



AALBORG UNIVERSITY  
STUDENT REPORT

# Can mindfulness alter pain sensitivity?

2. Semester master project - Spring 2018

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# 1 | Introduction

Probably everybody experienced pain once, for instance due to a cut, a burn or a fall. The pain occurring right after an injury is called acute pain and disappears near-term. However, if the pain does not disappear the pain is look upon as chronic pain [1, 2]

Approximately 1.5 billion people [3], which equals 20% of the population suffer from permanent pain[4]. The characteristic of chronic pain is a duration more than three months [2]. Due to the persistence of pain the patients get restricted physically as well as psychically. The patients' ability to participate in diverse activities decreases. Those activities are not only exercising, walking or lifting, but also social activities. Also maintaining an independent lifestyle and relationships to friends as well as to family, sexuality and sleeping are affected. Besides the impacts on life, pain has impact on the work life. 25% of the patients indicated in a survey that the persistence of pain had a lasting effect on their employment status. These patients changed their job, the job responsibilities or lost the job. As a result from this 21% of the chronic pain patients are diagnosed with depression. [5]

25 % of the chronic pain patients suffer from neck pain [4]. Those patients are restricted by negatively affected fatigue and concentration [6]. Furthermore, they suffer, like the majority of chronic pain patients, from anxiety and depressed mood, cognitive distress and the resulting physical limitations. [7]

At the moment there is no cure for chronic pain patients. The current treatment methods only provide possibilities to relieve the pain. [8, 9] Nevertheless, the majority of the patients feels pain daily and this pain is increasing throughout the day due to the daily activities. [5] Chronic pain is mainly treated by medication. However, those medicaments have side effects like abuse or organ damage. To avoid those risks, alternative methods are used. One of those methods is mindfulness meditation. Whereby meditation is used as mental training to achieve diminished judgment of emotions, cognitive control and existential insight. [10]

Previous studies show that mindfulness meditation provides the ability to enhance a broad spectrum of cognitive health outcomes. Furthermore, stress, depression and anxiety can be relieved. This improvements are due to the mental training achieved by mindfulness meditation. Especially because of emotion regulation, cognitive control, acceptance and positive mood. [10, 3]

The present study addressed the question if short-term mindfulness meditation can relieve neck pain by measuring pressure pain threshold and pressure pain tolerance. Therefore the hypothesis *"Short-term mindfulness meditation practice increases the pressure pain threshold and pressure pain tolerance"* was tested.

## 2 | Methods

### 2.1 Purpose

Approximately 375 million people suffer from chronic neck pain. The primary treatment for those patients is medication. But medication has side effects, as described in 2.3 Treatment of chronic pain. Besides medication, alternative treatment methods are used, often in combination with medication. For example physical therapy, chiropractor or psychological therapy showed a positive influence on pain relief. Most of the alternative treatment methods are related with high costs, because they require a specialist for the application. Whereas mindfulness meditation can be practiced alone. Hence a lot of studies focused on the ability of mindfulness meditation to relieve pain. As mentioned in 2.5 State of the art, there are not many studies which show the effect of mindfulness meditation on chronic neck pain. Since a lot of people suffer from chronic neck pain this study investigates the influence of mindfulness meditation on neck pain. Pain levels of chronic pain patients are not very easy to access and to quantify, therefore pressure pain was applied with an algometer on healthy subjects, to test the following hypothesis: *Short-term mindfulness meditation practice increases the pressure pain threshold and the pressure pain tolerance.*

### 2.2 Subjects

40 healthy subjects were recruited for the experiment, 20 males (M) and 20 females (F) with a mean age of  $XX \pm XX$  years. To get a homogeneous group of participants, specific inclusion and exclusion criteria were formed for this experiment.

#### Inclusion criteria:

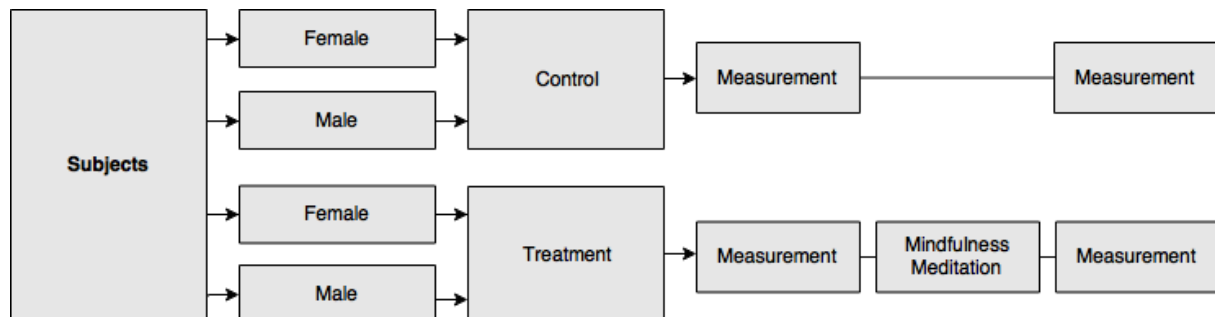
- Healthy
- Age between 20 and 30 years
- Normal BMI (F: 19-24 M: 20-25)
- Must have time to meditate for 5 days, 20 minutes per day.

#### Exclusion criteria:

- Ongoing meditation practice
- Acute or chronic pain
- Pregnancy
- Neurological, musculoskeletal or mental illness
- Signs or symptoms of any serious systemic diseases
- Psychiatric, analgesic or other medications that might influence their response to pain
- Abusive drug or alcohol use
- Lack of ability to cooperate

## 2.3 Study design

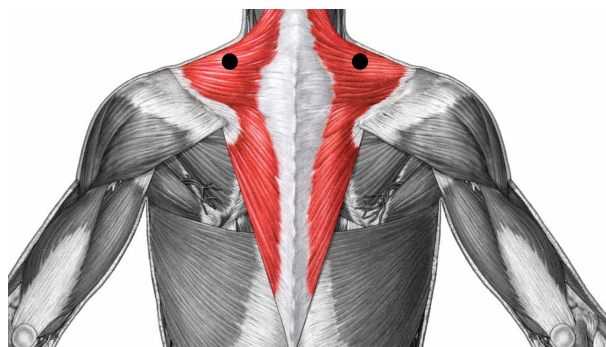
For this particular experiment a parallel study was conducted. The subjects, recruited for the experiment, were randomly assigned in two different groups. Whereby an equal amount of females and males were assigned in the control group and the treatment group. The treatment group was measured before and after the intervention, which was the practice of mindfulness meditation. To ensure that a measured effect was not due to habituation to the measurement, a control group was measured with the same time difference. The structure of the study design is illustrated on figure 2.1.



**Figure 2.1:** Parallel study design.

## 2.4 Procedure

First of all, general information about the subjects' were collected, such as gender, height and weight. Furthermore, information about the experiment was given to the subjects. Measurement points were marked at the upper trapezius on both right and left side, as illustrated on figure 2.2 while the subjects lay prone to ensure reliable and rapid location during the experimental procedure.



**Figure 2.2:** Measurement points on the upper trapezius

The Pressure Pain Threshold was measured with an algometer (Wagner Force Ten <sup>TM</sup> Digital force Gage). Firstly, the algometer was applied until the subject feels it unpleasant

and the pain threshold was notated. Secondly, the Pressure Pain Tolerance was measured with the same algometer at the same points and was applied until the subject was feeling to much discomfort to continue.

The same measurement routine was conducted four times, two times on the left upper trapezius and two times on the right upper trapezius. Each measurement was notated and an average of those four measurements was used as for the pain threshold and pain tolerance respectively. To avoid oversensation, the two sides were measured alternately with 1 minute pause in between, so the subjects had a resting time between the measurements on the same side.

To test the effect of mindfulness meditation on the pressure pain threshold and the pressure pain tolerance, the treatment group practiced 20 minutes mindfulness meditation for 5 consecutive days. To ensure same meditation conditions for all of the subjects, a guided meditation in form of an audio file was used. Furthermore, subjects were told to have the most comfortable position during the meditation. Additionally a short introduction to mindfulness meditation was provided on the first day.

The subjects of the control group continued their normal routine. After the last meditation session of the treatment group the second measurements were conducted. The same time interval between the measurements were used for the subjects of the control group. The second measurement session was conducted likewise the first measurements.

## 3 | Future plans

We want to enroll subjects during week 14-15 primarily from biomedical engineering. The experiment will take place in both basis and campus in order to get as many subjects as possible. The experiment will be running in week 16-18.

For data analysis we want to use statistical tests to validate the hypothesis. The choice of statistically test depends on the distribution and variance of the data. Since, two groups are compared a t-test or Mann-Whitney should be used depending on the distribution. If the data is normal distributed a parametric t-test will be used otherwise the non-parametric test Mann-Whitney will be used.

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