

Development of a vibrotactile stimulation system for cognitive rehabilitation

Master Thesis

In partial fulfillment of the requirements for the degree

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Declaration in Lieu of Oath

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Schlagwörter: Schlagwort 1, Schlagwort 2, Schlagwort 3, Schlagwort 4, Schlagwort 5

Abstract

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Keywords: Keyword 1, Keyword 2, Keyword 3, Keyword 4, Keyword 5

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1 Introduction

1.1 Motivation and Problem Statement

[1], [2]

[3]

[4], [5], [6]

1.2 Objectives of the Thesis

Erläutern Sie an dieser Stelle *genau* was ihre Aufgabe ist. Gegebenfalls grenzen Sie auch die Teile aus, welche nicht im Umfang der Arbeit liegen. Dies kann Ihnen gegen Ende ihrer Arbeit bei der Argumentation helfen.

1.3 Structure of the Thesis

Geben Sie in diesem Abschnitt eine grobe Vorausschau auf den Aufbau der Arbeit. Die Arbeit könnte empirisch motiviert sein und mit der Auswertung eines Experimentes beginnen oder theoretisch und somit logischerweise mit einem Theoriekapitel beginnen.

Etst

2 Theoretical Background

2.1 Cognitive Rehabilitation: Concepts, Methods, and Target Groups

Multidisziplinäre Ansätze [3]

EEG-Biomarker wie der Brain Symmetry Index (BSI) und der Laterality Coefficient (LC) erlauben eine objektive Bewertung des funktionellen Zustands des Gehirns. Die EEG-Analyse ermöglicht eine individualisierte Rehabilitationssteuerung, indem sie Veränderungen in der Hirnaktivität erfasst – insbesondere im Zusammenhang mit Motor Imagery, einer etablierten kognitiven Rehabilitationsmethode. Die Zielgruppe der Studie sind Schlaganfallpatienten, die oft sowohl motorische als auch kognitive Beeinträchtigungen aufweisen.

[7]

Table 2.1: Vergleich verschiedener Studien zur taktilen, niederfrequenten Vibration in der Demenzbehandlung

Studie (Autor, Jahr)	Vibrationsart
Clements-Cortes et al., 2016	Vibroakustisch (40 Hz, Musik, physioakustisch)
Clements-Cortes et al., 2017a	Vibroakustisch (40 Hz, tägliche Heimanwendung)
Kim und Lee, 2018	Mechanisch (WBV, Frequenzsteigerung von 20 Hz auf 40 Hz)
Lam et al., 2018	Mechanisch (WBV, 30 Hz, 2 mm Amplitude)
Heesterbeek et al., 2019a	Mechanisch (WBV, 30 Hz, 1–2 mm Amplitude)

2.2 Vibrotactile Stimulation: Principles and Therapeutic Applications

[7]

[8, 9, 10, 11, 12, 13, 14, 15, 16]

2.3 Actuation Technologies for Haptic Feedbacks

40 Hz & Gamma Frequenzen, [17] [4] [5] [6] zeigen neurobiologische Wirkung

2.4 Voice Coil Actuators for Vibrotactile Stimulation

EEG & Wearables [18] [19] [20] [21] über EEG-Tech, BCI, und mobile Erfassung

2.5 Overview of Existing Vibrotactile Stimulation Systems

3 Analysis of the Current VCA-Based System

3.1 Overview of the Current VCA System

This section provides an overview of the existing Voice Coil Actuator (VCA)-based setup. The System consists of seven main parts.

- Spring frame
- Magnet Housing
- Bobbin Coil
- Node
- Node screw
- Rubber frame
- Connection PCB

3.2 Dynamic Behavior: Frequency Measurement

3.2.1 Objective

3.2.2 Measurement Setup

3.2.3 Results & Interpretation

3.3 Limitations and Identified Challenges

Figure 3.1: Abbildungsüberschrift

4 Modify

5 Evaluation

6 Conclusion

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