

Research article

The Demand for a Hybrid Nutritional Assessment and Educational Tool among Thai Dietitians Using Online Questionnaires

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ABSTRACT

Malnutrition is a common health problem and significant risk factor for numerous noncommunicable diseases (NCDs). It remains underdiagnosed, posing a primary public health challenge in Thailand. Screening and assessment of nutrition status, along with providing nutrition knowledge to the Thai population, are still limited due to the lack of appropriate nutrition diagnosis tools. Therefore, this research aims to investigate the requirements for a hybrid nutritional assessment and educational tool among Thai dietitians. This questionnaire-based investigation surveyed 345 Registered Dietitians who were members of the Thai Dietetic Association and had more than one year of hospital experience. Participants completed an online questionnaire through web-based Google Forms, providing general and academic information, working experience, and responses on hybrid tool requirements. Of these, 87 participants (20%) were excluded for not meeting inclusion criteria. Among eligible respondents, 55.9% reported no prior experience with food or nutrition applications. Preferences for incorporating the Nutrition Care Process (NCP) to evaluate nutrition status varied from 53.6% to 99.7%. Notably, 340 out of 345 participants (98.6%) expressed interest in testing a developed hybrid tool. Most (55.9%) preferred a website platform, though platform significance varied by prior experience with nutrition technologies. The present study highlights the lack of a suitable tools for Thai dietitians to assess patients' nutritional status and supports the adoption of digital technologies. The findings provide a reference for developing a nutritional assessment and educational tool to advance the nutrition field in Thailand.

Key words: Malnutrition, Noncommunicable diseases, Nutrition assessment, Educational tool, Nutrition Care Process

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INTRODUCTION

Malnutrition is defined as deficits or excesses in nutrient intake, an imbalance of essential nutrients, or impaired nutrient utilization, and it can be classified into 3 stages: acute, subacute, or chronic malnutrition⁽¹⁾. The double burden of malnutrition consists of both undernutrition and overweight and obesity, as well as diet-related noncommunicable diseases. Undernutrition is characterized by 4 primary manifestations: wasting, stunting, underweight, and micronutrient deficiencies⁽²⁾. All these issues, when considered together, indirectly increase hospital costs, secondary to the management of their primary medical reason for admission, worsened clinical course, increased length of stay, and raises mortality. Consequently, it may be possible to implement simple nutrition screening systems that target malnutrition during the initial stages of treatment to expedite the patient's recovery and prevent malnutrition^(3,4). Addressing malnutrition at the early stage of treatment will facilitate recovery while providing patients with numerous benefits⁽⁵⁾. Nutrition screening, assessment, and intervention in all patients are the key components of nutrition care. Nutrition evaluation is required by the Joint Commission in the United States within 24 hours of admission to an acute care center. The purpose of nutrition assessment is to detect any identifiable nutrition risk or the evident presence of malnutrition⁽⁶⁾. The Nutrition Care Process (NCP) is a recognized method for screening and evaluating nutritional status and is primarily used to provide nutrition care to individuals in healthcare settings. The NCP consists of four steps that form a framework: nutrition assessment, nutrition diagnosis, nutrition

intervention, and nutrition monitoring and evaluation to improve patient health and nutrition status⁽⁷⁾. This process is widely recognized and adopted in clinical practice because it enhances critical thinking, support professional judgment, and improves the quality and continuity of nutrition care^(7,9). To enhance the effectiveness of the assessment, it is also possible to evaluate the patient's readiness to change behavior (stage of change) and learning method (learning type) individually^(8,9).

Currently, social media has significantly impacted every aspect of our lives, making it significantly easier and more convenient while connecting academics, educators, and researchers worldwide. It also provides engaging, enlightening, and interesting content⁽⁹⁾. By providing participants with more engaging and in-depth learning experiences, the traditional educational system has effectively transformed into a useful hybrid educational tool and facilitated the learning process by supplying the current system with a new dimension⁽¹⁰⁾. The dietitian-patient interaction, long-term treatment among patients, and the incapacity to follow up on treatment or provide appropriate treatment for each individual are all factors that limit the optimal use of nutrition education applications^(11,12). Nevertheless, there is evidence of the efficacy of smartphone applications in providing nutritional support⁽¹³⁾.

The screening and assessment of nutritional status, as well as the provision of nutrition knowledge to the patients, are limited by a lack of accurate and appropriate information, as well as the lack of convenience and reliability in data sharing and storage among dietitians, patients, and other healthcare providers. In a

situation of limited healthcare resources, the finding of this study will help design an effective hybrid nutritional assessment and educational tool. Therefore, this study aims to investigate and determine the requirements for the hybrid nutritional assessment and educational tool among Thai dietitians in Thailand to enhance the efficiency of the nutrition field.

MATERIALS AND METHODS

Study design

This research project used a quantitative cross-sectional survey. The researcher developed validated questionnaires to conduct the study, with closed-ended question types. The question topics were divided into the following categories: general information and nutritional tools usage behavior, the level of need for the hybrid nutritional assessment and education tool, and opinions and suggestions to determine the requirements of hybrid nutritional assessment and educational tools. The participants completed the self-administered questionnaire via an online system, while the researcher provided guidance on how to respond to questions if participants were uncertain about a question's meaning or how to complete the questionnaire.

Study participants

Thai dietitians were the targeted population for this study. Eligible participants were Registered Dietitians and members of the Thai Dietetic Association with at least one year of experience working in hospitals who were willing to participate in the project. Participants were recruited using email and social networking services such as the Thai Dietitians website page, Facebook, Line, Instagram, etc. For

participant screening, a web-based Google Form was generated, and a screening questionnaire link was shared via email or Line.

The inclusion criteria for this study included Registered Dietitians and members of the Thai Dietetic Association who had at least one year of experience working in a hospital and were willing to participate in the project. Exclusion criteria included incomplete information. The sample size was determined from a finite population of 3,263 dietitians who passed the Thai Registered Dietitians exam in 2023, using Cochran's Formula for sampling population determination. A 95% confidence level was applied, corresponding to a Z-score of 1.96, along with margin of error of 5% and an estimated population proportion of 0.5 to ensure maximum sample size precision and calculated by the following equation⁽¹⁴⁾.

$$n_o = \frac{Z^2 pq}{e^2}$$

To adjust for the small sample size of the population in this study, the sample size must be modified using the following equation⁽¹⁵⁾.

$$n = \frac{n_o}{1 + \left(\frac{n_o - 1}{N} \right)}$$

It is necessary to apply the method to obtain a 20% dropout rate, as the study might not include all respondents. The total population was determined by the following equation⁽¹⁶⁾.

$$n' = \frac{100N}{100 - x}$$

According to the calculation, the sample size of the research participants, which included a 20% dropout rate was 432 participants.

Study outcomes and statistical analysis

The statistical analysis was performed using SPSS software (version 18, SPSS Inc., Chicago, IL, USA). Demographic variables were



described using descriptive statistics. Measurements of parameters were presented as percentages and analyzed to determine if there was a relationship between the selected platform and the working field using the Pearson chi-square test ($p < 0.05$). To measure the study outcomes, two parameters were described using proportion percentages: the purpose of the nutrition application use and the platform access requirement.

Ethical consideration

This study was begun after obtaining approval from the Institutional Review Board, Mahidol University (Protocol No. 2024/067.2702). Participants were thoroughly briefed on all aspects of the study, including its objectives and methods, after which they provided written consent before enrolling in the study through Google Forms. All procedures followed the

ethical standards of the IRB and the Helsinki Declaration of 1975.

RESULTS

The study included 345 participants who met the inclusion criteria. The average age was 34.80 years with a standard deviation of 9.36, indicating a wide age range. Most participants (43.8%) were aged between 31 and 40 years, while only 1.4% were over 60 years. In terms of education, 89.6% were graduates. A smaller number achieved higher degrees, with 9.0% holding a Master's degree and 1.4% a Doctorate. Occupationally, the majority (56.2%) were employed in clinical settings, while 36.0% worked in food services and 7.8% in community roles. These demographic details are presented in **Table 1**.

Table 1. General characteristics of participant

Characteristics	Overall (n=345)
Age, years	34.80 ± 9.36
Age, n (%)	
20 - 30 years	117 (33.9)
31 - 40 years	151 (43.8)
41 – 50 years	49 (14.2)
51 – 60 years	23 (6.7)
more than 60 years	5 (1.4)
Gender, n (%)	
Female	313 (90.7)
Male	32 (9.3)
Education, n (%)	
Bachelor	309 (89.6)
Master's	31 (9.0)
Doctoral	5 (1.4)
Working field, n (%)	
Food Service	124 (36.0)
Clinical	194 (56.2)
Community	27 (7.8)

Qualitative data is represented as n (%), while quantitative data is represented as mean ± SD.

The Platform-specific use requirements (**Figure 1**) revealed that a significant 56.52% of participants preferred the website platform, underscoring its dominance in user choices. Following this, iOS smartphone apps were favored by 17.68%, reflecting their strong presence in the mobile market. Computer programs, chosen by 16.23% of participants, maintained a consistent user base, likely due to the specific functionalities they offer. Interestingly, Android apps are the least used, chosen by only

9.57%. This shows that the website platform was the most preferred option, selected by more than half of the participants. This indicates that web-based platforms are the primary choice for accessing nutrition-related systems among the respondents, demonstrating clear dominance over other platform types. This distribution not only highlights the preference for websites but also displays diverse utilization patterns across technological platforms.

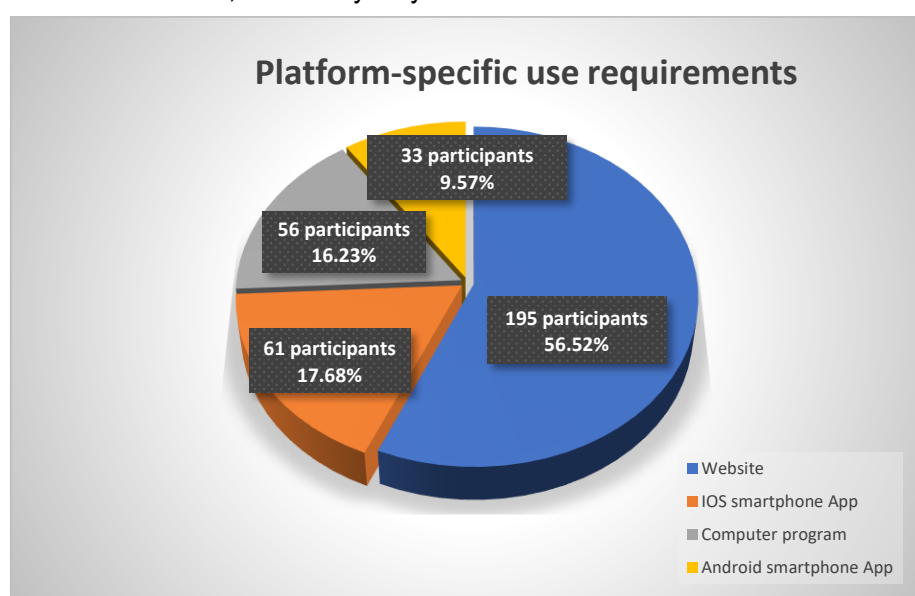


Figure 1. Platform-specific use requirement. Data are presented as *n* and percentages.

The analysis demonstrates a substantial correlation between the platform chosen and user experience with prior nutrition technology use. The data table provides a comprehensive overview of user experience across several platforms (**Table 2**). Among total responders, 56.2% indicated prior experience, while 43.8% did not. Among experienced users, the majority (50.4% of the total) predominantly chose the website, highlighting its significant importance in user engagement. Conversely, merely 3.2%

employed a computer program, 2.0% an iOS smartphone application, and 0.6% an Android smartphone application.

Among participants without previous experience, the distribution was as follows: 15.7% chose an iOS smartphone application, 13.0% chose a computer program, 9.0% chose an Android smartphone application, and 6.1% continued to prefer the website. This indicates that the website is favored by experienced users, either due to their familiarity or the platform's



usability, whereas inexperienced users tend to explore a wider range of alternatives. This reveals an important difference in platform preference according to user experience level.

The chi-square test, yielding a Pearson Chi-Square value of 200.173 and a p-value of

0.000, substantiates that these differences are statistically significant. This indicates that the website is predominantly chosen by experienced users relative to other platforms, revealing a significant gap in user experience.

Table 2. User experience by platform distribution

Prior experience using nutrition technologies		Platform (n, %)*				Total
		Website	Computer program	IOS smartphone App	Android smartphone App	
YES		174	11	7	2	194
		50.4%	3.2%	2.0%	0.6%	56.2%
NO		21	45	54	31	151
		6.1%	13.0%	15.7%	9.0%	43.8%
Total	Count	195	56	61	33	345
	% of Total	56.5%	16.2%	17.7%	9.6%	100.0%

* Values are expressed as a percentage. This illustrates the distribution of user experience across different platforms, Values with different platforms chosen between experienced and inexperienced indicate significant differences at $p < 0.05$ using crosstabs followed by Pearson Chi-Square

The figure illustrates participants' preferences for various dietary assessment methods (**Figure 2**). With 41.2% (142 out of 345 participants) favoring the Dietary History, its popularity is evident, likely due to its comprehensive approach. The 24-hour Recall, chosen by 35.4%, offers efficiency, capturing immediate dietary intake. Meanwhile, 13.0% of

participants opted for the Food Frequency Questionnaire (FFQ), valued for its ability to track eating patterns over time. Finally, the 3-day Dietary Record, selected by 10.4%, provides a practical option for short-term assessments. Overall, the chart underscores a preference for methods that balance thoroughness with practical use, effectively assessing patients' nutritional status.

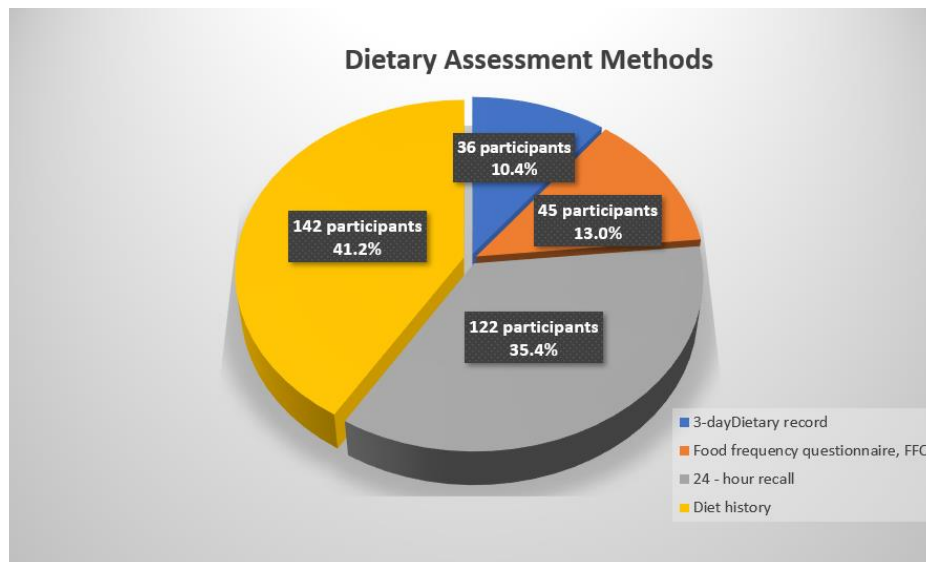


Figure 2. Dietary assessment methods. Data are presented as n and percentages.

Figure 3 illustrates participant agreement levels regarding several different subjects. The results demonstrated responses to various topics considered for inclusion in a hybrid nutritional assessment and educational tool. High agreement for Anthropometry assessment and Energy distribution emphasizes their strong appeal to participants, reflecting perceived significance and utility. Conversely, the topic of Game emerges as particularly contentious, with a notable 46.4% disagreement rate, indicating

perceived irrelevance that warrants attention. Additionally, the Printed function and Knowledge brochure show substantial debate. This diagram efficiently contrasts consensus with areas of disagreement, offering valuable insights for refining tools to better meet participant needs and expectations. However, 340 out of 345 participants (98.6%) reported interest in trying out a hybrid nutrition assessment and educational tool after it was developed.

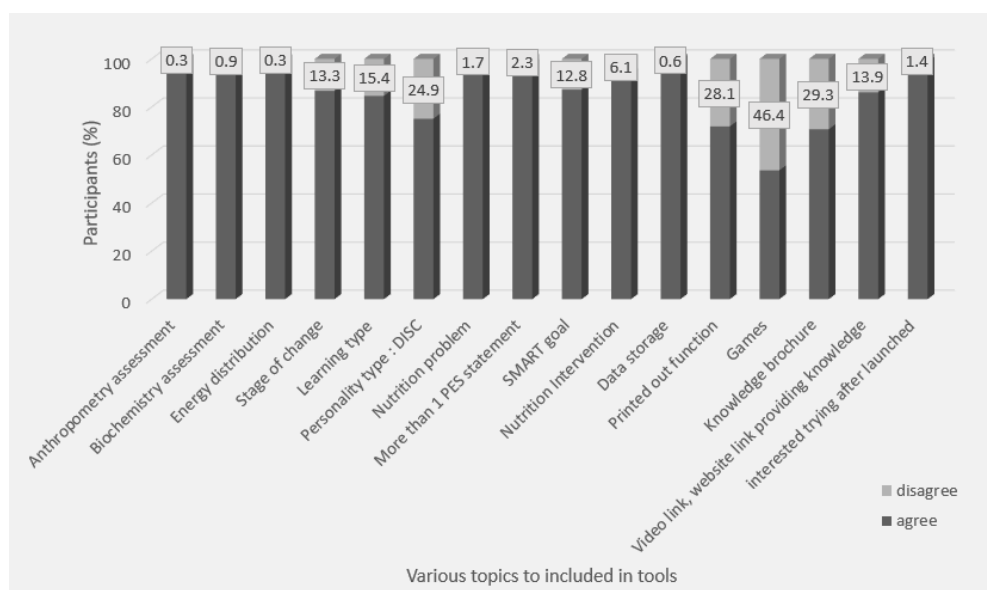


Figure 3. Participant's agreement level regarding several different subjects. Data are presented as percentages.



The agreement level represents the proportion of participants who indicated that each listed topic should be included in the nutrition care tools. Participants were asked to express their agreement or disagreement with each topic, and the responses were summarized and presented as percentages.

The needs reveal a comprehensive view of priorities in nutrition technology. Nutrition Assessment stands out as the most critical requirement, with 92.5% of participants stressing its significance. This emphasis underscores the foundational role assessments play in effective nutritional practices.

Additionally, 79.4% of respondents highlighted data saving as a major necessity, pointing to the vital role of efficient data management in facilitating accurate assessments and interventions. Nutrition Diagnosis and Intervention were also key areas, noted by 74.8%

and 77.1% of participants, respectively. These figures emphasize the essential nature of precise diagnostics and intervention strategies in delivering high-quality nutritional care.

Moreover, 63.2% of respondents identified Nutrition Monitoring and Evaluation as crucial, reflecting a desire for ongoing assessments to ensure the success of nutritional plans. The focus on setting SMART goals, acknowledged by 58.6%, highlights the need for structured and measurable outcomes.

Together, these insights offer a clear path for the development of a hybrid nutritional assessment tool. By focusing on these priorities, developers, and practitioners can craft tools that are both comprehensive and practical, ultimately enhancing the quality of nutritional care and education provided.

Table 3. Frequencies (*n*) and percentages (%) of various needs identified by respondents

	Responses (<i>n</i>)	Percent of Cases
Nutrition Assessment	319	92.5%
Nutrition Diagnosis	258	74.8%
Nutrition Intervention	266	77.1%
Set SMART goal	202	58.6%
Nutrition Monitoring/Evaluation	218	63.2%
Data save	274	79.4%

The dichotomy group tabulated a valued “needed”. A total of 1,537 responses.

DISCUSSION

This study investigated the requirements of Thai dietitians regarding nutrition technology, using an engaging an online survey to gather data. Dietitians highlighted essential features they

seek, particularly the need for personalized solutions that meet their specific requirements. They pointed out gaps in current tools and expressed a strong desire for technology that enhances accuracy and effectiveness in their

assessments and evaluation^(17–19). The survey also provided valuable insights into the preferred content and structure of these hybrid nutrition assessment and educational tool programs, offering a clear roadmap for developers^(20–22). By tapping into these preferences, developers have the opportunity to create innovative solutions that truly address dietitians' needs, ultimately improving the quality of nutritional care⁽²²⁾. Overall, this study represents an important step in advancing nutrition technology in Thailand, ensuring it aligns with the evolving demands of professionals in the nutrition field.

The online approach was a crucial adaptation that allowed dietitians from all over Thailand to participate. This inclusivity provided a diverse and comprehensive range of insights from professionals across the country, particularly because individuals in the modern era are already familiar with technological media⁽²³⁾, which allows for seamless integration into their daily routines⁽²⁴⁾.

The preferences and needs in nutrition technologies offer an in-depth understanding of demographic insights, platform usage patterns, dietary assessment methods, and broader nutritional requirements, with a substantial sample of 345 participants, predominantly women. Nevertheless, this gender imbalance is unlikely to affect the research outcomes, as the majority of dietitians are women. Moreover, the findings suggest that opinions are consistent regardless of gender⁽²⁵⁾, age 31–40, and holding graduate degrees; the study identifies critical trends necessary for advancing nutrition technology^(26–31). A significant portion of respondents work in clinical environments, reflecting a strong professional focus on nutrition-

centric applications^(32,33), a pattern that mirrors broader industry dynamics and suggests potential areas for further development. Experienced users display a marked preference for websites, likely due to their familiarity, easy interactivity, and intuitive user interfaces, establishing them as trusted platforms^(34,35). The organized design and user-friendly nature enhance their widespread adoption⁽³⁶⁾. However, this preference also underscores the importance of building trust through reliable and consistent user experiences⁽³²⁾. There is a potential to further enhance web platforms by integrating more personalized features that cater to individual user needs, possibly through adaptive design and machine learning technologies⁽³³⁾.

In contrast, the varied preferences among inexperienced prior nutrition technology users highlight opportunities to enhance the platform's accessibility and ensure it is more user-friendly, with the aim of implementing improvements that make the platform more inclusive and easily navigable for a diverse range of users⁽³⁷⁾. By enhancing user interfaces and optimizing functionality, developers can close the usability gap and increase adoption across diverse demographics. It might be beneficial to conduct workshops or offer tutorials that simplify these technologies for users, thereby demystifying perceived complexities and encouraging broader engagement^(38,39). In evaluating dietary assessment methods, the Dietary History method stands out for its comprehensive approach to capturing detailed dietary patterns. This preference emphasizes the method's ability to provide deep insights into eating habits. These insights could be invaluable for tailoring nutritional interventions and ensuring adherence to dietary



changes. Creating more interactive tools that guide users through this assessment process could further enhance its effectiveness^(40–42). Meanwhile, the popularity of the 24-hour Recall method underscores a valuable blend of thoroughness and timeliness, catering to those needing swift dietary evaluations. This balance is crucial in clinical practice, where timely and accurate data are essential. Developing mobile applications or websites that facilitate real-time data entry and immediate feedback could support professionals in making rapid, informed decisions. The study also underscores user consensus on hybrid nutritional tools, showing strong support for components like Anthropometry assessment and Energy distribution. These features strongly resonate with participants, underscoring their perceived importance and effectiveness. Further development of these tools could focus on enhancing accuracy and integrating them with predictive analytics to forecast long-term health outcomes⁽⁴³⁾.

Conversely, the considerable debate surrounding "Video link, website link providing knowledge" suggests potential areas for improvement. This debate highlights a need to reassess how content is delivered, ensuring it meets evolving user expectations and technological advancements. Offering diverse content formats, such as interactive videos and podcasts, might engage users more effectively, catering to various learning preferences. Furthermore, focusing on key nutritional requirements—Nutrition Assessment, Diagnosis, and Intervention—emphasizes the necessity of developing tools that enhance intervention efficacy. By centering efforts on improving

assessment tools and diagnostic capabilities, stakeholders can craft strategies that are both comprehensive and impactful. Collaborating with interdisciplinary teams could lead to innovative solutions that encompass not only nutritional care but also behavioral and psychological considerations.

In the broader discussion, several factors contribute to these preferences. The inclination toward websites among experienced users might be driven by stability and consistent performance, critical in professional settings. Additionally, general reluctance towards less popular platforms could be mitigated through user education and support, potentially overcoming perceived complexities and enhancing user confidence. Incorporating user feedback in the development process can ensure the platforms evolve to meet actual user requirements and expectations.

The debate over content delivery methods indicates a demand for more interactive and engaging educational resources. Incorporating multimedia elements that cater to different learning styles could address these challenges, creating a more inclusive user experience. Moreover, leveraging augmented reality (AR) and virtual reality (VR) technologies could transform how users interact with educational content, providing an immersive learning experience⁽⁴⁴⁾.

Ultimately, these findings highlight the importance of strategically advancing digital platforms, dietary assessment methods, and nutritional tool development. Aligning innovations with diverse user needs and expectations may substantially enhance user engagement and improve outcomes within nutrition technology applications. This study contributes foundational evidence to support a more informed and user-

centered direction for future development, ensuring that emerging tools are relevant, effective, and responsive to the evolving demands within the nutrition field. Sustained attention to adaptability and user engagement suggests that nutrition technologies hold significant potential to positively influence health outcomes moving forward.

However, this study has certain limitations that should be acknowledged. The use of self-reported data may introduce response bias, and the cross-sectional design restricts interpretation of causality. Furthermore, age may influence platform preference and could act as a confounding factor. Nevertheless, age-specific analysis was not conducted in this study and should be addressed in future research to strengthen understanding in this area.

CONCLUSION

This study demonstrates essential user preferences and requirements in the field of nutrition technologies. Experienced users suggest an obvious preference for websites, emphasizing the importance of user-friendly and easily accessible interfaces. This indicates that usability and satisfaction can be greatly increased by improving user-friendly design on digital platforms. Inexperienced users, demonstrating a wider range of platform preferences, provide developers the chance to enhance and improve user experiences on platforms that users are not familiar with. The preferred dietary assessment methods, specifically dietary history demonstrate an ideal combination of detailed evaluation and practical accessibility, providing the decision of effective tools for dietitians. The investigation highlights important topics such as data storage

and other digital tools that, while not directly relevant to nutrition assessment, are still essential for practitioners. Although there is high agreement in adding functionalities such as anthropometry assessment, nutrition assessment, and biochemistry assessment, it can improve the quality of the tool. Overall, these findings provide an extensive framework for guiding toward the development of more flexible and user-centered nutrition technologies, offering user satisfaction with varied requirements, while improving the overall effectiveness and usefulness of digital nutrition tools among dietitians.

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