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A Mobile Serious Game for Nutrition Education in Oman: LaObese An AHP-Guided Approach to Childhood Obesity Through Interactive Health and Learning Technologies

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ABSTRACT

LaObese is an interdisciplinary serious game designed to address preschool obesity among Omani children by providing engaging gameplay and culturally relevant nutrition education. The title of the game derives from the Arabic words "La" meaning "no", and "obesity", signifying a stance against obesity. Healthy and familiar foods for children were prioritised through the Analytic Hierarchy Process (AHP) in collaboration with Omani nutrition specialists. Omani cuisine and culture serve as a basis for the simulation of healthy meal assembly, physical activity, knowledge assessments, and virtual doctor feedback across four interactive levels. Concise instructions and more motivating rewards improved usability and appeal during a pre-launch pilot test involving 6 six-year-olds and parents. The final evaluation utilised Usefulness, Satisfaction, and Ease of Use (USE) and User Motivation Inventory (UMI) questionnaires to assess children's diet, knowledge, usability, and motivation prior to and following the LaObese game. Participation in LaObese showed a statistically significant improvement in children's healthy food choices ($p < 0.001$) and enhanced nutrition knowledge, as evidenced by quiz scores. The USE questionnaire indicated significant utility, ease of use, and enjoyment, while the UMI demonstrated a strong inner urge to play. Interviews with nutritionists affirmed the cultural significance and educational value of the game. As the first Arabic game to incorporate AHP-driven modelling for childhood obesity prevention, this work demonstrates how culturally sensitive, gamified interventions can promote healthier lifestyle behaviours among young children. The findings contribute to research in e-health, educational game design, and culturally informed human-computer interaction.

1.0 Introduction

Childhood obesity has become a global public health crisis with serious long-term consequences (Beghali et.al, 2021). Excess weight in early life increases risks of type-2 diabetes and cardiovascular diseases and reduces overall life expectancy while also harming mental health (Spychalski et.al, 2024). These concerns underscore the need for effective preventive education

starting in the preschool years. In Oman, childhood obesity is a pressing issue and one of the major health problems. Recent studies (Oman Observer, 2025) estimate about 16.3% of Omani children are obese, even as ~13.7% are underweight, indicating a double burden of malnutrition.

Furthermore, over one-fifth of school-aged Omani children show central (abdominal) obesity, reflecting unhealthy diet and lifestyle patterns (Al-Saadi et.al, 2023). Key contributors include excessive intake of energy-dense foods, sugary drinks, sedentary behaviour, and inadequate physical activity (Al-Saadi et.al, 2023; Almaamary, S. et.al, 2021). Despite national initiatives such as the Ministry of Health's Healthy Food Guidelines (MoHE), effective interventions targeting young children remain limited without promoting the use of educational games such as healthy serious game applications. Digital serious games offer a promising approach to engage children in healthy behaviours by harnessing interactive technology for education (Belghali, M. et.al, 2021). Most anti-obesity games are for older children or adults and lack cultural significance. Young children, especially non-Westerners, may not connect with games that overlook their native foods and language. Many previous games were built without diet or health experts, which can lower their teaching value. LaObese was created, a culturally adapted serious game for Omani children, to fill these gaps. Designing with topic specialist knowledge and local culture distinguishes LaObese. Even though Omani diet appears to contain less fat than the Western diet, the less knowledge and concern about a healthy lifestyle would affect the Omani childhood diet. The Analytic Hierarchy Process (AHP) is used (Saaty, 1987) to identify and priorities nutritious, familiar food content for Omani youngsters. In decision-making, multi-criteria decision-making, such as Analytic Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Analytic Network Process (ANP), are normally used to find the priority criteria for the decision-making. It is widely used for system development, applications, healthcare systems, case studies (Rizal et.al., 2020), etc. The game uses pediatric nutrition specialists and local diets to connect with kids' real-life experiences and promote healthy eating.

There are many serious nutrition and health games in the literature, but few target pre-schoolers or regional contexts like the Middle East. This study presents one of the first Arab serious games for early childhood obesity prevention based on AHP and culture foods. Healthy Lunch game (Espinosa-Curiel et.al, 2020) and Alien Health game (Hermans et.al, 2018) also discovered that gameplay improved children's diets, but they focused on older children. A comprehensive study (Adaji, 2022) indicated that most nutrition games improve knowledge or behaviour; however, uneven evaluation methods and lack of personalization were noted. LaObese covers this gap by evaluating players using in-game data (choices logged) and subjective measurements (surveys) and tailoring content to their culture. Unlike other games, LaObese includes cultural foods, activity, knowledge quizzes, and medical comments. In Level 2, children actively choose between inactive and active routines and learning how daily movement complements healthy eating. This holistic approach may boost efficacy by reinforcing eating, exercising, and real-life knowledge which provides a more holistic and realistic intervention model than diet-only games.

Despite the increasing urgency of early childhood obesity prevention, few serious games have been developed specifically for preschool-aged children in the Arab region (Wang & Mohamad Yatim, 2021). This gap may be attributed to historical disconnects between public health initiatives and educational technology development, as well as cultural hesitancy to introduce screen-based tools during early learning years. While some may argue that real-life instruction is preferable to digital encouragement, current research suggests that developmentally appropriate, culturally grounded digital tools can serve as valuable complements to traditional teaching especially when access to consistent nutrition education is limited (Manaf et al., 2024). LaObese was designed with this in mind not as a replacement for real-life guidance, but as a playful, interactive reinforcement mechanism. Unlike adult-focused dietary apps, which rely on calorie counts, weight tracking, or textual content, LaObese adopts a

child-centric approach using visual storytelling, voice narration, drag-and-drop gameplay, and instant feedback. These design decisions reflect key cognitive and motivational differences between children and adults, ensuring that the game is not only usable but also educational and engaging for its intended age group.

2.0 Literature review

2.1 Game Design and AHP-Based Content Modelling

Educational goals, cultural importance, and gameplay fun were LaObese's challenges. An iterative, user-behavioural centred design method based on behavioural research and expert guidance was used. Game material selection using the Analytic Hierarchy Process (AHP) is applied (Saaty, 1987; Olson, 1996; Zulkefli et.al, 2022). The well-established multi-criteria decision-making approach AHP hierarchically splits difficult problems and uses pairwise comparisons to generate priority weights. Foods and health routines were chosen for the game based on the nutritionist's and local parents' ratings of Omani children's food. In addition, the list of food categories was also collected based on the literature and national dietary guidelines. Omani diets (and game levels) began with fruits (dates, apricots, peaches), vegetables (carrots, cucumbers, spinach), proteins (fish, chicken, legumes), beverages (water, milk, sweet tea, juices), grains (biryani, bread), and snacks/desserts.

Experts compared foods within categories based on nutritional content and children's preferences using a 9-point scale and mapped the food with healthy and unhealthy subcategories. The Body Mass Index (BMI) is not included in the game based on the nutritionist advice to not confuse the children and categorizing healthy and unhealthy is much easier for the children to understand. Meanwhile, parents reported their kids' real-world eating habits. The AHP survey showed cultural Omani eating preferences. Traditional foods like madrouba and biryani scored well, and dates were the best fruit chosen. Sweet tea and sugary drinks were culturally significant while being unhealthy. This led to more culturally appropriate eating habits. AHP makes LaObese's content effective and culturally relevant. The game's nutritional challenges used the final weight-prioritized food. The top food item by weight by category is below:

i. FRUITS: Dates (0.1386), Apple (0.1280)

ii. VEGETABLES: Potato (0.1150), Cucumber (0.1126)

iii. OMANI TRADITIONAL DISHES: Biryani Chicken (0.0978), Biryani Fish (0.0821)

iv. BREAD AND GRAINS: Brown Toast Bread (0.2919), Burger Bread (Bun) (0.2272)

v. PROTEINS AND DAIRY: Almonds (0.1284), Chicken (0.1035)

vi. BEVERAGES: Tea with Milk (0.3607), Fruit Juice (0.2722)

vii. SANDWICHES AND FAST FOODS: Sandwiches: Cheese Sandwich (0.2695), Chicken Sandwich (0.2129); Fast Food: KFC (0.2406), Chicking (0.1709)

viii. DESSERT and SWEETS: Biscuit (0.1897), Candy (0.1204)

High-priority healthy items (e.g., fruits, veggies, water) were made prominent in gameplay and associated with rewards, whereas unhealthy favourites (e.g., candy, soda) were included as tempting options but linked to gentle penalties or corrective feedback. This balancing reflects an important design philosophy where it meets children where they are. Rather than simply excluding all unhealthy foods, LaObese includes them in scenarios to teach consequences and foster moderation. Our approach aligns with recommendations from related serious games, for example, the game Space Adventures reported success by specifically targeting reduced sugar

intake in players' choices (Adaji, 2022). Similarly, LaObese uses the expert-derived priorities to gamify healthy habits that experts want to instil while also acknowledging the items children enjoy, thereby bridging the gap between ideal and actual preferences.

The game's design focused on three key objectives: improving diet choices, increasing physical activity, and building health knowledge that is based on a game framework (Tan, W.H., 2010). Educational design principles with behaviour change theories were combined, using positive reinforcement to encourage healthy habits. Similarly, unhealthy choices trigger immediate negative feedback to discourage poor habits. All game elements were carefully designed to be both educational and culturally appropriate, creating a foundation for testing and refinement in development.

3.0 Methodology

3.1 LaObese Serious Mobile Games

LaObese was evaluated for a pilot test to evaluate the game's initial effectiveness and usability and to gather feedback for refinement. This study involved N=26 children (13 boys, 13 girls, age 6) from local kindergartens in Dhofar, Oman, along with their teacher's participation. This pilot had two key components: (a) a pre-test questionnaire session to measure children's baseline knowledge and choices and (b) playtesting sessions where children tried the game prototype while observing usability and engagement.

3.1.1 Pre-Test (Baseline) Questionnaire

Each child's food behaviour and understanding were assessed with a brief, game-like questionnaire. Visuals captivated the children. Children were shown breakfast, lunch, and dinner photos and asked, "What would you eat or drink?" They can choose healthy or unhealthy food and drinks. Healthy and unhealthy meals and calories were documented using typical portion estimations for each child. Nutrition questions like "Is soda a healthy drink?" tested knowledge. The child's preference for sugary and fatty foods over veggies and fruits supported the strategy. In the pre-test, sweet drinks and fried munchies beat water and veggies. Most children preferred juice or sweet tea to milk or water with meals, and fries and junk food beat salads at lunch. Children ate largely low-nutrient items but avoided healthy ones. Many children didn't know how many glasses of water to drink daily or thought "juice is just as healthy as fruit." Studies demonstrated that compelling interventions were needed to change children's pre-launch choices to healthier ones.

3.1.2 Playtesting and Usability Feedback

After the questionnaire, each child played LaObese early beta under supervision for 20–30 minutes. The child was invited to "think aloud" or communicate their feelings during play, and usability and perplexity were recorded. Children liked the colourful interface and interactive tasks. The pilot found improvements. Some children struggled with text instructions. In response, game instructions were simplified to clarify. The prototype reward system's basic colour notifications annoyed some children. Healthy successes were awarded with happy sounds after this report. To keep a 6-year-old's attention, the virtual doctor animation was condensed. Most importantly, the pilot test indicated early brief session behaviour improvements. Some children made better choices on their second try after playing through the stages. One child stated, "I need to give him veggies!" on his second playthrough after feeding his avatar mostly chicken and rice in Level 1. Game feedback made an instant impact. Comments suggest gaming potential. A simple smiley-face Likert scale was employed to assess child enjoyment after the playtest. Most children smiled when asked if they liked and would play the game again.

3.2 Gameplay and System Description

LaObese was developed as a mobile application (Android platform) to ensure accessibility in homes and schools. The gameplay is organized into a narrative sequence of four levels (Fig. 1), each corresponding to a daily healthy habit routine.

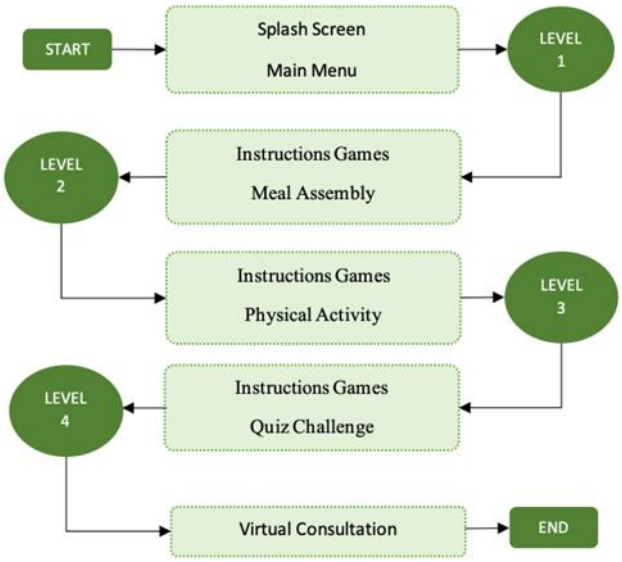


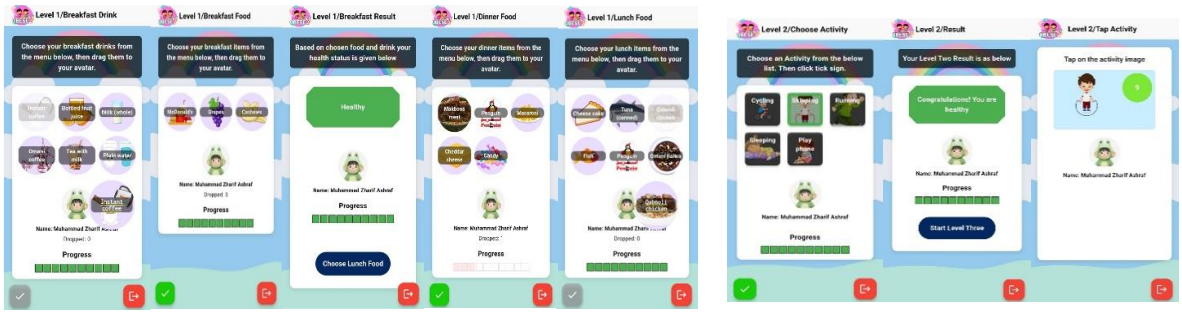
Figure 1: LaObese Game Flow

3.2.1 Meal Assembly (Level 1)

The player helps their avatar prepare meals (breakfast, lunch, and dinner) by dragging and dropping food items onto a plate (Fig. 2a). The available foods in each meal include a mix of healthy and less healthy options drawn from the AHP-ranked lists (for example, breakfast might offer eggs, bread, fruit, as well as donuts or sugary cereal). The child can choose multiple items to create a complete meal. The goal is implicitly to choose a balanced meal for the avatar. The game provides immediate feedback: selecting nutritious items (like fruits or vegetables) makes the bar called "health meter" drop slightly from green (healthy) to yellow (medium) and red (unhealthy). This gentle feedback guides children toward positive food selection. For instance, if a child adds dates or a salad to the plate, a message like "Good! That will help me grow strong!" appears, reinforcing the healthy choice. At the end of each meal assembly, the game briefly reviews the choices (e.g., "You picked unhealthy foods") to build awareness.

3.2.2 Physical Activity (Level 2)

After eating, the avatar's energy depends on being active. In this level, the player must choose an activity for the avatar to do during the day (Fig. 2b). Several illustrated options are presented, some active (playing football, dancing, riding a bike) and some sedentary (watching TV, taking a nap). The child's task is to pick an activity that keeps the avatar healthy. If they choose an active play (e.g., soccer represented by a ball icon), the avatar's health meter increases to green, and it shows a happy animation (like jumping). If they choose a sedentary option (e.g., TV), the game responds with the avatar yawning or the health meter dropping, along with a friendly prompt like "It is an unhealthy activity!" This level reinforces the importance of daily exercise in an intuitive way. It's kept simple, one choice per session, to fit a 6-year-old's cognitive level.



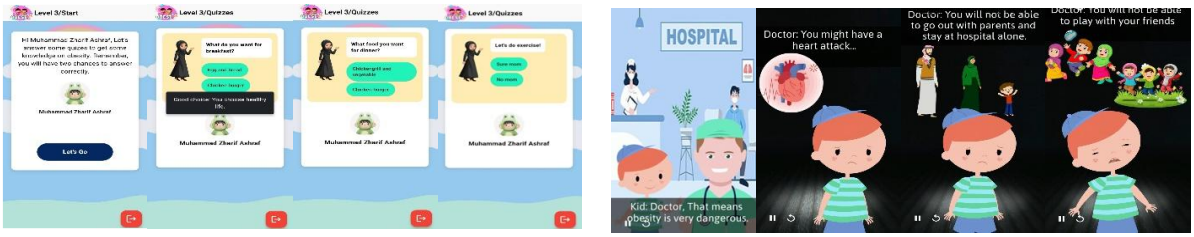
(a) (b)

Figure 2: (a) Level 1 Breakfast, lunch, and dinner meals, (b) Level 2 Physical Activities

3.2.3 Quiz Challenge (Level 3)

Next comes a short quiz mini-game to test and teach nutrition knowledge (Fig. 3a). The quiz consists of about 10 questions delivered with colourful images and voice narration so that non-readers can participate. Questions are age-appropriate and cover three themes aligned with the learning objectives: healthy eating, physical activity, and hydration. For example, one question might show an apple and a candy and ask, “Which one is a healthier snack?” Another might ask, “How many glasses of water should you drink each day: 1, 3, or 8?” The child selects an answer (with feedback given after each). Correct answers earn praise (“Great job, you’re right!”) and points, while incorrect answers trigger a gentle correction (“Oops, actually drinking 8 glasses is best – water keeps you healthy!”). This quiz is designed with constructive alignment in mind. I

It directly reinforces facts and concepts introduced implicitly in Levels 1 and 2. To pass the level, the child needs to answer a majority of the questions correctly (we set a threshold like 7 out of 10). However, even if they don’t pass on the first try, the game encourages them to learn and retry in a fun way (see Level



(a) (b)

Figure 3: (a) Level 3 Quiz knowledge, (b) Level 4 Virtual Consultation with a doctor

3.2.4 Virtual Consultation (Level 4)

A friendly animation physician evaluates the avatar's "health report" based on final level choices (Fig. 3b). Discussion is quick and interactive. The doctor avatar thanks players who made good choices in previous stages (meals, activities, quiz) (“You gave your friend great food and exercise today – excellent job!”). Drs. advise on unwise decisions and missing quizzes. Doc may respond, "Your friend ate a lot of candy but not much vegetables”. With simple visuals, kids can see the impact of these lessons (e.g., too much sugar slows the avatar vs. eating veggies energizes it). Importantly, after this interaction, the game enables the child to retry the Level 3 quiz to improve their score and understanding. The doctor's advice helps the child learn from mistakes, and the quick repetition boosts motivation. Educational best practices view mistakes as learning opportunities, not punishment. The avatar thanks the player and displays a celebration screen (“Day Complete! You helped your friend be healthy!”) after the consultation or quiz retry. To familiarize Omani children with the game, cultural aspects were highlighted throughout. The avatar, parents, and friends wear Arab clothes kids may relate to. Besides English text, we provide

an Arabic voice-over for instructions and remarks, including common Arabic idioms like “La ﻻ” meaning “No”. Biryani, makboos, harees, and shuwa, as well as Penguin, Chicking, and Makdas, were cartoonized alongside international cuisine to teach youngsters their everyday meals. By reflecting Omani culture, LaObese's localization promotes relatability and engagement. Parents reported their children were “excited to see foods like dates and biryani in the game” in pilot study, so they were excited to play more.

4.0 Evaluation and Results

LaObese was evaluated through a pre-post study with the same cohort from the pilot, focusing on two dimensions: (1) Behavioural and knowledge outcomes for the children before vs. after using the game and (2).

4.1 Pre-Post Behavioural and Knowledge Outcomes

To measure the impact on children’s food choices and knowledge, a meal-selection scenario and quiz were replicated from the pre-launch test after the children had several exposures to LaObese. In the final session, a post-test similar to the baseline was administered: the children assembled meals from pictures without game guidance (to see if their choices improved) and answered the same set of simple nutrition questions. The results for pre vs. post were compared.

4.2 Healthy Unhealthy Nutrition

There was a marked improvement in the balance of foods chosen by children after playing LaObese. Table 1 summarizes the average outcomes. Children’s average meal composition before and after playing LaObese. “Healthy items” include fruits, veggies, water, etc., while “unhealthy items” include sweets, fried snacks, and sugary drinks. Calories are estimated per meal from chosen items. Statistical tests (paired t) indicate all improvements are significant. Before intervention, children on average chose about 2.7 healthy items and 1.0 unhealthy items per meal. After playing, this shifted to 4.2 healthy items and only 0.5 unhealthy items per meal on average, which shows a substantial improvement in favour of healthy foods. This means, for example, a child who initially might pick one fruit and one vegetable out of four items on their plate was now choosing perhaps three fruits/veggies and leaving out most junk food. Caloric distribution also improved: healthy food calories per meal increased from ~334 kcal to ~368 kcal, while calories from unhealthy foods (e.g., sweets, fried snacks) dropped (pre ≈ X kcal vs. post ≈ Y kcal) roughly a 50% reduction in unhealthy calorie intake per meal on average.

Table 1: Average of healthy and unhealthy food items and calories by children

Metric	Pre	Post
Healthy Items	2.71	4.23
Unhealthy Items	1.03	0.52
Healthy Calories	334.47	367.92

4.3 Alignment with Expert Priorities

An interesting secondary analysis is how children’s choices aligned with the expert-defined healthy priorities before vs. after (Table 2). Initially, a negative correlation was found– the healthier an item was rated by experts, the fewer kids chose it (Spearman $\rho \approx -0.68$, $p < 0.02$). After playing LaObese, this correlation became much weaker ($\rho \approx -0.43$ and not significant). In other words, children’s post-game selections were more in line with what experts would recommend, narrowing the gap between “what kids want” and “what’s healthy”. For example, before, children overwhelmingly preferred fries over vegetables; after the game, some children chose vegetables more often, and the aversion to greens was less pronounced. Although the correlation was still slightly negative (kids won’t start loving spinach overnight), the improvement suggests LaObese nudged preferences in the right direction. This trend supports the qualitative

observation that the game can serve as a "bridge" between child preferences and expert advice – using fun and rewards to make the healthy choices more appealing.

Table 2: Pre- vs Post-Game Selection Averages (N=26) (Mean ± SD per meal)

Healthy items chosen	2.71 ± 0.5	4.23 ± 0.6	+1.52 (↑56%)	21.27	<0.001
Unhealthy items chosen	1.03 ± 0.4	0.52 ± 0.3	–0.51 (↓50%)	–7.23	<0.001
Healthy calories (kcal)	334.5 ± 80	367.9 ± 90	+33.4 kcal	7.80	<0.001
Unhealthy calories (kcal)	210 ± 100 (est.)	100 ± 60 (est.)	–110 kcal (↓52%)	–5.77	<0.001

In addition to the numbers, parents noted house improvements during the evaluation. After playing, some parents claimed that their child started drinking water or eating fruit ("She asked for water at dinner instead of juice – I was surprised!"). Subjective feedback suggests the game's messages were translated into real-world intents, if not acts, and this small trial did not examine long-term adherence, but these results are promising.

4.4 Nutrition Knowledge Gains

Improvements in children's knowledge about healthy habits also was observed. In the pre-test quiz, many children were unsure or answered incorrectly on questions like "Which is healthier, water or soda?" and "Should you play or watch TV to be strong?". After the game, their quiz scores improved notably. The average number of correct answers (out of 10) increased from about 6 pre-games to 9 post-games (most kids could answer nearly all questions correctly by the end). All children recognized by post-test that fruits are healthier snacks than candy and that water is the best drink – concepts explicitly reinforced during gameplay. This indicates that LaObese effectively conveyed important nutrition facts. Moreover, the virtual doctor feedback loop in Level 4 seems to have helped cement understanding; children often cited the doctor's advice during the post-test ("I gave water because the doctor said juice has too much sugar"). While the sample size was modest, these knowledge gains are encouraging and align with findings from similar interventions where serious games significantly increased nutritional knowledge in kids (Adaji, 2022).

4.5 Usability and Satisfaction Findings

LaObese's usability and player experience using two standardized questionnaires were assessed: the USE Questionnaire (Usefulness, Satisfaction, Ease of use) (Shanklin et.al, 2022) for general usability and the User Motivation Inventory (UMI) (Bruhlmann et.al 2018) for intrinsic motivation. Since participants are very young, the questionnaires were administered in an adapted format. Respondents from different backgrounds, such as parents and children, academics, and university students, helped in answering some items, and simple wording with some visual analogues (like smiley scales) was used.

4.5.1 Usability (USE) Results

The USE questionnaire by Lund (Shanklin et.al, 2022) measures four dimensions of perceived usability on a 5-point agreement scale (5 = strongly agree that the system is usable). LaObese scored highly on all dimensions (see Table 3). Respondents agreed that the game was useful for learning (Mean = 4.6/5) and that it helped them be more aware of healthy choices. The ease of use was rated very positively (4.7/5); even children with minimal gaming experience could navigate the app after brief instruction, with the support of the intuitive drag-and-drop and touch interactions. Ease of learning received the highest marks (4.8/5) indicating that participants picked up how to play very quickly and didn't find the tasks confusing. This reflects our efforts in simplifying instructions and providing clear feedback. Finally, satisfaction was also high (4.5/5), with children expressing enjoyment and parents reporting that their kids were happy and engaged when playing. No serious technical issues or crashes were encountered during the study, and all users were able to complete the game levels, further underscoring good usability.

4.5.2 Motivation and Engagement (UMI) Results

Based on self-determination theory, the 18-item User Motivation Inventory (UMI) measured interest/satisfaction, perceived competence, effort, and pressure/tension when using technology to assess the children's intrinsic motivation and enjoyment (Bruhlmann et.al, 2018). The interest/enjoyment subscale was utilized because intrinsic motivation is more significant to game participation. The results were promising children found LaObese "very fun and interesting" (6.3 out of 7). These players wanted to play after the session and asked when they may play at home. Perceived competence averaged 5.9/7, indicating children's self-efficacy in the game. The effort/importance subscale was about 6.0/7, indicating that youngsters enjoyed the game and didn't mind the task. A low pressure/tension score (~2.0/7, inverted scale) indicates that children did not feel worried or stressed by the game fun, not stressful. These UMI results imply that LaObese encouraged motivated, engaged learning rather than testing or chores. For a serious game to succeed, children must enjoy it enough to play and learn.

Table 3: Usability and Motivation Feedback; averages from post-game questionnaires

Aspect	**Questionnaire**	**Score (Mean ± SD)**
Usefulness for learning	USE (1–5)	4.6 ± 0.5
Ease of Use (Interface)	USE (1–5)	4.7 ± 0.4
Ease of Learning (controls)	USE (1–5)	4.8 ± 0.4
Satisfaction (overall likeability)	USE (1–5)	4.5 ± 0.6
Interest/Enjoyment (fun factor)	UMI (1–7)	6.3 ± 0.7
Perceived Competence (confidence)	UMI (1–7)	5.9 ± 0.8
Effort/Attention to game	UMI (1–7)	6.0 ± 0.6
Pressure/Tension (lower is better)	UMI (1–7)	2.1 ± 1.0

4.6 Usability and Engagement (Expert View)

The expert unanimously rated the game's user interface and ease of use as 5/5 for the child audience. The expert was impressed that even without adult help, the child in this study could navigate the game – a testament to the interface design. A high mark for engagement/interest level (average 5/5, "excellent") is given, agreeing that the game elements (graphics, sounds, interactivity) are well-tuned to keep a young child's attention. The expert remarked that "the game cleverly uses rewards and fun tasks, so the kids don't realize they're learning – they're just having fun, which is the best way to teach them." Also, the virtual doctor idea in Level 4 was good, noting it provides a friendly authority figure that can reinforce advice.

4.7 Cultural and Ethical Appropriateness

It is specifically queried whether anything in the game might conflict with local cultural or religious norms. The experts found LaObese fully culturally appropriate (5/5). They appreciated the respectful inclusion of traditional foods and the option of Arabic culture. One minor suggestion was to ensure the avatar characters have modest clothing options if introducing more customization, to respect local norms. However, the current avatar was fine in their view. Ethically, they felt the game was positive and did not stigmatize overweight children. The messaging focuses on health, not weight or appearance, which the experts approved of. Table 4 presents a quantitative snapshot of the expert validation.

Table 4: Expert Validation Ratings (N=4 experts)

Criterion	**Average Rating**	**Comments Summarized**
Content Accuracy (health info)	5 / 5	Follows nutrition guidelines; no misinformation.
Cultural Relevance	5 / 5	Excellent – incorporates Omani foods and context.
Age Appropriateness	5 / 5	Very appropriate; messages simple and positive.
Usability for Children	5 / 5	Excellent UI: children can play with minimal help.
Engagement Level	5 / 5	Highly engaging and fun for kids (graphics, rewards).

Table 4 shows nutritionist experts' evaluation of LaObese. Ratings are on a 5-point scale (5 = excellent). Comments indicate unanimous positive feedback on content and design, with

some suggestions for broader integration. The strong endorsement from experts bolsters confidence in LaObese as a credible intervention. As one expert aptly put it, “This game is the first of its kind here, and it’s fun, it’s culturally on point, and it teaches kids in a gentle way. I see it as a great supplement to what we do in clinics and schools.” Their feedback also provides a roadmap for enhancements, reinforcing many points we identified internally.

5.0 Conclusion and Future Research

LaObese, the first serious game for childhood obesity reduction in Omani culture, was presented in this research. The game's architecture and Analytic Hierarchy Process made healthy eating and exercise material relevant to the target audience's diet. Age-appropriate, fun, and reminiscent of local life, LaObese's games received outstanding usability ratings, kid approval, and health professional support. LaObese improved children's nutrition and food choices in the short term. Qualitative remarks and high USE/UMI questionnaire scores indicated engagement and motivation. Expert considered the game nutritionally sound and promising for preventing early childhood obesity. These findings demonstrate the potential of culturally adapted gamification in public health. Interventions like LaObese can engage with users more deeply and possibly have a higher impact by speaking their language. Even though our study involved 26 children, it can be improved for larger implementations. Future steps include incorporating LaObese into school health courses or pediatric care and investigating its long-term impacts. It is also suggested to adapt this technique to other locations and health themes, as expert-driven content modelling and child-centred game design can engage young minds in healthy behaviour modification worldwide. In conclusion, LaObese shows how cultural nutrition research, decision modelling, and interactive design which AHP can create an instructive and fun intervention for kids and young children and create a healthier Oman and beyond.

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Author Contributions

Nurul A.M.Z.: Conceptualization, Methodology, Development, Software, Writing Original Draft Preparation. **Mukesh M.:** Software, Validation. **Zainab M.A.N.:** Data Collection, Consultation, Validation. **Jayasree R.:** Writing- Reviewing, Editing.

Conflicts of Interest

The manuscript has not been published elsewhere and is not being considered by other journals. All authors have approved the review, agree with its submission, and declare no conflict of interest in the manuscript.

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