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Social Stairs: a case study for Experiential Design Landscapes

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Abstract: In this design research study, an interactive staircase called Social Stairs, was used as an Experiential Design Landscape (EDL) to research emergent behaviour. Its aim has been to evoke physical active behaviour of people that contributes to their wellbeing. Following the newly developed EDL method, this installation was used as a research vehicle to propose a variety of Experiential Probes in an everyday life context of a public staircase in an office setting. Various data acquisition methods have been used to capture and analyse emerging behaviour patterns of people, and address the motivations which drive their physically expressive behaviour. Explorations in factors contributing to the richness of the interaction such as sound quality, surprise elements and perceived harmony of the composition were at the basis of the occurence of explorative and social behavior. From the people who visited the Social Stairs it became clear that the experience of using the staircase was predominantly associated with positive emotions. People's reflections indicated that their usage of the staircase is stimulated by the presence of the interactive sound installation. We believe that this case study shows it is worthwhile to employ similar experiments in daily life situations that aim to emerge new behaviour patterns towards a physically active lifestyle. It was also found that the ethical and legal regulations concerning data acquisition are strongly dependent on the socio-cultural context in which the design disruption takes place.

Key words: behaviour change, Experiential Design Landscapes, Experiential Probes, experience design, physical expressive interaction, playful

1. Introduction

Modern societal trends and technological developments enable us to live our lives in safety and comfort while having easy access to (an excessive amount of) food and experiencing only minor physical effort throughout the day. We have surrounded ourselves with technologies designed for our efficiency and comfort. While these developments indeed create quality of life, with respect to our health and wellbeing there are serious downsides as well. In our current society we are dealing with an increasing sedentary and inactive lifestyle resulting in numerous consequences for our mental and physical health and wellbeing e.g. obesity, diabetes, cardio vascular problems [7]. The consequences become increasingly severe for our society and if we fail to deal with these issues society can get stuck or spin out of control.

Van Gent et al. [1] mention that "while solutions to these matters are being developed, products and systems are often designed with the intention that users will change their behaviour, but this sometimes happens in quite unpredictable manners. New patterns may (and will) emerge that may, positively or negatively, affect societal patterns."

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This paper describes a case study called Social Stairs, that was executed to investigate how the recently developed EDL approach can be put into design practice, and how this approach can support the translation of data into unexpected but meaningful behaviour of people in the everyday life towards structural societal transformation. This was done through iterations of several Experiential Probes [4]; disruptive concepts of highly interactive and intelligent product-service systems deployed in everyday life. These are 'propositions for change' allowing and facilitating new and emergent behaviour (i.e. transformation). By allowing people to use these propositions in their everyday life, design researchers can involve people into the development of new products or systems leading towards structural change [5].

Social Stairs is an Experiential Design Landscape, in which several Experiential Probes have been tried. It is an intelligent staircase installed in the university's main building that makes ascending/descending sounds as you walk up and down them. The concept aims at stimulating people to move by making the stairs more appealing, creating social engagement that encourages more active behaviour.

2. Setup of the study

This study aimed to identify design opportunities that can contribute to a state of wellbeing by means of physical activity. It attempted to identify factors that influence people's decisions in terms of choosing between the elevator or the Social Stairs. This research project also investigated how an Experiential Probe on a staircase could become a place where people can engage in physically active play, whilst unwittingly working on a sufficient (and desired) amount of daily activity.

On a wider perspective, this research project aimed to explore how the approach of EDLs can be put into design practice. It intended to clarify how practical experience from applying this approach can help design researchers incorporate continuous data inputs from people, into their design process. On a more substantive level it means to answer practical questions on how data can be processed to become meaningful for design practice, and to clarify how ethical and legal aspects affect the nature of this design approach.

In this study an exploration was done to gain insight in motivations of people to express themselves physically in the environment of a public staircase, by means of an Experiential Probe to evoke more physical active behaviour. These motivations and new emerging patterns were used as an inspiration for next design iterations, with the goal to create ways for people to be intrinsically motivated to adopt a healthier and more active lifestyle.

This work is being carried out as part of the "Design for Wellbeing" project, sponsored by NL Agency under the IOP-IPCR program.

3. Related Work

There have been other initiatives stimulating people to take the stairs. One of the pinnacle examples is the Piano Staircase [8], a design concept of a musical staircase which was built next to the escalator at the Odenplan subway station in Stockholm, Sweden. People could choose to either use the stairs or the escalator, with the latter being the more popular but unhealthier choice. The designers of the Piano Staircase aimed to change people's behaviour by transforming the stairs into a giant piano keyboard. By applying pressure on each step the staircase would play a musical note. Through the interactive steps the staircase successfully persuaded and motivated 66% more people to use the stairs instead of the escalator throughout the day they shot the video [8]. This case study of

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the Social Stairs starts from this result, but aims to research the emerging behaviour over time to gain insight in whether such a design proposition can lead towards structural behaviour change, on an individual and collective level.

4 The Social Stairs EDL

In this study, the EDL was defined as the combined exchange of activities between people and design researchers, experimenting with newly proposed concepts in a real-life context, to map a yet to be defined area of interest, with the aim to identify meaningful design opportunities and to design for new emerging value propositions.

In short, the design researchers dynamically take different perspectives on approaching the people and their interaction with the design interventions during the process, in order to gain a richer overview on the to be explored context. He/she picks the information relevant for his research from the data obtained through these perspectives, and uses it for inspiration and to make improvements for the next design iterations.

4.1 Data acquisition

To observe and record how the behaviour of people changed or emerged, three types of data were acquired: video footage for observation, numerical data logs of the sensors for factual and quantitative information, and interviews to capture motivations behind the behaviour on the stairs.

4.1.1 Acquisition of interview data

Multiple interviewing sessions were held throughout the project course to extract the core values of the user experience. Whenever a new design was introduced, interviews were held after a few days. This way people would have multiple experiences to reflect upon. The general intention was to capture a rich description of the activities of people and their motivations for their behaviour. The interviews were held in the staircase allowing people to describe their experiences and recall them by means of the physical space.

Most interview sessions were held around lunch time as there was usually much traffic on the stairs and people felt more inclined to share their thoughts for a few minutes. Interviews typically lasted for a few minutes, in order to not disrupt the initial intentions of interviewees. In total 58 people participated in interview sessions over the course of this project. Interviews were audio-recorded and the data was analyzed later on.

People were asked open questions (Table 1) in order to trigger for more elaborate answers. The interviewer fed the conversation with follow-up questions that attempted to unveil core values by applying the laddering technique [6]. This technique involves 'why'- questions, which are proposed in succession to answers as a means for the interviewee to reflect at high levels of abstraction and to get to a deeper level of his/her motivations. The interview comments have been translated from Dutch and can be found in the Findings section of this paper.

Some interview questions focused on the general attitude that people could have towards the Social Stairs. Others questions aimed to address the motivations behind the actions that people undertake. While the research project progressed the research focus started to shift towards the physical expressivity of people on the stairs. For this reason the interview setup was redesigned later on, to focus more on this aspect (Table 1, right column).

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Table 1. Interview questions

Week 41 - Week 48	Week 49 - Week 51
What do you think about the stairs?	What do you think about the stairs?
What do you do on the stairs?	What do you do on the stairs?
Have you tried to do different things?	Have you experimented with it?
Do you talk about it with others? On the stairs? Outside of the staircase?	Did you notice the stairs change? What was your experience? Which one did you prefer?
Would you like the installation to stay?	What would be a cool addition to the stairs to make it interesting to you?

4.1.2 Analysis of the interviews

During analysis of the audio-recorded interviews, all comments that reflected elements of the user experience were noted down on separate post-its. Each post-it was tagged with a user-id and scenario-id. The comments were then clustered by the affinity that was perceived by the design researchers. At least 200 statements ended up in 15 clusters. The formed categories were used to map the scope of the prevailing behaviour and motivations on the stairs. From this general view the attention was focused on a specific research area (behaviour change towards physical expressivity) in order to acquire more in-depth insights.

Figure.1 Observation data analysis

4.1.3 Acquisition of observation data

To discover how people responded to the different Experiential Probes (i.e. sound scapes), video footage was taken from a birds-eye perspective, see figure 1, so that observation of new emerged behaviour was possible at a later time. The camera was placed between between the two staircases. People were informed of the study, and received notion of a camera within the space. Around 200 hours of video was recorded in the time span of this study.

4.1.4 Analysis of the observation data

The video data reveals how people physically behave during interaction with the Social Stairs. The newly acquired video data was checked approximately twice a week by scrolling between events. Later on, the numerical data layer was used as an event log to identify key moments in the video footage. The goal of this analysis was to have a complete perspective of new behaviour patterns that emerged on the stairs. Around 300 interactions occurred per day. Later in the study the distinguished observations were analyzed again with the emphasis on

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physically expressive behaviour. These events were shortly described in a log book, which acted as a reference of examples to illustrate specific behaviour patterns.
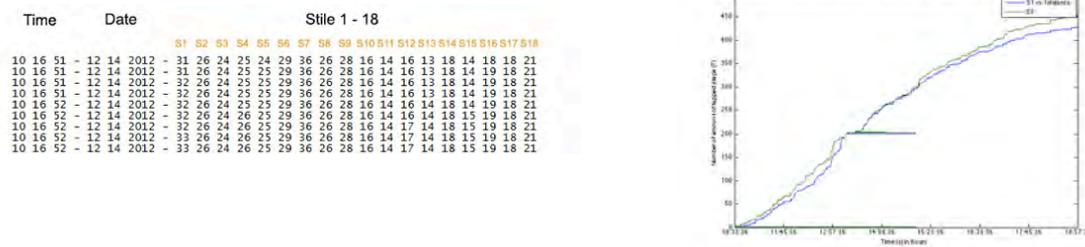

Figure.2 Left: *Part of a sensor numeric data log file*   Right: *Cumulative graph of numeric sensor data*

4.1.5 Acquisition of numerical data

In sync with the same video taped intervals, numerical data was logged from step sensor input for factual and informational purposes; everytime a stair was stepped on, a computer-logged time stamp (Fig. 2, left) was saved together with the cumulative amount of touches for that stair on that day.

4.1.6 Analysis and modelling of the numerical data

The acquired log-files of the numerical data were plotted to survey the cumulative step-patterns on a daily basis (Fig. 2, right). Fig. 3 represents an event-log plot that was created by logging such fast-paced sequences of tapped stair steps. It illustrates how numerical sensorial data has acted as a behaviour filter. Higher peaks refer to a high density of stair stepping, and were traced back to the observable situations in the video footage at the exact same time intervals. They have shown to be related to situations of interest; the observations typically depicted situations of many people simultaneously interacting with the stairs, but also often provided events in which individuals showed unusual physical activity in their attempts to explore and play with the installation.

The nature of the used algorithms caused this method to mainly deliver situations in which people typically move relatively fast, or otherwise move in groups. For time considerations the processing of data in this particular study has been limited to use it as an event log for physical expressivity, which is mainly characterized by fast movements, but has left out more careful and slow explorations by people.
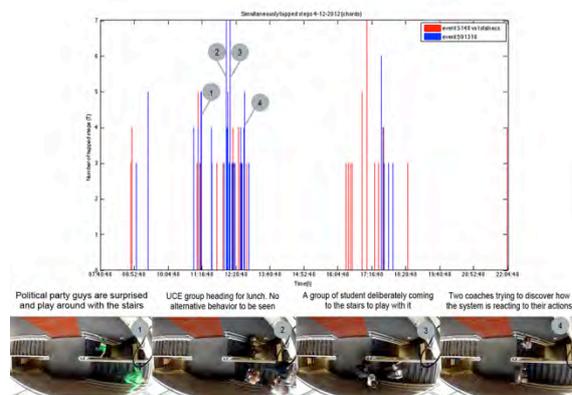

Figure. 3 *: Event graph of simultaneously tapped stairs on 4 december 2012*

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In this study, the numeric logs of data gathered by the stair sensors, have been processed to act as a bridge of translation between ordinary factual numbers and abstract information on emerging human behavioural patterns. It deals with modelling the complexity of situations in a way to get a grip on data sets that have become so large and complex (Big Data) that they are difficult to process by traditional methods of data processing. In that respect the EDL approach of this study links to the findings of Keller et al., who addresses the current major challenge for social scientists to model how human beings behave [2]. Keller also states that changes of behaviour will be more detectable under Big Data, since it captures many facets of complex interactions between the physical world and human behaviour. The study of societal behavior shifts from the use of data to confirm assumptions on defined problems, towards starting with data as a means to discover valuable information about where the real design opportunities are.

5 Case study (EDL infrastructure)

The design experiment took place on a staircase in the Main Building of the Eindhoven University of Technology (TU/e) in the Netherlands. The installation probed 12 weeks in total.

At first a working platform for the creation of Experiential Probes was developed, acting as a basic research vehicle to build further upon during the remainder of the design process. This platform consisted of several thin and flat sensors, placed upon 18 selected steps of the staircase, which each transmit a signal once stepped upon. The sensors were covered with carpet to hide the technology as much as possible.

Next the system was made to generate a specified virtual patch containing a soundscape, triggered when the sensors were touched in desired sequences.

Video was recorded on 60% of the days, with an average of 7 hours per day, because of unforeseen implications with implementing technology (e.g. camera firmware update bugs, computer system crashes).

On the same videotaped intervals, numerical data was logged. In this study this data was mostly used as an event log for detecting interesting emerging patterns, by logging fast-paced sequences of tapped stairs. Social Stairs was used by an average of 300 people a day.

The Main Building is the heart of the University of Technology Eindhoven and therefore the EDL has been visited mostly by students, university employees and occasional (external) visitors of the university. Everybody was able to freely visit and explore the stairs; no people were or could be excluded. People were informed about the experimental setting by multiple posters at the entrance of the space.

5.1 Description of Experiential Probes

The Experiential Probes that were used in thus study are described below in table 2.

Table 2. Description of interaction design explorations

Title	Description	Duration
Piano_Stairs	When a stair is stepped on, a specific piano-tone is played. The tones followed each other up in plain octaves (Do-Re-Mi). A higher stair stair also produced a higher pitch. After a week the mapping was changed to a pentatonic tone-scale to reduce the possibility of playing false tones together.	16 days
PianoSynth_Stairs	Similar to the Piano_Stairs, but with piano tones mixed through a synthesizer.	3 days
Tiesto_Stairs	Uses the basic set-up of the Piano_Stairs, but the triggered tones return a few seconds later in a faded echo. This was done to enable playing multiple tones through each other with the aim to create a richer sound experience. After one week the stairs were	16 days

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	expanded from 8 to 18 stairs, divided over two stairways. One stairway was mapped with low pitch tones, while the other was armed with high ones, in order to create more contrast in music making when multiple people would find themselves standing on both stairs.	
Buffer_Shuffler	Plays a musical sample patched together from 16 short beats and melody samples. The total sample loops for around 10 seconds. People can adjust the sequence of the 16 smaller samples in order to create a new composition. This was done in order to move away from that people could only influence tones, but instead influence the composition structure.	1 day
Bloom_ComputerLoop	A patch that makes use of generative ambient music into a soundscape instead of instrumental tones. When a stair is touched, the soundscape plays natural sound elements (best described as a pitched water-drop/chime). Furthermore the system makes use of a Computer Loop, which means it randomly inserts similar other tones, to act as an autonomous agent that people can play together with. Next to that the tone mapping was reversed (i.e. to a high-to-low pitch as one walked up the stairs), but the pentatonic scale was maintained.	7 days
Bloom_UserLoop	Similar to Bloom_ComputerLoop, but the loop was replaced with a User Loop. This means that the patch remembers people's last 8 inputs, and repeats them every 5 seconds. This was done so people could leave a mark in the system, by making a pattern that is every now and once repeated until someone changes it.	7 days
Bloom_ManyNotes_UserEvolve	This design was the same as Bloom_UserLoop but now the system slowly evolves the patterns created by the participant, which means that their pitch and timing are slightly changed. Next to that the installation recalled and replayed up to 12 latest inputs of people.	13 days
Bloom_BGfadein	When different stair stairs are touched at roughly the same time, a background elongated synth is triggered to play up behind the water-drop patterns. The more such separate stairs are simultaneously tapped, the louder the background sound becomes. This patch was made to give multiple people, walking on the staircase at the same time, a reason to explore the stairs together further. People's input is still looped.	4 days
Bloom_BGfadein_Alwayspresent	A second generation of the Bloom_BGfadein, but now with the background sound always noticeable, as it starts at a low volume instead of out of nowhere.	1 day
Bloom_Chords	A version of Bloom_UserLoop, but instead of water-drop tones, triad chords are created. High and low pitched tones were randomly distributed over the stairs, taking away the chromatic scale.	1 day
SpaceScape	Stepping on the stairs triggers a few futuristic sci-fi tones that follow up each other, accompanied by an omnipresent ambient spacey background.	0.5 day
Laughter	Each stair triggers a sample of a laughing person that sticks for a while. When walking normally, people automatically create a composition of laughing people. The first quarter of a day was tested with samples of laughing children, the second half with laughing adult males.	0.5 day
Guitar	This design uses a short loop of an acoustic guitar playing in C chord, continuously playing music in the stairwell. The pentatonic scale is brought back so each stair is linked to a tone again. Each stair starts off with its dedicated tone, but now creates a few tones after it, so that in a few steps it eventually gets deformed to a C chord. Low stairs are higher tones on the both staircases, with the lower staircase having lower tones in general than the higher staircase.	8.5 days
Bloom_CompLoop_UserEvolve	Based on earlier feedback from data, this design uses water-drop sounds, in combination with a system adding random tones to the composition, and slowly evolving people's input. This time the system only remembered the 6 last tones of people's input instead of 12.	1 day

6 Findings

This section discusses the relevant results on physical expressivity in interaction with similar Experiential Probes and analyzes them on the basis of people's comments and observations.

6.1 PianoStairs, PianoSynth_Stairs and Tiesto_Stairs

"I tried to avoid the musical false tones, because I didn't like them in the composition I made"

"It hasn't got enough possibilities to captivate me every day enough to play"

During initial encounters people show explorative actions (e,g. jumping, tapping multiple times at once, trying different spots on a stair). People are using the stairs to make simple melodies, The division of tones on an

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ascending scale seems to make it physically challenging to play richer melodies or chords that follow up in a suitable way, because of the limited distance people can bridge.

"After a while I really became annoyed by the pitch and the repetition"

After a few days, a majority of mostly younger people indicates they are bored or sometimes even annoyed by the stairs. The reasons they provide are mainly (1) because the sounds are too low-quality, cheesy and simple, (2) because the ways of interaction are too limited, and (3) because the system is always predictable.

"I think walking down is more fun than up, because of the flow I can put into the tones more easily"

"Normally I am in a hurry. But when I walk down the stairs now I try to hear back my rhythm"

With this Experiential Probe, and to a lesser extent in the Bloom Experiential Probes, people seem to walk in an altered manner down the installed stairs in relation to the normal staircases around it. Interviews with people appear to explain this behaviour as being related to the desire to alternate the speed, rhythm and flow to form some sort of composition.

Especially people who do not have direct vision on the stairs, seem to link these sound rhythms to a person with dedicated characteristics instead of focusing on the sounds themselves. Their perceived meaning of the installation seems to have shifted focus from making music to hearing back human characteristics through sound patterns.

6.2 Buffer_Shuffler and SpaceScape

Once the Buffer_Shuffler patch was uploaded in the research vehicle, it appeared to be completely unclear what exactly happened with the composition when stairs were threaded upon. The feedback was even unclear to the design researchers, despite they knew what was supposed to happen. This Experiential Probe did not invoke emerging new patterns, which was the reason this Experiential Probe was removed after a day.

Also SpaceScape has invoked no patterns of emerging behaviour, other than an initial surprise with people as the tones have changed in respect to the former Experiential Probe.

6.3 Bloom_ComputerLoop, Bloom_UserLoop and Bloom_ManyNotes_UserEvolve

This Experiential Probe was designed with the intention for new patterns of interaction to emerge on the long term, as the system was operated by more complex rules compared to the PianoStairs probes. An autonomous system has inserted random tones in the composition and later also played back people's input.

The sounds of Bloom and Guitar probes are perceived as 'more pleasant' by many people in comparison to the Piano and Tiesto sounds. This is most likely because the sounds are more ambient, which means they are softer, more natural, more fluent and less intrusive.

"Does it matter for the music when I walk over the stairs? From my personal view it doesn't seem to, actually"

"Sometimes I just don't know what to do with it"

The Experiential Probe does not seem to invite for long-term physical and explorative behaviour, apart from the occasional exception. With the Computer- or UserLoop on, people often seem to be confused about whether their input makes a difference. Although the system does give feedback, the exact response becomes hard to distinguish because of the other inserted tones (either randomly generated by the computer, or being remembered sounds created by earlier users) that play simultaneously with what the participant is creating. This confusion invites in

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some cases for curiosity and further explorations, although these never seem to last very long when people are receiving no clues at all.

In the Bloom_Manynotes_UserEvolve, the combination of the 12-tone loop and the slow evolution of tones, no individual was found that could deduct how the installation worked, and how it should therefore be interacted with. The loop of 12 tones was later shortened to 6 tones in order to reduce complexity of interaction. Also the recycle time was shortened to 3 seconds so that people had a greater chance of hearing back his 6 latest inputs when leaving the stairs.

In later interviews it appeared that people had noticed that they were leaving marks into the system, however these insights did not lead to people exploring during periods of observation. This might also be partly due to the fact that the video observations and numerical data from the first week of testing, appeared to be unusable due to system and camera malfunctioning.

Apparently it is important to people that the response they directly cause from the system should be transparent, but for the sake of long-term interest it should still remain unclear how they affect the complete composition, in order to tempt for long-term interest and physically expressive interaction.

6.4 Bloom_BGfadein, Bloom_BGfadein_Alwayspresent and Bloom_Chords

Only a handful of people seems to consciously act to create these background rises, doing this by continuously tapping between two stairs in a fast pace. Other people react very surprised upon hearing background noise.

At the start of Bloom_Chords, it is again not clear for many people whether the system responds or not. Multiple groups of people are seen inviting each other to start playing on the stairs by speculating with each other about how it possibly works. Although most people conclude it does probably not respond, some are able to figure out that there is not a chromatic scale but that tone mapping is randomly distributed.

"It is somewhat like an air bubble environment that I am in for just a short moment" (Bloom). "When I was walking on the stairs I noticed I had suddenly forgotten where I was going to" (Guitar)

A few interviewed people mentioned that, as they walked over the stairs, they had become immersed into the experience in a way they had forgotten their original destination for a short moment. Other comments indicate that many people see the stairs as a brief playful activity. According to the PLEX framework of Korhonen et al. [3] immersion is part of captivation, which is again one of the key factors in the suggested playful experience framework they propose.

"I think this scenario is more captivating than the piano one, but it invites less to play with it"

Multiple observations, seen over all Bloom probes and the Guitar probe, show situations where people that do not necessarily physically act out, seem to forget their original intentions for a brief moment. People have shown to turn the wrong direction after coming down from the stairs, correcting to the direction they were originally heading after a few seconds.

Our findings do point at a high threshold for the emergence of physical play to occur. Considering the strong prevalence of immersive experiences in this study, this high threshold for the emergence of physical play seems not to be completely affected by a state of immersion.

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6.5 Laughter

Although the Experiential Probe was originally intended as a comical setting, interviews showed that the low adult male laughter was perceived as scary when walking on the stairs in the evening with not many people around.

6.6 Guitar

"I figured the sounds must have come from somewhere, but I didn't realize I was the one that made them" (a new visitor)

"I think the stairs are really cool now, as I can now step into the composition at rhythmic moments"

Similar to the Bloom probe, the Guitar probe has also invoked many situations where people appear to be in doubt about whether their actions are of direct influence on the composition. The difference with the Bloom situations is that this Experiential Probe seems to afford for subtly orchestrated actions from people, as this allows control and understanding over the resulting complexity of the sound effect.. Observations have also shown typical situations where people try to reduce complexity in interaction, as people do careful physical explorations by taking pauses between steps or deliberately skipping stairs.

"The benefit of the Guitar-scenario is that I can comfortably play solo on the stairs"

"I think people can be less embarrassed for walking over the stairs because a background sound is already playing. The threshold to make music is lower."

In contrast to the previous Experiential Probes (Bloom, Laughter, SpaceScape) the Guitar probe has invited to people to play music on the stairs. From the observations it appeared that people sometimes change their behaviour and became physically expressive in order to try and create something musical.

Some people expressed that they felt accompanied by the continuously playing guitar on the background, and that they believed this lowered the threshold to make music. Other people mentioned that they took the stairs instead of the elevator a few times, because the background sound reminded them of the presence of the installation.

7 Conclusion

The experimental samples taken in this case study suggest that people are more inclined to show physical expressive behaviour in the context of an interactive staircase. Although their typical interaction time is relatively short, the installation is able to invite people to perform extra physical actions while they are on the stairs.

The results from the interviews and video observations also propose that this type of design interventions can turn a daily activity into an enjoyable experience for a majority of people. Not only does this invite for physical expressive behaviour at the specific time spans of interaction, but also interview quotes have suggested that several people intrinsically motivate themselves at convenient times to return to the staircase and interact with it again.

When designing for long-term behaviour change to physically interact with a system, our findings indicate that in the first few moments of interaction people feel a need to understand that their actions have an actual influence on the system. Direct and logical feedback (e.g. a successive chromatic tone mapping) is needed to provide a sense of impact and contribution to the total composition. Nevertheless people do not immediately have the need

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to understand how their input affects the complete composition. This complexity leaves room for them to express their curiosity on a longer term, and maintain physical expressive behaviour for further exploration and discovery. In order to get an understanding of this complexity in interaction, people are prepared to regularly perform distinct physical expressive behaviour, often well considered, in attempts to explore or control the system.

Our observations and interviews indicated a large group takes the stairs and enjoys this experience. Nevertheless our analysis shows that there is a high threshold to start physically expressive behaviour. People's comments reveal that this depends on the urgency of more serious tasks or a sense of embarrassment and how individuals are intrinsically geared. People also indicate that they engage less with the installation over time because of several aesthetical reasons during interaction; (1) when sounds are perceived to be too plain and too low quality, (2) when the ways of physical interaction are too limited for people to fully express themselves, and (3) when the system is too predictable.

Also social factors and experience sharing are triggers to engage in physical expressive interactions. People show and mention that they change their behaviour to physically express themselves when they are together with a familiar person or group. When a person's influence on a composition is not entirely clear, it is likely they share their ideas of how the system functions in order to seek confirmation with other, familiar individuals. From interviews it appears that passive people assign human characteristics to these (un)intentional sound compositions, that express the physical behaviour of the active sound altering individuals on the stairs. In these situations the resulting sound dynamics feeds the build of an image that is formed of the other person.

In respect to wellbeing, this case study gives the impression that people can participate in activities related to their wellbeing, provided that these activities are fun to engage in, even when the environmental atmosphere does not typically invite for such behaviour. Some of the case study's findings (i.e. regarding social relations, aesthetical quality and interaction complexity) could possibly be applicable in other studies that aim for physical expressive behaviour, but which are developed in completely different design contexts. It suggests that this type of design interventions can possibly contribute in stimulating active lifestyles amongst people inside the work environment. The results raise the question whether experiments of the same nature can be applied in other daily contexts, and could possibly take part in motivating people to (unintentionally) work on their bodily wellbeing by means of pleasurable experiences.

8 Discussion

It was experienced that the EDL approach allows experiments to evolve in an exponential way. This study was started out with a very global vision and the immediate realization of a working vehicle as a tangible instance of this vision. It was experienced that releasing such a prototype in a real-life context with people, offered great handhelds to adapt quickly to arising situations, and allowed for dynamic experimenting with system settings to test and validate a range of different but relevant hypotheses. Therefore this research method has helped the design researchers to find directions that are in fact relevant and interesting to be researched in the specific context. The EDL approach was found to allow for time-efficient research proceedings, which at the same time also leaves room to the highly dynamic and unstructured processes that are involved in design activities.

It should be noted that this study has taken input from people that repeatedly made use of the Experiential Probe in the time span of this research experiment. Therefore it should be taken into account that the chosen

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sequence of certain Experiential Probes has created a frame of reference for these people, which might have affected their behaviour throughout the process. The resulting behaviour from the study might therefore not as easily be reproducible in different contexts. Such issues that affect the validity of insights are still a matter of discussion for design researchers who deal with the development of comparable research methods.

Furthermore there are ethical and legal issues to consider in further applications of the EDL approach. Working with big data also brings challenges regarding people's privacy when acquiring and analyzing this data. With the decision to perform the research at the university campus, ethical issues about notifying people of being video recorded were less complicated, as the experimental regulations in this setting are more flexible compared to most other locations. In the university community there is a shared trust to responsibly handle such private data amongst staff and students. Also the willingness to participate in experiments is high.

For these reasons it is most likely that EDLs will take along multiple challenges as they enter more public environments. Depending on to what extent the expected benefits of the design outweigh the potential crossing of ethical borders, the ethical regulations may be set for a specific context in accordance with people, design researchers, industrial stakeholders and other relevant disciplines that deal with human behaviour. In order to protect personal data, consent procedures may be needed to define the standards, agreements and research margins for all the involved parties, in order to allow permission to access and use private data for future design developments.

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