

Eliciting casual activity through playful exploration, communication, personalisation and expression

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ABSTRACT

In the PlayFit project, we aim to persuade teenagers to be physically active through playful actions with inherent physical activity. We envision small moments of casual active play throughout the day, matching the target group's interests and activities, and fitting into their daily life.

Our research revealed four core interest and activity areas for the target group: exploring, communicating, personalising and expressing. We created three design explorations that connect to these areas and persuade teenagers to explore, communicate, personalise and express in a playful way.

The first prototype, Speakers-of-Oz, consists of a series of interactive speakers that respond to passers-by with sound output. Whisper Balls, the second prototype, are interactive balls that allow a person to record and play a spoken message. The Magic Mirror prototype is an interactive video wall that mirrors and repeats the actions of passers-by.

The results of informal evaluations are promising; all three prototypes elicit playful behaviour, incorporating exploration, communication, personalisation and expression.

Keywords

Play, playful interaction, persuasive technology, motivation, interaction, experience design, design-research, casual activity

INTRODUCTION

Teenagers who suffer from overweight or obesity have an increased chance for physical, physiological and emotional problems in their life [7]. There is a consensus among scientists that physical activity prevents obesity [19]. However, research shows that most Dutch teenagers do not adhere to the advised Dutch healthy exercise norm [5][6]: “at least one hour of moderately intensive physical activity (..) every day (summer and winter), where at least twice a

week the activity is aimed at improving or maintaining physical fitness (power, agility and coordination)”. (cited from [5])

In addition, the negative effects of a sedentary lifestyle have become more apparent in recent years [14]: many youngsters spend a large part of their day in a sedentary way (e.g. school, games, television, internet) [6][20].

In the PlayFit research project [21], we try to reduce the problem of an inactive and sedentary lifestyle by inviting teenagers to be casually active throughout the day in a playful way: we want to invite them to moments of playful behaviour with a low-medium intensity of physical activity (see Fig. 1), that connect to the teenagers' daily activities and interests. Eventually, we want to help in the creation of a more active, less sedentary, and more playful lifestyle.

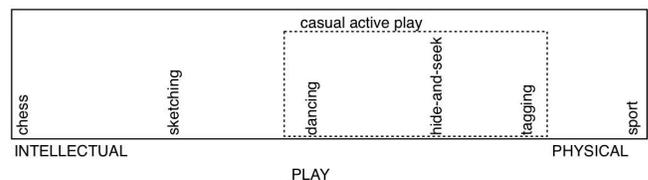


Figure 1. Casual active play; playful behaviour with a low-medium intensity of physical activity.

In this paper, we start with a short analysis of *exergaming* and related concepts, and we will show the main differences compared to our vision. Next, we give a brief overview of the teenagers' daily interests and activities, and the opportunities for design implementations that these offer. We describe our design-research scope and process, and illustrate this with three design explorations, interactive prototypes that elicit casual active play. We end this paper with a sketch of our future plans, a discussion and a conclusion.

RELATED WORK

Serious games are games that do not merely try to amuse or reward the player, but have an explicit and carefully thought-through additional purpose [1]. Serious games are most of the time video games with this additional goal, as defined by Zyda [25]:

“a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy and strategic communication objectives.”

A subcategory of serious games, in which the player is stimulated to be physically active, are exergames (exercise games). Mueller [15] defines exertion as *‘the act of exerting, involving skeletal muscles, which results in physical fatigue, often associated with physical sport’*. An exertion game has an input mechanism that uses physical exertion; the outcome of the game is determined by physical activity [15].

This category comprises terms such as activity games, interactive exercise games, exertainment, interactive fitness, kinetic videogames and motion fitness. Exergames have been developed for several decades; High Cycle [2] was one of the first, a bicycle that allowed the player to cycle through a virtual landscape, where the physical cycling speed controlled the virtual speed. Since then, a broad variety of exergames has been developed, with the highly popular Dance Dance Revolution [8], Nintendo Wii [17] and Xbox Kinect [12] games as well-known examples (see Fig. 2). In addition, larger exergames such as Kompan’s Icon [13] and Yalp’s YalpSona [23] create interactive areas in which several exergames can be played (see Fig. 3).

Related to exergames are mobile activity monitoring applications: the Pokéwalker [18], Nike+iPod [16] and training/coaching applications on mobile phones all enrich the experience of exercising, by visualising progress, giving hints, and other sorts of feedback (see Fig. 4).



Figure 2. Three types of indoor exergames: Dance Dance Revolution [8], Nintendo Wii [17], and Xbox Kinect [12].



Figure 3. Two types of outdoor exergames: Kompan’s Icon

[13] and Yalp’s Sutu Wall [23].



Figure 4. Mobile exergames: Pokéwalker [18] and Nike+iPod [16].

Analysing exergames & daily life

In the case of almost all exergames, the sort of activity is *fixed*, at a *fixed* location, with a *fixed* duration. We see several downsides to this:

- Being physically active for 30 minutes, one time a day, seems to be less effective than one minute, 30 times a day [10].
- Recent studies indicate that intense physical activity can create a compensation effect; e.g. people taking the elevator because they have already cycled to work [**Error! Reference source not found.**].
- The conscious participation that an exergame requires does not change the teenagers’ lifestyle. We want to change the openness of teenagers to playful activities (e.g. regularly jumping from tile to tile, or balancing on a curb), thus partly influencing their lifestyle.

In addition, we disagree with the almost exclusive focus on extrinsic motivation in exergames: in most exergames, executing the ‘boring’ physical activity is rewarded with points or other in-game rewards. Therefore, the only motivation is on an extrinsic level; we want to motivate on intrinsic levels as well.

Finally, we want to compare playing soccer with playing exergames. Someone who likes to play soccer, often does so throughout the day: with a soda-can during the break, or with friends during a barbeque. The playful activity of playing soccer fits into their lives and matches their interests; exergames rarely fit so well into one’s daily life, since they can only be played at a relatively fixed location and time.

Casual active play

If we summarise the above, we can state that exergames and activity monitoring applications try to motivate people to be *physically active* at a *planned* moment in a *playful way*. We, on the other hand, propose to persuade people to engage in *playful actions throughout the day*, with *inherent physical activity* - activity with a low-middle intensity level, dubbed ‘casual activity’. We envision all sorts of small moments of play throughout the day, matching the target group’s interests and activities, and fitting into their lives. The user is invited to participate in those playful

moments, for example while walking through the school or while waiting for the bus. The casual activity is inherent to the playing: the users have to use their body in order to participate.

EXPLORATION, COMMUNICATION, PERSONALISATION AND EXPRESSION

Our goal is to elicit moments of casual active play, that connect to the teenagers' daily interests and activities. This poses two preliminary questions: *what are the teenagers' daily interests and activities*, and *how can we connect to them?*

In order to answer these questions, a literature review was conducted on youth, youth behaviour, lifespan development, and leisure activities, focused on Dutch secondary school youth. This review was complemented by seven focus groups at high schools, in which daily activities and interests were discussed.

Youth from 12-16 is in the middle of the adolescence, the transition between childhood and adulthood. In this period, the teenagers rapidly develop on a physical, cognitive, emotional and social level, initiated by the puberty [3]. The cognitive, emotional and social changes focus among others on *exploration* and *development: self-reflection, identity development, self-concept* and *self-esteem* are important topics, in addition to the *need for autonomy*, the forming of *cliques and crowds*, and the strong *peer conformity* and *pressure*. The teenagers explore, define and develop their own identity, and their relation with others [3].

In the life of the teenagers, the school plays an important role: a large amount of time and (social) attention is spent here. Besides this, the average teen has six hours of leisure time per day, filled with the following popular activities [6][20]:

- Internet (profile sites (e.g. FaceBook), instant messaging (e.g. MSN), etc)
- Gaming: individual, with friends, and online-
- Sport
- Television and movies
- Meeting friends (face-to-face and via digital media)
- Music

The cognitive, emotional and social focus is apparent: exploration, development, identity, autonomy and peer influences are pivotal in all those leisure activities.

Based on our literate review and focus groups, we identified four core interest and activity areas for the Dutch youth:

A. Exploring: trying novel experiences; exploring and developing one's relations, preferences and boundaries.

B. Communicating: social interaction; verbal, written, virtual and body communication; individual and group interaction.

C. Personalising: adapting and personalising one's items, environment, activities and actions, both individually and in peer groups.

D. Expressing: broadcasting one's individual and group identity and opinion, through actions and appearances.

Those four areas offer design opportunities to connect to the youth's daily interests and activities. Two well-known examples clarify this: Facebook [9] and YouTube [24] both connect to the needs for exploration, communication, personalisation and expression, by allowing the youth to perform those activities through their network sites. We believe that, by using those interest and activity areas, we can elicit youngsters to participate in a moment of casual active play.

This leads to our main research question:

How can we elicit teenagers to explore, communicate, personalise and/or express in a casually active playful way?

This question is the main challenge for our design and research project. We try to answer this question in the form of proof-of-concepts and design recommendations. In the remainder of this article, we will describe the process that we envision to answer this question, and illustrate this with three design explorations.

DESIGN-RESEARCH APPROACH

In order to answer our research question, we apply a *design-research* approach. In such an approach, research is performed *through design*: iterations of prototypes are evaluated *in situ*, leading to rich, qualitative and situational insights. Eventually, by applying those insights to other prototypes and contexts, one tries to derive *conditional laws*, in contrast to the more traditional general laws (if this happens in context X, then...) [11].

In our case, we follow five steps:

1. *Design the user experience*: we start from the user perspective. In what playful, enjoyable activity should the user participate, and more importantly, why? Why would one choose to act in a different way than normally, when encountering our interactive system? What sort of medium-intensity active behaviour should be elicited?
2. *Design a system to elicit the user experience*: next, we try to design a system that elicits this experience, in iterations of design and user confrontation. We try to attract the attention of the user, and 'guide' him/her into our playful activity.
3. *Evaluate if the system elicits the experience*: after the design and implementation, we have to confirm our assumptions: is the system actually eliciting the planned behaviour in the real context. Our prototypes are installed in public areas, such as high schools, and evaluated over a period of time.

4. *Identify design elements and propose design recommendations:* if the evaluation was successful, we try to identify which design elements are pivotal for the designed system. These design elements are translated into design recommendations: conditional rules that can aid similar systems (e.g. ‘An interactive system can create curiosity among passers-by using x and y’)
5. *Apply these design elements and recommendations in new user experiences and systems:* we try to implement the design recommendations in new prototypes, both in our own work, and in design projects for (pre-)graduate students in the field of HCI. This way, we take a first step towards validating these recommendations: are they applicable in different situations?

These five steps are iterated as well: throughout the research project, we keep developing our design elements and recommendations for eliciting enjoyable activities.

DESIGN EXPLORATIONS

Using the design-research approach, we explored the design space through three design explorations. We designed and prototyped three interactive experiences for school youth, centred on exploration, communication, personalisation and expression. In the creative process, we applied principles from fields such as gaming theory, social sciences and psychology, in order to create cool and motivating designs for the teenagers. In this first step, we mainly focused on eliciting playful activity: we used this iteration to gain insight and design feeling for the problem space, and to verify if the four interest areas that we defined could be used to motivate playful behaviour. Motivating moderate-intense physical activity will be a focus for a future design cycle: we first want to know if we can elicit playful behaviour, before we try to elicit active playful behaviour. Therefore, physical activity was a secondary objective in these three prototypes; the aimed-for behaviour has a low intensity of physical activity.

The first prototype, Speakers-of-Oz, is a series of interactive speakers that respond to passers-by with sound output. Whisper Balls, the second prototype, are interactive balls that allow a person to record and play a spoken message. The Magic Mirror prototype consists of an interactive video wall that mirrors and repeats the actions of passers-by.

In the following section, we describe the activity scenarios of the concepts, the implementations, and the informal evaluations.

Speakers-of-Oz

Activity scenario

Bob and Sandra, two high school students, walk through a corridor to their next class. Suddenly, they hear a short fragment of Pink’s new music hit. Surprised, they stop and look around, trying to locate the source of the music. They walk back, and discover a small interactive object, that

emits music when they walk by. Waving in front of the object, they manage to increase the volume, playing the music at a continuous, clearly audible level. Sandra walks to a second object, and discovers (in her opinion) boring classical music, and quickly retraces her steps.

Implementation

We wanted to create a ‘walk-through-and-use’ interaction: a short spurt of playful exploration while walking through a corridor. The exploration and the interaction should be short, and mostly driven by curiosity: something that causes passers-by to stop and interact for a few seconds.

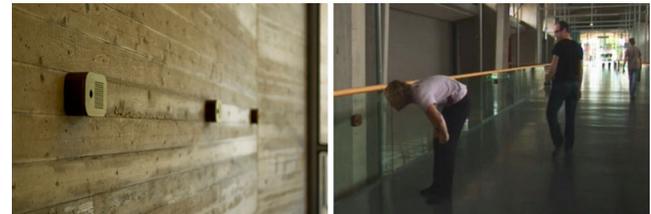


Fig. 5. Speakers-of-Oz: interactive speakers that respond to passers-by with sound output.

We created six interactive speakers, containing a camera and a loudspeaker each. These speakers could be attached to a wall, enabling us to observe all passers-by in the corridor, their actions, and respond to them with sound and music - either automatically through software, or using a wizard-of-oz control mechanism.

Two interaction scenarios were implemented:

Music by movement: in this first implementation, each speaker was coupled to a certain type of music (e.g. rock, pop, and R&B). Movement in front of the speaker influenced the volume level of that speaker: passers-by would create a short, soft moment of music, while people who stopped and ‘waved’ to the speaker would create loud music. Throughout the day, the location of a specific music type would vary between the different speakers.

Speakers-of-Oz: in the second implementation, a researcher manually controlled the sound output. Using the cameras in the speakers, and a speech generator, the speakers would respond to passers-by in a ‘intelligent way’. The researcher (and thus, through the speech generation, the speakers) would greet passers-by in an identifying way (‘Hello there, red shirt guy!’ or ‘Hey, come back here, don’t ignore me!’).

Informal evaluation

Informal evaluation with university students and colleagues showed that both interaction scenarios elicit curiosity and explorative behaviour. In the first scenario, people stop and play with the speakers for a short amount of time, in order to understand how to ‘activate’ the music. They discuss and interact together, showing the different types of music to each other. In the second scenario, the exploration was more ‘verbal’; passers-by questioned aloud how the system would work, and tried to activate the speakers in a variety of ways, cooperating with each other.

We are currently preparing an *in situ* evaluation, in which we will place the speakers in a high school. We will observe the behaviour of the students and the dynamics of the group, paying special attention to the exploration and communication.

Whisper Balls

Activity scenario

Maria is finishing her lunch in the central hall of the school, when a ball is thrown at her. She catches it, and hears a soft sound coming from inside the ball. Struggling to hear it, she moves to a quiet corner of the hall, and squeezes the ball again. She hears a familiar boy's voice whisper "I like you, Maria!", and sees the classmate she has been flirting with smiling shyly at her. She squeezes the ball again, and, just before throwing it to her classmate, whispers "Shall we meet at four?" to the ball.

Implementation

We wanted to create a playful, active way of sharing messages, inspired by the secret throwing of paper notes that regularly happens in classrooms. The type of messages, the information shared, and the 'activity' of sharing should be open and personalisable by the students: they should be able to use it any way they want, sharing for amusement ("Hey loser!"), gossip ("Did you see Ms. J.'s trousers?"), to flirt and so on.



Figure 6. Whisperballs: interactive balls that record and play sound messages.

We created four small balls, each containing two buttons and a recording-playback device (buttons are used instead of squeezing to simplify the sensors). If the orange button is pressed, the ball records all sounds. If the green button is pressed, the ball softly plays the recorded sounds. The balls are light and feel relatively 'solid', allowing users to roll or throw the balls.

Informal evaluation

An informal evaluation with colleagues and students has shown that most people start playing with the balls, and after discovering how they function, record 'insults' that they play aloud ("Loser!"). Following this, they usually record a message, and give the ball to someone else, who then listens to the message and responds in kind. Overall,

the balls elicit playful behaviour: especially during meetings and when walking by, colleagues grab the ball and record a quick message, wanting to surprise the next person who is playing with the ball.

We are preparing a co-design session with teenagers, where we want to give the teenagers the opportunity to play with the balls, and observe what sort of information they share. Following this, we will conduct a co-design act out session, in which we ask the students to come up with, and act out, different ways of using those balls: this should give us insights into how the students think and feel about personalising an activity, how they communicate, and what sort of information they would share together.

Magic Mirror

Activity scenario

Marc walks through his school's main hall, on his way to his friends. On the wall, he sees a projection of a group of girls walking by, followed by his friends who seem to run right through them. Apparently, he somehow sees some previous events in the hall, mixed together in one video. Smiling, he approaches the wall, and tries to hit the mirror image of his friends. He times it badly, and is rewarded by laughter from the group of onlookers, as he now seems to hit his own mirror image.

Implementation

We wanted to create a playful 'mirror', where one's movements, expressions and actions are repeated over time. This way, an open-ended video wall would allow students to play with their own mirror image, that of previous interactors and the images of passers-by and audience.



Figure 7. Magic Mirror: interactive video wall that mirrors and repeats actions from passers-by.

We created an interactive screen, consisting of a camera and a display. The camera records everything that happens in front of the screen, and 'mirrors' that on the display. At the same time, the images from a minute before are looped and cross-faded through the current image. This creates a looping history mirror: for example, if someone walked by the screen, this is now repeated eight times in a row. At the same time, the 'current' mirror image is visible, creating a virtual interaction between the looping history, and the current person. The 'current' person can, for example, pretend to hit the 'previous' person; this movement is recorded, and added to the looping history movie. After a while, the oldest history loops fade out, being replaced by more recent recordings.

Informal evaluation

Informal evaluation with students and colleagues showed that people immediately started to explore in a physical way: they wave, walk to the screen and back, and try to understand how the installation functions. When they discover the ‘repeating history’, they usually start playing with this: they rhythmically wave their arms, creating a multi-armed image of themselves, or they sit down and stand up again, creating a loop where they go and sit on their own lap.

We will place this installation in the hall of a highschool, and will observe the performed behaviour. How do the students express themselves, how does it change the social interaction of performers and audience, and how do they adapt the activity to their own preferences? We will pay special attention to the communication, expression and personalising, if it occurs.

DISCUSSION & FUTURE WORK

The concepts and evaluations covered in this article are explorations: they allow us to get a feeling for the target group, the context, and the design space. At the same time, they give us preliminary evaluation results, and serve as a first iteration for the concepts and methodology.

If we describe the concepts in terms of our original focus of eliciting exploration, communication, personalisation and expression, then we can see that each concept is focused on different aspects (see Table 1).

	Speakers	Balls	Mirror
Exploration	**	*	*
Communication	*	**	*
Personalisation		**	*
Expression		*	**

Table 1: Each concept (speakers, balls and mirror) incorporates the four interest and activity areas in a different way.

In this first explorative iteration, we miss several important aspects for making teenagers more active throughout the day. In follow-up design iterations, we will also focus on:

- Mid-to-long term effects: the current concepts are only enjoyable for a short time, at the first encounters. Future concepts will have to remain interesting over a span of several weeks to months.
- More ambient aspects: the current concepts only work at relatively fixed locations. Eventually, we want to design an ambient solution that allows and elicits playful activity throughout the day, in various locations and contexts.
- More active behaviour: in future work, we will focus on the role of the body and the movements, inviting the students to be physically yet casually active in order to fully experience our systems.

The challenge of creating an enjoyable experience with inherent physical activity poses a problem: we can first create an enjoyable experience, and then try to add the physical activity elements, or we can start with the physical activity, and try to design an enjoyable experience around it. We argue for a third approach: combining the enjoyable experience *and* the physical activity in the entire design process. This is difficult, but we believe it is possible to let the enjoyment and the physical activity interact throughout the design process, eventually creating a homogeneous mixture of the two. To us, this is one of the reasons why we use an iterative, explorative approach: this allows us to experience the different activities, behaviour and reactions of the target group in depth.

Future work

In the upcoming years, we want to iterate through the five steps of our proposed approach. In this exploration, we have completed the first two steps: we have designed three playful experiences, and implemented three prototypes that try to elicit these experiences. The results of informal evaluations are promising, in the sense that the prototypes elicit playful behaviour among colleagues and students. Step 3 will follow: we will evaluate if, and how, our systems elicit the intended behaviours. Just as important is step 4, identifying design elements and proposing design recommendations, which will be based on our insights in these design evaluations.

In a previous pilot study [22], we have identified important elements that are important when eliciting curiosity; mechanisms such as *scaffolding* and *scaleability* serve as design guidelines for future implementations. We will attempt to do the same for the current topic, by giving recommendations and tools to elicit bodily exploration, communication, personalisation and expression, in a playful way. We will try to present these recommendations on a user, system and designer level.

CONCLUSION

In this article, we have presented our vision and design approach to the problem of inactive secondary school youth. We proposed to persuade teenagers to engage in playful actions with inherent physical activity throughout the day. In order to elicit this casual active behaviour, we wanted to connect to the teenagers' daily activities and interests. This aim raised two preliminary questions: *what are the youth's daily interests and activities*, and *how can we connect to them?*

Based upon our literature review and focus groups, we identified four interest and activity areas for the secondary school youth: *exploring*, *communicating*, *personalising* and *expressing*. This led to the main question: *How can we persuade youth to explore, communicate, personalise and/or express in a casual active playful way?*

In order to answer this question, we created three design explorations:

The first prototype, Speakers-of-Oz, consists of a series of interactive speakers that respond to passers-by with sound output. Whisper Balls, the second prototype, are interactive balls that allow a person to record and play a spoken message. The Magic Mirror prototype is an interactive video wall that mirrors and repeats the actions of passers-by.

The results of informal evaluations are promising: all three prototypes elicit playful behaviour, incorporating exploration, communication, personalisation and expression. In future work, we will iterate and evaluate our current and to-be-developed concepts, in order to answer the research question with proofs-of-concept and design recommendations.

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