

# A home based exercise program: are older adults able to use mHealth technology?

**Author(s)**

Mehra, S.; van den Helder, J.; Dadema, T.; Cila, N.; Visser, B.; Engelbert, R.H.H.; Weijs, P.J.M.; Kröse, B.J.A.

**Publication date**

2017

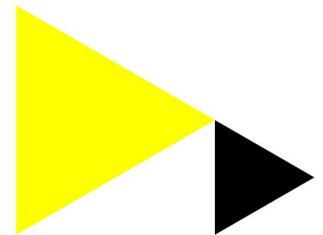
**Document Version**

Submitted manuscript

[Link to publication](#)

**Citation for published version (APA):**

Mehra, S., van den Helder, J., Dadema, T., Cila, N., Visser, B., Engelbert, R. H. H., Weijs, P. J. M., & Kröse, B. J. A. (2017). *A home based exercise program: are older adults able to use mHealth technology?*. 125. Abstract from 12th International Conference, PERSUASIVE 2017, Amsterdam, Netherlands.  
[https://pure.hva.nl/admin/files/5661452/Adjunct\\_proceedings\\_2nd\\_ed.pdf](https://pure.hva.nl/admin/files/5661452/Adjunct_proceedings_2nd_ed.pdf)

**General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

**Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please contact the library: <https://www.amsterdamuas.com/library/contact/questions>, or send a letter to: University Library (Library of the University of Amsterdam and Amsterdam University of Applied Sciences), Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

# Symposium: Tailored interactive technology for a healthy lifestyle

## Participating researchers

Joan Dallinga<sup>1</sup>, Sumit Mehra<sup>2</sup>, Joey van der Bie<sup>2</sup>, Nicky Nibbeling<sup>2</sup>, Monique Simons<sup>3,4</sup>

## Leader symposium

Marije Baart de la Faille<sup>1,2</sup>, lector Power of Sports

<sup>1</sup> Inholland University of Applied sciences, Haarlem, the Netherlands

<sup>2</sup> Amsterdam University of Applied Sciences, Amsterdam, the Netherlands

<sup>3</sup> Utrecht University, Utrecht, the Netherlands

<sup>4</sup> Municipality Utrecht, The Netherlands

## Abstract

During the last five years the use of creative technology (e.g. smartphone applications, beacons, smart watches) to impose a healthy lifestyle has increased enormously [1, 2]. Creative technologies seem a promising method to increase physical activity in a variety of target groups among which children, elderly, and novice runners. In the current symposium, researchers working in the mentioned target groups will present their work and share their experiences and ideas. For children, gamification is a promising method to increase intrinsic motivation to participate in exercise interventions as games make participation fun [3]. Moreover, it appears that physical activity mobile phone games more often contain behavior change constructs than non-game health apps, and are therefore potentially very effective in motivating children to be more active [4]. For elderly, there is ongoing work on the utilization of digital tools such as tablets to stimulate elderly to exercise more and support self-regulation. For novice runners, the combination of apps and beacons is potentially effective in increasing physical activity. Beacons can be integrated into public spaces and offer the possibility to tailor feedback to the individual user, for example through game instructions and location specific exercise instructions [5]. Finally, the number of smartphone applications that can be downloaded in app stores is increasing rapidly, however it is not clear which app fits which user. A first step towards a decision tool for app use is increasing knowledge on the components that an exercise app should contain. In the last presentation we will focus on which app features are important in an app. With this knowledge the health enhancing effects of apps can be improved.

## Goal and course of the symposium

In the 'tailored creative technology for a healthy lifestyle' symposium four presentations will be provided. The goal is to provide examples of tailored, interactive technologies that stimulate people to adopt an active lifestyle.

## Content

- Introduction
- Presentation 1: A home based exercise program: are older adults able to use mHealth technology? (Sumit Mehra).
- Presentation 2: Promoting healthy diet and physical activity in children through the use of games: bridging the gap between industry and science (Monique Simons).
- Presentation 3: Increased motivation for exercise through exercise apps such as BAMBEA (Joey van der Bie & Nicky Nibbeling)

- Presentation 4: Which factors are important for effectiveness of sport- and health-related apps? Results of focus groups with experts (Joan Dallinga).
- Discussion

#### Discussion topics:

- 1) How to deal with innovations as health care professional?
- 2) What are the best ways to create user engagement and adherence?
- 3) Blended interventions: how to combine the best of both worlds?
- 4) How to collect user data while guaranteeing privacy?

#### Match between symposium and PT theme “Smart monitoring and persuasive coaching”

The researchers presenting in this symposium have backgrounds in the fields of behavior change (applied psychology), system design and human movement sciences. In the applications they develop their expertise is combined to develop persuasive technology. Theory from the field of behavior change, exercise psychology and human movement sciences are combined in order to develop scientifically based technologies that fit the user in different exercise encouraging settings. As the symposium covers topics such as behavior change, creative technology, personalized feedback, coaching, gamification and big data, it perfectly fits the PT theme.

#### References

- [1] Middelweerd A, Mollee JS, van der Wal CN, Brug J, Te Velde SJ. Apps to promote physical activity among adults: a review and content analysis. *Int J Behav Nutr Phys Act.* 2014 Jul 25;11:97. doi: 10.1186/s12966-014-0097-9.
- [2] West JH1, Hall PC, Hanson CL, Barnes MD, Giraud-Carrier C, Barrett J. There's an app for that: content analysis of paid health and fitness apps. *J Med Internet Res.* 2012 May 14;14(3):e72. doi: 10.2196/jmir.1977.
- [3] Simons M, Brug J, Chinapaw MJ, de Boer M, Seidell J, de Vet E. Replacing Non-Active Video Gaming by Active Video Gaming to Prevent Excessive Weight Gain in Adolescents. *PLoS One.* 2015 Jul 8;10(7):e0126023. doi: 10.1371/journal.pone.0126023.
- [4] Payne HE, Moxley VB, MacDonald E. Health Behavior Theory in Physical Activity Game Apps: A Content Analysis. *JMIR Serious Games.* 2015 Jul 13;3(2):e4. doi: 10.2196/games.4187.
- [5] Dallinga JM, Janssen M, van der Bie J, Nibbeling N, Kroese B, Goudsmit J, Megens C, Baart de la Faille-Deutekom M and Vos S. De rol van innovatieve technologie in het stimuleren van sport en bewegen in de steden Amsterdam en Eindhoven. *Vrijtijdstudies.* 2016, 34 (2): 43-57.

## Abstract 1.

### **A home based exercise program: are older adults able to use mHealth technology?**

**Mehra, S., van den Helder, J., Dadema, T., Cila, N., Visser, B., Engelbert, R.H.H., Weijs, P.J.M, Krose, B.J.A.**

Physical activity is vital to a healthy life. Not only can it lower the risk of various diseases, older adults can also delay the onset of functional impairments and prolong the ability to live independently if they exercise sufficiently [1]. As a result many community programs have been developed, like the Dutch 'Meer Bewegen voor Ouderen' (MBvO). As part of this program weekly 300.000 older adults exercise in groups under guidance of an instructor.

To achieve the recommended intensity a home-based exercise program could prove an useful addition to a community based program: in the convenience of their home older adults can continue the exercises they have learnt during the weekly community classes. A focus-group study [2] showed that the MBvO-participants believed additional home exercises would be useful, but also had worries about the safety, self-efficacy and adherence to such an intervention. The authors conceived a blended approach would increase the chances of success.

An app for a tablet was developed to support the self-regulation. It featured 48 instructional videos that demonstrated exercises that were designed by human movement scientists. With a wizard a tailored exercise program could be drawn up in line with personal goals. Furthermore, users could track this progress and evaluate exercises. This can be remotely monitored by a coach with whom users can video call for guidance.

To ascertain the app was sufficiently user-friendly 15 older adults, ranging from 69 to 99 years old, were asked to perform 11 tasks in a usability lab. The participants were instructed to think aloud and after completing the tasks they were interviewed briefly about their general impressions. All responses were classified independently by two researchers.

The results from the usability study indicate that the app appears to be sufficient user-friendly. The vast majority of the users could complete the assigned tasks within reasonable limits: on average within a minute, with occasionally one or two hints. The authors found this not to be alarming. The majority of the users, ranging from 69 to 99 years old, had no prior experience with tablets. It can be presumed that their ability to operate the app will increase with time. Furthermore, being able to get support from a coach is part of the envisioned blended intervention.

Follow up studies will have to determine the long-term user experience and actual health benefits.

This work is part of the research projects VITAMINE (funded by the AUAS program UrbanVitality) and MOTO-B (funded by NWO, the Netherlands Organisation for Scientific Research, grant number023.006.013)

## References

[1] Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., ... & McBurnie, M. A. (2001). Frailty in older adults evidence for a phenotype. *The journals of gerontology series A: biological sciences and medical sciences*, 56(3), M146-M157.

[2] Mehra S, Dadema T, Kröse BJA, Visser B, Engelbert RHH, Van Den Helder J and Weijs PJM (2016) Attitudes of Older Adults in a Group-Based Exercise Program Toward a Blended Intervention; A Focus-Group Study. *Front. Psychol.* 7:1827. doi: 10.3389/fpsyg.2016.01827

## Abstract 2.

### **Promoting healthy diet and physical activity in children through the use of games: bridging the gap between industry and science.**

**Simons M, Poelman MP, Gevers DW.**

Overweight in children is a major public health challenge as overweight is associated with increased risks for many health problems during childhood itself (e.g. high blood pressure, diabetes, low self-esteem) and later in adulthood (e.g. cardiovascular diseases, and multiple types of cancer). Important behavioral determinants of overweight are dietary behavior and physical activity. Many children have an unhealthy diet and a low level of physical activity. Promoting a healthy diet and sufficient physical activity are important strategies for overweight prevention, however these health behaviors are often habitual and difficult to change and to maintain. A key driver for behavior change is autonomous motivation (i.e. acting out of choice and enjoyment). A promising strategy to foster autonomous motivation is through the use of games, because of their unique ability to elicit fun and enjoyment. This has resulted in a growing trend in utilizing games (serious games) or game elements (gamification) for promoting health behaviors. In this presentation the iterative process of game developing, evaluating, adapting and evaluating will be shown and discussed. The serious game *Garfield vs Hotdog* developed by the company Grendel Games will be used as a showcase. *Garfield vs Hotdog* is a serious game targeted at children aged 5 – 11 years to promote a healthy diet and physical activity. The game consists of seven mini games each targeting a specific factor related to healthy diet (e.g. drinking water instead of sugar-sweetened beverages) or physical activity (e.g. physical activity is fun). The seven mini games were tested in pilot studies in three countries (Israel, Scotland and Serbia). Based on the findings the mini games were adapted and tested again. Finally, the overall game (consisting of all seven mini games) was tested in 59 Dutch children (7-12 years old). The participating children received the game on an iPad for one week and were asked to play the game as often as they liked. Play time was collected by the game itself and game experience was assessed using a questionnaire. Results showed a mean game play time of 46 minutes (range 5 - 141 minutes). The children rated the game on average with a 8.1 (scale 1 -10), ranging from 1 to 10. A part of the children was not aware of a learning goal of the mini games (ranging from 5 to 26% depending on the mini game). The results and in particular the delicate balance between learning and fun and the need for tailoring will be discussed. Moreover, lessons learned regarding collaborating with a game company will be discussed.

## Abstract 3.

### Increased motivation for exercise through exercise apps such as BAMBEA.

**Nibbeling, N, van der Bie, J, Krose, B, Baart De La Faille-Deutekom, M.**

The positive effects of physical activity on health are more and more generally accepted. However, despite their efforts nearly half of the Dutch citizens are not able to meet the national exercise norm. The current study investigates whether a theory-based, interactive smartphone app (BAMBEA) in combination with Bluetooth beacons can contribute to the motivation of low to moderately active users to increase their physical activity. A smartphone app based on theories of behavior change and sport psychology was developed. The app intends to motivate the user to exercise (walk, run) by providing goal setting support [1], location-specific instructional (exercise instructions in video) and motivational feedback [2], and by rewarding effort with healthy incentives [3]. The app was tested in our living lab: the Oosterpark in Amsterdam. The park is equipped with Bluetooth beacons (transmitters that send a signal every second) through which the app determines the location of the user and location specific messages can be sent to the user. Ten moderately active inhabitants of the Oosterpark area participated during ten weeks. Afterwards usage data was analyzed and participants were interviewed to gain insight into the operative elements of the app and peoples' needs and wishes concerning the exercise app. The results will be used to improve the design, functionalities and terminology in the app. As a consequence, a decrease in experienced utilization problems and an increase in user satisfaction is expected. The current study describes the development and usability testing of the exercise app BAMBEA. It is expected that the current study results in a more user friendly app and consequently, to an increased use of the app and increased movement behavior of its users.

This research is made possible by the AUAS research programs Urban Vitality and Amsterdam Creative Industries Network.

## References

- [1] Sebire, S., Standage, M., Gillison, F.B., & Vanteenkiste, M. (2013). "Coveting thy neighbour's legs": a qualitative study of exercisers' experiences of intrinsic and extrinsic goal pursuit. *Journal of Sport and Exercise Psychology*, 35, 308-321.
- [2] Badami, R., Vaez Mousavi, M., Wulf, G., & Namazizadeh, M. (2011). Feedback after good versus poor trials affects intrinsic motivation. *Research Quarterly for Exercise and Sport*, 82, 360-364.
- [3] Charness, G., & Gneezy, U., (2009). Incentives to exercise. *Econometrica*, 77, 909 - 931.

## Abstract 4.

### **Which factors are important for effectiveness of sport- and health-related apps? Results of focus groups with experts.**

**Dallinga, J, van der Werf, J, Baart de la Faille-Deutekom, M.**

A huge amount of sport- and health-related smartphone applications (apps) is available in the app stores [1]. These apps are often used by individual recreational athletes participating in running, walking or cycling [2]. Exercise apps ideally should support athletes and encourage them to be physical active in a frequent and healthy way. In order to reach these goals, more insight into the value of different app features is necessary. With this knowledge the health enhancing effects of apps can be improved. Therefore the aim of this study was to identify which features in sport- and health-related apps are important for stimulating and maintaining physical activity. Two focus groups (n=4 & n=3) were organized to identify and rank app features relevant for increasing and maintaining physical activity. These groups were facilitated by two of the authors (JD and JvdW). A nominal group technique was used. Seven behavioral and sport scientists participated in the focus groups consisting of three consultation rounds. In the first round these experts were asked to individually list all factors that they found necessary for increasing and maintaining physical activity. After that, all factors were collected, explained and listed on a white board. In the second round the experts were asked to individually rank the ten most important features. Subsequently, these rankings were discussed groupwise. In the last round, the experts individually made a final ranking of the ten most important features. In addition, they were also asked to appoint a score to each feature (0-100), to indicate the importance. The participants in the focus groups generated 28 and 24 features respectively in round one. After combining these features and checking for duplicates, we reduced the number of features to 25. Factors with highest frequency in the top 10 most important factors were 'usability' (n=7), 'monitoring' (n=5), 'fun' (n=5), 'anticipating/context awareness' (n=5) and 'motivational feedback' (n=4). Factors with highest importance scores were 'instructional feedback' (95.0), 'motivating/challenging' (95.0), 'monitoring' (92.5), 'peer rating and peer use' (92.0) and 'motivational feedback' (91.3). In conclusion, based on opinions of behavioral and sport scientists several app features were extracted related to physical activity, with instructional feedback and features that motivate or challenge the athlete as most important. A smart and tailored app may need to be developed that can provide feedback and anticipate on the environment. A feature for monitoring and a fun element may need to be included as well. Interestingly, usability was mentioned by all experts, this seems to be a premise for effectiveness of the app. Based on the results of this study, currently available exercise app rating scales could be revised [3, 4].

This research is cofinanced by 'Regieorgaan SIA', part of the Netherlands Organisation for Scientific Research (NWO).

## References

- [1] Yuan S, Ma W, Kanthawala S, Peng W. Keep Using My Health Apps: Discover Users' Perception of Health and Fitness Apps with the UTAUT2 Model. *Telemed J E Health*. 2015 Sep;21(9):735-41. doi: 10.1089/tmj.2014.0148.
- [2] Dallinga JM., Janssen M, van der Bie J, Nibbeling N, Krose B, Goudsmit J, Megens C, Baart de la Faille-Deutekom M en Vos S. De rol van innovatieve technologie in het stimuleren van sport en bewegen in de steden Amsterdam en Eindhoven. *Vrijtijdstudies*. 2016, 34 (2): 43-57.

[3] Abraham C, Michie S. A taxonomy of behavior change techniques used in interventions. *Health Psychol.* 2008 May;27(3):379-87. doi: 10.1037/0278-6133.27.3.379.

[4] Stoyanov SR, Hides L, Kavanagh DJ, Zelenko O, Tjondronegoro D, Mani M. Mobile app rating scale: a new tool for assessing the quality of health mobile apps. *JMIR Mhealth Uhealth.* 2015 Mar 11;3(1):e27. doi: 10.2196/mhealth.3422