

# New app can give nutritional support to home-dwelling elderly

The recently developed app APPETITT can inspire to a varied diet and increase the attention to dietary habits for home-dwelling elderly.

## AUTHORS

Caroline Farsjø

Stipendiat

Institutt for helse og samfunn, avdeling for sykepleievitenskap, UiO

Anne Moen

Sykepleier og professor

Institutt for helse og samfunn, avdeling for sykepleievitenskap, UiO

## SUMMARY

**Background:** Risk of malnutrition is a common problem among home-dwelling elderly, and we have explored if an application on tablets offers new opportunities to prevent nutritional risk. We developed APPETITT; a tablet application about nutrition, presenting dishes, enabling registration of food choices and notifications about meal time.

**Objective:** To assess if the application was sufficiently adapted to the elderly inexperienced users of technology, and if the application had potential to contribute to encouragement and orientation about meals.

**Method:** We did a pilot study in spring 2014. Four elderly used APPETITT for four weeks. Data was collected in a focus group interview and the informants demonstrated how they used APPETITT.

**Results:** The informants used APPETITT daily and considered it easy to use. Meal suggestions presented as pictures inspired and influenced to some extent the informants' meal choices. Two informants found that reporting food choices could increase awareness, while two saw little need for this function in the prototype. The pilot test revealed that notification of meals did not work as anticipated; only one of them had paid attention to the notifications.

**Conclusion:** APPETITT can inspire to include variations in diet and contribute to increased awareness about meals and nutrition. The application is suitable for novice technology users. In further development of the application, opportunities for individualisation should be further supported.

## **INTRODUCTION**

The proportion of elderly in the Norwegian population will continue to increase in the coming decades (1). Health authorities thus encourage municipalities to focus on the development of competence and innovative service with novel technologies to meet the municipal health services' challenges related to the increasingly elderly population (1, 2). Welfare technology solutions as a part of the health services are important contributions to the national effort to help the elderly live independently and safely in their own homes as long as possible (1–4). Welfare technology focussing on promoting health and prevention through new communication possibilities, information collection and support for self-care, is called health-enabling technology (4, 5). Tablet computers are considered intuitive and easy to use, also for the elderly, and are therefore attractive for technological health-enabling solutions (6, 7). It may nevertheless be challenging to introduce this kind of technology to the elderly. Some studies point out that elderly have low motivation, self-management expectations, and technological experience, raising the threshold for starting to use technology (3, 8). The cost of the tablet computer and loss of physical function may affect the elderly's introduction to using modern technology. They may need repeated instructions and follow-up during a training period (3, 8–10). Studies, in which elderly have been introduced to technology using a touch screen, show that the elderly often master this kind of technology. However, individuals with cognitive impairment have greater challenges and more limited possibilities for learning to use the technology independently (6–8,10, 11). Use of a tablet and applications may also be influenced by the applications' design, interactions and whether the topics for the app are considered interesting and relevant (6, 7, 10, 11).

From a nursing perspective, the purpose of the study was to explore whether the tablet application APPETITT (APplikasjon for Eldre, Tiltak mot vekTTap [Application for elderly, intervention to prevent weight loss]) could potentially prevent malnutrition. A good nutritional status is important for the elderly to maintain self-care and personal vitality (12). Studies from Norway and Sweden report that a high proportion of home-dwelling elderly are at risk for developing malnutrition, or they are malnourished (13–15). Inadequate nutrition late in life may give health-related complications such as weakened physical and cognitive function, weakened immunity and reduced quality of life (14, 16). The causes of nutritional problems are often complex and may be difficult to uncover (14, 16). Protein-energy deficiency is particularly frequent in elderly with nutritional problems, and reduced appetite and reduced interest in food are risk factors in unwanted weight loss (14, 16, 18). Studies have shown that nutritional counselling may give the elderly increased knowledge on adequate nutrition and improve the intake of food (19, 20).

In this article we present findings from a pilot study on the tablet application APPETITT. We chose to design a new application, APPETITT, as available applications assessed by us in 2013 seemed either difficult to use or focussed on weight loss. In the pilot study we specifically looked at whether the application's design made it easy to use for elderly persons with little experience with tablet technology, and whether the app, APPETITT, might contribute as encouragement and guidance with regard to meals and diet.

## **METHOD**

### **DESIGN**

The pilot study had an exploratory design (21). A prototype of the app APPETITT was tested by four elderly women. We carried out a focus group interview in which we collected user experiences and we observed the informants demonstrate how they used the tablet and APPETITT.

### **THE TABLET APPLICATION APPETITT**

APPETITT is developed specifically for the elderly. The app's design is in accordance with

recommendations from studies where elderly persons are introduced to touch screen technology (6, 7, 22). The requirements that guided the development was that the application should have a stable user interface without menu function, distinctive colour contrasts and large letters, consistent touch functions and large touch surfaces. National nutritional guidelines for preventing malnutrition in the elderly are reflected in the application's basic functions: meal plan, meal suggestions, visualisation and notification. Special emphasis is put on regularity of meals, reduced time periods between meals, and protein and energy dense food (14, 23). APPETITT was created for tablets of the iPad type. The tablets were connected to Internet with a mobile broadband in the trial period, so that the informants could explore the tablet's other functions if they wanted.

APPETITT's meal plan consists of six meals: breakfast, lunch, dinner, supper, and two snack meals. APPETITT notifies the user with sound and message when it is time for a meal. Notification times were determined in advanced during the trial period. For each meal there are several dishes to choose from. Each meal suggestion is presented with a photo of the dish and accompanied by a recipe. The user can register what he/she has eaten and drunk. A registered meal is visualised with this feedback to the user: a) the figure in the meal rhythm shows a photo of the chosen meal, and b) the right hand side of the figure is gradually filled with green colouring. The left hand side of the figure represent liquids and is filled with blue colouring. In the pilot study the app was set up so that the user had to report four meals and 20 units of liquids before the figure was full. The colouring becomes more intense when more food or drink is reported.

**Figure 1:** Screen shot of APPETITT



## SAMPLE

We recruited four women aged 69 to 76 from a municipality in Eastern Norway. They were volunteers at a low threshold programme for persons with cognitive impairment. Local contact person at the low threshold programme approached the women and asked if they wanted to participate in the study. At the first meeting with the researchers the women received more detailed information on about the project before giving written consent. Two of the informants lived alone, and two lived with their spouses. All four had worked before retirement: two in the health sector and two in the business sector.

## THE TRIAL

The informants used the tablet and APPETITT over a period of four weeks. They were all introduced to APPETITT and the tablet in a meeting where the authors (CF, AM) gave information and guidance. Three of the informants received assistance in downloading applications within their field of interest. After one week the first author (CF) arranged a follow-up meeting for those who wanted further guidance.

## DATA COLLECTION

Data were collected in February 2014. The informants completed a questionnaire giving demographic data, technological experience and Internet use before they were given the tablet. At the follow-up meeting with the informants tablet use in particular was emphasised and the first authors made field notes. After four weeks we carried out a focus group interview (21, 24). The focus group interview helped uncover variations in the informants' experiences and views (24). The literature also points out that focus group interviews are suited as a method for collecting data to be used in development processes (24), in our case APPETITT. The interview was thematically guided by an interview guide. We introduced the following themes: a) use of tablet, b) using APPETITT (including discussion of the various functions), and c) implications for diet and eating habits. The informants brought their tablet to demonstrate and illustrate their own use of APPETITT. Both authors participated in the two and a half hour focus group interview. The interview was audio recorded and transcribed (CF).

## **ANALYSIS**

The transcribed interview was colour coded to identify each participant's contribution before the thematic analysis (CF) (21). The material was grouped according to thematics (CF). The interview guide indicated the themes. The material was later abstracted into descriptive categories (C, AM) (21, 25). Descriptive quotes were selected to exemplify each category (25).

## **ETHICAL CONSIDERATIONS**

The study was reported to the Data Protection Official for Research, the Norwegian Centre for Research Data (NSD). All data have been anonymised and processed so that they cannot be traced back to the individual informant.

## **RESULTS**

In the article we first present the informants' experiences with use of the tablet and APPETITT. Then we present findings linked to key functions in the prototype application APPETITT: meal rhythm and meal suggestions, notification of meals and visualisation.

### **APPETITT AND USE OF TABLET**

Three informants used Internet daily through PC, smartphone or tablet before the project, while one informant said she rarely used the Internet. The informants characterised the tablet as functional and easy to use, and a fun tool for using the Internet. They had used APPETITT on a daily basis during the pilot period to explore the functions for meal rhythm, meal suggestions and visualisation. Three informants had also downloaded entertainment applications, such as radio, Online TV and games. The fourth informant used a separate Android tablet for this. Three informants participated in the follow-up meeting with first author.

The informants had arranged a separate meeting for themselves, where they explored the tablet together. They said:

«Well, I've got over that first hurdle. And then there is support here, you know» (Gerd, 75).

«We had one of those little tablet meetings yesterday» (Kari, 70).

Such help and support in the beginning were important for starting to use the tablet, especially for the informants who did not have much IT experience.

### **MEAL RHYTHM AND MEAL SUGGESTIONS**

The informants followed their set routines with regard to number of meals and the timing in

the pilot period. They put it like this:

«The way I work, a snack meal in the morning just isn't my thing» (Inger, 75).

«No, too many meals there for me» (Liv, 75).

The informants agreed that the mealtime rhythms should be more individually adapted, so that the number of meals in the mealtime rhythm corresponds to the meals the individual user normally eat.

The informants described the photos of the meals as appetising and appealing. They had tried several meals presented in APPETITT, including meals they had not tasted before. One informant commented:

«That (pointing to gouda cheese with cherry tomatoes) was really good, I had it the other day. Just really inspired by that photo» (Kari, 70).

Recognition of the meals was important to encourage and stimulate the use of APPETITT, and the results suggest that the photos of the meal suggestions inspired the food habits of the informants during the trial period.

#### **MEAL NOTIFICATION**

To support the guidance regarding meals, APPETITT had a function that notified the user with a short signal at mealtime. Only one informant had noticed the notification. She found the notification easy to hear, without it being disturbing or invasive. She said:

«I think it is all right. I was awake when it gave a signal at seven, and I heard it from the bedroom» (Kari, 70).

In the focus group interview the informants discussed the notification function, and they suggested that the notification should be set up in accordance with the individual user's wishes and meal routines.

#### **VISUALISATION**

All informants had reported meals and liquids daily during the pilot period, and they discussed this among themselves. Reported food and drink are visualised in APPETITT by a filling up of the figure. Two informants pointed out that reporting and visualisation enabled them to pay attention to their intake of food and drink, and that they became somewhat more aware of own diet.

«I like being able to register what I eat, it gives me some control» (Kari, 70).

The two other informants saw little utility in the visualisation and felt the reporting may become a burden.

«But to always report what I eat, I'd feel uncomfortable with such reporting» (Inger, 75).

One informant was also sceptical to sharing information about food habits and meal choices over the Internet. She considered this to be personal information and pointed out that it should be possible to reserve oneself from the use of such functions.

The informants did, however, want a function where they could see what food and drink they had reported earlier. One informant put it like this:

«I want to be able to go back and see what I really ate. Like how long has it been since I ate fish. I eat a lot of fish, that's not it, but how often have I in fact eaten fish?» (Inger, 75).

They thought such an overview would make the reporting more meaningful and stimulate to further use. The informants also felt that the expectations at the basis of the visualisation function must be realistic and be individually adaptable. The number of meals and types of meals were discussed. They considered four meals to fill the figure to be a realistic expectation, but suggested that main meals should fill up a greater part of the figure than the snack meals. In the pilot test the recommended target for drinks was 20 reported units. In order to fill the figure the informants thus had to report much more liquids than what they in fact drank during the day. The informants used this as another example of the importance of individual adaptation and realistic targets for the individual user.

**«The photos of meal suggestions gave inspiration to prepare new recipes.»**

## **DISCUSSION**

The findings from this pilot test suggest that the informants quickly learned how to handle the tablet, both APPETITT and other applications. The suggested recipes in APPETITT were inspiring and they found the photos appetising and inviting. With regard to visualisation and reporting, the findings ranged from «awareness of own diet» to questions on the need or wish for such functionality. The pilot test uncovered that only one informant had noticed the notification.

## **INTRODUCTION TO TECHNOLOGY**

The informants used APPETITT from day one. Three informants also used the tablet to access entertainment applications and surf the Internet, in addition to using the APPETITT app. For the informants with the least data experience, having someone available for support and to answer questions at the outset was important. Findings from other studies show that support in the introductory phase reduce barriers when starting to use new technology; especially for elderly with cognitive impairment, repeated training and reminders of how to use the app may be crucial (10, 11).

The motivation for starting to use technology may depend on the users' perception of usefulness and meaningfulness (3, 26). Family and others who know the person well, are often important contributors when elderly start using new technology, in giving instructions or adapting the technology to the user's wishes and needs (27).

Our aim was to develop an application that would be easy to use for elderly persons without technological experience. The informants easily discovered how to use APPETITT, and they mastered the touch screen functions in the application. They used APPETITT daily to look at meal suggestions and for reporting. The informants would like more individualised adaptations, especially in the set up of meal rhythms and the targets for food and drink shown in the visualisations. Findings in other projects where elderly are introduced to welfare technology show that technological improvements and adaptations following trials may be important for stimulating use over time (3, 11).

## **MEAL SUGGESTIONS AND EATING HABITS**

All informants said they had been inspired to eat some of the dishes presented in the photos in APPETITT. One user was inspired to try specific suggestions and prepare new recipes, while others found inspiration in the photos of already familiar food. The findings from the pilot test suggest that already established routines and habits guided the choice of meals

and eating patterns, but that the photos in APPETITT to a certain extent did influence the informants' choices during the trial period. Studies have shown that nutritional counselling may give increased knowledge on adequate nutrition, and this may influence the food intake (20, 28). Eating habits are, however, very personal, and it is important to acknowledge that changes in diet can be difficult to make for those who need it the most (29). APPETITT may be a tool in nutritional counselling, especially if small, simple measures to add energy and protein content to meals are emphasised (23). The findings from this pilot test suggest that more adaptation to personal routines, nutritional requirements, and a greater variety of meal suggestions should be considered for further development of the application.

## **ORIENTATION AND OVERVIEW**

In APPETITT we used the tablet's general functionality for setup of notification: push notification. APPETITT was set up to notify time for a new meal with a short signal. Three informants had not noticed the notification. The informant who did notice the notification found the sound easy to hear and non-invasive. This strategy for notification had natural limitations: the user must be in the vicinity of the tablet, must notice the signal, and the signal must be acknowledged and acted upon (11, 30). Studies where notification reminders are given on medications or activities point to a lack of adherence over time as a challenge (11, 30). The informants suggested individualized notification functionality where timing, duration and type of signal are adaptable. Duration of the notification and type of signal may be significant for whether users hear and recognise the notification (30). On the other hand, a welfare technological system for elderly with cognitive impairment did find limited recognition of notification even after it was personalised in collaboration with the users (11). In our pilot we do not know enough about why the notification went unnoticed – whether the notification function was turned off in the general set up of the tablets, whether there was an error in the prototype so that the notification did not work during the test period, or whether the informants did not notice or recognise the sound as notification. For the next version of APPETITT we may try out other kinds of notifications: repetitive notification or other signals to see if this would attract more attention from the users.

## **«Registering what I eat gives me control. Kari, 70»**

The informants' had mixed opinions about on the visualisations, both in terms of the significance of registering food and drink, and the actual visualisation. The filling up of the figure and the miniature photo of the chosen meal in the meal rhythm are intended as guidance and encouragement. The meal plan shows photos of what has been registered as eaten during the day. The visualisation of this intake in the figure indicates the amount of food and drink consumed during the day. Part of the feedback from the informants was that the expectations in the application were unrealistic, especially for the amount of liquids. A realistic and personal encouragement, in addition to personal motivation, may be decisive for nutritional measures intended to prevent or serve as early intervention in the case of nutritional risk (20).

One informant was sceptical to sharing information on eating habits in this kind of application as she considered this to be personal information. Fear of surveillance or loss of control over one's private life may affect the acceptance of welfare technology, and perceived utility may have to be considerable for elderly to start using the technology (3, 31). In APPETITT the informants were given an overview of reported food and drink for each day. They suggested a calendar function to view their own activity over time as a useful addition. In the prototype such historical information was not available to the users, as we gave priority to designing the application with a stable appearance.

## STRENGTHS AND WEAKNESSES

The pilot test with the data from the focus group interview and the users' demonstrations gave important information on the functionalities in the prototype APPETITT. The informants' interests and varied IT-experience provided rich information on how the application may be used by the elderly. Although the volunteers were age-wise in the target group for APPETITT, they were not fully representative as elderly at risk of malnutrition. The pilot test sample is small, and the findings and the conclusion must be viewed accordingly. The informants did, however, find the application a useful aid for their own age group. The findings will be of importance for further development of the application and of services related to it.

## CONCLUSION

The pilot test showed that the prototype APPETITT was considered a user-friendly tool. The informants found it easy to use, even without much IT experience. APPETITT has the potential to inspire to a varied diet and give increased awareness of meal habits. It may thus be a tool to raise awareness and prevent risk for undernutrition among elderly. User experiences from this pilot study will inform the further development of APPETITT. More variation in the content and expanded functionality adapted to the user's personal nutritional and fluid needs, preferences and habits, will be emphasised.

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