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Systems Neuroscience
& Neurotechnology Unit

Working Title

Master Thesis

Systems Neuroscience & Neurotechnology Unit
Saarland University of Applied Sciences
Faculty of Engineering

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Abstract

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Zusammenfassung

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Declaration

I hereby declare that I have authored this work independently, that I have not used other than the declared sources and resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources. This work has neither been submitted to any audit institution nor been published in its current form.

Saarbrücken, August 31, 2019

Dominik Limbach, B.Sc.

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The Empatica E4 wristband is a wearable wireless device designed for comfortable, continuous, real-time data acquisition. It is a class IIa medical device in the EU, according to CE Cert. No. 1876/MDD (93/42/EEC Directive) and was designed for daily life usage [1].
A total of four different sensors are featured in the E4 wristband and will be discussed briefly in the following.

- **Photoplethysmography (PPB)** to provide blood volume pulse (BVP), from which heart rate, heart rate variability and other cardiovascular features may be derived
- **Electrodermal activity (EDA)** is used to measure sympathetic nervous system arousal and to derive features related to stress, engagement and excitement
- **3-axis accelerometer** to capture motion-based activity
- **Infrared thermopile** for reading skin temperature

As the E4 is intended to be worn on the wrist these sensors are setup in a specific way to provide for optimal use. The majority of the sensors are located on

Although the E4 was designed to be suited for domiciliary settings, indoor or outdoor, there are some caveat that need to be kept in mind before application.

- **Light condition -** 100-500lx, visual distance: 20-40cm, visual angle: +/- 90°
- **Environmental condition -** temperature: -10°C +40°C, relative humidity: 20% - 95%, air pressure: 500hPa - 1200hPa, acoustic level: not relevant

- -

All recordings were performed using only software licensed by Empatica. Using the approved streaming application and the compatible Bluetooth receiver, the recorded data was then streamed directly to an operator's personal computer via a Bluetooth connection.

3.1.2 Dataset/Subjects

3.1.3 Paradigm

3.2 Signal Analysis

During the experiment the EDA, BVP, and temperature of all subject's were measured using the Empatica E4 wristband at its default location on the non-dominant side.

3.2.1 Heart Rate Variability

3.2.2 GSR

3.2.3 Temperature

4 Results

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

5 Discussion

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6 Conclusions and Future Work

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Bibliography

[1] *E4 wristband from empatica. User's manual*. Empatica, Via Stendhal 36, 20144 Milano (MI). URL www.empatica.com.