INTRODUCING PERSONALISED SELF-MANAGEMENT TO SUPPORT PHYSICAL ACTIVITY IN ELDERLY: A CASE STUDY

Jan-Willem van 't Klooster[1], Inge van Bruinessen[2], April Boessen[3], Loek van der Heide[3], Miriam Vollenbroek-Hutten[4] and Sandra van Dulmen[5]
[1]*Roessingh Research & Development, Enschede, The Netherlands*
[2] *Netherlands Institute for Health Services Research, Utrecht, The Netherlands*
[3] *Zuyd University of Applied Sciences; Maastricht University, Maastricht, The Netherlands*
[4] *Ziekenhuisgroep Twente, Enschede, The Netherlands*
[5] *Netherlands Institute for Health Services Research; Radboudumc; University College of Southeast Norway Utrecht, The Netherlands; Nijmegen, The Netherlands; Drammen, Norway*

ABSTRACT

Our population is aging, leading to great challenges in healthcare. A transformation to a pro-active system, support through technology, and self-management are regularly mentioned as potential solutions. In this context, the self-management program LIFE ("living independently functioning elderly") was started to promote physical activity in seniors.
A technology-supported personalized self-management program was developed. The aim of the program is to contribute to a physically active life style. LIFE offers various modules to elderly who are at risk of functional decline. These modules contain personalized advice, recommendations and suggestions how seniors can develop or maintain a healthy behaviour and prevent functional deterioration. To restrict functional decline, activities of the program are tailored to the needs of the user. The activities are delivered preventive instead of after the functional decline has been progressed to the extent that elderly have to be institutionalised. A main aspect of the concept of the program is that elderly can choose between the various provided services, making their own decisions. LIFE offers this in an easily implementable self-management program. In this paper, the program is presented, the care pathway of operationalizing the program is described, and evaluation results are discussed. As such, this paper demonstrates the feasibility of introducing an ict-mediated self-management program in elderly care.

KEYWORDS

Self-management programs, Physical activity, Elderly, Ehealth

1. INTRODUCTION

Our population is aging. This leads to great challenges in healthcare. In fact, the fastest growing age group of the western world population is elderly (> 65 years). In the Netherlands, 2.5 million of the population in 2010 was aged (above) 65 years and it is expected that in 2020 3.4 million of the population in Netherlands will be elderly (CBS, 2007). Elderly have a higher life expectancy compared to life expectancy of elderly in past decades (Moran, Cauwenberg, Hercky – Linnewiel, Cerin, Deforche & Plaut, 2014; Nelson et al., 2007). A decline of functional ability is often associated with increasing age. Much of the health care costs occur due to the patient's loss of functional independence. Also, the probability to suffer accidents or develop other problems rise with age (Cochrane, Munro, Davey, Nicholl, 1998). For these reasons, it is necessary to support elderly to maintain an adequate physical functioning that helps them to live longer independently (Van Holle, van Cauwenberg, Deforche, van de Weghe, Bourdeaudhuij & van Dyck, 2015). Physical activity has the potential to reduce the years of dependent living and improve health related quality of life. In addition to that, long – term physical activity is associated with postponed disability (Spirduso and Cronin, 2001) and also independent living in elderly (Paterson, Jones & Rice, 2007).

A transformation to a pro-active system, support through technology, and self-management are regularly mentioned as potential solutions. As aging leads to functional decline, self-management services become more and more important for active and healthy aging.

Yet, little is known about the working mechanisms and effectiveness of self-management programs to counter functional decline. (RVO, 2017) The question arises what makes such a program work in practice? To learn this, we developed and evaluated a self-management program for prevention of functional decline.

This program, called LIFE, is a technology-supported personalized self-management program. Its aim is to contribute to a physically active life style in a personalized way. LIFE offers various modules to elderly who are at risk of functional decline. These modules contain personalized tips, recommendations and suggestions how they can develop or maintain a healthy behaviour and prevent functional deterioration. The program offers personalized training exercises to this end and provides insight into a users' physical activity.

The goal of this paper is to present the self-management program and its implementation into elderly care. Researchers and healthcare professionals involved in promoting physical activity in seniors may benefit from the approach and lessons learned presented in this paper.

The paper is structured as follows. Section 2 describes the program and its components. Section 3 describes how the program was put to practice in a pilot case study in a nursing home. Section 4 describes the case study results. Section 5 describes the conclusions.

2. SELF-MANAGEMENT PROGRAM 'LIFE'

Following a series of focus group sessions with stakeholders, a requirement elicitation was conducted for the self-management program. The elicition approach is described in Boessen et al. (2016).

As a result, the program 'Life' was based on 4 pillars: screening, activities, exercise, and feedback. Section 2.1 describes these 4 pillars, then the operational usage of the program is described in Section 2.2. The program is available in Dutch and English at the moment at www.beweegportaal.nl.

2.1 Main Program Components

2.1.1 Screening

When starting the self-management program, a screening takes place, to obtain personal information necessary for tailoring. The user is requested to indicate personal preferences regarding physical activities. This information is used to match the preferences against available activities. The result of this match is presented to the user, to tailor the offer of activities to the individual preferences. Furthermore, screenings are offered for self-assessment, to give users insight in the current health status. This insight can be obtained, e.g. through filling out the PF-10 questionnaire measuring physical capabilities (van der Zee et al., 1993).

The program is based on the self-determination (SDT) theory (Deci & Ryan, 1985) in that users are offered a wide range of means to become more physically active, but the decision which actual activity is performed when is let to the user. As such, the program adapts the level of exercises to the capabilities of the user by advancing or decreasing the difficulty level.

2.1.2 Offline Activities

To support becoming active in a way that fits to the individual user, the program recommends 'offline' activities (e.g. outdoor activities in the neighbourhood) that correspond with the personal preferences. These activities are administered for a local setting such that when the program is used in a community, only local activities are offered.

The recommendation functionality used to suggest activities is based on two aspects:

- The intersection between users' interests and the interests that new activities are interesting for (a match of properties of a user and properties of an activity);
- Novelty of activities.

This way, the program presents matching activities, but also provides new potentially interesting novel activities.

2.1.3 Physical Exercises

The third part of the program consists of 'online' activities by means of over 65 video-based exercises. We use the scientifically validated Otago program to provide physical exercises (Campbell et al., 2005). These are offered as videos and contain spoken as well as written instructions, to enable home based exercises of physical fitness, strength, balance, and flexibility.

The program adopts adjusts to the level of the user by inquiring the perceived difficulty at the end of a 30 min. session, or by automatic advance to more challenging exercises after three weeks. A training session (which consists of a warming up, exercises sessions, and cooling down), automatically varies each time to keep the sessions interesting. Figure 1 shows the general concept; a movie with spoken instructions is played in which a recognisable actress shows the exercises; the instructions are also written in text. Strength, balance, flexibility, condition, agility *categories* are available, in both standing and sitting position. Users can follow a program with exercises from all categories, or choose to focus on one category. The portal measures time spent on each exercises page. Figure 2 shows tiles with different exercise categories for a given user.

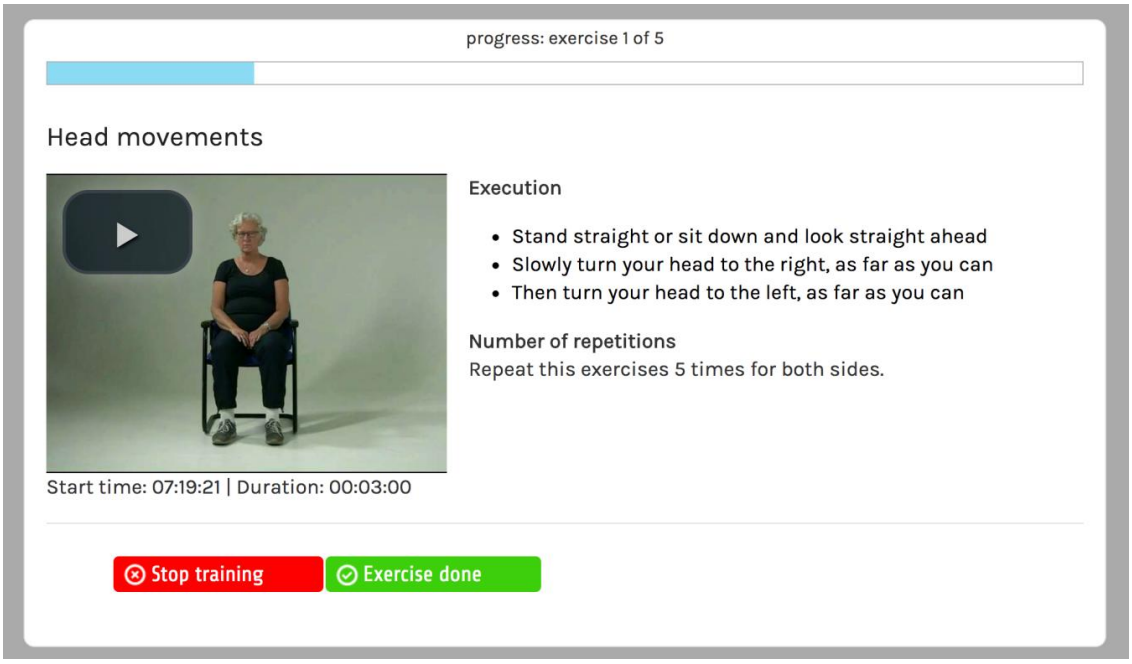

Figure 1. Exercise Page with Video and Instructions to Perform Physical Exercise

2.1.4 Result Overview

The final part of the program consists of a *dashboard* with an overview of activity metrics so that users can monitor their progress. The dashboard shows how much time is spent on performing activities and exercises, level or difficulty of exercise achieved, and what self-assessments are carried out. This is measured as mentioned in the above paragraph.

Optionally, an armband tracker measuring activity using accelerometers can be integrated. Then, both time spent on exercise webpages (only an indication that the exercises are in fact performed) but also actual daily physical activity are shown. The accelerometer addition is for the sake of brevity not further discussed in this particular paper.

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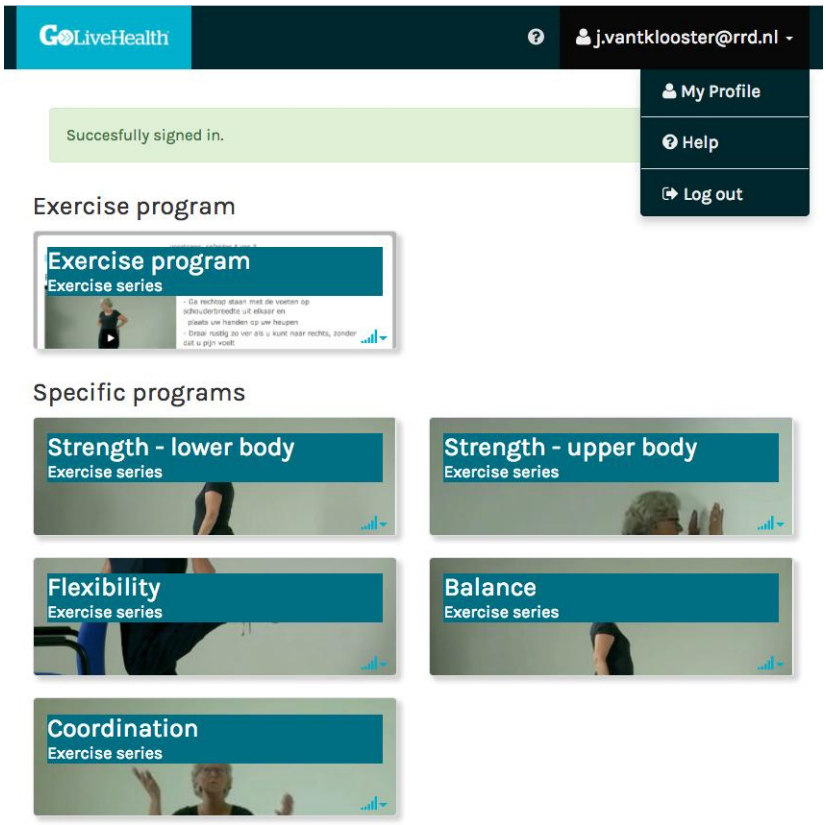

Figure 2. Different Exercise Categories (Mixed, Strength Lower / Upper Body, Flexibility, Balance, Coordination)

2.2 Embedding the Program in Practice

Based on interviews, focus groups sessions and literature reviews, a care pathway was crafted to structure the operational process regarding the self-management program. It is based on Boessen et al. (2016) and shown in Figure 3.

When embedding the program in practice in care institutions or nursing homes, we ought it to be crucial to have support of local organization staff. Hence, preparatory meetings with staff are paramount to be able to embed the service in the daily care pathways. Besides, local staff stimulate their clients to get to know the program. Finally, commitment and local contact such as ambassadors are essential to sustain usage of the program. The other option explored is elderly getting acquainted with the self-management program themselves through e.g. local news media.

Then, an instructional kick off session is organized to explain and to promote using the program in an adequate and informed manner.

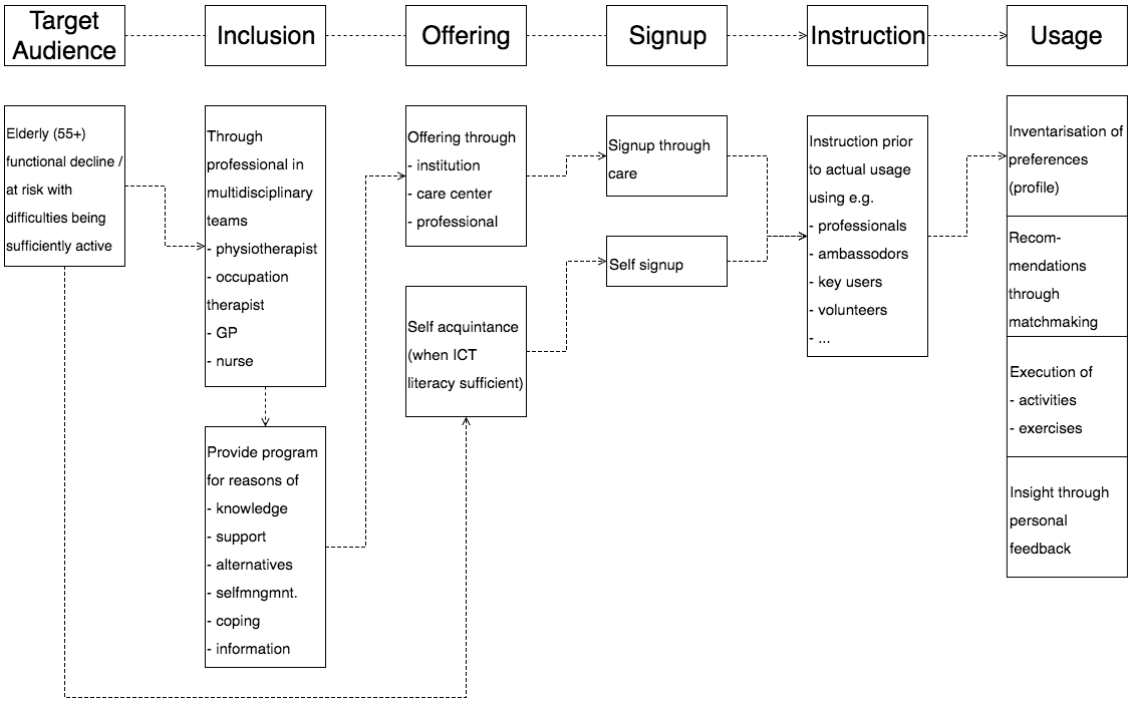

Figure 3. Care Pathway Self-Management Program Showing Process Flow for Elderly Working on Countering Physical Inactivity. Based on Boessen et al. (2016)

3. METHOD

Self-management programs for physical health are new and little is known about their working mechanisms (REF sm-programs). Therefore, we are interested in the working mechanisms behind the adoption and the uptake of the program.

Effects of the Otago program itself are already known (Campbell et al., 2005) as well as the effects of exercise and enough daily activity towards a person's health status.

Yet, it is unclear how web-based self-management programs contribute towards this end. Hence, we piloted this program and follow the usage and uptake both qualitatively (using interviews and focus groups) and quantitatively using log and database data.

After a series of lab tests and demonstrations, the program was embedded in a nursing home 'Parc Imstenrade' in Heerlen, The Netherlands. The approach taken was the upper approach in Figure 3. Approval from the regional medical ethical committee was obtained prior to rollout of this program. It was demonstrated at a kick off sessions with 26 elderly users, following a presentation on the motivation for maintaining a physically active lifestyle and a discussion. Then, the seniors were able to start using the program with assistance by students in personal hands-on sessions. Two follow-up focus group sessions were organized after a month.

4. RESULTS

As the goal of this paper is to present the self-management program and the implementation into elderly care, we limit ourselves here to discussing high-level results of the case study. More evolved results of end-user involvement in this case study are presented in (Bruinessen et al, 2017).

16 of the 26 potential participants registered to the program, both male and female. Their mean age was 83 and ranged from 74 to 91 years old. All were inhabitants of the nursing home. The participants tried

out both offline and online activities offered. They used their own laptop or tablet computer to use the program. Some asked the opinion or approval of their caregivers, showing that collaboration and communication with professionals before the introduction of a self-management program is paramount. There were 3 professionals involved: an activity manager, a physiotherapist and a district nurse.

The majority of the users felt that a weekly scheduled group to perform the physical exercises would be a good idea. Three reasons were mentioned: (1) because of computer literacy barriers, (2) to be able to perform the exercises under supervision, and (3) because of extrinsic motivation, as other, in many cases familiar seniors, are attending the group as well. A physiotherapist then added a weekly exercsise session asking a small fee of the participants, using the video-based exercise program. As expected, collaboration with a nursing home is indeed crucial to organize this.

Participants indicated that kick-off sessions are very important to get to know the relevance and ways of maintaining a physically active lifestyle and that it helps them think about their own health status. Otherwise, it would be difficult to see what a self-management program is about.

Interesting was that some activities mentioned in the system for demonstration purposes were indeed frequented, although not actually taking place. Other activities proposed by the users such as e.g. a weekly tai chi class were added.

There were no specific comments to the working of the recommender in personal contact or in focus group sessions. This 1) showed the screening mechanism for soliciting personal interests was stable and worked in practice and 2) meant that the system was successfully possible to present recommended events and activities matching to the user's interests.

Two follow-up focus groups took place two months after the kick-off session was organized. Here, reactions ranged from '*it really helps, after a few weeks I really started to feel something'* through '*the exercises provided are much too easy for me*. *I already have my own exercise program, every morning I wake up*.' The exercise group was especially appreciated, since it combined social and physical activity and served to promote discipline. This shows us there is a wide range of reactions to the program. Yet, the large difference in age and ICT literacy indicated that more pilot projects are necessary to pinpoint working mechanisms and effects of self-management programs for different types of users.

5. CONCLUSION

This paper presented Life, a novel self-management program to promote a physically active lifestyle in older adults. The paper demonstrates the feasibility of the ict-mediated program and described the content of the program. The LIFE program aspires to contribute to a physically active life style in a personalized way. LIFE offers various modules to elderly who are at risk of functional decline. These modules contain personalized advice, recommendations and suggestions how they can develop or maintain a healthy behaviour and prevent functional deterioration. To this end, the program offers screening, activities, exercise, and feedback.

Sharing knowhow on how to operationalize self-management programs in practice based on various sessions with end users, we crafted a care pathway (see Figure 3). The paper discussed two possibilities of implementing such a program in care, in a care pathway. It enables either (1) self-administered usage of the program (which supports elderly living at home), or (2) embedding in a nursing home (intramural setting). The case study involving the latter learns us that ICT literacy is important to consider and that it can be aligned with the program by offering activities together, such as an physiotherapist chairing sessions using the program in a group. This allows for social interaction and physical exercises at the same time. Participants indicated that kick-off sessions are very important to get to know the relevance and ways of maintaining a physically active lifestyle and that it helps them think about their own health status.

The screening mechanism for soliciting personal interests worked in practice; it was successfully possible to present recommended events and activities matching to the user's interests.

There is a wide range of reactions to the program. Yet, the large difference in age and ICT literacy signals that more case studies cq. pilot projects are necessary to pinpoint working mechanisms and effects of self-management programs for different types of users. Some users asked the opinion or approval of their carers prior to start using the self-management program, or needed them for performing exercises. This shows that collaboration and communication with healthcare organisations and professionals prior to introduction of a self-management program is of paramount importance.

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REFERENCES

A.B.C.G. Boessen, L.A. van der Heide, J. Vermeulen, J.W. van 't Klooster, M. Vollenbroek, I. van Bruinessen, L.P. de Witte. (2016). A technology supported self-management program to promote physical activity in older adults *Eur J Public Health*. 26 (suppl_1): ckw175.029.

Campbell, A. J., Robertson, M.C., La Grow, S.J., Kerse, N.M., Sanderson, G.F., Jacobs, R.J., Sharp, D.M., Hale, L.A. (2005). Randomised controlled trial of prevention of falls in people aged >=75 with severe visual impairment: the VIP trial. *BMJ*, 331(7520), 817-0. doi:10.1136/bmj.38601.447731.55

Castaneda -Sceppa, C. (2007). Physical Activity and Public Health in Older Adults: Recommendation from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise*.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic Motivation and Self-Determination in Human Behavior. *doi:10.1007/978-1-4899-2271-7*

Eveleens et al. (2017). Een analyse van het innovatiesysteem ten behoeve van ondersteunende producten en diensten voor zelfmanagement in de gezondheidszorg. *RVO rapport,* 2017

Moran, M., Cauwenberg, J.V., Hercky-Linnewiel, R., Cerin, E., Deforche, B., Plaut, Pnina. (2014). Understanding the relationships between the physical environment and physical activity in older adults: a systematic review of qualitative studies. *International Journal of Behavioral*. *Nutrition and Physical Activity*, 11(79). doi:10.1186/1479-5868-11-79

Nelson, M. E., Rejeski, W. J., Blair, S. N., Duncan, P. W., Judge, J. O., King, A. C., Macera C. A., Spirduso, W. W., & Cronin, D. L. (2001). Exercise dose-response effects on quality of life and independent living in older adults. *Medicine and Science in Sports and Exercise*, 33(Supplement), 598-S608.doi:10.1097/00005768-200106001-00028

Paterson, D.H., Jones, G.R., Rice, C.L. (2007). Ageing and physical activity: evidence to develop exercise recommendations for older adults. *Canadian Journal of Public Health*, 32, 69-108. doi:10.1139/H07-111

Van Bruinessen IR, et al. *(*2017). Involving (elderly) end-users in the development and implementation of a web-based, physical activity platform. *Under review*

Van der Zee KI, Sanderman R, Heyink J. (1996). A comparison of two multidimensional measures of health status: The Nottingham health profile and the RAND 36-item health survey 1.0. *Qual Life Res* 1996, 5:165-174.

Van Holle, V., Cauwenberg, J.V., Deforche, B., Van de Weghe, N., Bourdeaudhuij, I.D., van Dyck, D. (2015). Do psychosocial factors moderate the association between objective neighboorhood walkability and older adults' physical activity? *Health & Place*, 34, 118-125. Retrieved from http://dx.doi.org/10.1016/j.healthplace.2015.05.004

WHO (2010). Global recommendations on physical activity for health. *World Health Organization*. Retrieved from http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf