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Getting a GRIP at the Design of a Nature Inspired Relaxation Space for Work-Related Stress

Abstract

This paper presents the work that has been conducted as part of the GRIP project about work-related stress in combination with the nature inspired design consortium. After 1,5 years of extensive research on the GRIP project including contextual user research, gathering stress insights through probes and data visualisation, and co-creation with stress experts and employees, it was finally decided to design an ambient space that enables employees to relax. The design of the relaxation space was inspired by nature and offers employees an adaptive environment that reacts to their presence by creating a personal environment, varying in size, sounsdscape and animated light. The environment stimulates paced breathing, meditation and helps employees to become more aware and in control of their personal response to stressors and relaxation. The design has been evaluated by 23 experts on the basis of one time use of the space. The expert evaluations resulted in very positive responses regarding the low effort required and the high quality of the relaxation experience provided. We are currently collecting feedback from employees taking part in a prolonged end user evaluation to explore the value of small adaptations in our design in order to further improve the relaxation experience.

1 Introduction

The work described in this paper is conducted in light of two collaborations, namely the GRIP project, and the Nature Inspired Design consortium, and aims to address work-related stress through design. In this section first relevant background information about the project collaborations will be provided, followed by a short introduction to the domain of work-related stress, and the peculiarities that need to be considered when designing within this domain.

1.1 Project collaborations

The Dutch government funded the GRIP project, as part of a larger program (CRISP) focusing on the design of Product Service Systems (PSS). The aim of CRISP is to develop new markets for the creative industry by stimulating research on the role of design in industry. GRIP deals with flexibility versus control in the design of PSS for work-related stress (Badke-Schaub & Snelders, 2011). The GRIP project is a collaboration between Philips Design Innovation, the Design Academy Eindhoven, and TU Delft and Eindhoven University of Technology. GRIP starts from the premise that in the case of PSS, the control of designers over processes and outcomes is reduced.

The Nature Inspired Design Consortium unites multiple companies, among which are Philips and Interface, and the Industrial Design department of the TU Delft in

performing research on the practice of Nature Inspired Design (NID). The aim of the consortium is to come to better and proven effective NID methods. Design inspiration through nature can take various forms such as biomimicry or Life's Principles. Biomimicry can be defined as imitating or taking inspiration from nature's forms and processes to solve problems for humans (Benyus, 1997). Life's principles are successful principles of nature that provide the parameters, conditions, and requirements to function more sustainably. Life's Principles can be used to develop selfsustaining ventures and technologies that, like nature, maximize benefits with minimal effort and negative impact." (Patel & Mehta, 2011).

This paper presents our experiences within the GRIP project and the Nature Inspired Design Consortium, and discusses the development of a nature inspired prototype, namely a relaxation space. The relaxation space offers a platform for designers and service providers to create new PSS in the future.

1.2 Work-related stress

The concept of stress has been introduced first by Hans Selye who defined stress as a non-specific response of the organism to any pressure or demand (Selye, 1956). Later, Selye (1974) made a distinction between eustress and distress. If an effective coping strategy can be found, and if the necessary resources are present, this will result in positive stress, called Eustress. This state of positive stress brings an individual in an optimum state to perform. When the individual is not able to cope effectively the stress becomes chronic and the individual will experience distress (Selye, 1974). The influence of the environment on the evaluation of stress is pointed out by Lazarus & Folkman who define stress as: "a particular relationship between a person and the environment that is appraised by the person as taxing or exceeding his or her resource and endangering his or her wellbeing" (Lazarus & Folkman, 1984).

Some literature targets work-related stress in particular. Le Blanc et al. (2003) identified the main stressors occurring in an office environment and divided them in the following four categories: job content, working conditions, employment conditions and social relations at work. Job content includes among others work over/ underload, complex or monotonous work, excess of responsibilities, conflicting/ambiguous demands. Working conditions include factors such as noise, vibrations, lighting, temperature, posture, or lack of protective devices. Employment conditions include shift work, low wage, poor career perspective, job flexibility/insecurity. Social relations at work include poor leadership, low social support, liberties, and discrimination Le Blanc et al. (2003). A model that explains the experienced pressure from work is the job demands and job resources model (Bakker et al., 2004). Job demands refer to physical, psychological, social or organizational aspects of the job that require physical or psychological effort and costs (e.g., work pressure, role overload, emotional demands, and poor environment conditions). Job resources refer to physical, psychological, social or organizational aspects of the job that are functional in achieving work goals, reduce job demands and the associated physiological and psychological cost, or stimulate personal growth and development.

Stress or tension can be effective and healthy, and may help you to perform better, for example when giving a presentation. However, stress can become ineffective and harmful if it continues over a prolonged period of time (Petri & Bouman, 2009). Without sufficient moments of relaxation to release tension, the stress will build up over time. "If you push your body by constantly being in an alert state and do not give it a chance to recover, a time may come when you won't be able to continue" (Petri & Bouman, 2009). In this paper we explore various design directions and opportunities that could help working people to balance between an alert state and recovery.

1.3 Designing for work-related stress

One of the roles of designers is to think about the relationship between human and technology and to designate it: give meaning to it (Krippendorf, 1989; Verganti, 2009). Thus, the role of the designer is to give new meaning to technology. While technology has the capability to expand upon the possibilities of human beings, this is not achieved in a neutral way. Technology changes human perception.

Krippendorff & Butter (1984) indicate that designers can demystify complex technology, improve the interaction between artifacts and their users, and enhance oppor-

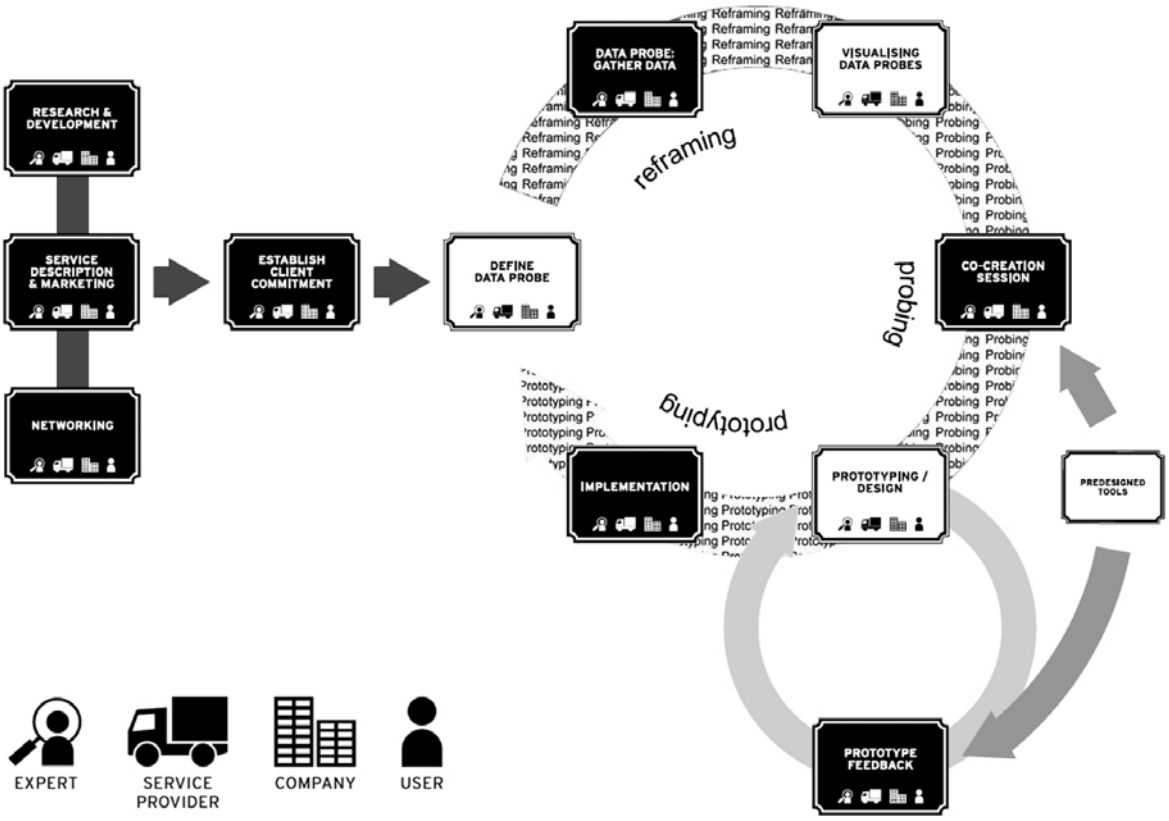

Fig. 1. GRIP Service Model v6, designers (white) and all stakeholders (black) alternate in taking up a central role in 3 different stages: design for analysis (reframing), design for research (probing), design for support (prototyping)

tunities for self-expression through product semantics. Meanings emerge in human interaction with objects (Krippendorff & Butter, 1984). By formulating ideas about the object, and cognitively placing it into (real or imagined) contexts, people allow themself to formulate an understanding of the object, or in other words: "Meaning is a cognitively constructed relationship" (Krippendorf, 1989)

The role of the designer is different for PSS design compared to traditional product design (see also Raijmakers et al., 2012; Van de Garde-Perik et al., 2013). In PSS development multiple stakeholders can play a role and each can offer different values to the PSS development. In our project targeting work-related stress PSS, we discovered already at the start that there were a large number of stress combating or relaxation techniques that were available through various channels (books, websites) and service providers (psychologist, mindfulness therapists, wellness resorts).

One of the first activities within the GRIP project was an expert day were industry stress experts with backgrounds in psychology, technology and occupational health, and a worker with experience of burnout met with designers to discuss and explore the topic of stress at work. Furthermore it enabled us to gain and share knowledge with industry professionals, and to start building a network of expertise. The invited stress experts indicated that there is currently a lack of accessible tools that visualise the effects of stress. Thus, many of these existing techniques lack the use of technology, while Philips had the opportunity to make use of various technologies to monitor human physiological processes.
The main conclusion of the expert day was that people need to be aware of their body signals or stress levels, but also need to be motivated, in control, responsible, and active to deal with stress. In addition, it became apparent that there is a strong taboo on discussing stress at work, and that the image of stress might be in need of 'rebranding'. Therefore, within this project we took an open innovation approach together with various experts and explored the potential of a combination between existing stress techniques, and state of the art technology, while using research and design expertise.

2 Choosing a design direction for work-related stress

Before choosing a final direction for our nature inspired design prototype we performed contextual research into work-related stress. The three stages of the GRIP service model were followed in this process: reframing, probing and prototyping (See Fig. 1; For a more detailed description see Raijmakers et al., 2012; Van de Garde-Perik et al., 2013).

2.1 Reframing work related stress

Currently, many organizations feel more responsibility to take care of their employees, e.g. to lower burnout rate, to let people perform optimally, to take care of employee well being. Within the GRIP project, we partnered with a mental health care institution in Eindhoven (GGZE), to co-develop a PSS targeting work-related stress. We chose for a mental healthcare organization because we learned from the expert day that especially employees in a caring job such as in health care or education tend to take up more work than they can deal with or find it hard to say no in their job, because they are working with people who need their help (mental health clients, or students). Besides, the GGZE is particularly open to employee wellbeing, because of their Planetree vision that good healthcare can only be provided through by a healthy organization (for more information, see http://planetree.org/).

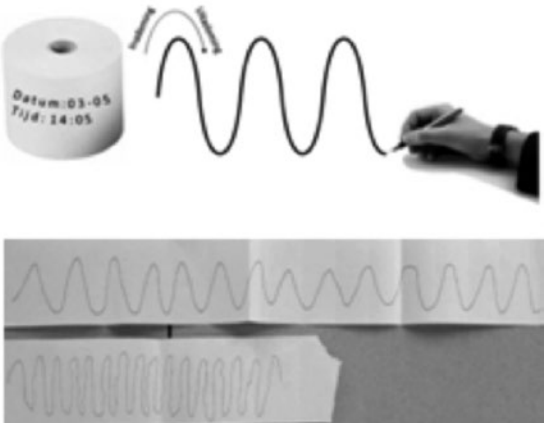

Fig. 2. One of the probes used to collect stress insights via breathing patterns. Instruction (top) and samples (bottom) of manual breathing registration on paper (upwards line when inhaling, downwards when exhaling).

As a first step in getting familiar with the GGZE organisation and work routines, we observed and interviewed health care workers in their own environment to spot potential problems or causes of stress that we could target and monitor. As designers we wanted to better understand their work pressure and stressors, and understand the differences between various approaches or strategies that employees have regarding work-life balance and stress relief. It was agreed with the department of Ambulant Care that we could shadow several GGZE employees during a working day to observe the overall organisation's culture of stress. Furthermore, we collected more stress insights by having employees monitor their work patterns through three different stress data collection probes: a manual registration of breathing patterns, a GRIP-booklet to collect various stress measurements, and a public relaxation measure.

Firstly, the manual registration of breathing pattern was inspired through different channels, for example by various expert presentations, existing technologies such as emWave (http://www.heartmathstore.com/), stresseraser (http://stresseraser.com/), and the book by O'Hare & Blase (2010). Participants were asked to register their breathing for a period of 2 minutes by drawing a wave pattern on a paper roll (see Fig 2). Secondly, the GRIP-booklet of stress measurements was inspired by diaries as often used in cultural probes studies (Mattelmäki, 2006). Each page of the GRIP booklet consisted of a number of fields where the following data could be entered: date and time of the registration, a comment field, the Self-Assessment Manikin (Bradley & Lang, 1994: positive-negative valence, high-low arousal and low-high dominance), the six item State Trait Anxiety Index, and a field to enter the result of the Azumio Stress Check (http://www.azumio.com/apps/stress-check/). Thirdly, the public relaxation measure asked questions concerning relaxation and break taking behavior at work. The relaxation measure encompassed reading a question and giving an answer by putting an ice stick in the appropriate vase (see Fig. 3).

Multiple workshops were organised with researchers, designers, GGZE employees and managers, as well as stress experts to discuss and visualize work-related stress from various perspectives. Together we discovered large individual differences between employees; in terms of work strategy and perceived obstacles/difficulties, in preferences regarding the use of particular data probes, but also in actual stress measurements (i.e. level of stress). For some people the mere reflection on the personal situation was sufficient, whereas others were in need of the data being visualised and interpreted for them. Some people indicated to want evidence of the data probe before using it, whereas others where open to using it without any

Fig. 3. One of the three probes used to collect stress insights on break taking behavior, namely the public relaxation measure used in canteen of GGZE.

Fig. 4. Example Personal Balance: Reco, smartphone relaxation coach app – TU/e student project by Christoph Lukkien

evidence or explanation. It became clear that extreme scores and deviations are potentially interesting and easy to investigate in more detail. Furthermore, in order for self-assessment to become successful there needs to be motivation, but also some sort of routine (i.e. fixed times during the day; every time you return to your desk, at the start of a team meeting). The environment was another important factor that turned out to have an influence on perceived work load (i.e. different locations of the GGZE were perceived differently; open plan offices resulted in most disturbances from visitors or noisy colleagues).

Fig. 5. Example Paced Breathing: Rhythm Pad 3D render (top) and prototype (bottom) including feedback on Heart Rate Variability – TU/e student project by Sergej Lojko

2.2 Probing work-related stress solutions

More than 50 ideas and probes targeting work-related stress were developed on the basis of data visualization and co-creation events with all stakeholders involved. After receiving feedback from stress experts and GGZE employees these ideas were eventually reduced to 3 directions for prototypes of work-related stress solutions: Personal Balance, Paced Breathing and Ambient Experience (see Figures 4-6). Over 25 prototypes have been made in total, both by students of Eindhoven University of Technology and by Philips Design Innovation. Below, we present a selection of these prototypes, aimed at making work-related stress less of a taboo topic for people, encouraging people to treat stress in a more lighthearted fashion, while respecting that people differ in what might help them. Note that there are overlapping elements between the prototypes, since all of them require monitoring some kind of parameter (physiological stress levels, consecutive working times, keyboard hits, emotions etc.).

The Personal Balance solutions aim to help people by providing insight into this measured parameter (an example is shown in Figure 4). This is a personal well-being solution that helps a person to see their daily stress and the way they cope with it. By giving feedback of previous stress events and the current stress level, a person gets motivated to recuperate, by going for a walk, or relaxing for a while.

Fig. 6. Example Ambient Experience: Initial concept sketch and prototype (left). Zen Pebble, Intelligent Aroma Diffuser. Emotion detecting software is used to release aroma at an appropriate moment through Zen Pebbles (right) – TU/e student project by Sherry Hui Wang

The Paced Breathing solutions are centred on helping people to regulate their breathing rhythm and consequently to influence other relevant parameters (see Figure 5 for an example). Paced breathing is intended to re-establish an optimal connection between the mind and the body. People are sometimes not aware of their mental state while at work. As tension goes up, the head is overflowing with things that need attention or require decision-making. People get disconnected from thoughts, feelings and bodily responses, and unaware of their well-being.

Finally, the Ambient Experience solutions are based on reactive environments that provide a more public (and thus social) type of feedback to people (see Figure 6). By tickling the senses and offering different types of mental triggers, an environment can stimulate you to become more aware of your body and mind. Subtle fragrances, sounds, haptics and visuals can be (sub)conscious cues for people in the environment to take a moment for themselves, and nudge people into different norms and values about relaxation at work.

2.3 Co-creating a work-related stress solution

We intended to build and evaluate a nature inspired prototype for work-related stress that is informed by insights from all three directions at Philips Design Innovation, in collaboration with multiple experts. This means that experts in various domains are actively involved in the design process, and give intermediate feedback to our design decisions and input for future decisions. As such, Philips has chosen a flexible approach for the development of the prototype, based on the experiences in the GRIP project and the NID consortium. The final design activities of Philips Design Innovation are a powerful push towards re-branding the notion of work-related stress, following some of the probing directions we discussed above.

The project's aim of the prototype building was to generate expert and user feedback. The purpose of the actual design was to help people to cope with work-related stress during work time, both as prevention of stress building up and treatment of existing stress. Furthermore, we wished to place the demonstrator in a public space to raise awareness regarding the topic of stress, and hopefully to change group dynamics within the workplace. Therefore, the space should build on the strengths of nature, yet fit into the working environment. It should be an accepted and attractive place to retreat oneself during work time, it should not be stigmatizing in any way but inviting by its appearance.

A pressure cooker was conducted to build further on the experiences in the GRIP project and the NID consortium. Within this pressure cooker we generated more detailed ideas for our relaxation space, created a rough first prototype and applied body storming as a means to explore various use scenarios and obtain quick feedback from Philips employees. From this pressure cooker we learned among others that the space should allow oneself to be shielded of from the work place

and provide a safe and private environment that would fit both individual and group use. The insights from the pressure cooker were later complemented with additional internal research and employee interviews within Philips Design Innovation.

Originally the idea was to have two related prototypes, namely one prototype at people's workplace to trigger people to take a break. And the other prototype would be the place where people can go to have their break, a relaxing session or a peaceful moment away from the usual work place and activities. However, after long deliberation it was decided to offer a communal experience instead of a personal treatment. A personal measurement or trigger to go to the relaxation space, could lead to stigmatizing people (being too stressed or incapable of managing your work), or even resulting in people avoiding to use the triggering function (e.g. such as frequently happens after installing RSI software). Therefore, the personal stress measurement or trigger, was not incorporated in the final design. Instead, we aimed to increase awareness within the community regarding the need for healthy and balanced working behaviour by intrinsically motivating people and encouraging positive social support among colleagues within the working environment.

The prototype of the relaxation space had to be build within two months and should fit to the context and employees of the Philips Design building at the High Tech Campus in Eindhoven. The design of the space would be a nature inspired ambient environment, supporting individuals and groups of people to regain their personal balance. Besides, it should support several relaxation techniques, such as paced breathing, mindfulness, meditation, regaining energy, and power napping. In order to achieve these qualities, a mix between technology (mainly lights, sound, enclosing curtains) and natural aspects (materials, feeling of a natural environment, aroma therapy etc.) was strived for.

In our design of the relaxation space we wanted to build on existing knowledge in the field of stress, as well as rely on nature's qualities (see Figure 7). Nature has a high level of attraction to people, it offers many experiences through various senses, and it has relaxing qualities for people even though we have limited control over it (e.g. we cannot control the weather).

Fig. 7. Inspiration from nature and design

Nevertheless, we can have some control over our experience in nature by choosing when, where and how to go (e.g. winter or summer, forest or seaside, alone or with others). Taking into account the fact that people who suffer from negative stress have difficulties making decisions, we wanted to create a similar yet different experience to nature with our relaxation space. The relaxation space should offer always changing experiences, have a relaxing quality yet offer limited control. Thus, as in biomimicry and in line with Life's principles we wanted to take inspiration from nature's forms and processes to enable people to easily balance relaxation and work; maximizing the benefits for employees with minimal effort. The aim was to create an ambient environment that will help people to feel at ease, and let go of some control.

The relaxation space could be considered as a gateway from the work environment into a different world, with the following features:

- It should be a welcoming space with an inviting ambiance, appealing to people's curiosity. The space should appear to be alive and inviting even if nobody is using it (like with nature there is always activity which could potentially catch someone's attention).

- Physically away from the work space-environment but still be nearby/out of sight from working people to provide a shield from the open office working environment.
- It should offer a relaxing, calming experience through intuitive interaction, and provide focus and breathing guidance through enclosure, music therapy and chromo therapy (in max. 15 min.)
- The space should enable people to tune the experience to their own preferences and strategies for relaxation in an easy way (e.g. individual vs. group use, size of space, moment of day, position)

3 Implementation & evaluation of a relaxation space

To enhance choosing the final design direction for the relaxation space three different scale models were built. Then, both a full scale paper prototype and a working prototype of the relaxation space were developed. Each of these stages will be discussed below.

3.1 Prototyping a relaxation space

After building three different scale models, the rough set up of the final design was chosen (see scale model in Figure 8). The final design would be a relaxation space that was shielded of from the environment through curtains that could move separately from one another to adapt the size of the space to the number of inhabitants. The original scale model was designed as 4 by 4 cells, allowing many different configurations (e.g. 4 single cell configurations, 2 simultaneously used 2*2 configurations, a 3*3 and single cell configuration). The next intermediate stage, was a low-fidelity prototype that was built in the basement of the Philips Design building (see Figure 9). The paper prototype consisted of just 2 cells, and had paper curtains, a computer to provide sound experience, and one single light source from the ceiling above each cell. Nevertheless, the paper prototype enabled us and invited experts to experience what being in the relaxation space could be like. Both the scale model and the low-fidelity prototype were presented to experts in the stress domain, to get intermediate feedback regarding our design.

We arranged meetings with various experts and made visits to 2 location of the GGZE where special attention is put into the design of rooms and buildings to make clients feel at ease. These visits and meetings

Fig. 8. Small scale model for relaxation space (4*4 cells)

Fig. 9. Full scale low-fidelity prototype of relaxation space (1*2 cells)

served as a great inspiration to our design process. For example, we discovered that many experts we have consulted use nature in their treatments in some form (e.g, use of images, or going for a walk outside in nature). The overall sensation of nature around oneself can help to achieve a positive result (i.e. changing in space, differences in temperature, wind, smells, etc.). According to our experts nature works calming, but it can also give problems (e.g. if you don't like certain weather types; or if you suffer from winter depression, spring exhaustion, or allergies). Therefore, we needed to decide how closely we wanted to get inspired through nature. Taking into account all feedback and insights obtained so far, we decided to create an indoor space with the strength of nature, yet fitted to an office environment. As such, we wanted to create a space with its own specific qualities next to having the opportunity to go out in the real nature. As in real nature, the relaxation space should offer a rich, multisensory experience, with a rhythm of its own (daily or seasonal).

Furthermore, it was important that we provided a space that is not work-related (to enable people to step out of the work context). A cozy environment or the feeling of safety can be truly important. Also, having the feeling of owning a particular spot, or having control over the situation are influencing factors that can make people change their mind. Furthermore, in the research phase we have seen that people sometime feel the lack of control over their working environment (especially in open plan work spaces).

Also the posture during meditation and relaxation is very important; you should not be distracted by physical discomfort. People are not supposed to fall asleep when meditating, but that one should stay alert, while mind and body should be relaxed. Following specific indications can help people to stop their mind from working. This is a skill that can be trained. Once you know how to do it, you can do it without help. Furthermore, from stress experts we learned that relaxation is personal; what works for someone may not work for another.

3.2 Full scale Implementation

Because of restrictions in the amount of available time and resources, it was decided to build a smaller configuration for our working prototype than the original 4*4 configuration. The smaller configuration allowed fewer possibilities for simultaneous use of the relaxation space, but still it allowed us to explore the overall concept underlying the space. The final relaxation space is a configuration of 2*2 cells, with Interface flooring, 12 curtains allowing the separation of the 4 different quadrants, a ceiling with 16 individual light sources, and an ambient soundscape.

Initially, the relaxation space invites passers by to come in through the attraction of a white pulsating light coming from the ceiling. Once people enter the space, the relaxation space responds to people's presence. The curtains lower, the soundscape is being generated, and the lights turn into a colored spectrum. Depending on people's preferences they can either sit down or lay down, using the comfortable repositional cushions provided with the space. Besides the ceiling light, also light objects could be used inside the space to create a different dynamic to the space. People have implicit control over the relaxation space. The curtains automatically adapt to people's position within the space. In addition, people can choose to bring in furniture or light objects to further adapt the space to their own relaxation preferences.

The relaxation space has been evaluated by 23 experts from various fields (see Figure 10), i.e. ambient experience design, interaction design, relaxation (service providers & researchers). This evaluation proved that the space is very well suitable to speed up the relaxation process. People experienced with yoga and meditation indicated the relaxation space enables them to get an even quicker experience than when relying on traditional yoga and meditation procedures. People with less experience in relaxation (e.g. interaction designers), did not really try to use the space for their own benefit, but stated on the basis of exploring the relaxation space that "It could work". Perhaps the context of the expert evaluation (they were asked to professionally evaluate the relaxation space in the presence of a designer and design researcher) did not fully enable them to use the space for relaxation purposes. Therefore, in the next stage of evaluation more emphasis was put on the need for users to surrender to the space. The relaxation space does not provide a magical cure to stress, but people need to play and an active role (as was already discovered during the first expert day).

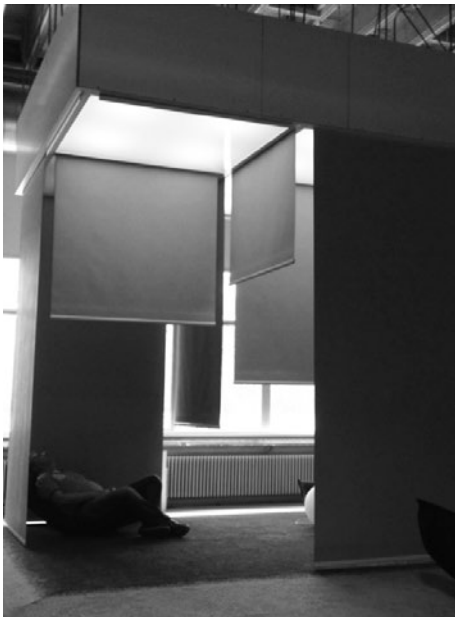

Fig. 10. Individual use of relaxation space occurred in expert evaluations and prolonged user evaluation

Fig. 11. Shared use of relaxation space for meditation purposes

Currently, we are further investigating the meaning of the relaxation space for employees from Philips Design over a prolonged period of interaction, namely three weeks. Simultaneously, we are exploring small adaptations in our design to improve the relaxation experience for users. While the investigation is not yet completed, we can already see that different use situations and meanings of the relaxation space emerged over time. For example, some people made use of the relaxation space to get out of sight of colleagues and enjoy a moment for oneself (see Figure 10), while there were also large groups of people that used the relaxation space during lunch time for a group mediation with approximately 20 people (see Figure 11). The pace of the lights suggests a breathing rhythm to users and can provide support in paying attention to ones breathing pace. The soundscape is generally appreciated and supports the relaxation experience (e.g., "the sounds are soft and contribute to thinking less and feeling/ experiencing more"). Furthermore, based on positive responses from various industries it could be that (some parts of) our design become of meaning in different application areas e.g. mental healthcare, or hospitals.

4 Conclusion

This paper illustrates how open innovation together with multiple experts can be achieved in a relatively new area for design (i.e. the field of work-related stress). Our open and flexible approach has proven beneficial to all stakeholders involved in PSS design. Furthermore, the adaptive environment enables multiple forms of interaction and hence can carry different meanings depending on its use.

We have discovered that the relaxation space that was designed, implemented in an office environment and evaluated enables people to let go of control and allows them to open up to a relaxing experience. People who already practice yoga or meditation indicate that they are capable to achieve a quicker and deeper effect by being in the relaxation space.

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