

Games & CI-rehab

A game for critical listening training in CI-rehab

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INTRODUCTION

Today, a lot of hearing-impaired children and adults receive cochlear implants (CI). Research shows that the majority are satisfied with their implants and that the quality of life (QOL) has increased thanks to them (Gaylor et al., 2013). A great deal of research is being conducted on speech understanding for people with CI and how it can be improved (Gaylor et al., 2013). Language is no doubt important, but it is also important to think about aspects other than speech clarity for quality of life and inclusion. It is well-known that there are problems with the enjoyment of music with CI and that it varies a lot between people (Riley et al., 2018). Research shows that there may be opportunities to practice listening to music and that it may also have positive effects on speech understanding for people with CI (Firestone et al., 2020). However, there seems to be a lack of research when it comes to rehabilitation with other types of audio than speech or music, for instance with sound effects and environmental sounds.

GAMES FOR REHAB

“Serious Games” are games that have some purpose other than entertainment. In different types of rehabilitation, games have proved to help with patients’ motivation in performing their rehabilitation exercises (Engström and Backlund, 2022). Serious games are finding their way into CI-rehabilitation as well, mostly focusing on speech and communication (Cano et al., 2018).

TECHNICAL EAR TRAINING (TET)

Audio engineers (and similar professions) need to be good at listening. And not just listening to sounds as functions in specific contexts, but listening critically to the fine details in the sounds themselves, in other words; critical listening (Corey, 2016). In audio engineering and musical education it is common to have critical listening training as part of the curriculum (Elmosnino, 2022). This type of training is referred to as Technical Ear Training (TET). In TET, students and professionals in audio engineering and sound/music production, focus on the acoustic and technical properties of sound to improve sound design, mixing and mastering skills (Corey, 2016; Gordon, 2021). The aim of the current research project is to identify and utilize appropriate aspects of TET-methodology in a game, aimed at critical listening training for CI-users.



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RESEARCH STRATEGY

This research project employs an iterative Design Science strategy derived from a model proposed by Offerman et al. (2009), adapted to suit the needs of game development in general and this project in particular (Figure 1). We employ a mixed methods approach, using both quantitative and qualitative methods. For the final evaluation of the game, a case study (studies) or experiment(s) will most likely be conducted. Data collection methods will consist of: documents, observations, interviews and questionnaires (Johannesson and Perjons, 2021).

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ABSTRACT

The majority of patients that has received cochlear implants (CI) report an increase in quality of life. There are however issues with CI. For instance, some patients report disappointment at the quality of sound and that they expected more out of their implants. There is, however, evidence that these perceived issues can be minimized with practice. Hence, there is always rehabilitation or habilitation following implantation. Most CI-rehab is focused on speech and communication and most research on CI-rehab also focuses on speech and sometimes music training. Rehabilitation runs the risk of becoming tedious due to the need for repetitive exercises. It is well-known in the Serious Games and Games for Health-communities that digital games can be useful in rehabilitation. The fun aspects of a well-designed digital game can help patients stay motivated, thus actually taking the time to do their exercises. Audio professionals, such as audio engineers, sound designers or musicians get better at listening and hearing nuances in sound through their work than non-professionals. They can many times identify and analyze aesthetic and technical aspects of a sound better than non-professionals. In shorter terms, they increase their listening skills. In the audio engineering community practitioners also actively practice their listening skills. This practice is called Technical Ear Training (TET). The current research project aims to evaluate whether a digital game can be a useful tool in CI-rehab by combining the motivational aspects from game design knowledge with technical ear training methodology.

The current project utilizes a Design Science Research-protocol based on three phases; (1) Problem identification (2) Solution design and (3) Evaluation. (1) will consist of an extensive literature review and interviews with professional healthcare workers about the CI-rehab process and possibilities for improvements. (2) consists of iterative game development and testing together with CI-rehab professionals and CI-users to produce a prototype for evaluation. In (3), the game prototype will be extensively tested together with healthcare professionals and CI-users to evaluate its validity and results will be analyzed and published.

The project is currently at the end of the problem identification phase. Results from this phase indicates there is a lack of motivational tools that CI-patients can use on their own to get fun, quantitative training with their CI at home. The tools that are available are mainly focused on speech and sometimes music. Few research projects have focused on other sounds or practicing listening skills with technical ear training.

Motivation is a key factor in any rehabilitation. Digital games can help keep patients motivated. Lots of listening practice is a key factor to CI-rehabilitation. By combining the motivational aspects of a game with technical ear training we aim to evaluate if such a game could be a viable tool in CI-rehabilitation.

AIM AND EXPECTED OUTCOMES

Using a design science research strategy, the aim of the current research project is to design and evaluate a game, based around Technical Ear Training (TET) methodology (Corey, 2016; Gordon, 2021), that enables patients in CI-rehab to increase their critical listening skills (Corey, 2016; Elmosnino, 2022).

The main contribution is expected to be in CI-rehab research-communities. Hopefully this project can validate the use of a game for critical listening training using TET-methodology in CI-rehab. In addition, it can possibly also infer further knowledge on using games in CI-rehab in general.

A secondary expected contribution is to the serious games-community. This project can exemplify applied game-design and game-audio research in a live rehab-setting.

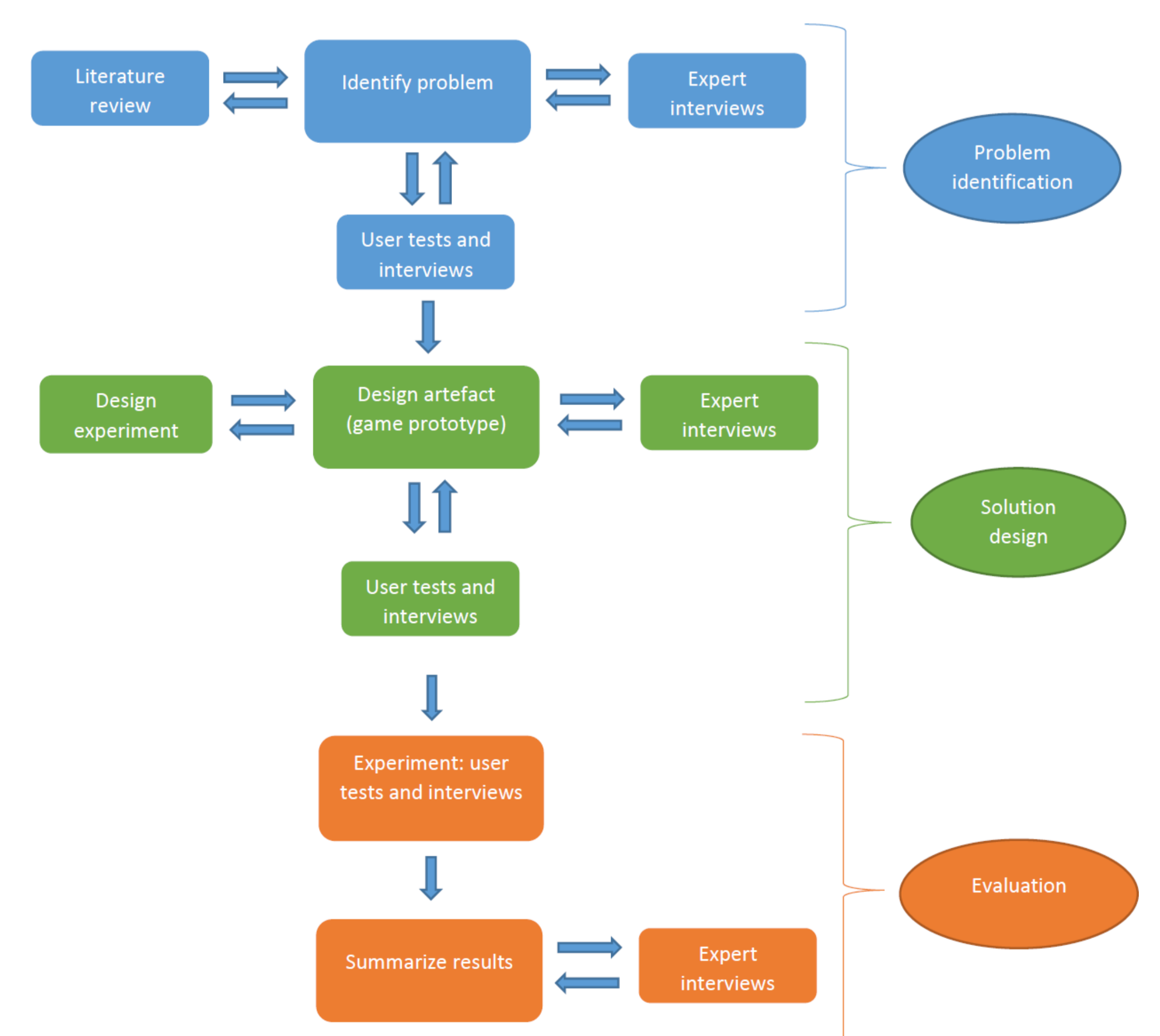


Figure 1 Design Science-model derived from Offerman et al. (2009)