

“ON THE TOP OF HIGH TOWERS...” DISCUSSING LOCATIONS IN A MOBILE HEALTH GAME FOR DIABETICS

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ABSTRACT

The potential impact of “games for health” on education and motivation within healthcare has been widely discussed and is the focus of many current research projects. Games, running on mobile devices, with attached biosensors and Internet access, promise to unfold an increased influence on individual health related behavior. In particular, for the prevention and management of so called “lifestyle diseases” such as obesity or diabetes, game designers explore a wide range of Ubiquitous Technologies. As *mobile* health games are played within user’s everyday life, they find their way into our cities: parks, schools, offices or shopping centers are their potential playgrounds. This article discusses three concepts for a mobile game for children with diabetes. The focus lies in particular on their involvement of different locations and participants within the game play. Early conceptual prototypes have been “playtested” by a group of patients and their doctors from the Diabetes centre at the Olgahospital in Stuttgart, Germany. The participants’ comments, presented in this article, point to several design challenges of mobile health games: Various locations, it is argued here, do not only implicate technological challenges, but also reveal social issues regarding interactive design.

KEYWORDS

Mobile Health Games, Ubiquitous Technology, Urban Design, Diabetes Management, Participatory Design

1. INTRODUCTION

Current research projects on health games aim to combine principles of learning and health behavior change with game design strategies in order to motivate players to improve their health habits. Serious games seek to be pleasurable *and* to support, educate or train its users in their real life. With the rise of Ubiquitous Computing, *mobile* serious games stress an important aspect, since they address particularly the boundaries between user’s game experience and his or her everyday life. As B.J. Fogg has pointed out: “When interactive computing systems are embedded in everyday objects and environments, they can intervene at precisely the right time and place, giving them greater persuasive power” (Fogg, 2003, p. 10). A growing number of “persuasive technologies” attempts to motivate and influence for a certain health, safety, and eco friendly behavior. So far, games for health largely run on consoles or desktop computers. Nintendo’s bestselling Wii Fit for instance, is predominantly set up in distinctive places, such as the domestic living room. As Ian Bogost has argued for so called exergames, social environment is crucial to user-involvement and long-term motivation. These in particular seek to encourage physical activity in their players. So far, he states, game designers would merely borrow “ritual practices” from other domains and implant them to private locations: “When we play Wii Sports with one or two friends or family members, we create a micro-environment that *mimic* the golf course or the bowling alley” (Bogost, 2007).

In contrast to that, *mobile* health games potentially can be played everywhere and at anytime. The research project “Mindless Eating Challenge” by the Cornell University currently investigates “persuasive mechanisms in mobile health games” (Health Games Research, 2009). Their case study rewards players’ health related behavior and food choices involving eating tips, mobile phone snapshots and “nurturing” of a virtual character. Mindless Eating Challenge can be played at home, in schools or in restaurants, since the

game platform, a mobile device, can be taken anywhere. A shift from gaming for health in private spaces to playing a mobile health game potentially everywhere, involving public spaces, raises several questions: How can the social micro-environment of a mobile game unfold in different real world locations? How can they possibly interact with the city and its architecture? Merely technological aspects deal with the interplay between digital media and diverse potential locations. However, virtual and physical environments are strongly intertwined with social aspects regarding interactive design: How can players interact with other participants and how do they deal with public or private audiences? On the one hand, mobile health games seem to promise an increased potential for learning and motivation. On the other hand, they implicate certain issues regarding security and privacy, which need to be addressed by further research. This article discusses the work in progress at University of Stuttgart, looking on mobile health games in the perspective of urban design and research.

2. RELATED WORK: A MOBILE HEALTH GAME FOR DIABETICS

Diabetes is a chronic disease likely becoming a major epidemic in the developed countries. Today more than 220 million people live with the disease and this number is likely to more than double by 2030 (World Health Organization, 2009). Type-2-diabetes that comprises 90 % of the diabetes cases, has multiple causes, but seems closely related to excess body weight and physical inactivity. Moderate changes in lifestyle such as an adequate diet, more physical activity and loss of weight positively influence the disease management of type-1 and type-2-diabetes. Taking record of all relevant factors including blood sugar levels, insulin dosing, meals and physical exercise is an essential part of diabetes management and education. On the basis of accurate records patients, doctors, and diabetes-assistants can point to potential therapy improvements.

Therefore, many insulin-dependent diabetics, largely type-1, collect their data in so-called “diabetes diaries”, which so far usually consist of hand-written logbooks. A variety of diabetes management software is available on the market, being increasingly developed for mobile devices. Yet, these applications seem to be slowly accepted by a broader range of diabetics. They face several evaluative, development, technical, policy and ethical issues, which need to be addressed by further research (Demiris et al., 2008, p.12). However, it is of particular importance to combine an active lifestyle with a well-adjusted diabetes treatment at a young age in order to avoid the various long-term complications of the disease.

So far, most digital games dealing with diabetes self-management run on desktop computers. “Packy & Marlon“ (Wave Quest, 1995), an educational game for diabetic children and adolescents, has pioneered this field in 1995, when it was developed for Nintendo’s console Super NES. Its capacity to provide diabetes relevant knowledge, to increase its users’ motivation and to foster communication about the disease has been evaluated in clinical trials (Brown et al., 1997). Since then numerous video games dealing with general information about diabetes have been developed for various platforms. The health games research project gives a useful overview on its website’s database (Health Games Research, 2009a). A recent attempt to combine diabetes management with mobile gaming has been launched with Bayer’s glucose meter system Didget. It can be attached to Nintendo’s portable gaming platforms DS and DS Lite, where certain blood sugar levels and testing habits are rewarded within the game play (Bayer HealthCare, 2009). So far, no evaluation has been published regarding the long-term impact on players’ testing habits. For the context of mobile health games, an investigation on the impact of using mobile devices in contrast to console platforms may appear of particular interest. However, the potentials of locations and location awareness within diabetes educational games seem to be scarcely explored yet.

DiabetesCity therefore aims to develop a mobile game concept, which playfully motivates children with diabetes to document their diabetes relevant data. Exploring potential combinations of available mobile technology with game design strategies has led to the development of three conception prototypes, which are discussed in the following. The author’s interest has been focused on the influence of different locations on mobile health games and certain forms of social interaction that might result by different kinds of game play.

3. DEVELOPING IDEAS OF GAME PLAY

The serious aspect for each player of DiabetesCity would be to collect as much data as possible for the suggested game period. As a result, the record eventually serves as a therapy tool, pointing to potential therapy improvements. This section presents three possible kinds of game play. Each version has been developed according to the objection framed above, but differed significantly in their implementation of a) locations and b) potential participants (See figure 1). All concepts were developed in order to run on a mobile platform for a test period of one week.

3.1 Version I: Candy Castle

In Candy Castle, children team up with their parents in order to take on the role of creative builders. Both jointly document a part of their daily routines such as meals, physical activity or blood sugar levels. This data is gained in real world locations, for instance, in school or in the office and then transferred to the game environment of Candy Castle. As explored in the Mixed Reality Game “Ere Be Dragons“, the virtual landscape being built up on the screen of the mobile device corresponds partly to the real space, players walk, eat, study or live in. On the other hand, it responds to players’ particular physiological data (Boyd Davis et al., 2007, p. 200). Accordingly, the cartoon like world of Candy Castle consists of secret gardens, buildings, towers, and dungeons and is built up through the game play itself. By using GPS, the game environment, “mapping“ its players’ diabetes relevant data is tied to certain locations in real life. Moreover, its shape and look corresponds to players’ measured glucose levels.

3.2 Version II: “Capture the Flag“

In Capture the Flag, the diabetic and up to three of his or her friends form a “gang of journalists“. They film, photograph and report on stories from their everyday life in school. By reporting to other participants, each gang captures various locations throughout the school area. Reports may contain the latest gossip along with tested blood sugar levels. Players may mark several locations with “Capture the Flag“ stickers, incorporating Near Field Communication (NFC) tags. Having spotted these locations, players can read and upload new reports by holding the mobile device close to the NFC tag. The teams therefore start to compete about the best, e.g. most popular reports. The “journalist gang“ having gained the biggest area during the game period wins the challenge.

3.3 Version III: “Sugar Pet“

Sugar Pet is a single player version of DiabetesCity. In contrast to the first two concepts, users play with a virtual pet by “nurturing“ it with information. Entering his or her glucose levels, the player begins to create and taking care of its virtual companion. The latter develops from a simple cell to a complex character as it does, for instance, in the computer game “Spore“ (Wright, 2008). Eventually, the character begins to mirror therapeutic actions, doing strange and entertaining gestures, like for instance, scratching his neck, when the player tests his sugar levels. The more parameters the player enters, the better the player gets to know its companion. As it turns out, Sugar Pet has been diagnosed with diabetes as well and could definitely need a helping hand.

4. PLAYTESTING A CONCEPT?

In this section several methods for participatory, user-centered design processes are presented. Initially, we produced one-page conceptual design treatments, from which we have retrieved the short passages shown above. We started to play around with different forms of game play, storytelling, motivation and technical set ups. Eventually, we focused on three versions, which became an important part of theory development, as discussed below. Short descriptions of formal and dramaturgical elements can be used to outline several Do’s and Don’ts by sending them to the doctors in very early design stages. Moreover, we used “visual

brainstorming,” initiating a correspondence via conceptual sketches with interested game designers. They spent in the maximum one hour to read and simultaneously putting together a rough conceptual drawing, including first impressions about emotions, characters, and the mood of DiabetesCity.¹ “In addition to being a demonstration tool, a board game prototype provides a world-in-miniature that allows game play to be easily tested” (Ballagas & Walz, 2007, p. 268). As a design instrument for mobile games, the three-dimensional board game gives an impression of spatiality and travel time in the game. Building numerous working models and board game prototypes has proven to be extremely useful: not only to communicate with the doctors and patients, but as well to sharpen our own ideas.

Gameplay Version of DiabetesCity:	Candy Castle	Capture the Flag	Sugar Pet
Participants involved:	Parents	Peers	Single Player / Virtual Character
Locations involved:	Everywhere (Data transferred to virtual world)	Restricted Area (School)	Everywhere

Figure 1. Different versions of DiabetesCity and their involvement of locations and participants.

5. USERS' COMMENTS ON LOCATIONS AND PARTICIPANTS

In various sessions, we presented these early working models and board game prototypes to a group of patients and doctors from the Diabetes Centre in the Olgahospital, Stuttgart. We had the chance to speak to twelve children, two girls and ten boys, aged between eight to thirteen years, diagnosed with type-1-diabetes. If not marked otherwise, the following quotations represent answers given by the participants in their own words, respectively by choosing from multiple options at various stages of each session.² The following section discusses the results of our survey and presents users' comments on locations and participants. The resulting design challenges stressed within DiabetesCity are associated here to relevant keywords of game design theory in general.

5.1 Social Interaction

Social interaction is one of the key points of long-term motivation in mobile games. According to Salen & Zimmermann, actions within the game play such as following or breaking social codes exert “a tremendous influence on the overall experience of play” (Salen & Zimmermann, 2004, p. 464 ff). Social interactions consist of a so-called “metagame“, which derives its rules from the relationship “between the game and outside elements, including everything from player attitudes and play styles to social reputations and social contexts in which the game is played“ (Salen & Zimmermann, 2004, p. 481ff). Even if a direct influence by game design on these correlations remains questionable, the observation of players' interactions may well contribute to a broader understanding of mobile health games. Regarding both multi-player versions of DiabetesCity, Candy Castle and Capture the Flag, we pitched the contest between several teams, including the cooperation between teammates. Two design challenges regarding social interaction arise from this setting: First, with whom would patients like to play?

¹ The website www.intothepixel.com provides an overview of the art of conceptual sketches within computer games.

² Interviews had been conducted in the “Centre for Diabetes Care and Education” at the [blinded for review] in April 2009. Any proceedings were held in German language and have been translated by the author for this publication.

In Candy Castle, parents are integrated into the game play concept. “Monitoring” of the diabetic child by the parents seems to be a problematical issue for both in everyday live. We decided to address exactly this aspect as a possible interactive and playful feature of the game. We suggested the children might like the idea that their parents lead a logbook and the two of them jointly build up the virtual landscape of Candy Castle. In the survey eight out of twelve patients ticked on the answer “I would like to play DiabetesCity with my friends.” Three patients added “with other diabetics”, further three stated “with my parents” and two children preferred to play “on my own.” It is important to note that none of the four children, who had specified earlier that their parents do their diabetes documentation for them, did favor playing DiabetesCity “with their parents” at all. Even though two of them liked the concept of Candy Castle in general. On the one hand, it might be a common place that children prefer to play with their peers. On the other hand, this result underlines the thesis that transforming social codes is an essential attraction of any game situation. Escaping from parental monitoring may have a particular attraction within a game that aims on disease management.

A key question that arises by this assumption is how to involve non-diabetics into the game play of DiabetesCity? To include actions such as measuring blood sugar levels for non-diabetic players appears plausible. However, it is supposed to loose its fascination after the first attempts and may entail certain issues for untrained users. Patient’s friends may be curious about diabetes, about its therapy and the medical gadgets involved in diabetes management. Debra Lieberman has shown that educational video games can be a springboard for a conversation about disease with friends, family members, and caregivers (Lieberman, 1997, p. 114). A suitable idea therefore might have been to implement a quiz-module, in which diabetics and their peers would solve questions jointly. It remains questionable whether the quiz-feature would work in a mobile game context, though. Moreover, diabetics and non-diabetics may be interested in documenting and sharing their experiences, as the success of the various social networking websites suggests. The particular challenge remains, how to implement the very individual need of documenting and sharing medical data into a game play that would be interesting to the whole group. We addressed this issue within the version of Capture the Flag, in which the diabetic child teams up with his or her friends. The “reported“ stories have been experienced by the whole team and may involve relevant data to diabetes management. In this case, the shared motivation for each player within the game play is to capture the biggest area on the school ground.

5.2 Storytelling/Educative Features/Immersion

For all three versions storytelling is an essential feature. Especially in a health context, it is very important to provide a different, playful perspective onto the serious content. Transferring the scientific and medical notion of disease management into a softer and more entertaining concept is one key point of developing a health game. Furthermore, a good story would absorb the player and therefore can be considered as one technology of immersion in serious games. Regarding Sugar Pet, storytelling might be even seen as an education and therapy tool. It therefore applies a psychological trick: The virtual character is diagnosed as diabetic as well, and appears to have similar daily struggles. The underlying assumption is to be able to motivate players for certain diabetes related behavior by switching their role from being a patient to being a “mentor” of his digital friend within the game. Doctors and diabetes educators have appreciated this feature in particular. Incidentally as well as the patients: Eight of twelve patients claimed that they “favor the version Sugar Pet the most.”

5.3 Spectators

Every game has its spectators, which is an important aspect of the social and spatial interaction it may engage. This becomes particular apparent in mobile games, not least because their playgrounds include public spaces. Since the game play of DiabetesCity could involve intimate actions like measuring blood sugar or injecting insulin, the game design would have to consider who could and who may be watching the game. We therefore asked patients: “[...] Which persons can be aware of you playing DiabetesCity?” Seven out of twelve patients ticked on the answer “friends”; five children added “parents” and two stated “other diabetics”. Four out of twelve answered that “no one“ should be able to watch the game, contrasting this eight-year-old boy, who seemed not to seek for any restriction at all, saying: “anyone, who cares!”



Figure 2. “Playtesting” early prototypes of DiabetesCity at Diabetes Centre in the Olghospital Stuttgart.

5.4 On and Off Playgrounds

In considering the playgrounds of mobile health games, it is important to note that locations are intertwined with the people, who frequently use or are expected to use certain spaces. The strong interconnection can be sensed in the patients’ responds asking them to relate distinctive locations to their diabetes management. In order to see whether there would be any difference between an imagined game situation and an imagined everyday routine, we distinguished between a) “Where would you not like *to play DiabetesCity*” and b) “Where would you not like *to test your blood sugar*”?

In each case, seven out of twelve patients did not state any locations. Interestingly, those five responding with locations to question a) were not identical to these five persons, responding to question b). The following quotes on user’s “non-locations” reveal several design challenges, touching on technical and social aspects. This 8-year-old boy for instance stated: “I would not like to play DiabetesCity in school or on excursions. During school lessons, one is not allowed to play and on excursions one must not bring mobile phones.” His remark clearly points to the fact that certain potential playgrounds may have their own house rules, which game designers would have to deal with. This girl, 11, contrasted this rather technical argument with the statement: “I would not like to play DiabetesCity in school. Because it’ll make me feel uncomfortable.” She preferred the single-player version of DiabetesCity, described above as Sugar Pet.

All three game play versions involve measuring blood sugar, as it is an essential part of diabetes management. We asked therefore: “Are there locations, where you would not like to test your blood sugar?” The answers mirror the mixture of social and technical connotations, mentioned above. This 8-year-old boy claimed for instance: “I wouldn’t test my blood sugar on a party, because there are lots of people.” This strong link between locations and potential spectators is clarified by the following remark of a 13-year-old boy: “I wouldn’t test my blood sugar on a stage or during presentations. [It would be] embarrassing.” In contrast to that, this 12-year-old-boy pointed to a different aspect: “I wouldn’t test my blood sugar on the bus. One would miss the bus stop, if it took you too long.” Involving actions of diabetes management into a game play requires to think of the way we use locations usually: How much time do we spend there? Are we in a hurry? Do we move there fast or slowly? And do we feel secure? Hearing what the users have to say about potential locations more than often reveals unexpected aspects. This article has borrowed its title from the following statement of an 11-year-old girl within the survey. The two locations she refers to, appear to be rather extreme for both activities - testing your blood sugar or playing a mobile health game. Nevertheless, she points to the importance of considering very pragmatic factors such as comfort and safety within the game play. She stated: “I wouldn’t test my blood sugar on high towers and on big ships. There, parts of your equipment can get lost.”

6. CONCLUSION

It is important to note that the discussion presented above is intended rather to be a generator of future research keywords than attempted to be a “scientific” survey. As urban researchers, we have explored methods of sociological and psychological investigation in order to raise questions and ideas on mobile health games in the perspective of our own field. Therefore, it claims to be seen as an approach to contribute to an interdisciplinary discourse, which is currently emerging. The development of mobile health games, potentially being played everywhere, next to (immobile) health games, played in private spaces, emphasizes the role of locations within these digital services. Facing the complex of potentials and challenges that come along with mobile health services, a transparent, participatory and user-centered design process appears to be essential. As shown above, playtesting early stages of conceptual prototypes and board game models of DiabetesCity has helped to set a group of 6 to 13-year-old patients into the position to point to several design challenges in their own perspective. Their comments on locations and potential participants, presented in this article, have shown that social and technical aspects are closely related in interactive design, especially if it deals with a health related context. Involving users in very early design stages leads to several insights to the new and evolving topic, and revealed a variety of unexpected impulses and questions. It has rendered this participatory design approach as encouraging for further exploration.

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