Cooperative Play for Preventive Healthcare in the Office

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Abstract. In this paper we introduce a novel technological concept to support and improve preventive healthcare for office employees. The overall approach is to motivate and persuade employees to pro-actively impact their personal health-status. Therefore we propose a cooperative (computer-) game, which utilises affective interfaces and persuasive technologies to enhance motivation and cooperation of the employees. Our approach is based on the TripleC-Model (cognition, communication, cooperation), which allows for addressing health issues on an individual and on a social level.

1 Introduction

The omnipresence of office computers implicated more working comfort and increased productivity. But it also started discussions concerning health problems stemming from computer work. Especially Musculoskeletal Disorders (MSDs) are a major problem for employees as well as business and national economies. They are the most common work-related health problem in Europe, affecting also workers in low-intensity static work (e.g. computer work) [1].

In order to tackle this problem, it is not sufficient to refer only to the obligations of the employer, such as providing ergonomic preconditions for the office or creating state-of-the-art computer workspaces. It is also necessary to address the self-responsibility, the sensitisation and the continuous motivation of the employees regarding preventive healthcare. But many people are not aware that their habits while working at a computer (e.g. a bad sitting posture, staring onto the screen for hours without breaks) might have negative effects and can seriously and long-lastingly impact their well-being. Nevertheless, there are many strategies and physical exercises that may help employees to maintain physical health at work.

The overall aim of our work is to highlight ways which foster the employees' awareness for potential health risks in office work. Moreover employees should be persuaded to pro-actively impact their personal physical well-being. For this purpose we introduce a game concept which encourages players to cooperate in order to build a “preventive healthcare community”.

2 Background

Our approach is based on the TripleC-Model [2], an evolutionary stage model that describes the emergence of cooperation – from cognition and communication – as ultimate goal in social systems. The TripleC-Model considers both the indiviudals' (subjective) knowledge and the collective (objective) knowledge. Thus, it allows for addressing and balancing the individuals' and the group's needs on health issues.

The TripleC-Model forms the theoretical basis for our game concept (see Fig. 1): An individual starts on the level of *cognition* where awareness and initial motivation are propagated. Then he gets in contact with other individuals by using certain mediating systems, thus actors enter the *communication* level. If actors work together and have shared goals they can reach the level of *cooperation*. At that level everyone can benefit, because actors that are embedded in such a social network learn from each other and are mutually dependent and responsible. This supports the exchange of experiences and knowledge on health issues, which in turn improves the individuals' as well as the group's knowledge on these topics.

Human cognition, communication, and cooperation can be mediated by a technical infrastructure. Applied to our concept this means that we use a game with a cooperative play strategy to reach the ultimate goal of establishing cooperation among the players, i.e. the employees. But before cooperation can be established, the levels of cognition and communication have to be addressed. Affective interface technologies are used on the level of cognition. This will foster an engaging user experience through its fun aspects. Such a positive experience will provoke that employees are motivated to play and share their thoughts and feelings about this, thus entering the communication level which is supported through ambient persuasive technologies to foster motivation and even more communication and motivation. At this point the employees enter the level of cooperation, because of the cooperative play aspects of the game, joint efforts are required to advance. Thus, we are aiming at providing a technological concept, which is affective, persuasive *and* cooperative.

3 Explanation of the Game

The TripleC-based game design fosters community building through the interaction of the players. The game starts in a classic single-player mode, but as it advances the game crosses the border from human-computer interaction to computer-mediated human-human interaction.

The game requires the employees to carry out short and simple physical exercises, e.g. stretching arms or rolling shoulders. By performing these exercises the player progresses in the game. The game provides a pool of predefined exercises. The game system automatically measures how well these exercises are performed by the employees. For this purpose an appropriate motion capturing technique will be used. The captured motion data is then compared to an archetypical performance of this exercise (this archetypical data will be trained a priori to the system, e.g. by a physical therapist). Based on this comparison the system determines the quality of the exercise

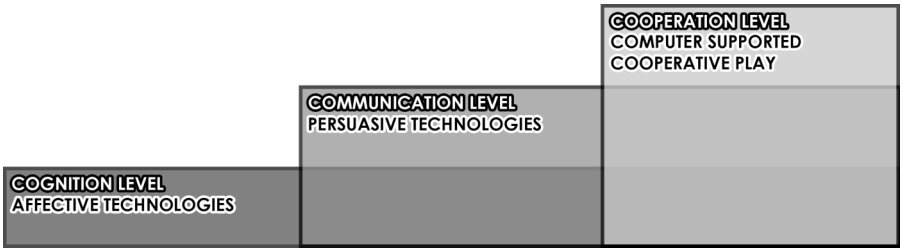

Fig.1. The TripleC-Model applied to our concept. Each level introduces a new quality (white labels) which builds upon the previous ones and is appropriately supported by a technological concept (black labels).

performance and rewards the employee with a certain fitness score. Each employee's personal aim is to raise this score, because it is a benchmark for his personal fitness.

The game is composed of several stages, advancing is possible by increasing the fitness score. For progressing in the game it is also necessary for players to team up: The necessary threshold for advancing to the next stage cannot be reached by a single player but only by groups of players. The higher the level, the more team members are required. The team benefits from each group members performance.

3.1 Cognition Level: The Trainer

On the level of cognition we utilise an affective interface [3] in the form of a Personal Virtual Trainer (PVT). In reasonable intervals the PVT will appear on a dedicated display (e.g. a digital picture frame on the desktop) and demonstrates a certain exercise. He instructs and motivates the player, who in turn decides whether he wants to react on the coach's suggestions immediately, to postpone exercising or even refuse to exercise. The employee's individual fitness score only increases if he adheres to the instructions. He gets feedback from the PVT through its facial expressions. The PVT motivates the player and reminds him to act in case he forgets practising. The game does not include any penalties, but the PVT expresses emotion (e.g. looks sad).

3.2 Communication Level: The Persuasive Ambient Display

To foster social interaction – and consequently communication – the game incorporates a persuasive ambient display [4]. Thus, a wall-mounted screen is installed in a common area where employees can meet informally and discuss. The display shows the overall group fitness and the scores of each team. This Ambient Display takes advantage of the *social facilitation* persuasion strategy [5]. This strategy leads to community building and improves the willingness to deal with the personal health-status by the means of peer assistance. The communicative setting at the ambient display fosters exchange of experiences as well as team building.

3.3 Cooperation Level: The Teams

To achieve the ultimate goal of cooperation in our game setting, we utilise the concept of computer supported cooperative play [6]. In order to progress in the game it requires joint efforts of several players. For example, to reach the second stage it requires a team of two persons, to reach the third stage it requires three persons etc. In the previous level the employees were encouraged to build teams. After teaming up, players still perform their exercises individually. The difference in team playing is that the fitness score of the group is used for advancing to the next stage. In order to reach the threshold for the next stage it is not sufficient that only a few team members practice, but every team member has to be engaged. Earlier stages can be reached fairly easy as teams are composed of a rather small number of players. At higher stages a larger number of team members is required, which results in even higher coordination efforts and hence, makes it harder to advance in the game.

4 Expectations & Future Work

The main assumptions are that the proposed TripleC-based concept will raise the awareness for potential health risks and furthermore that employees will be motivated and persuaded to pro-actively impact their personal health status. More generally, our concept might also provide great beneficial potentials for technology-supported healthcare: we suppose that the TripleC-Model is generally applicable for healthcare applications, because it fosters peer assistance and community building, which are important factors for healthcare services.

The next steps are to specify the rules of the game in more detail. As a proof of concept we will develop a prototype. This will be deployed in situ to evaluate our game concept and substantiate the applicability of the TripleC-Model for healthcare applications. To measure the persuasive effect, we will assess the participant's baseline motivation and attitude towards preventive healthcare, then conduct a long-term study in order to measure the user experience of our application as well as the employees' attitudes and motivation after the deployment.

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