, participants highlighted barriers that continued to challenge their ability to maintain healthier eating habits. Self-control remained a recurring issue. Some participants admitted to struggles with nibbling and late-night snacking:

“Qieghda nbati mill-nibbling ħafna. Speċjalment billejl nibda mmur u niekol” (I’m struggling a lot with nibbling. Especially at night I go and eat). (Maria, female, 54)

“Il-problema tiegħi hi li niekol il-ħelu wara l-ikel. Tgħidli tiekol healthy imma wara trid xi ħaġa ħelwa” (My problem is eating sweets after meals. I eat healthy food, but afterwards I want something sweet). (Sylvana, female, 50)

Mental health challenges also limited progress for some, with depression cited as a factor reducing motivation:

“Jiena għaddejt minn depressjoni... u għadni nħossha li diffiċli nbiddel xi affarijiet” (I went through depression... and I still feel it's difficult to change some things). (Joyce, female, 56)

Food prices were seen as another significant obstacle. Participants observed that healthier alternatives such as alternative sweeteners, stevia-based chocolate, and plant-based milk drinks were more costly than conventional options:

“L-affarijiet healthy huma aktar għaljin. Bħal almond milk u erythritol jiswew ħafna aktar” (Healthy products are more expensive. Things like almond milk and erythritol cost much more). (Ray, male, 72)

At the same time, some emphasised that prioritising health made the cost worthwhile:

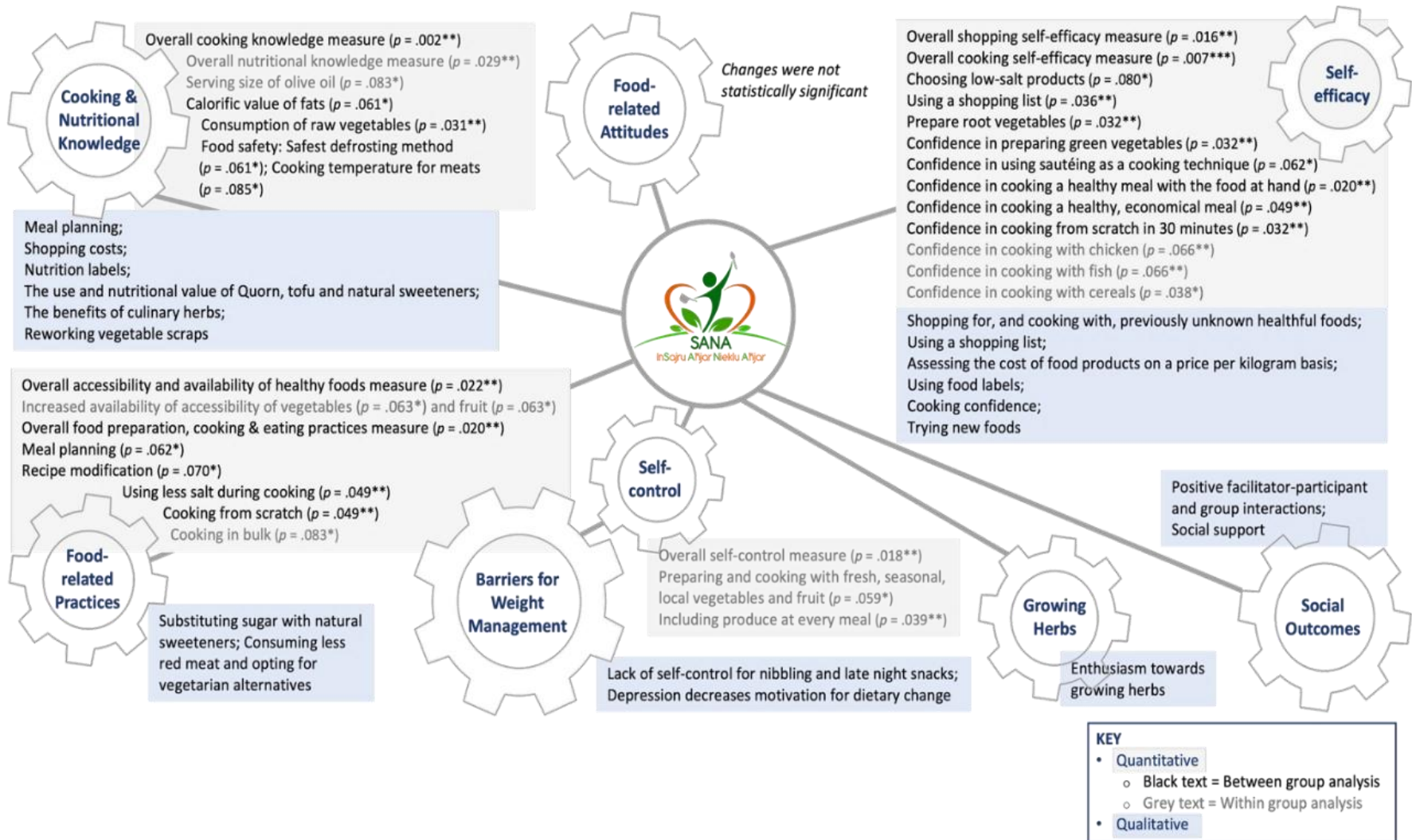
“L-ewwel saħħti, imbagħad il-flus” (My health comes first, then money). (Joyce, female, 56)

Family and cultural influences also emerged as barriers. Although families were generally supportive, certain entrenched preferences limited the adoption of novel foods:

“Ir-raġel tiegħi qatt ma kien jiekol tofu, u xorta ma jridx jiekol. Imma jien inħobbu issa u nagħmlu għalija” (My husband never ate tofu, and he still won't. But I like it now, so I cook it for myself). (Carmen, female, 71)

Figure 3 provides a combined summary of the quantitative and qualitative results, indicating within-group and between-group results and whether statistically significant, as well as related qualitative findings. Together, these findings show that the SANA programme supported knowledge and skill development, in particular self efficacy in multiple strategies for healthy food choices, preparation and intake. Nonetheless the FGI also uncovered that psychological, financial and cultural factors continued to constrain full behavioural change in relation to weight management.

Figure 3 Summary of Quantitative and Qualitative Findings



Discussion

This study has demonstrated that experiential culinary and nutrition education programmes can produce significant improvements in key determinants of dietary behaviour among adults transitioning from structured obesity treatment into independent living. The SANA programme led to measurable gains in cooking knowledge, food-related practices, shopping and cooking self-efficacy, and dietary self-control. These outcomes reinforce the growing evidence base that interventions which combine theoretical nutrition content with hands-on cooking experiences are more effective than knowledge-only approaches (Contento & Koch, 2025, 2024; Hawkes et al., 2015; Wood et al., 2025; Venkatesh et al., 2025).

Improvements in knowledge and practices

The findings indicate that cooking knowledge improved significantly in the intervention group, while nutrition knowledge gains were more modest. This pattern is consistent with the expectation that participants, as former service-users at DKghS, had already acquired a foundation of nutrition knowledge through prior treatment programmes. What was lacking from the DKghS programme, and effectively provided through the SANA programme, were the practical skills and contextual supports necessary to operationalise this knowledge in daily life. The improvement in behaviours such as meal planning, cooking from scratch, modifying recipes, and reducing salt intake demonstrates that participants translated knowledge into tangible practices, which is critical for long-term dietary change.

These results align with existing international evidence. Studies have repeatedly shown that cooking interventions can lead to greater vegetable intake, healthier home food environments, and reduced reliance on convenience foods (Garcia et al., 2016; Garcia et al., 2017; Iacovou et al., 2012, Rees et al., 2012; Rees et al., 2022; Reicks et al., 2018, 2014). Improvements in bulk cooking observed in this study are particularly relevant, as this practice supports time efficiency, reduces costs, and facilitates adherence to healthy eating when time is scarce (Piscopo, 2015; Piscopo & Mugliett, in press).

Self-efficacy as a mediator of behaviour change

One of the strongest outcomes was the significant increase in both shopping and cooking self-efficacy. According to Social Cognitive Theory (Bandura,

1995), self-efficacy is a crucial mediator of behaviour change, influencing motivation, perseverance, and resilience in the face of challenges. The intervention group reported feeling more confident in choosing healthier products, reading labels, and preparing meals from available ingredients, reflecting enhanced mastery experiences. Between-group differences in preparing economical meals and cooking within 30 minutes illustrate the importance of designing interventions that are realistic and responsive to participants' everyday constraints.

These findings are consistent with other evaluations of cooking interventions, which have identified increases in confidence as a recurring outcome (Condrasky et al., 2011; Bernardo et al., 2017). Improved self-efficacy is particularly significant in the Maltese context, where high rates of obesity coexist with abundant access to energy-dense foods, financial insecurity and busy lifestyles that discourage home cooking (Cauchi et al., 2017; National Audit Office, 2023). Strengthening individuals' belief in their capacity to plan, shop, and cook healthy meals equips them with practical tools to resist obesogenic influences.

Self-control and consistency in healthy eating

The significant improvements in self-control and effort demonstrate that participants were more able to consistently apply healthy eating behaviours, such as incorporating vegetables at every meal. This is an important outcome as dietary consistency is strongly linked to sustainable weight management. Behaviour change theories such as the Theory of Planned Behaviour (Ajzen, 1991) highlight the role of perceived behavioural control in translating intentions into actions. The SANA programme appears to have enhanced this sense of control, supporting participants to adopt healthier routines and regulate their dietary choices more effectively.

Social and motivational benefits

Qualitative findings highlighted the importance of the group context in motivating participants and reinforcing learning. While COVID-19 restrictions limited opportunities for social interaction during the study, participants nevertheless emphasised the value of teamwork and shared experiences. This aligns with research on community kitchens, which shows that group-based cooking fosters peer support, accountability, and enjoyment, all of which

enhance adherence and sustainability (Jessiman et al., 2023; McGowan et al., 2017; Piscopo, 2014).

The social dimension of cooking interventions is particularly relevant in Malta, where food plays a central role in family and community life (Billiard, 2010). Group-based learning not only enhances skills, but also normalises healthier practices, helping participants to reframe cultural norms around cooking and eating (Piscopo, 2014).

Barriers to healthy eating

Despite the indicated positive outcomes, participants identified persistent barriers, including the cost of healthy foods, time scarcity, and family food preferences. These constraints reflect broader environmental and socio-cultural influences, consistent with ecological models of health behaviour (Sallis et al., 2008). Addressing these barriers requires more than individual-level interventions. Policy measures to make healthy foods more affordable and accessible, along with community-level strategies to promote supportive environments, are essential to complement education programmes such as SANA. This has been reiterated in various studies and reports (FAO et al. 2024; Rockström et al., 2025; Ziso et al., 2022) and also acknowledged in the recent *Malta's Strategy for Resilient Food Systems* (Ministry for Agriculture, Fisheries and Animal Rights, 2025).

The tension between participants' personal health goals and their families' food preferences highlights the importance of involving households in interventions where possible. Studies have shown that when families attend culinary interventions as a group there are positive outcomes which can be more sustained (Calleja, 2024; Hasan et al, 2019; Mohedo et al, 2026). Future programmes could explore family-based formats to reduce conflict and create shared commitment to healthier eating.

Engagement with food production

An unanticipated outcome was the enthusiasm participants expressed for growing herbs at home. This engagement reflects an important aspect of food literacy – connecting food preparation with food production. Research shows that even small-scale food growing can enhance appreciation for ingredients, increase vegetable consumption and foster greater autonomy in food choices (Gulyas et al., 2024; Kortright & Wakefield, 2011). Incorporating elements of

food production, such as container gardening or herb cultivation, into culinary interventions may therefore further strengthen outcomes.

A role for Home Economics and Food Literacy education

Taken together, the findings highlight the role of Home Economics education and food literacy as lifelong resources. The SANA programme demonstrated that even a short, six-week intervention can significantly enhance competencies critical for dietary management. For individuals transitioning from clinical treatment for obesity, such interventions can serve as valuable continuity of care, bridging the gap between therapeutic environments and the realities of everyday living.

More broadly, the results illustrate how experiential food education contributes to public health by equipping individuals with skills that extend beyond weight management to overall wellbeing. This aligns with recent calls to embed food literacy within national education frameworks and community programmes, recognising its importance across the life course (McCloat & Caraher, 2020; Silva et al., 2023).

The Maltese food environment presents both challenges and opportunities. The density of fast-food outlets and affordability of processed foods reinforce obesogenic patterns, but the strong cultural traditions surrounding home cooking and communal meals provide a valuable foundation for promoting healthier practices. Culinary interventions that build on these traditions, while addressing contemporary barriers, have the potential to be particularly impactful in Malta.

Strengths and limitations

This study has several strengths. It is one of the first randomised controlled trials in Malta to evaluate a community-based culinary and nutrition education programme targeted at adults with a history of obesity. The mixed-method design enabled both statistical evaluation and in-depth exploration of participant experiences, providing a comprehensive picture of outcomes. The use of validated tools, culturally adapted for the Maltese context, further strengthened reliability.

Limitations include the small sample size, which limits generalisability. COVID-19 restrictions also constrained delivery and social interaction,

potentially limiting the full social benefits of the group format. The follow-up period was relatively short, meaning long-term impacts on behaviour and weight outcomes could not be assessed. Future research should employ larger samples, longer follow-up, and potentially multi-site designs to strengthen external validity.

Conclusion

The findings of this study demonstrate that the SANA programme, a six-week experiential culinary and nutrition education intervention, produced measurable improvements in cooking knowledge, food-related practices, self-efficacy and dietary self-control among adults transitioning from obesity treatment into independent living. These outcomes provide evidence that hands-on, skill-based approaches can bridge the gap between nutrition knowledge and daily practice, thereby supporting sustainable dietary change.

Importantly, the study highlights the value of situating nutrition education within broader frameworks of food literacy and Home Economics. Knowledge of nutrition principles alone is insufficient; individuals require the confidence, skills and supportive pedagogic contexts to translate knowledge into consistent behaviours. By combining theory with practical cooking, the SANA programme enabled participants not only to increase competence but also to reframe attitudes towards healthy eating and food preparation. Thus, the SANA can be seen as a form of pilot or feasibility study, laying the groundwork for similar ‘after care’ projects targeting individuals with diet-related health problems.

Future research should examine the long-term sustainability of outcomes observed in this study, particularly regarding dietary behaviour. Larger-scale trials, conducted across multiple sites and populations, would help establish generalisability and scalability. Exploring integration with food production elements, such as community gardening, may also provide additional benefits by fostering deeper engagement with healthy eating.

The SANA intervention results carry several implications for policy and practice in Malta. At a healthcare level, culinary and food literacy programmes could be integrated into obesity management pathways as continuity of care, ensuring that individuals leaving structured treatment have the tools and support to sustain progress. At the community level, partnerships with local councils, schools and NGOs could extend the reach of such interventions,

promoting food literacy across diverse population groups and life stages including families, older adults and individuals with chronic health conditions. At the policy level, the inclusion of Home Economics and experiential food education within national health promotion strategies would signal a commitment to addressing obesity through skill-based, empowering approaches that go beyond information provision to provide lifelong competencies with relevance for personal health and national wellbeing.

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References

- Ahmed, S. K., & Mohammed, R. A. (2025). Obesity: Prevalence, causes, consequences, management, preventive strategies and future research directions. *Metabolism Open*, 27, 100375. <https://doi.org/10.1016/j.metop.2025.100375>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Bandura, A. (1995). *Self-efficacy in changing societies*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511527692>
- Begley, A., Gallegos, D., & Vidgen, H. A. (2017). Effectiveness of Australian cooking skill interventions. *British Food Journal*, 119(5), 973–991. <https://doi.org/10.1108/BFJ-10-2016-0451>
- Bernardo, G. L., Jomori, M. M., Fernandes, A. C., Colussi, C. F., & Proença, R. P. C. (2017). Nutrition and culinary in the kitchen program: A randomized controlled intervention to promote cooking skills and healthy eating in university students—Study protocol. *Nutrition Journal*, 16, 83. <https://doi.org/10.1186/s12937-017-0305-y>

- Billiard, E. (2010). Searching for a national cuisine. *Journal of Maltese History*, 2(1), 47-57.
<https://www.um.edu.mt/library/oar/bitstream/123456789/17970/1/5.Searching%20for%20a%20National%20Cuisine.pdf>
- Bouwman, E. P., Onwezen, M. C., Taufik, D., de Buisonjé, D., & Ronteltap, A. (2020). Brief self-efficacy interventions to increase healthy dietary behaviours: evidence from two randomized controlled trials. *British Food Journal*, 122(11), 3297-3311. <https://doi.org/10.1108/BFJ-07-2019-0529>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Buyinza, T., Buzigi, E., Kitimbo, J., Ssabika, G., Mbuliro, M., Kiwanuka, J., Bukenya, J., Guwatudde, D., & Ndejjo, R. (2025). Socio-ecological factors influencing dietary behaviours among adolescents and young adults in rural Eastern Uganda: A qualitative study. *PloS one*, 20(12), e0337797. <https://doi.org/10.1371/journal.pone.0337797>
- Cauchi, D., Pliakas, T., & Knai, C. (2017). Food environments in Malta: Associations with store size and area-level deprivation. *Food Policy*, 71, 39-47. <https://doi.org/10.1016/j.foodpol.2017.07.004>
- Condrasky, M. D., Williams, J. E., Catalano, P. M., & Griffin, S. F. (2011). Development of psychosocial scales for evaluating the impact of a culinary nutrition education program on cooking and healthful eating. *Journal of Nutrition Education and Behavior*, 43(6), 511-516. <https://doi.org/10.1016/j.jneb.2010.09.013>
- Contento, I. R., & Koch, P. A. (2025). *Nutrition education: Linking research, theory, and practice* (5th ed.). Jones & Bartlett Learning.
- Creswell, J. W., & Creswell, J. D. (2018). Qualitative, quantitative, and mixed methods approaches. In *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications. <https://doi.org/10.1891/9780826146373.0007>
- Cuschieri S. (2020). The characteristics of an obesogenic small European country: results from a Malta cross-sectional study. *Perspectives in public health*, 140(6), 327-337. <https://doi.org/10.1177/1757913920926533>
- Cuschieri, S., & Libra, M. (2021). Adherence to the Mediterranean diet in Maltese adults. *International journal of environmental research and public health*, 18(1), 10. <https://doi.org/10.3390/ijerph18010010>
- Di Costanzo, G., Di Castelnuovo, A., Ruggiero, E., Costanzo, S., Esposito, S., Cerletti, C., Donati, M.B., de Gaetano, G., Iacoviello, L., Bonaccio, M., and for the Moli-sani Study Investigators. (2025). Cross-sectional associations of home cooking with diet quality and food consumption by degree of processing in women from the Moli-sani Study. *International Journal of Food Sciences and Nutrition*, 76(8), 878-887. <https://doi.org/10.1080/09637486.2025.2574087>

- Eriksson, M., Sundberg, L. R., Santosa, A., Lindgren, H., Ng, N., & Lindvall, K. (2025). Health behavioural change - the influence of social-ecological factors and health identity. *International journal of qualitative studies on health and well-being*, 20(1), 2458309. <https://doi.org/10.1080/17482631.2025.2458309>
- FAO, IFAD, UNICEF, WFP and WHO. (2023). The state of food security and nutrition in the world 2023. Urbanization, agrifood systems transformation and healthy diets across the rural-urban continuum. Rome, FAO. <https://doi.org/10.4060/cc3017en>
- Farmer, N., Touchton-Leonard, K., & Ross, A. (2018). Psychosocial benefits of cooking interventions: A systematic review. *Journal of Health Education & Behavior*, 45(2), 167–180. <https://doi.org/10.1177/1090198117736352>
- Garcia, A. L., Reardon, R., McDonald, M., & Vargas-Garcia, E. J. (2016). Community interventions to improve cooking skills and their effects on confidence and eating behaviour. *Current Nutrition Reports*, 5, 315–322. <https://doi.org/10.1007/s13668-016-0185-3>
- Garcia, A. L., Reardon, R., Hammond, E., Parrett, A., & Gebbie-Diben, A. (2017). Evaluation of the “Eat Better Feel Better” Cooking Programme to Tackle Barriers to Healthy Eating. *International Journal of Environmental Research and Public Health*, 14(4), 380. <https://doi.org/10.3390/ijerph14040380>
- Gulyas, B. Z., & Edmondson, J. L. (2024). The contribution of household fruit and vegetable growing to fruit and vegetable self-sufficiency and consumption. *Plants, People, Planet*, 6(1), 162–73. <https://doi.org/10.1002/ppp3.10413>
- Hasan, B., Thompson, W. G., Almasri, J., Wang, Z., Lakis, S., Prokop, L. J., Hensrud, D. D., Frie, K. S., Wirtz, M. J., Murad, A. L., Ewoldt, J. S., & Murad, M. H. (2019). The effect of culinary interventions (cooking classes) on dietary intake and behavioral change: a systematic review and evidence map. *BMC nutrition*, 5, 29. <https://doi.org/10.1186/s40795-019-0293-8>
- Hawkes, C.; Smith, T.G.; Jewell, J.; Wardle, J.; Hammond, R.A.; Friel, S.; Thow, A.M.; Kain, J. Smart food policies for obesity prevention. *Lancet* **2015**, 385, 2410–2421. [https://doi.org/10.1016/S0140-6736\(14\)61745-1](https://doi.org/10.1016/S0140-6736(14)61745-1)
- Iacovou, M., Pattieson, D. C., Truby, H., & Palermo, C. (2012). Social health and nutrition impacts of community kitchens: A systematic review. *Public Health Nutrition*, 16(3), 535–543. <https://doi.org/10.1017/S1368980012002753>
- Jessiman, T., Murrin, C., & Hebden, L. (2023). Community cooking programmes and health outcomes: A realist review. *Health Promotion International*, 38(2), daac134. <https://doi.org/10.1093/heapro/daac134>
- Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Kortright, R., & Wakefield, S. (2011). Edible backyards: A qualitative study of household food growing and its contributions to food security. *Agriculture and Human Values*, 28(1), 39–53. <https://doi.org/10.1007/s10460-009-9254-1>

- Krueger, R. A., & Casey, M. A. (2015). *Focus groups: A practical guide for applied research* (5th ed.). SAGE Publications.
- Lang, T., & Caraher, M. (2001). Is there a culinary skills transition? Data and debate from the UK about changes in cooking culture. *Journal of the HEIA*, 8(2), 2–14. <https://acrobat.adobe.com/id/urn:aaid:sc:EU:8d26f85c-dc6b-45c2-97fb-708953a7afbc>
- Lins, M., Nakano, E. Y., Soares, J. R. Q., Queiroz, F. L. N. d., Botelho, R. B. A., Raposo, A., & Zandonadi, R. P. (2024). Exploring the relationship between cooking and food skills and eating competence among Brazilian adults. *Nutrients*, 16(23), 3980. <https://doi.org/10.3390/nu16233980>
- McCloat, A., & Caraher, M. (2020). Home Economics as a vehicle for food literacy education: Ireland as a case study. *International Journal of Home Economics*, 13(2), 72–86.
- McGowan, L., Caraher, M., Raats, M. M., Lavelle, F., Hollywood, L., McDowell, D., Spence, M., McCloat, A., Mooney, E., & Dean, M. (2017). Domestic cooking and food skills: A review. *Critical Reviews in Food Science and Nutrition*, 57(11), 2412–2431. <https://doi.org/10.1080/10408398.2015.1072495>
- McManus, S., Pendergast, D., & Kanasa, H. (2025). The Intersection Between Food Literacy and Sustainability: A Systematic Quantitative Literature Review. *Sustainability*, 17(2), 459. <https://doi.org/10.3390/su17020459>
- McMullen, J. M., & Ickes, M. J. (2017). Evaluating a nutrition education program for college students. *Journal of Nutrition Education and Behavior*, 49(2), 150–154. <https://doi.org/10.1016/j.jneb.2016.09.001>
- Michaud, P. (2007). Development and evaluation of a culinary skills confidence measure. *Public Health Nutrition*, 10(10), 1058–1065.
- Mills, S., White, M., Brown, H., Wrieden, W., Kwasnicka, D., Halligan, J., ... & Adams, J. (2017a). Health and social determinants and outcomes of home cooking: A systematic review of observational studies. *Appetite*, 111, 116–134. <https://doi.org/10.1016/j.appet.2016.12.022>
- Mills, S., Brown, H., Wrieden, W., White, M., & Adams, J. (2017b). Frequency of eating home cooked meals and potential benefits for diet and health: cross-sectional analysis of a population-based cohort study. *Int J Behav Nutr Phys Act*, 14, 109. <https://doi.org/10.1186/s12966-017-0567-y>
- Ministry for Agriculture, Fisheries and Animal Rights. (2025). *Malta's Strategy for Resilient Food Systems*. Ministry for Agriculture, Fisheries and Animal Rights. <https://agriculture.gov.mt/wp-content/uploads/2025/07/national-food-strategy-for-resilient-food-systems.pdf>
- Mohedo, J. C., Murillo-Llorente, M. T., Ferre, A. P., Faus, M., Taylor, B. G., Claramunt, F. E., Palomares, S.M. & Sandri, E. (2026). Nutritional needs, dietary knowledge, and culinary skills in individuals with diabetes mellitus: A scoping review. *Advances in Nutrition*, 100627. <https://doi.org/10.1016/j.advnut.2026.100627>
- Murimi, M. W., Kanyi, M., Mupfudze, T., Ruhul, A., Mbogori, T., & Aldubayan, K. (2017). Systematic review factors influencing efficacy of nutrition education

- interventions: A systematic review. *Journal of Nutrition Education and Behavior*, 49(2), 142–165. <https://doi.org/10.1016/j.jneb.2016.09.003>
- National Audit Office. (2023). *A review of the implementation of Sustainable Development Goal 2: Addressing pre-obesity and obesity*. NAO, Malta. <https://acrobat.adobe.com/id/urn:aaid:sc:EU:7bbd3fbe-6a8d-44b0-aafb-5717654e69e4>
- OECD and European Observatory on Health Systems and Policies (2025). *State of health in the EU: Malta country health profile 2025*. OECD/European Observatory on Health Systems and Policies. <https://acrobat.adobe.com/id/urn:aaid:sc:eu:7f115c47-b5b5-46a8-9f90-d66d2c188b12>
- Piscopo, S. (2014). Home Economists in Action: Implementing a community course on sustainable living, in G. Hodelin, *Family socioeconomic and cultural issues: A continuing Home Economics concern*, International Federation of Home Economics, pp.111-121. https://www.ifhe.org/fileadmin/user_upload/Publications/2014_Ebook_IYF_anniversary_full_document.pdf
- Piscopo, S. (2015). Are food convenience and sustainable consumption mutually exclusive? Home Economics literacy to the rescue. In R.J. Didham, D. Doyle, J. Klein, V.W. Thoresen (Eds.), *Responsible living: Concepts, education and future perspectives*, Springer, 197-216.
- Piscopo, S. & Mugliett, K. (in press). The ecology of time-strapped parenting in Malta and beyond: A lament or spur to action? In C. Borg (Ed), *Parenthood in Perspective: Exploring Social Dimensions Across Cultures*, ICPN
- Rees R, Hinds K, Dickson K, O'Mara-Eves A, Thomas J (2012) *Communities that cook: a systematic review of the effectiveness and appropriateness of interventions to introduce adults to home cooking*. London: EPPI Centre, Social Science Research Unit, Institute of Education, University of London. <https://eppi.ioe.ac.uk/cms/publications/systematic-reviews/communities-that-cook-a-systematic-review-summary>
- Rees, J., Fu S.C., Lo J., Sambell R., Lewis J.R., Christophersen C.T., Byrne M.F., Newton R.U., Boyle S., & Devine A. (2022). How a 7-week food literacy cooking program affects cooking confidence and mental health: Findings of a quasi-experimental controlled intervention Trial. *Front. Nutr.* 9:802940. <https://doi.org/10.3389/fnut.2022.802940>
- Reicks, M., Kocher, M., & Reeder, J. (2018). Systematic review impact of cooking and home food preparation interventions among adults: A systematic review (2011-2016). *Journal of Nutrition Education and Behavior*, 50(2), 148–172. <https://doi.org/10.1016/j.jneb.2017.08.004>
- Reicks, M., Trofholz, A. C., Stang, J. S., & Laska, M. N. (2014). Impact of cooking and home food preparation interventions among adults: Outcomes and implications for future programs. *Journal of Nutrition Education and Behavior*, 46(4), 259–276. <https://doi.org/10.1016/j.jneb.2014.02.001>
- Rockström, J., Thilsted, S. H., Willett, W. C., Gordon, L. J., Herrero, M., Hicks, C. C., Mason-D'Croz, D., Rao, N., Springmann, M., Wright, E. C., Agustina, R., Bajaj,

- S., Bunge, A. C., Carducci, B., Conti, C., Covic, N., Fanzo, J., Forouhi, N. G., Gibson, M. F., Gu, X., ... & DeClerck, F. (2025). The EAT-Lancet Commission on healthy, sustainable, and just food systems. *Lancet*, 406(10512), 1625–1700. [https://doi.org/10.1016/S0140-6736\(25\)01201-2](https://doi.org/10.1016/S0140-6736(25)01201-2)
- Rimal, R. N. (2000). Closing the knowledge-behavior gap in health promotion: The mediating role of self-efficacy. *Health Communication*, 12(3), 219–237. https://doi.org/10.1207/S15327027HC1203_01
- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. In K. Glanz, B. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 465–485). Jossey-Bass.
- Silva, A. M., Costa, A., & Ramos, F. (2023). Culinary education and food literacy: Current perspectives and future directions. *Nutrients*, 15(6), 1402. <https://doi.org/10.3390/nu15061402>
- Tiwari, A., Aggarwal, A., Tang, W., & Drewnowski, A. (2017). Cooking at home: A strategy to comply with U.S. Dietary Guidelines at no extra cost. *American Journal of Preventive Medicine*, 52(5), 616–624. <https://doi.org/10.1016/j.amepre.2017.01.017>
- Treki, Y. M. & Jones, P. (2012). Adherence to the Mediterranean dietary pattern among University students. *Malta Journal of Health Sciences*, <https://doi.org/10.14614/MEDITERRDIET/8/21>
- Vaughan, K. L., Cade, J. E., Hetherington, M. M., Webster, J., & Evans, C. E. L. (2024). The impact of school-based cooking classes on vegetable intake, cooking skills and food literacy of children aged 4-12 years: A systematic review of the evidence 2001-2021. *Appetite*, 195, 107238. <https://doi.org/10.1016/j.appet.2024.107238>
- Vidgen, H. A., & Gallegos, D. (2014). Defining food literacy and its components. *Appetite*, 76, 50–59. <https://doi.org/10.1016/j.appet.2014.01.010>
- Venkatesh, S., Keenan, O. E., & Bably, M. B. (2025). Impact of the Dinner Tonight Healthy Cooking School on participants' nutrition knowledge and cooking confidence. *Nutrients*, 17(10), 1668. <https://doi.org/10.3390/nu17101668>
- Warmin, A. (2009). The development and validation of the Cooking with a Chef evaluation tool: Assessing culinary skills and self-efficacy [Doctoral dissertation, Clemson University].
- World Health Organization. (2023). *WHO acceleration plan to stop obesity*. WHO. <https://acrobat.adobe.com/id/urn:aaid:sc:EU:dc649c80-3260-4262-a9b7-a9c1e2be3777>
- World Health Organization. (2024). *European health report 2024*. WHO Regional Office for Europe. <https://acrobat.adobe.com/id/urn:aaid:sc:EU:b299b391-0a4b-4c8f-8951-b267d10dffa8>
- World Health Organization. (2025). *WHO European Childhood Obesity Surveillance Initiative (COSI): Report on the sixth round of data collection, 2022–2024*. Copenhagen: WHO Regional Office for Europe. <https://acrobat.adobe.com/id/urn:aaid:sc:EU:239bdb18-6c43-485d-abf9-2e4e90e5247d>
- Wood, B., Turner, J., & Jomori, M. M. (2025). Evaluating adult cooking interventions: Lessons for community practice. *Journal of Nutrition Education and Behavior*, 57(1), 12–21. <https://doi.org/10.1016/j.jneb.2024.09.006>

Ziso, D., Chun, O. K., & Puglisi, M. J. (2022). Increasing access to healthy foods through improving food environment: A review of mixed methods intervention studies with residents of low-income communities. *Nutrients*, 14(11), 2278. <https://doi.org/10.3390/nu14112278>