Spontaneous Interventions for Health: How digital games may supplement urban design projects

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Chapter 12
Spontaneous Interventions for Health: How Digital Games May Supplement Urban Design Projects

Martin Knöll, Magnus Moar, Stephen Boyd Davis and Mike Saunders

Abstract Health games seem to provide for attractive play experiences and promise increased effects on health-related learning, motivation and behavior change. This chapter discusses the further possibility of mobile games acting as a springboard for communication on health and its correlations to the built environment. First, it introduces the notion of spontaneous interventions, which has been used to characterize co-design projects in which citizens seek to improve infrastructure, green and public spaces, and recreational facilities of their local neighborhoods by adding temporary objects and installations to the built environment. Focusing on interventions, which aim to stimulate physical activity, this chapter identifies potentials and challenges to increase their impact from an ICT perspective. Second, the chapter gives an overview into current research and best practice of health games which seek to enable interaction with urban spaces through mobile and context-sensitive technologies. Specifically, it highlights "self reflective" games in which players seem to adjust their behavior in response to interacting with real time bio-physiological and position data. Observing how mapping technology enables users to relate objective data to subjective context, the chapter identifies how health games may supplement future urban research and design in the following aspects: Raising attention to new complexes, stimulating

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participation, identifying locales for potential improvement and evaluating impact. The chapter concludes with an outline of future research directions to facilitate serious games supplementing health-related urban design interventions.

Keywords Mobile games · Context-sensitive games · Health games · Urban design · Urban planning · Active design · Playful intervention

12.1 Introduction: Morning Stroller Clubs and an iPhone Stair Climbing Game

At first sight, it seems astonishing how disparate disciplines such as urban design, preventive healthcare and serious gaming begin to form overlapping research interests. In the face of today's health challenges, such as obesity and type-2 diabetes, multi-disciplinary strategies are highly sought after. While health games so far principally focus on internal aspects such as motivation, learning and behavior change [1], public health experts also stress the importance of external factors to tackle obesity. For example, James and colleagues provide an overview into environmental aspects such as whole grocery and fresh food supply, proximity of recreational facilities and walkability of our cities [2]. The general public, however, may be hardly aware of the link between urban design and health. In this chapter, we will be speculating on how serious games may mediate between internal and external aspects of promoting health. We introduce this argument with an illustration of how intertwined personal healthcare and urban planning have been in history.

There is much scholarship describing how doctors, sanitarians and town planners teamed up to build housing, streets and parks from as early as the late nineteenth century [3]. It is important to note that developing design standards for food, drinking water, sidewalks, streets, parks, housing or furniture went hand in hand with a growing interest in personal regimes to regain and sustain one's health. Around 1860, alternative healing advocate Herrmann Klencke observed that in various German cities so called "Morning Stroller clubs" had been founded. Their members met in the morning, regardless of the weather to go for one-hour walks in the natural landscape. Dropping out of sessions without giving notice to fellow club members was punished with a substantial monetary fine. "A necessary disciplinary regime", finds Klencke, "for the modern man would be easily overwhelmed and remain all day inactive in his office [4]." Goeckenjan observes how nineteenth century alternative medicine started off as an emancipatory movement, in which dissident doctors and lay persons explored vegetarianism, sunbathing or physical activity. However, for Goeckenjan, stroller clubs signify a certain level of stagnation in that movement. They would be merely inventing tools to reinforce already established doctrines [5]. It is important to note

that these nineteenth century stroller clubs seem innovative in organizing new ways to motivate physical activity in face of changing working and living conditions of the industrial city. However, they did not intend stimulating members to also explore, question or re-shape their urban environment.

Today, mobile health games seek to motivate for increased daily physical activity, too. The iPhone game *Monumental* invites players to climb iconic monuments such as the Eiffel Tower or Empire State Building on their smartphone screens, while tracking players' movement in the real world through the phone's built-in sensors. Its designers hope that players would begin using the stairs more frequently, aim to beat personal high scores and compete with friends via Facebook [6]. As Knöll and Moar have noted in earlier articles, mobile and context-sensitive health games seem to interact with their topographic [7], social [8] and cultural [9] context in various ways. To us, today's health games too often appear like morning stroller clubs: Despite their manifold potentials in interactive storytelling, digital games so far hardly intend to make users aware of the link between inner aspects of personal health and wider causes for health outcomes such the built environment. In this article, we aim to further discuss this argument and will focus on how play experiences may stimulate interest and even inform health-related urban design projects.

12.2 Active Design Guidelines and Community Games

In this section, we will introduce urban design projects in which citizens seek to stimulate physical activity by re-shaping their local neighborhoods. It is important to note that there is a broad spectrum of possibilities to stimulate physical movement through architecture, urban planning and urban design. In 2010, the New York City public planning departments have provided a comprehensive set of guidelines for architects and urban planners based on most recent research and best practices. Focusing on the question how to design so that people would more often prefer using stairs over the elevator, possibilities already vary widely. The Active Design guidelines highlight position, accessibility and visibility of staircases within a facility, to actual design features such as stair dimensions, provision of light, colors, and using valuable finishing and materials [10]. At the same time architects Janson and Tigges emphasize the positive, enhancing experience of climbing and descending well-designed staircases in palaces, operas and some public buildings. As well as the affective pleasures of being gently guided by spatial features, in which one would enjoy changing position in space and touching fine materials, they note the influence of stairs, which may become a stage on which to enjoy one's own and observe other people's movement [11]. Designers have only started to explore how such potentials for health resulting from the physical qualities of the built environment may be stimulated, augmented and supported with playful ICT applications and interventions.

Coenen and Laureyssens have recently noted that urban practices seeking to engage citizens into urban design interventions do not yet involve ICT on a large scale [12]. They refer to projects such as parents joining up to organize a pedestrianized "play street" in their neighborhood. We can confirm this impression for the field of health-related urban interventions. Borden has pointed to self-organized building processes of skate parks and mini ramps [13], but we may also take runners creating new paths in their local park by putting wood chipping on the green to provide for more comfortable running. Coenen and Laureyssens see one possible approach to research how more "social cohesion" in local neighborhoods can be activated and sustained through playful technology. They have presented their ongoing work on Sustainable Community Games (SCOGA), which will be tested in Ghent in February 2013, at the time we are writing this chapter. In the Ghent community game, two neighborhoods will contest each other in various web and location-based features to win an audience with the city mayor to discuss how to realize a project in their neighborhood. Next to extrinsic game factors such as scoring and competing, Coenen and Laureyssens emphasize the intrinsic motivators to do something good for one's neighborhood and to enjoy the more "ludic" aspects such as interacting with augmented objects [12]. We welcome more research into this direction to highlight interventions that have an informal, temporary and co-design character.

12.3 Spontaneous Interventions for Health

The US Pavilion for the thirteenth Architectural Biennale in Venice 2012 has collected over 100 projects in which New Yorkers have been seeking to improve traffic, infrastructure, and recreation facilities of their neighborhoods. The curators have framed the title "Spontaneous Interventions" to characterize their provisional, temporary and co-design character, as opposed to long-term planning schemes [14]. In this section, we discuss two such spontaneous interventions and review how they explore the boundaries between urban design and mobile technologies.

First, a project from Alison Uljee and Sierra Seip, from *Design That Moves You* (DTMY) may illustrate how spontaneous installations in the public realm can be realized with a low budget and small resources. Their most engaging example may be "Stairway Stories", for which they adjusted stickers on to a two flight stairway leading up to Manhattans' Highline—a recreational space having been developed along a retired train track. A hint on the elevator doors points towards the experience of reading an "entertaining, sexy story" while taking the stairs close by for which the authors promise to make peoples' "gorgeous faces" glow [15]. Second, the Stair Piano is an example for an intervention that blends built environment and ICT technology seamlessly. Their designers attached sensor pads to a flight of stairs leading down to a Stockholm underground station and connected each step to a piano sound being amplified through a speaker system. Being installed for not

more than a day, they observed 66 % more people taking the steps than the next door escalator—enjoying the sounds while they climb the stairs [16].

In the following, we will take both projects as a starting point to discuss aspects that we feel may be worth improving in such spontaneous interventions. We will argue in terms of user experience, evaluating actual impact, participation and their potential to be transformed into sustainable, scalable projects.

12.3.1 Lack of Expertise to Explore ICT in Urban Design

The Stairway Story project shows how even a small budget (90 USD production cost, with two people involved, adjusting the stickers in less than 30 min) may have a startling impact [17]. However, with increasing advertisement and information being attached to objects in public spaces, such low budget interventions will have to compete for city travellers' attention with ever more projects. This is why designers may want to explore a bigger variety of design solutions including more subtle, more sophisticated and more technically advanced ways of enchanting physical space. Rogers observes how through affordable "plug and play" technologies, tools and materials such as Arduino, prototyping interactive ICT applications now seems to require less technical expertise [18]. Indeed, increasingly research and design projects try to balance research on existing conditions and starting to intervene with temporary installations [19]. We observe that many architects and urban designers begin to become more sensitive towards the potentials of mobile and context sensitive technologies for design practice and education curricula [20]. However, we may note that the design and development of systems consisting of built and IT interventions still seems too complex to be integrated in more mainstream urban design and research practice. The broad mass of designers and citizens are not able to explore such a broad range of possibilities to develop interactive and site-specific media.

12.3.2 Lack of Data Evaluating Medical and Social Impact

We may also question if and for how long spontaneous interventions may have an impact on peoples' daily behavior. Hansen makes an interesting observation regarding the lack of sound research on the long-term impact of projects such as piano stairs. Rather than just setting up a camera over a day or two, he points to standards in sociology and behavioral science that future projects would have to meet. He wonders how people would feel about the sounds at their second, third or fourth visit. Hansen questions the acceptance by local residents, who are using the underground on a daily basis and would have to cope with a noisy installation for a whole week [21]. The Active Design guidelines, introduced above, present studies and early experience of best practice in the field of stimulating physical activity

through the built environment. However, most studies gain their results by comparing existing circumstances over different time periods and user groups retrospectively. Those best practices featured in guidelines—that seem to us most fruitful as they are set up in contemporary environments—have hardly been investigated yet [10]. This lack of data on the impact of temporary urban interventions and recently built architecture seems remarkable. By contrast, research on the relation between environments and behavior in Human Computer Interaction (HCI) has moved on considerably over the last couple of years. Rogers observes a paradigmatic change from merely observing ordinary behavior and consequentially suggesting design implications, to creating and evaluating new technologies at the same time, out "in the wild" and not in the lab [18:58]. Many more interdisciplinary research projects begin to explicitly address urban design and development on different scales and in various collaborations. One of its latest editions, Intel's joint venture with University College London and Imperial College London, investigates urban conditions by analyzing users' movement patterns through London's underground. By using everyday technologies such as travel cards, they hope to also find more cost-efficient and flexible ways to research the city [22]. Despite the insights to be gained out of projects on such a scale, we may note that such research cooperation models have not been adopted to smaller and local interventions yet. To our knowledge, there is little research that combines the possibilities of prototyping ICT "in the wild" with the approach of spontaneous interventions.

12.3.3 Not Stimulating User Co-design

The example of Stairway Stories provokes a discussion on user participation in urban design and planning. Its low costs, and few requirements for an ICT expertise would potentially enable many lay persons to get involved either by following up this concept or adapting it to comparable interventions. This is not the place to discuss the pros and cons of experts in city planning. However, we want to point to the merits of ICT supporting communication between users and experts. A popular example is the website SeeClickFix.Com on which citizens can report non-emergency failings of pavements, streets, benches, etc. As Mergel points out, more research needs to be done to investigate their success, with several more local governments embracing the service in order to provide users with sufficient feedback to their postings [23]. Social platforms, that let users also participate in developing constructive ideas and visualizations of their suggestions are currently mushrooming [24]. So far, there seems no service that seeks input from citizens in that respect and focuses on aspects of health and wellbeing.

12.3.4 Lack of Cooperation and Business Models for Further Development

Ho characterizes spontaneous interventions as being about rolling up one's sleeves, "personally bankrolling or finding creative sources of funding [25]." Earlier in this section, we have pointed to potentials and difficulties that low quality interventions in the public realm might be causing. The overall budget of the Staircase Piano project, which features considerable ICT skills and expertise, is hard to estimate. The installation was developed with the support of The Fun Theory initiative, which, supported by a big car company, aims to show that joyful, entertaining and engaging interaction would be key to stimulate behavior change [26]. The project emphasizes philanthropic motives at the expense of more detailed research into its actual impact. So far, it is hard to find business models aiming to bridge the gap between business and research institutions, activists and bottom-up approaches in the field of health-oriented interventions.

In the remaining sections, we will discuss how serious games may contribute to tackle challenges that we have identified above.

12.4 Context-Sensitive Games as a Spring Board for Communication

Debra Lieberman showed as early as the 1990s how video games can motivate better therapy management in young diabetes and asthma patients. She coined the idea of health games acting as a "springboard" for communication between patients, family members, friends and health experts [27]. More recently, she has pointed to the new potentials for learning that result from new game technologies such as motion tracking and collaborative learning in multiplayer games (MUDs) [28]. Lieberman's scholarship serves us as a starting point to speculate how mobile and context-sensitive health games may act as a springboard for communication on health and the built environment. In order to better understand how the latter are being played in their urban environment, Knöll has suggested that we should distinguish current design practice into "collaborative, expressive and reflective" health games [29]. In this section, we will use his analysis to discuss which kind of games may be best suited to supplement spontaneous interventions.

Knöll has observed how players collaborate in Jane McGonigal's Mixed Reality Game *CryptoZoo* [30] with the support of real world locales. On the one hand, players develop running styles in response to objects and topography such as stairs, benches, parking lots or squares. On the other hand, CryptoZoo seems to form a temporary and provisional stage, where players meet to perform runs, observe and communicate with fellow players. CryptoZoo therefore augments the built environment with videos, pictures and maps showing users' activities. Knöll observes that while collaborative play seems to motivate for physical activities as part of the

game sessions, CryptoZoo hardly intends to stimulate discussions on serious matters outside of game situations [29]. Like the morning stroller clubs mentioned earlier in this article, games such as CryptoZoo waste a lot of potential for learning, if they just want to re-use the city as a playground consisting of objects and topographies. From our perspective, it could be precisely peoples' experiences and their ability to articulate and share them, that can become useful for health-oriented urban design.

Game theorist Ian Bogost has described "persuasive games" as videogames that are confronting users' more established views on everyday situations with a most expressive game rhetoric. By interacting with the world view as expressed by game designers in game rules, conducts and behaviors, Bogost hopes a "simulation fever" is being stimulated. Artistic techniques such as defamilarization would make users rethink deeply inscribed behaviors in the real world [31]. In his article on mobile persuasive games, Bogost points to the importance of carefully choosing real world locales to support digital game play. For Bogost, his "airport game", which criticizes non-transparent security policies at US airports, needs to be played precisely while standing in line and waiting for one's bags to be checked [32]. Knöll shows how health games use real world locations as "expressive" backgrounds to more effectively articulate their critique of health-related behavior. In future, choosing the right site for a health game may unfold potential in making players aware of environmental causes for healthy behavior. By design, he finds, such expressive health games may hardly be suitable to explore new correlations [29:155–158]. We may specify that site-specific health games help to make users aware of how the built environment influences our daily routines—for example the use of an elevator over that of stairs. Further research needs to elaborate how the combination of mobile persuasive games and spontaneous interventions may also help to indicate new correlations and new locales for improvement.

Elsewhere, Boyd Davis and colleagues have observed how digital games related to promoting physical activities would often instill guilt in players. They present established answers on what is good or bad for players' health [33]. With their multidisciplinary project *Ere Be Dragons*, Boyd Davis and colleagues have pointed to a further way of playing health games in the city and in response to interacting with the urban environment. They describe the game experience as follows: In its simplest form, the player wears a portable heart rate monitor and inputs her age into a smart phone device featuring a GPS module. On the basis of the player's age, the game calculates an optimal heart rate according to a standard formula. Players then proceed to walk along wherever and however they wish. During the walk an on-screen landscape is being built up that corresponds to the player's position and movement in the real world. On the other hand, the virtual landscape also corresponds to the measured heart rate. If the player does well, e.g. is exercising adequately, the landscape flourishes. The heart rates are split into five ranges on the basis of each player's optimal heart rate. His territory is represented in isometric tiles with distinctive colors and landscape features. Insufficient exertion causes the current landscape to impoverish, while over-exertion leads to the growth of a dark, forbidding forest [33:200–201]. Elsewhere, Boyd Davis has

borrowed the term "reflection-in-action" to describe this kind of gameplay, in which players seem to adjust their behaviors—for instance moving in the city—in response to a visualization of their position and pulse data [34]. Players set out with a goal such as to keep their pulse in a certain area, but are free to explore how to achieve this.

We agree that more research is required to underline that more creative, "free" ways of playing as opposed to competitive play can result in long term effects on health related behavior change. In the remaining paragraph, we wish to elaborate further why we highlight reflective health games as most promising to supplement and inform spontaneous interventions. Elsewhere, Boyd Davis has pointed to Nold's Bio Maps as a parallel approach to Ere Be Dragons. Whereas players of Ere Be Dragons would reflect in action, Nold's visualizations allow users to reflect on their journeys—on different routes taken and body data gathered—in retrospect [34:48]. Nold emphasizes the need of users interpreting "objective" data such as stress levels and positioning and relating them to "subjective" data. He has explored various technologies to provoke user input—personal anecdotes, context, biographical notes and feelings—in order to gain a set of data that are more meaningful [35]. Nold's projects illustrate the need for users taking an active part in interpreting data for themselves, but especially when the data is being gained to inform policy making or planning legislations. Knöll has pointed out how combining these two approaches—reflecting-in-action and reflecting-on-action—is one crucial challenge to build serious games that inform health-oriented urban design [29:199–211]. A main part from the perspective of game design is to implement the serious aspect of co design into the gameplay of location-sensitive mobile apps.

More recently, Waterson and Saunders have presented their insights into a mobile service they developed for Kew Gardens in London. Based on extensive surveys on visitors' expectations and information needs, which among others stated that users would like unguided exploration and serendipitous discoveries, they developed the idea of helping users "to get delightfully lost." The resulting app provides no pre-planned tours, but help users find information where they want them. This may include browsing user generated content and news, but also interacting with QR-Codes and geo-referenced Augmented Reality functions. They found that the app succeeded in directing attention to some of the more "off the beaten track" attractions. Even though it was not primarily meant to be a guide, the app was perceived as an "expert companion" aimed at stimulating "information hunger" in the gardens and its plants [36]. In our view, such unobtrusive, flexible applications are most suitable to articulate how we perceive positive and negative impacts of the built environment on our health in a playful way. It is in a parallel step that users articulate their experiences and thus inform potential projects.

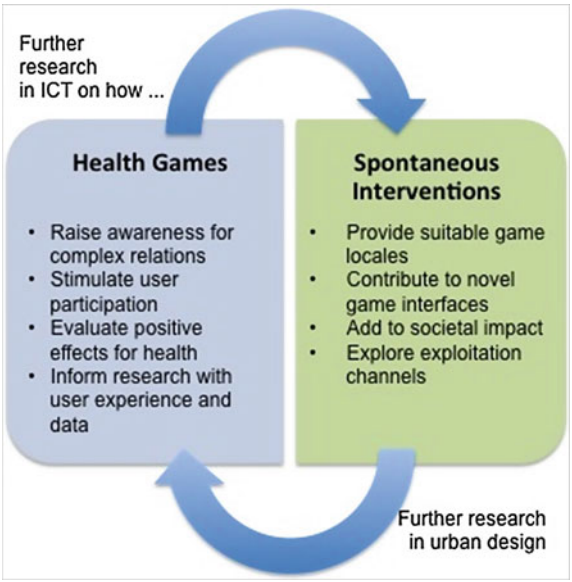

Fig. 12.1 This diagram lists potential synergies between mobile context-sensitive health games and spontaneous interventions in public space

12.5 Roadmap Towards ICT Supported Spontaneous Interventions

Earlier in this article, we have identified four main challenges of spontaneous interventions for health to overcome from an ICT perspective: First, the lack of interdisciplinary expertise, second the few strategies to evaluate positive effects for health, third, the lack of specific co-design platforms and fourth the little research on business and cooperation models. Having moved on to show what mobile and context sensitive health games may contribute to overcome these challenges, we will speculate on future research and design directions to further elaborate potential synergies (See Fig. 12.1).

In the following, we will list four steps to pursue these goals. Based on what we have found to be challenges of spontaneous interventions earlier in this chapter, we have structured this outline with a view to increasing user experience, evaluation methods, stimulating participation and more sustainable concepts.

12.5.1 Encouraging Interdisciplinary Educational and Research Projects

As touched upon above, designing and developing health games involves several research disciplines. Mehm and colleagues provide a comprehensive list of experts and roles [37]. We are convinced that involving urban designers and architects can

help to extend the specific positive effects, which mobile and context sensitive health games aim for to improve users' health and wellbeing. Specifically, action is needed to develop multi-disciplinary teaching formats dealing with serious games. An interdisciplinary discourse on design of ICT applications may help to integrate health games into users' everyday lives. In turn, architects and urban designers, who have been trained in basic concepts of location-based technologies will become more sensitive towards the potential contributions of serious games for urban design in raising user participation and promoting health prevention.[1] We consider such an increasing scientific exchange as one important step to also bring the knowledge and skills of agile prototyping to a wider audience including those citizens already interested in spontaneous interventions.

12.5.2 Developing New Strategies to Evaluate the Effects of Mobile Health Games in the Wild

Göbel and others have presented first attempts to integrate adaptive game play scenarios to static and dynamic data by deriving information from various sensor technologies. They have been focused on evaluating the medical impact of exergames mainly with indoor games so far [38]. As we have shown above to evaluate spontaneous interventions for health and their positive effects in their environment is key to their further development. We therefore would like to see further research that combines Rogers' approach on prototyping and evaluating "in the wild" that we have described earlier in this article, with research groups that have an expertise in Serious Games for Health and/or urban design.

12.5.3 Improve Access to Co-design Projects with Playful Approaches

We have described a burgeoning field of social websites inviting users to participate in urban planning and design projects. We are convinced that playful applications, such as what we have described here as self-reflective health games, can supplement social platforms such as SeeClickFi.com or Betaville. Furthermore, projects such as the community game for Ghent begin to extend the field to location-based features. Precisely in interactive objects being placed in public

[1] Since February 2013, TU Darmstadt has established a University Industry Collaborative (UNICO) research group on "Urban Health Games", which is situated at the architecture department and strongly interacts with the Multimedia Communications Lab (KOM). Further information on research projects and teaching formats that are currently being developed are available at http://www.stadtspiele.tu-darmstadt.de

places or distributed to facades, Coenen and Laureyssens see the biggest potential for more ludic activities and as a result to reach out to a wider audience [12]. We also consider development of augmented objects, which become a part of game play activities as crucial to include people with and without access to smartphones. Thus, integrating urban design can contribute to develop new game play interfaces, which may also benefit from the research in urban planning that has been presented here as Active Design. We welcome projects that develop such entertaining interventions in closer relation to the urban environment it aims to stimulate awareness for. In our view, involving urban designers and planners, who are sensitive towards location-based technologies, will support these co-design aspects of spontaneous interventions.

12.5.4 Working on New Business Models that also Target Local Neighborhoods

In order to conduct interdisciplinary research, design and implementation of spontaneous interventions, more sustainable business models need to be developed. As we have stated earlier, so far collaborations between research and corporate institutions focus on large scale projects. On the other hand, there are short-term interventions that are either low budget and/or hardly involve ICT. Site specific interventions such as the piano staircase project have been able to feature more sophisticated technology. Their collaboration between artists and corporate funds has so far focussed on short term promotion and less on long-term studies. We have stated that spontaneous interventions enriched with mobile health games may become a very powerful tool to gain more insights into this new complex and multidisciplinary field. We therefore hope to see a continuation of the approaches we have sketched in this chapter, which seek to bring together experts from urban and interaction design with corporate institutions and private interest groups. On basis of such research and design projects, strategies can be developed to convince stakeholders, improve design quality and implement spontaneous interventions on a bigger and more sustainable scale.

12.6 Conclusion and Outlook

In this chapter we have described our use of the term “spontaneous interventions for health” for an ongoing phenomenon which seems to merge context sensitive and mobile health games with urban design. We have pointed to four aspects that can be improved as (1) the lack of interdisciplinary research and educational formats, (2) the lack of studies that provide data on positive effects on users’ health, (3) the lack of social platforms for co-design that focuses on health and

wellbeing and (4) the lack of research on business models and cooperation between research, design and user groups. Second, we have discussed recent examples of health game practice with respects to their possible contribution to health-related spontaneous interventions. We have highlighted self-reflective games as a springboard for discussions that will inform and possibly stimulate spontaneous interventions. Finally, we have outlined necessary future research directions highlighting the need for (1) more multidisciplinary training, (2) new ways to evaluate the impact of temporary installations "in the wild", (3) improve access to co-design projects through novel interfaces and (4) developing business and cooperation models that will allow to develop spontaneous interventions for health into sustainable and scalable projects.

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