AIRplay: promoting physical activity among children with asthma through gamified environments

Miriam Cabrita[1,2], Randy Klaassen[3], Monique Tabak[1,2]

[1]Biomedical Signals and Systems group, University of Twente, the Netherlands
[2]Telemedicine group, Roessingh Research and Development, the Netherlands
[3]Human Media Interaction group, University of Twente, the Netherlands

Background

Asthma is the most common chronic lung disease in childhood. The large majority (70-90%) of asthmatic children is affected by exercise-induced asthma[1] which deters children from participating in regular physical activity or leads to dropping out of play and sports. Children with asthma should be encouraged to exercise, as physical activity improves asthma symptoms and lung function.

Objectives

To improve self-management of asthma in children (7-9 years old) by means of smart sensing and coaching incorporated in a mobile gaming environment in daily life.

Concept

(I) At a **community location**, children are engaged in the physical activity and social interactions by playing in the interactive playground.

(II) At **home**, the child is engaged in the physical activity and social interactions through the AIRplay application and continuous monitoring of physical activity & symptoms.

The AIRplay concept is fully explained in Klaassen et al[2].

(I) Interactive Playground

The installation combines floor-projections with tracking and real-time analysis of the movement of the players in a game resembling the *Tag*.

Sensing:

- Physical activity (in-game and w/ Fitbit Zip)

Coaching Strategy:

- Fun (intrinsic motivation)
- Social interaction
- Rewards from daily activity

Figure 1 – Playground being tested by children in a local museum.

(II) Mobile Application

The mobile app aims to support children becoming more physically active in their daily life.

Sensing:

- Physical activity (Fitbit)
- Asthma symptoms

Coaching Strategy:

- Feedback
- Personal step goal
- Competition
- Social interaction
- Education

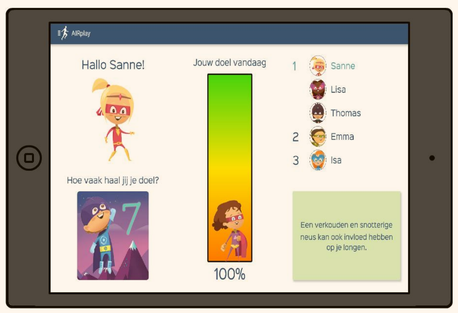

Figure 2 – Main screen of the mobile app with a personal goal (*middle*), the attainment of goals (*bottom left*), a ranking system (*top right*) and a tip of the day (*bottom right*).

Proof-of-concept

The proof-of-concept evaluation is a 4-week observational study, which takes place in a clinical setting (Paediatric department of local hospital) and in the home environment of the participants.

Parameter	Assessment tool/parameter
Use	Physical activity Interaction w/ mobile app
Enjoyment	Observation while playing in the playground Semi-structured interviews
Motivation of physical activity in daily life	Physical activity
Assessment tool for exercise capacity in clinical setting	Heart rate & respiratory while playing in the playground

Table 1 – Parameters and assessment tools of the proof-of-concept study.

Discussion

Based on the first pilots with approximately 100 children, the game is enjoyable, safe and leads in a fun way to a maximal physical activity effort, making it potentially usable for assessment, monitoring and improvement of physical fitness.
The hypothesis is that through gamified environments, children will be motivated to become more physically active and consequently more aware of their asthma control.
A partnership with primary schools is being established to perform follow-up studies in the community, promoting a fair competition of physical activity among children with and without chronic conditions.

References

[1]Welsh, L., Roberts, R. G. D. & Kemp, J. G. Fitness and physical activity in children with asthma. *Sport. Med.* **34,** (2004).
[2]Klaassen, R., van Delden, R., Cabrita, M. & Tabak, M. AIRPlay : Towards a ' Breathgiving ' Approach. in *Fifth International Workshop on Behavior Change Support Systems* (BCSS'17) 38–45 (2017).

Correspondence to: m.cabrita@rrd.nl

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