A Universally Designed Dietary Mobile Application for Healthier Lifestyles

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Keywords: Dietary App, Health Lifestyles, Universal Design, Systems Usability, Remote Evaluation.

Abstract: Practicing a healthy diet is becoming increasingly important not only because people are living longer, but because they also have a more sedentary lifestyle. Research has shown that using a mobile dietary application (app) could help enhance goal setting and self-monitoring of dietary behaviors. However, when using an app, users can become demotivated if the design of the app is not intuitive and user-friendly. The group of dietary app users varies enormously in terms of their demographic backgrounds, including age, gender, digital skills, and educational level. This means that dietary apps need to be universally designed so that they are intuitive, user-friendly, and accessible to people with a wide range of abilities, disabilities, and characteristics. However, only a limited number of studies have focused on making dietary apps more universally designed. In this study, we evaluated three already-on-the-market dietary apps (MyFitnessPal, Lose it!, and MyNetDiary) with 10 participants from diverse backgrounds. The evaluations consisted of usability testing and a semi-structured interview. The outcomes were used to propose an improved design for a dietary app. Universal design (UD) principles, together with Nielsen's usability heuristics, guided the entire study.

1 INTRODUCTION

A regular day for a person can be categorized into a number of main activities, such as paid work, sleep, leisure, eating and drinking, personal care, housework and shopping, and other unpaid work (Ortiz-Ospina, 2020). Paid work, as one of the main activities, has become less physically demanding, and hence, more sedentary in many sectors. Statistics from Eurostat showed that 39% of people employed in the European Union carried out their work sitting down, whereas 20% spent most of their time standing, 30% had some moderate physical effort, and only 12% were involved in heavy physical effort (Eurostat, 2019). Having a sedentary lifestyle could contribute to many causes of mortality by doubling the risk of cardiovascular diseases, diabetes, and obesity and increasing the risk of high blood pressure, depression, and anxiety (WHO, 2021). At the individual level, practicing a healthy diet and lifestyle can contribute to addressing a more sedentary routine. Under the second of the United Nations (UN) sustainable goals, good quality of food with improved nutrition is one of the objectives for improving health (UN, 2021).

Many people can now use mobile health-related technologies to help maintain a healthy lifestyle, given the advances in Information and Communication Technologies (ICT). Some examples of health-related applications (apps) now available are apps for monitoring blood glucose level, blood pressure, and oxygen level and daily-living apps, such as step-counters, sleep-tracking apps, and dietary apps. Consequently, many mobile users who have jobs that require them to be less physically active choose to pay more attention to their diets, and dietary apps have become increasingly popular among smartphone users as a result of greater accessibility and choices of these types of apps that can be simply downloaded from the App Store or Google Play (Bardus et al., 2016; Campbell & Porter, 2015). A systematic review that assessed the quality and content (i.e., features related to engagement, functionality, aesthetics, and information quality) of popular weight management apps, including dietary apps, highlighted the lack of focus on the usability aspects in the design and development of these apps, as these aspects can be highly associated with the users' behavioral changes (Bardus et al., 2016).

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Du, K. and Bong, W.
A Universally Designed Dietary Mobile Application for Healthier Lifestyles.
In *Proceedings of the 8th International Conference on Information and Communication Technologies for Ageing Well and e-Health (ICT4AWE 2022)*, pages 177-185
ISBN: 978-989-758-566-1; ISSN: 2184-4984
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The users of mobile dietary apps are diverse and can vary in terms of ages, genders, education levels, digital skills, and other socio-demographics. Thus, a more universally designed dietary app could provide a better user experience for these diverse users. Using the seven Universal Design (UD) principles (i.e., equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort and size and space for approach and use) can guide the design of more usable and accessible environments and products (Story, 1998). This type of design can ensure the inclusion of diverse users to the greatest extent possible, while further ensuring that the users will be motivated to use the app for a long time.

However, only a limited number of studies have focused on making dietary apps more universally designed. Fuglerud et al. (2018), in a project named APPETITT, attempted to create an easy-to-use yet attractive tablet app that could be used by older people at risk of malnutrition. After two iterations of development, evaluations, and trials with potential users, the results appeared promising, as the older users perceived the app as inspiring and easy to use. Hongu et al. (2015) designed and developed a dietary app focused on capturing diet intake, aiming to make this functionality more user-friendly for the users. While these studies highlighted the importance of the ease of use of a dietary app, the failure to incorporate UD perspectives in the design and assessment of dietary apps is apparent. In the present study, our aim was to explore how to make a more universally designed mobile dietary app. To achieve this, we have studied the design of already-on-the-market dietary apps, and we have proposed some improved designs.

2 METHODOLOGY

This study was divided into two phases. We first conducted evaluations of existing dietary apps with participants with diverse backgrounds. The evaluations consisted of usability testing and semi-structured interviews. The second phase consisted of redesigning a dietary app to make it more universally designed.

The study was conducted during the COVID-19 pandemic, when physical meetings were not recommended. Therefore, we conducted the usability evaluations remotely and adopted the protocols for conducting remote evaluation advanced by Simon-Liedtke et al. (2021). The usability evaluations were conducted by a test leader on 10 participants of diverse backgrounds who were recruited using convenience sampling (i.e., they were selected to participate because they were easily accessible).

Prior to the study, the participants were first asked about their willingness and ability (i.e., having the time, webcam, smart device, etc.) to participate in a remote usability evaluation. Once they agreed, they were asked to choose a preferred video conferencing system among Zoom, Discord, Google Hangout, or Microsoft Teams, and a suitable date and time for the remote evaluation. An instruction file was sent to all participants to instruct them on how to download and log in to the dietary apps they were going to test.

2.1 Instruments

Three already-on-the-market dietary apps were identified based on the following set of criteria (i.e., available either on the App Store or Google Play, have the feature of capturing diet intake, have a weight planner function, have a barcode scanning feature for food products, and have a personalized account). The chosen apps were MyFitnessPal, Lose it!, and MyNetDiary. Features of a weight planner function, barcode scanning, and a personalized account were considered inclusion criteria as they could heavily impact the users' selection of a dietary app with regards to user experience and user engagement (Bardus et al., 2016; Campbell & Porter, 2015). We then developed a list of testing tasks for the usability testing. The participants needed to:

1. Set their current weight and target weight (after a weight management program with dietary control);
2. Make changes to current weight;
3. Add breakfast (food and drink) using a search;
4. Add dinner using a barcode scanner;
5. Modify the amount of food eaten for dinner; and
6. Check their calorie intake for the day.

In addition to the testing tasks, a semi-structured interview guide was developed to gather more insight regarding the participants' experience in using a dietary app in general and the three apps chosen to perform usability testing specifically. Some of the questions included, "What do you like and/or dislike about these dietary apps?", "How hard was it for you to change your current and target weight?", "How hard was it to add different types of food?", "What do you think of the barcode scanner?", "Do you prefer searching or scanning the barcode for logging your diet?", "Will you use dietary app in the future? (If yes, which one; if no, why not?)", "What do you think of using dietary apps for improving health?", and "What needs to be improved in the dietary apps?"

2.2 Data Collection and Analysis

The participants were briefed about the evaluations and asked to provide their consent before the evaluation could begin. The evaluations started with collecting demographic information. Besides age, gender, and highest education level obtained, they were asked to rate themselves on their digital skills (from 1 to 10; 1 is very bad and 10 is very advanced), their concern about diet (from 1 to 10; 1 is not concerned at all and 10 is very concerned), and about their experience in using dietary apps.

After collecting the demographic information, we asked the participants to perform the usability testing tasks using their own phones. In order to ensure that the test leader could observe the ways in which the participants used the dietary apps, the participants were instructed to show their smartphones on a webcam (Figure 1). Each participant evaluated two apps, and the evaluations then ended with the semi-structured interview. The participants were also asked to give a score (from 1 to 10, 1 is very bad and 10 is very good) to the dietary apps they had tested and to indicate their preferred app.

The outcomes of the evaluations (notes made under observation, answers from semi-structured interviews, scores, etc.) were sampled together and analyzed. The design and functionalities that gave the participants the most issues were identified and reflected upon for our proposal of an improved design for a dietary app. UD principles, together with Nielsen's usability heuristics, then guided our analysis and redesign process.

Figure 1: Setup for remote usability testing.

2.3 Redesign (Prototyping)

Sketches were first made on paper, and wireframes were then created using Figma. The wireframes were aimed to show that the proposed improvements could be made. The improvements have yet to be evaluated at the time of writing this paper.

3 RESULTS

Table 1 summarizes the gathered demographic information, the apps tested by the participants (in their corresponding sequence of App 1, then App 2), the participants' respective scores, their preferred app comparing App 1 and App 2, their willingness to use any of the apps in the future, and their belief that using a dietary app could improve one's health. Most participants did not have any previous experience using dietary apps for the same reason, namely, that they had never had the need to use it and therefore never had the thought about using it. Their ages ranged from 21 to 50 years (median = 27.5, average = 29.1). Their self-rated digital skills and concerns about diet ranged from 2 to 8 (median = 7, average = 6.1) and 3 to 9 (median = 6, average = 6), respectively.

P7 preferred Lose it!, but the other participants preferred either MyFitnessPal or MyNetDiary. Half of the participants would use one of these two apps in the future, while the other half did not intend to use a dietary app. All participants, except for P3, believed that using a dietary app could contribute to healthier dietary behaviors and thus improve health.

In terms of preferred dietary apps, all participants, except for P2 and P8, chose the app that they had given a higher score. When clarifying, P2 and P8 gave the same answer; the sequence of the usability testing affected their scores. After the first round of testing, they gained experience using a dietary app in general. Therefore, they found the second app easier to use and gave it a higher score. However, when they had to recall and compare the design of both apps, they then expressed different opinions than the given scores. P8 expressed his preferences over a more complicated user interface, while P2 agreed that he would have given a higher score to MyFitnessPal had the sequence of the apps been swapped.

3.1 Usability Issues

The main usability issue across all three dietary apps was observed when the participants were trying to log and change the user's current weight. All three apps offered at least two ways to achieve these two goals. For instance, they could be done via "Log" and "Goals" for Lose it!; via a hamburger menu, then "My plan" and "Coach" for MyNetDiary; and via a hamburger menu, then "Goals" and "Me" for MyFitnessPal (From left to right, in Figure 2, indicated with red arrows). Eight of the ten participants needed guidance from the test leader, as they became stuck using one or both dietary apps, and had problems finding the right way to perform this task. These participants later expressed that the ways to log the current weight were not as expected, as they were confused between weight for today and current

weight. Weight for today referred to the weight to be logged by users every day (for example, under a weight management program), while the current weight was the weight reflected on the user profile, which was more general data.

Another usability issue was the low color contrast in some interfaces, which resulted in users not being able to recognize clickable buttons and search input fields. As shown in Figure 3a, in the "My Plan" page of MyNetDiary, the four clickable buttons for navigating between tabs of My Diet; Weight & Calories; Carbs, Protein & Fat; and Exercise Plan had the same color as the background of the app. Only one tiny white stripe under the button showed the selected button. For the search input fields for finding and logging the food taken, MyFitnessPal and Lose it! had fields of similar color and exactly the same color as the background color, respectively (see Figure 3b). A better color contrast was perceived in MyNetDiary.

Lose it! and MyNetDiary were deemed to have too much information and the information was considered too scattered around. As shown in Figure 2, at the diet tracking page, the calorie summary included information about exercise, steps, water, notes, breakfast, lunch, dinner, and snacks, in addition to a calorie budget and calories remaining for that particular day. This information was displayed around the calorie budget and calories left (the apple image at the center) and was judged as providing too much information scattered around on the page and needing better categorization.

Lack of instructions in guiding the users on how to use the barcode scanner was observed in MyFitnessPal and Lose it! Figure 4 shows that, compared to MyNetDiary (in the middle of the figure), both MyFitnessPal and Lose it! did not provide much information to the users on what to do once they had navigated there. The function of the barcode scanner was appreciated by some participants, as they thought it required less effort to log meals taken compared to typing and keying in the information.

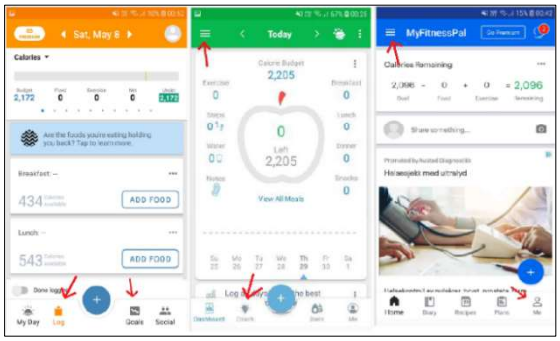

Figure 2: Ways to log current weight, from left to right, for Lose it!, MyNetDiary, and MyFitnessPal.

Similar usability issues were found on other pages in these dietary apps, where several elements either had no text describing what they were or nothing at all was provided to instruct and inform the users regarding what they should or could do. For instance, in MyNetDiary, the "0" number in the middle of the apple shown in Figure 2 was supposed to indicate the total calories taken. At the page of "Goals" in Lose it!, a graph displayed the weight tracking data.

Table 1: Demographic information and evaluation results of all participants.

	Age	Sex	Education level	Digital skill (1 to 10)	Concern about diet (1 to 10)	Prior experience in using dietary app	App 1, score	App 2, score	Preferred app	Future use	Improve health
P1	27	F	Master	7	8	Yes	MyFitnessPal, 8	Lose it!,7	MyFitnessPal	Yes, MyFitnessPal	Yes
P2	26	M	High school	7	6	No	MyFitnessPal, 3	MyNetDiary, 5	MyFitnessPal	No	Yes
P3	50	F	High school	2	4	No	MyFitnessPal, 3	Lose it!, 2	MyFitnessPal	No	N/A (unsure)
P4	23	F	Bachelor	7	3	No	MyNetDiary, 8	Lose it!, 8	MyNetDiary	No	Yes
P5	28	F	Master	7	8	Yes	MyFitnessPal, 7	MyNetDiary, 8	MyNetDiary	Yes, MyNetDiary	Yes
P6	31	M	Bachelor	6	9	Yes	MyNetDiary, 7	Lose it!, 6	MyNetDiary	Yes, MyNetDiary	Yes
P7	21	M	High school	7	4	No	Lose it!, 7	MyFitnessPal, 6	Lose it!	Yes, MyFitnessPal	Yes
P8	30	M	Bachelor	6	5	Yes	MyNetDiary, 5	MyFitnessPal, 6	MyNetDiary	Yes, MyNetDiary	Yes
P9	34	F	Master	8	6	Yes	Lose it!, 5	MyNetDiary, 6	MyNetDiary	No	Yes
P10	21	M	High school	4	7	No	MyFitnessPal, 7	MyNetDiary, 6	MyFitnessPal	No	Yes

Figure 3: (a) Low contrast between clickable buttons and background in MyNetDiary, (b) Search input fields (From top to bottom, MyFitnessPal, MyNetDiary, and Lose it!).

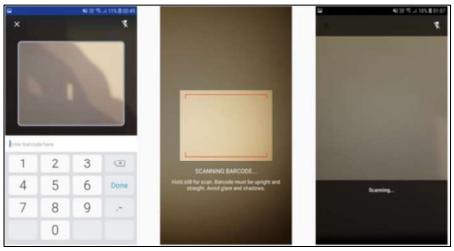

Figure 4: Barcode scanning page, from left to right, MyFitnessPal, MyNetDiary, and Lose it!.

To change the current weight, the users had to click on the graph to navigate to further details about weight. However, many participants had problems understanding this, as there was no instruction explaining that the graph was a clickable element for navigating to the weight details.

The participants also found the design troublesome due to a lack of flexibility in terms of choosing the units of measurement. In MyFitnessPal, users were limited to only a few options for units of measurement for milk (i.e., 8.0 oz., 1.0 oz., 1.0 lb., 1.0 kg, and 1.0 mg). MyNetDiary offered slightly more options. In Lose it!, the users could choose from units of cup, liter, pint, gram, pound, ounce, fluid ounce, etc. The participants also commented that these dietary apps did not offer any tutorials for first-time users and/or users who needed more guidance.

3.2 Improved Design

Using UD principles, the usability issues were reflected upon, and an improved design was made. During this process, Nielsen's usability heuristics were referred to as well. First, the design was aligned with UD principles "simple and intuitive use" and "perceptible information," and usability heuristics "visibility of system status," and clearer ways to differentiate between current weight and today's weight were incorporated. Current weight only appeared in the user profile, while today's weight was accessible on both the diet tracking page and the weight tracking page.

Second, the same UD principles and usability heuristics were referenced to ensure that the improved design offered more instructions and information on pages where the users would need clear guidance. For instance, clear and straightforward instructions were provided on the barcode scanner page (Figure 5a), while the diet tracking and weight tracking pages had clear labels indicating that the weight was today's weight and not the current weight.

Third, more categorization was provided for the displayed information to simplify the calorie summary. Figure 5b shows the simplified design of the calorie summary, which displays only the calorie budget, intake, and calories left for that particular day. This design was based on the UD principle "simple and intuitive use" and the usability heuristics "aesthetic and minimalist design."

Regarding units of measurements, more options were offered to achieve the aim of the UD principle "equitable use," which makes the design usable and marketable to all users, regardless of demographic background. The choice of units of measurement is often culturally influenced. The usability heuristics' "match between system and the real worlds" also emphasized that the system should follow real-world conventions by making information appear in a more natural way. In this context, we attempted to include all units of measurement to reflect the inclusion of diverse users.

A tutorial was designed to assist first-time users and/or users who needed guidance. This fulfills Nielsen's usability heuristic "Help and documentation." An option to skip the tutorial was provided as well. Finally, all interfaces were checked in terms of their color contrast, based on the requirements of the Web Content Accessibility Guidelines (WCAG).

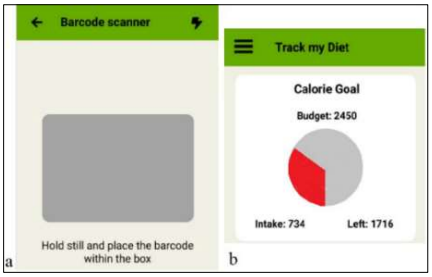

Figure 5: (a) Instruction provided on the barcode scanner page, (b) Simplified design of the calorie summary on the diet tracking page.

4 DISCUSSION

The findings of the usability evaluations showed that the three examined mobile dietary apps, had design strengths and weaknesses. The usability issues detected by our participants included confusion between the terms "current weight" and "today's weight," a lack of instructions, the display of unnecessary and complicating information, insufficient color contrast, inadequate options concerning unit of measurements, and the lack of a tutorial to guide users.

4.1 The Use of Design Principles

Our aim of using UD principles was to ensure the design of a dietary app that would be usable by the greatest varieties of mobile users possible (Story, 1998). When aiming to make the dietary app more universally designed, we noted that using UD principles alone was insufficient, as the apps involved interaction design. For this reason, we included Nielsen's usability heuristics (Nielsen, 1994). A review by Jiminez et al. (2016) summarizing the state-of-the-art of the development and use of usability heuristics reported a lack of using UD principles (i.e., only one paper out of the 57 included in the review had adopted UD principles). This review also highlighted that Nielsen's usability heuristics were the most general, despite being the most commonly used, in agreement with the findings of Quiñones and Rusu (2017), who reported that traditional usability heuristics did not evaluate the specific features or functionalities of an application.

The review by Jimenez et al. (2016) indicated that less than half of the included studies had applied more than one heuristics set, and none had combined UD principles with Nielsen's usability heuristics. Previous studies have shown similarities between UD principles and usability heuristics (Afacan & Erbug, 2009; Alexander, 2006). Our work supports evidence from previous studies that the use of the UD principle "simple and intuitive use" and the usability heuristics "aesthetic and minimalist design" in simplifying the calorie summary, and the use of UD principles "simple and intuitive use" and "perceptible information", and usability heuristics "visibility of system status" in providing necessary instruction and information.

Compared to Nielsen's usability heuristics, UD principles place more emphasis on accessibility. Sufficient color contrast is important to minimize unintended actions and errors (UD principle "tolerance for error"). Search input fields in MyFitnessPal and Lose it! were reported as not meeting the WCAG standard. By contrast, Nielsen's usability heuristics "Help and documentation" specifies the need to provide guidance to assist users. The combination of these design principles and standards could be seen as partially complementing one another. This resulted in an improved and more universally designed dietary app that could appear more user-friendly, easy to use, and intuitive to mobile users who vary in their demographic backgrounds.

4.2 Fewer Older Mobile App Users

A more universally designed mobile dietary app is targeted for use by diverse user groups. However, during our recruitment process, we noticed a challenge in recruiting older people. The participants in this study consisted mostly of younger people (their ages ranged from 21 to 50 years, median = 27.5, average = 29.1). Two factors contributed to this. One was that, compared to younger generations, older people tend to be less interested in using mobile apps, as they only use mobile devices for basic communication goals (Rosales & Fernández-Ardèvol, 2019). The reasons why they were not active smart device users included low digital literacy, bad experiences in using new technologies (which could be due to the lack of intuitive and accessible designs that consider their needs), and not seeing a need for smart devices, which is discussed next.

The second reason why we did not manage to recruit older participants is that older generations generally showed less interest in using mobile health-related apps. A national study conducted in the US by Krebs and Duncan (2015) asked 1604 people about their use of mobile health-related apps. Of these, 934 (58.23%) people had downloaded a health-related mobile app. The age group for the national study ranged from 18 to 81 years (mean = 40.1), which also covered more of the younger generation. Notably, our study also aims to encourage greater participation by older people in using a mobile dietary app. Older people face higher risks of undernutrition, and digital tools could aid in reminding and inspiring older people to engage in healthier eating behaviors Fuglerud et al., 2018). In the project APPETITT, Fuglerud et al. (2018) created an easy-to-use, yet attractive, tablet app for older people at risk of malnutrition, and the results were promising. Comparing their work with ours, the APPETITT design focused on older people, whereas we would like to have a more UD approach (i.e., to include diverse users to the greatest extent possible).

Another interesting finding is that all participants who had experience using a mobile dietary app had either a bachelor's degree or a master's degree. Although the sample size is small, this finding agrees with that of Krebs and Duncan (2015), who also found that mobile users with higher education were more likely to have used or be using a health-related app.

4.3 Use of Dietary App Influencing Attitude

Five of our 10 participants did not intend to use a mobile dietary app after the usability evaluations. When asked the reason, they expressed that they did not see the need or had never thought about it. The study by Krebs and Duncan (2015) revealed a lack of interest, cost, and concern about apps collecting their data as common reasons for a person not having downloaded any health-related app. A few participants in this study also mentioned that they would not use the diet app because of the cost, especially when some features were only available using a premium account.

Our study was only a one-time usability evaluation. User engagement over a longer period could influence the user's belief and attitude regarding the use of health-related apps. Wang et al. (2016) explored the ways that dietary and physical activity apps made an impact on the users, and they found that app usage over a longer period facilitated healthy eating behaviors and increased exercise and maintenance of a healthy lifestyle. The apps were reported to enhance the users' health consciousness, and self-education about nutrition. A positive finding in the present study is that all participants, except P3, believed that dietary apps could help people initiate healthier eating behavior and thus improve their health.

4.4 Preference of Logging Meals

Some of the participants found the barcode scanner feature useful, and that it required less effort, as they could log in a meal without typing and searching for the food. This feature was commented on as crucial in the modern design for a mobile dietary app by Zaidan and Roehrer (2016). Many traditional mobile dietary applications use input methods, such as 24-hour dietary recalls and food frequency questionnaires that rely on the user's memory. They are therefore considered less accurate due to poor reliability and validity, and low in usability. While investigating the usability features of the most popular (most downloaded) health-related apps, Zaidan and Roehrer (2016) concluded that barcode scanning, together with attributes such as ease of use, reminders, motivation, and usable for all, were important attributes that should be considered in the design of these apps. All these attributes are interrelated. Barcode scanners could provide users with an easier way to log their meals, which could then lead to higher motivation for using the app. Another interesting finding by Zaidan and Roehrer (2016) was that the most downloaded apps were not necessarily the most usable or effective, indicating that other factors contributed to the users' choice to download the apps in the first place. These could be cost (free to download) and popularity index scores.

4.5 Limitations

When aiming to make a mobile dietary app more universally designed, the target mobile user base should be as diverse as possible. Therefore, we acknowledge that the biggest limitation of this study is that most of the participants were in the younger age spectrum. As discussed earlier, this is due to the challenge in finding older people who were interested in dietary apps and hence interested in participating in this study. In addition, most older people show less interest in remote usability evaluations. However, with a more universally designed dietary app, we aim to include greater numbers of older people in target user groups in the future. By adopting a more inclusive approach, we hope to contribute to changing their attitudes about using a dietary app and other mobile health-related apps.

Due to time restrictions, we had to prioritize the functionalities that needed to be tested in a one-hour session usability evaluation. The usability evaluations were conducted remotely; therefore, we targeted the session to last approximately an hour so that the participants were not exhausted. Other important features that could be tested include personalized programs for diet and weight management and reminders, as these features were indicated as important for user experience (Wang et al., 2016; Zaidan & Roehrer, 2016). We have yet to evaluate the proposed more universally designed dietary app. Although these proposed designs use UD principles, Nielsen's usability heuristics, and WCAG, the users might have different options, such as choices of colors, fonts, formulations of instructions, and placements of elements. The proposed app should be evaluated over a longer time as well, instead of a one-time use evaluation.

5 CONCLUSIONS

In this paper, we have presented a study in which we had ten participants evaluate three existing dietary apps. Usability issues were found, and all three apps had their pros and cons in terms of design. Using the combination of UD principles (with accessibility concerning color contrast based on WCAG) and Nielsen's usability heuristics, we then proposed a more universally designed dietary app based on the findings from these usability evaluations. Through this study, we emphasize that a mobile dietary app is not only beneficial to people practicing a more sedentary lifestyle, but it also can benefit other user groups, such as older people who face the risk of undernutrition, who have low health literacy, or who have low health awareness and consciousness. Practicing healthy dietary behavior is part of a healthy lifestyle, and should be promoted to as many people as possible, which is the goal of UD.

In the future, we would like to first conduct usability evaluations to evaluate the proposed universally designed dietary app. In addition, other essential features of a dietary app should be evaluated. Zaidan and Roehrer (2016) reviewed 51 mobile apps for dietary and weight management and reported six attributes (ease of use, reminders, bar code scanning, motivation, usable for all, and synchronization) as significant features for inclusion in a dietary app. We only included barcode scanning in this study; thus, other functionalities that could contribute to the other above-mentioned attributes are to be evaluated. Our work supports the findings of Zaidan and Roehrer (2016) regarding "usable for all." In future usability evaluations, we will include a more diverse user group, focusing on older people and persons with different abilities and disabilities. The usability and user experience will also be evaluated over a longer time perspective than just one-time use.

ACKNOWLEDGMENTS

We thank all participants for their participation despite the restrictions and for their patience, as all project activities had to be conducted remotely.

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