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FACULTEIT GENEESKUNDE EN LEVENSWETENSCHAPPEN  
*master in de revalidatiewetenschappen en de  
kinesitherapie*

Masterproef deel 1  
Neurophysiological effects of therapeutic touch

Promotor :  
dr. Joeri CALSIUS

Copromotor :  
Mevrouw Imke COURTOIS

Cleo Aerts , Jonas Rouvrois

*Eerste deel van het proefschrift ingediend tot het behalen van de graad van master in de  
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## **RESEARCH FRAMEWORK**

In ancient times, therapeutic touch was already used to heal people (Goats, 1994). Within the different courses we had in our training, therapeutic touch was also a recurring therapy. In spite of its recurrence, it never got as much attention as 'training physiotherapy' and 'rehabilitation'.

We both opted for the specialization musculoskeletal rehabilitation, because we strongly believe that hands-on therapy is a good way to help and heal people. As such, we both thought it would be interesting to explore the effects of touch and therefore we chose this issue within mental health.

This master thesis is a literature study and is the first part of a two-volume work. The second part will be carried out next year in 2014-2015, this will be a qualitative study with depth interviews. The first part was written by two students physiotherapy and rehabilitation under the supervision of the promoter Dr. J. Calsius and co-promoter MSc. I. Courtois.



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## **PART 1: LITERATURE STUDY**

### **1. ABSTRACT**

#### **Background**

Hands-on therapy is often used in the rehabilitation. However, not much literature can be found on the benefits of hands-on therapy. Therefore we collected the neurophysiological effects in this study.

#### **Method**

For this literature study, we used two databases: PubMed and Web of Knowledge (WOK). In PubMed the MeSH terms 'Massage' and 'Hormones' were used in combination with each other. There were no limitations selected. In Web of Knowledge we used the terms 'Massage', 'Therapeutic touch' and 'Hormones'. The articles were selected based on their title or a small abstract. Afterwards, the selected articles were read and selected on the in- or exclusion criteria. A quality assessment was then performed.

#### **Results**

In total, 9 articles passed the selection criteria and were used for data extraction. After the quality assessment was performed, there were eight articles of good quality and one of average quality left. We were able to conclude that massage therapy resulted in a decrease in heart rate and cortisol levels, but also in an increase in oxytocin levels.

#### **Discussion and conclusion**

Because massage therapy is such a wide concept, it is difficult to standardize the treatment and results may vary. It is thus important when investigating to apply standardization of treatment as much as possible. Based on the available data, we conclude that the decrease in heart rate and cortisol levels and the increase in oxytocin levels after massage therapy, may result in lower stress levels and a state of relaxation.

#### **Operationalization research question**

A systematic review was conducted

#### **Purpose of research**

The goal of this study is to identify the neurophysiological effects and the influence of biological markers of massage therapy

#### **Keywords**

Neurophysiological effects, biological markers, massage therapy



## 2. INTRODUCTION

The aim of this study is to show that hands-on therapy can have an additional value in physiotherapy and a positive effect on the patient. We will try to demonstrate this by comparing neurophysiological measurements and biomarkers. This view is in contrast with the tendency to use hands-off therapy.

Therapeutic touch is a wide concept and in this study it is considered to be a massage or touch given by the therapist to the patient or participant. The American Massage Therapy Association defines massage as “*manual soft tissue manipulation that includes holding, causing movement, and/or applying pressure to the body,*” and massage therapy as “*a profession in which the practitioner applies manual techniques, and may apply adjunctive therapies, with the intention of positively affecting the health and well-being of the client*” (AMTA, 1999a). (Moyer, Rounds and Hannum, 2004).

Massage therapy (MT) often varies in duration, frequency, location and pressure, which influences the outcome of the therapy. A popular form of massage is called Swedish massage therapy and this forms the basis of many modern forms of MT.” (Moyer, Rounds and Hannum, 2004). A Swedish massage typically exists of five types of movements: effleurage, petrissage, tapotement, vibration and friction.

The goal of this study is to identify the neurophysiological effects of MT; in this study we included Swedish massage therapy as well as massage therapy in general. Based on practical knowledge and education we expect to find a reduction in stress levels, for example measured by neuro-endocrine markers such as cortisol and oxytocin, heart rate and subjective questionnaires, such as the State-Trait Anxiety Inventory (STAI).

So as outcome we will minimally look for the release of specific hormones or biomarkers in healthy participants, especially those that are stress-related, and biologic markers such as heart rate and blood pressure. At the same time, this research will also focus on the type, method and localization of the massage.



### **3. METHODS:**

#### 3.1 RESEARCH QUESTION:

Does massage have an influence on stress-related hormones or biomarkers? We thereby hypothesize that massage will produce a decrease in the hypothalamic-pituitary-adrenal axis function, which will lead to a decrease in stress.

#### 3.2 LITERATURE SEARCH:

For our literature study we used two databases: PubMed and Web of Knowledge (WOK). In PubMed the MeSH terms 'Massage' and 'Hormones' were used in combination with each other. There were no limitations selected. This resulted in 148 articles, the first selection we made was based on the title and abstract. Afterwards 13 articles remained. The second selection was made on inclusion and exclusion criteria and resulted in 4 articles.

In Web of Knowledge we used the terms 'Massage', 'Therapeutic touch' and 'Hormones'. When entering these terms in the following combination 'Therapeutic touch' Or 'Massage' AND 'Massage' we got 731 hits. There were no limitations selected. We made a first selection based on title and abstract, which left us with 20 articles. The second selection was made on inclusion and exclusion criteria and resulted in 5 articles.

When we combined the two databases, we had two duplicates, thus resulting in 7 useful articles. Afterwards 2 articles were added because of the snowball-effect, which resulted in a total of 9 articles.

#### 3.3 SELECTION CRITERIA:

(See appendix 3)

Inclusion criteria:

- Adults (18+)
- Humans
- Massage intervention
- Neurophysiologic effects or biologic effects

Exclusion criteria:

- Smoking
- Alcohol abuse
- Medication
- Children (-18)
- Medical conditions
- Pregnancy

### 3.4 QUALITY ASSESSMENT:

All articles that passed the in- and exclusion criteria were subjected to a quality assessment. We adapted the Dutch Cochrane checklist for randomized controlled trials. The questions: 1, 2, 4, 5, 6, 7 and 8 were kept. The questions that were excluded didn't apply to our research. We then added 2 questions ourselves i.e. 'What is the effect size?' and 'Is the research question formulated?'. For the reviews and preliminary reports we created our own checklist. (See appendix 1)

### 3.5 DATA EXTRACTION:

The following data were extracted from the articles:

- Author, title, year of publication
- Study design
- Aim of the study
- Population: age, sex
- Intervention
- Comparison
- Location of the given massage therapy
- Results

The aim of this data extraction was to collect all the neurophysiological effects and biological markers after the given massage therapy. (See appendix 2)

## 4. RESULTS:

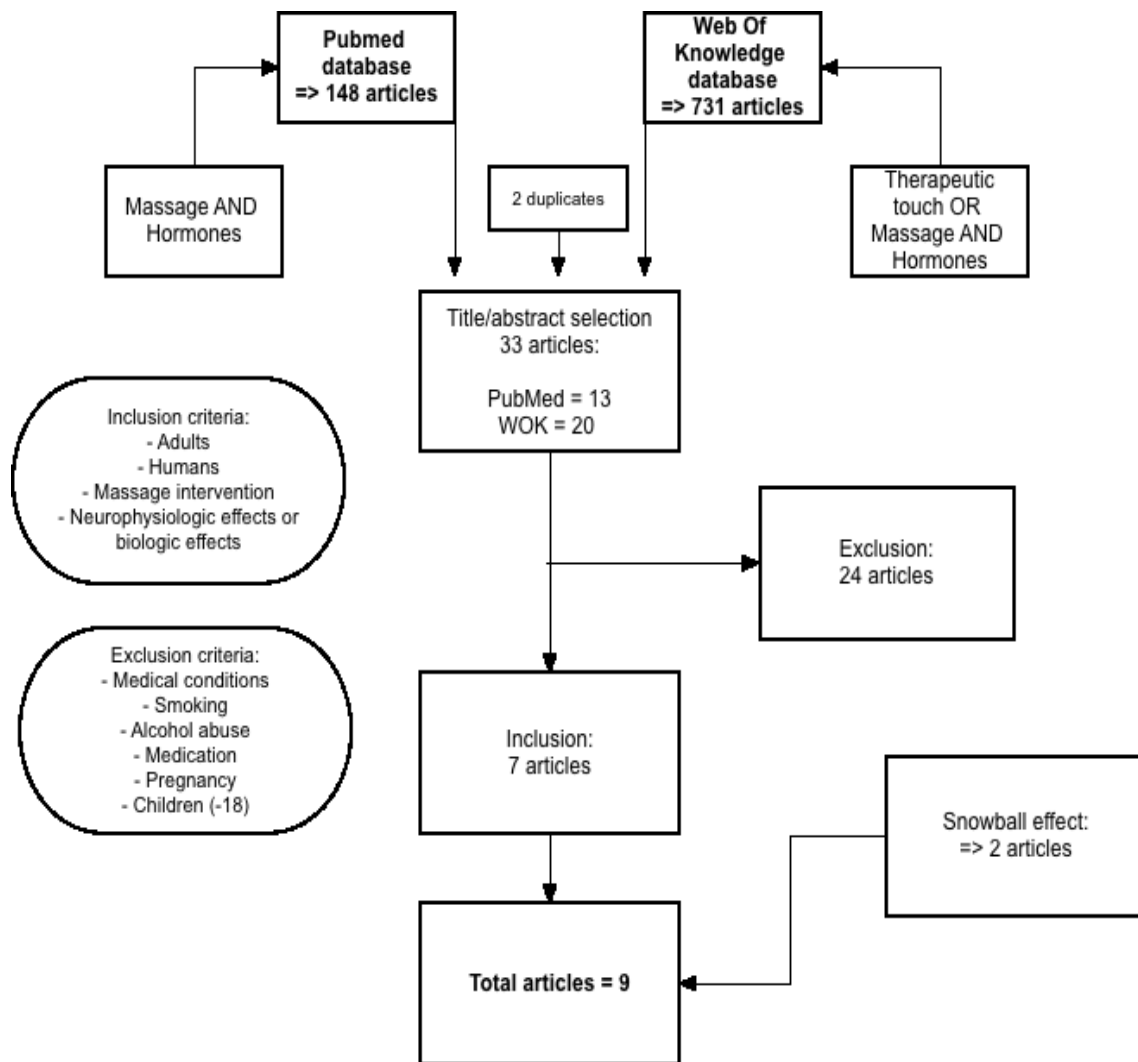
### 4.1 RESULTS STUDY SELECTION:

The PubMed search resulted in 148 hits, of which 13 articles were selected based on title and abstract. From these 13 articles, 4 passed the inclusion and exclusion criteria.

The Web Of Knowledge search on the other hand, resulted in 731 hits, of which 20 articles were selected on title and abstract. From these 20 articles, 5 passed the inclusion and exclusion criteria.

(See appendix 3)

Because 2 articles were duplicates, we ended up with a total of 7 articles. Afterwards 2 more articles were added because of the snowball-effect.



## 4.2 RESULTS QUALITY ASSESSMENT:

### 4.2.1 Checklists:

Quality assessment is an important part of our study. Because of this importance we had to use different checklists for the different study designs. Some of these checklists were adapted or created by us to match our articles perfectly. (See appendix 1)

#### Randomized controlled trials:

From the 9 articles there were 4 randomized controlled trials. The quality assessment was performed on these 4 RCT's with the adapted RCT checklist. Each article is scored on a scale ranging from 0 to 9. Three RCT's scored above average, with a result of 5/9. One RCT had an average score of 5/9. However, we still included this article because it confirms the results from other articles and because of the low amount of included articles.

#### Results checklist RCT:

Author	1. Effect size?	2. Randomization?	3. Blinding randomization?	4. Blinding patients?	5. Blinding effect rater?	6. Baseline equality?	7. Loss to follow-up?	8. Intention to treat?	9. Same treatment?	10. Research question formulated?	Score
Noto et al. (2010)	N=25	N/A	N/A	N/A	N/A	Yes	No	Yes	Yes	Yes	5/9
Morhenn et al. (2012)	N=95	Yes	No	Yes	N/A	Yes	No	Yes	Yes	Yes	7/9
Arroyo-Morales et al. (2009)	N=60	Yes	Yes	Yes	N/A	Yes	No	Yes	Yes	Yes	8/9
Lindgren et al. (2010)	N=22	Yes	Yes	N/A	N/A	Yes	No	Yes	Yes	Yes	8/9



**Preliminary studies:**

From the 9 articles there were 3 preliminary studies. The quality assessment was performed on these 3 preliminary studies with the self-created checklist. Each article is scored on a scale ranging from 0 to 7. Three preliminary studies scored 6/7, which we consider to be a good result.

Results checklist preliminary studies:

Author	1. Effect size?	2. Research question formulated?	3. Definition MT?	4. Population groups described?	5. Inclusion and exclusion criteria available?	6. Baseline equality?	7. Randomization?	8. Results described?	Score
Smith et al. (1994)	N=14	Yes	Yes	Yes	No	Yes	Yes	Yes	6/7
Rapaport et al. (2012) → Repeated message	N=53	Yes	Yes	Yes	No	Yes	Yes	Yes	6/7
Rapaport et al. (2012) → Single message	N=53	Yes	Yes	Yes	Yes	Yes	Yes	Yes	6/7

**Review:**

From the 9 articles there were 2 reviews. The quality assessment was only performed on the review of Weerapong et al. (2005) with the self-created checklist. The article is scored on a scale ranging from 0 to 7. The review had a good result, i.e. 6/7.

We could not apply our checklist on Goats' review from 1994, because it is a descriptive review.

**Results checklist review:**

Author	1. Research question formulated?	2. Search performed adequately?	3. Definition MT?	4. Inclusion and exclusion criteria available	5. Quality assessment performed?	6. Results described?	7. Results valid and applicable?	Score
Weerapong et al. (2005)	Yes	Yes	Yes	Yes	N/A	Yes	Yes	6/7
Goats G. (1994)	/	/	/	/	/	/	/	/

**Conclusion:**

From the 9 selected articles, we had 8 articles with a good score and 1 article with an average score. We still included the article with the average score because of the low amount of articles and because the results matched those from the other articles.

4.2.2 Strength and weakness analyses:

Title – Author – Year	Strengths	Weaknesses
<p>Noto et al. Back massage therapy promotes psychological relaxation and an increase in salivary chromogranin A release 2010</p>	<ul style="list-style-type: none"> <li>-ECG monitoring:</li> <li>-Back massage was standardized</li> <li>-Salivary biomarkers were used instead of a blood sample, because drawing blood can cause stress reactions with some participants</li> <li>-Objective measurements were compared with subjective questionnaires</li> </ul>	<ul style="list-style-type: none"> <li>-Study did not use a control group</li> <li>-Only female participants?</li> </ul>
<p>Morhenn et al. Massage Increases Oxytocin and Reduces Adrenocorticotropin Hormone in Humans 2012</p>	<ul style="list-style-type: none"> <li>-Randomization of participants</li> <li>-Use of control group</li> <li>-Large population (n=95)</li> <li>-Mixed gender population</li> <li>-Standardized treatment protocol</li> <li>-Baseline equality between intervention and control group</li> </ul>	<ul style="list-style-type: none"> <li>-Non even distribution of participants in intervention group (n=65) and control group (n=35)</li> <li>-Blood draws may induce stress for participants</li> </ul>
<p>Rapaport et al. A Preliminary Study of the Effects of Repeated Massage on Hypothalamic–Pituitary–Adrenal and Immune Function in Healthy Individuals: A Study of Mechanisms of Action and Dosage 2012</p>	<ul style="list-style-type: none"> <li>-Randomization of participants</li> <li>-Use of control group</li> <li>-Mixed gender population</li> <li>-Standardized treatment protocol</li> <li>-Swedish massage therapy</li> <li>-Baseline equality between intervention and control group</li> <li>-Participants got a habituation period of 30 minutes for the intravenous catheter to lower possible stress</li> </ul>	<ul style="list-style-type: none"> <li>-Blood draws may induce stress for participants</li> <li>-No saliva biomarker measurements</li> </ul>

<p>Rapaport et al. A Preliminary Study of the Effects of a Single Session of Swedish Massage on Hypothalamic–Pituitary–Adrenal and Immune Function in Normal Individuals 2012</p>	<ul style="list-style-type: none"> <li>-Randomization of participants</li> <li>-Use of control group</li> <li>-Mixed gender population</li> <li>-Standardized treatment protocol</li> <li>-Swedish massage therapy</li> <li>-Baseline equality between intervention and control group</li> <li>-Control treatment was performed by the same therapist who gave the intervention treatment</li> <li>-Participants got a habituation period of 30 minutes for the intravenous catheter to lower possible stress</li> <li>-Blood samples were collected at multiple times</li> </ul>	<ul style="list-style-type: none"> <li>-Blood draws may induce stress for participants</li> <li>-No saliva biomarker measurements</li> </ul>
<p>Lindgren et al. Physiological responses to touch massage in healthy volunteers 2010</p>	<ul style="list-style-type: none"> <li>-Randomization of participants</li> <li>-Use of control group</li> <li>-Mixed gender population</li> <li>-Standardized treatment protocol</li> <li>-Same setting for intervention and control group</li> <li>-ECG monitoring</li> <li>-Saliva biomarker measurements</li> </ul>	<ul style="list-style-type: none"> <li>-Massage therapy only applied to hands and feet</li> <li>-No Swedish massage therapy</li> <li>-Blood draws may induce stress for participants</li> <li>-No habituation period for intravenous catheter</li> <li>-Use of aromatic oils</li> </ul>
<p>Arroyo-Morales et al. Massage after exercise – responses of immunologic and endocrine markers: a randomized single-blind placebo-controlled study 2009</p>	<ul style="list-style-type: none"> <li>-Mixed gender population</li> <li>-Standardized treatment protocol</li> <li>-Salivary measurements</li> <li>-Use of placebo treatment</li> </ul>	<ul style="list-style-type: none"> <li>-Massage was evaluated after intense exercise. This exercise may have an influence on biomarkers and stress levels</li> <li>-Between-group design?</li> </ul>

<p>Smith et al. (1994)</p> <p>The effects of athletic massage on delayed onset muscle soreness, creatine kinase and neutrophil count</p>	<ul style="list-style-type: none"> <li>-Randomization</li> <li>-Use of Swedish massage</li> <li>-Use of a control group</li> <li>-Baseline equality</li> </ul>	<ul style="list-style-type: none"> <li>-Small population</li> <li>-Sex of population is not given in text</li> <li>-Blood analyses may induce stress for participants</li> <li>-Old article</li> </ul>
<p>Weerapong et al. (2005)</p> <p>The mechanisms of massage and effects on performance, muscle recovery and injury prevention</p>	<ul style="list-style-type: none"> <li>-Use of Swedish massage therapy</li> <li>-Clear articles search strategy</li> <li>-Good overview of results</li> </ul>	<ul style="list-style-type: none"> <li>-Quality assessment is not given in text</li> </ul>
<p>Goats et al. (1994)</p> <p>Massage – The scientific basis of an ancient art: Part 2. Physiological and therapeutic effects</p>	<ul style="list-style-type: none"> <li>-Good overview of results</li> <li>-Use of Swedish massage therapy</li> </ul>	<ul style="list-style-type: none"> <li>-No overview of how the results were obtained</li> <li>-No comparing studies</li> <li>-Old article</li> </ul>

#### 4.3 RESULTS DATA EXTRACTION:

##### Heart rate:

Weerapong et al. (2005) compared two studies. The first study consisted of a 6 minute back massage by using an effleurage technique. The heart rate, blood pressure and skin temperature increased after the massage. This indicates an increase in autonomic arousal level.

The second study showed no significant change in heart rate or blood pressure. The participants received a 30 minute Swedish back massage.

Noto et al. (2010) revealed that the heart rate decreased significantly after massage therapy on the back, this decrease remained for over more than 40 minutes.

Lindgren et al. (2010) provided evidence that massage therapy on hands and feet resulted in a significant heart rate decrease, this decrease was stronger in the intervention group compared to the rest group. This decrease in heart rate remained over 65 minutes.

##### Blood flow:

Weerapong et al. (2005) showed that it was difficult to determine if touch had an influence on the blood flow. There was one study in this review that showed no change in total muscle blood flow.

Goats et al. (1994) showed an effect on the arterial blood flow; gentle massage therapy dilates the superficial blood vessels and therefore increases the blood flow. Forceful massage therapy also increases the blood flow, but has longer lasting effects.

##### Neuroendocrine levels:

The neurophysiological effects were measured by the amount of hormones detected before, during and after the given therapy, with specific attention to oxytocin and cortisol.

“Cortisol is notably a culprit variable deriving from stressful conditions and ultimately negatively affecting immune function. Cortisol is an end-product of the sympathetic system, the hypothalamic-pituitary-adrenal-cortical axis.” (Field, Hernandez-Reif, Diego, Schanberg and Kuhn, 2005). “Oxytocin is a hormone released from the neurohypophysis and has an anxiolytic function. It will increase when one is feeling trusted and when one feels empathy.” (Morhenn, Beavin and Zak, 2012).

Two methods can be used to collect these endocrines measurements. The first method consists of drawing blood from the participant. The disadvantage of this method however, is that it can evoke a stress reaction and therefore influence the outcome. Another option is to collect saliva from the patients with a cotton swab. This is a non-invasive method and therefore less stress evoking for the patient.

In several studies we found an increase in oxytocin after massage therapy. Morhenn et al. (2012) found that moderate pressure back massage resulted in an oxytocin increase of 17% compared to

basal levels. While the rest group in this study showed a decrease of 9%. Rapaport et al. (2012) found an increase in oxytocin after a Swedish massage therapy was given twice a week, this increase could not be found if this Swedish massage therapy was only given once or just once a week.

In several studies we noted a decrease in cortisol levels after massage therapy. Rapaport et al. (2012) noted a decrease in salivary cortisol, but no effects for plasma cortisol were detected after Swedish massage therapy. Lindgren et al. (2010) provided evidence that massage therapy on hands and feet showed a significant decrease in salivary cortisol levels. Smith et al (1994) showed a decrease in cortisol level in the two groups. This decrease was more prominent in the massage group. Weerapong et al. (2005) provided evidence that massage therapy may cause a decrease in cortisol levels. Only in the massage group the cortisol levels decreased.

#### Frequency:

The frequency of massage therapy may have an influence on the outcome. These effects were discussed in the study of Rapaport et al. (2012). The endocrine measures with once-a-week massages showed minimal effects on the neuroendocrine function. However, an increase in total lymphocyte counts could be measured.

The group who received a massage twice a week showed an improvement with regard to the stress related hormones. Here we could see an increase in oxytocin and a decrease in salivary cortisol and adrenal corticotropin hormone (ACTH). In contrast with the once-a-week massage group there was a decrease in circulating lymphocyte markers (Rapaport, Schettler and Bresee, 2012).

#### Immunologic levels:

Rapaport et al. (2012) provided evidence that once-a-week massage therapy had a greater influence on total lymphocytes than a twice-a-week massage. When Swedish massage therapy was applied once a week, there was an increase in total lymphocytes. When this Swedish massage therapy was applied twice a week, a small decrease in total lymphocytes could be noticed. Noto et al. (2010) noted an increase in salivary chromogranin A after massage therapy on the back. This hormone has an antibacterial and antifungal function and therefore may contribute to the immunologically beneficial effects of massage therapy.

#### Subjective questionnaire:

State-Trait Anxiety Inventory (STAI) is a subjective questionnaire used to evaluate psychological stress or mental relaxation. Because the questionnaire is subjective, results have to be compared with objective measurements. Noto et al. (2010) reported a decreased STAI score after a back massage was given. A lower STAI score correlates with lower anxiety.

Pain:

Goats et al. (1994) provided a physiological explanation for massage therapy to relieve the patients' pain. Massage therapy produces analgesia for a short period, by activating the pain-gate mechanism. "Cutaneous mechanoreceptors are stimulated by touch and transmit information within large nerve fibers to the spinal cord. These impulses block the passage of painful stimuli entering the same spinal segment along small, slowly conducting neurons" (Goats, 1994). Massage therapy is therefore a useful therapy to ease the patients' pain.



## **5. DISCUSSION:**

### 5.1 REFLECTION ON QUALITY OF STUDIES

Because we couldn't find an appropriate checklist for RCT's, we created a new one (see appendix 1). The advantage to this approach is that the questions are ideal for the chosen articles, the disadvantage however is that there are no cut-off scores available. We also created a complete new checklist for the reviews and preliminary reports (see appendix 1). The same disadvantage applies now, as there are no cut-off scores available. Furthermore, it was also not possible to use our checklist on Goats' review (1994) because it is a descriptive review.

None of the studies could answer if the effect rater was blinded. The question 'Was the practitioner blinded' was excluded because it was not possible to blind the practitioner. To determine whether we were dealing with a good or decent article, the article needed to score at least 5/9 when using our own created checklist for the review/preliminary reports and adapted checklists for RCT's. One article scored 5/9, which we consider to be an average score and 6 articles scored 6/9 or higher, which we consider to be a good score. Therefore we can conclude that we have good quality articles.

### 5.2 REFLECTION ABOUT FINDINGS RELATING TO THE RESEARCH QUESTION

The goal of this study is to evaluate the neurophysiological effects of massage therapy. Some biologic markers were also evaluated.

Furthermore, we also took a close look at the neuroendocrine levels, immunologic levels and heart rate. The frequency of massage therapy also influences the effects and was therefore researched.

### 5.3 REFLECTION ON STRENGTHS AND WEAKNESSES OF THE LITERATURE STUDY

Our research is not flawless. One weakness is that we only included healthy participants. We didn't include any medical abnormalities because they could influence the outcome and therefore give a false perception. Another weakness is that we only included adults, we didn't include children because they have other stressors than adults and therefore could influence the outcome. In most of the articles, the population is also mixed. This may have an influence on the outcome too as men's hormone secretion may differ from women's. The menstrual cycle can interact with their hormone secretion.

The strength of our study is that we used a control group. Out of the seven RCT's and preliminary reports there was only one article that didn't use a control group. Because of this control treatment we can compare the effects with the intervention treatment.

### 5.4 RECOMMENDATIONS FOR FUTURE RESEARCH

The literature study has revealed contradicting results. A remark that can be made is that the current studies didn't always pay attention to factors that may influence the outcome such as: type of MT,

location of MT and duration of MT. Because of this, contradicting results can occur and wrong conclusions can be drawn.

Future studies should focus more on the type of massage that is given. Variation in pressure or technique may influence the outcome. Therefore more attention should be paid to the type or the technique that is given. A change in the MT's location can also result in a change in outcome. MT given on the back can evoke more relaxation than MT given on hands and feet. The duration is also an important factor. When a massage is given at the same location, but when it differs in duration, it can result in a different outcome.

#### 5.5 RECOMMENDATIONS FOR THE READER

We want to show that it is unjust to underestimate the importance of hands-on therapy and that massage therapy could have a significant and positive effect on the patient. With this study we hope to influence physiotherapists to make more use of hands-on therapy.

## **6. CONCLUSION:**

The participants, who underwent massage therapy, presented multiple factors (heart rate, biological markers, subjective questionnaires) that demonstrated that massage therapy results in lower stress levels and relaxation.



## 7. REFERENCE LIST:

### 7.1 INCLUSION ARTICLES:

1. Arroyo-Morales; Olea N; Ruíz C; del Castillo Jde D; Martínez M; Lorenzo C; Díaz-Rodríguez L (2009) Massage after exercise--responses of immunologic and endocrine markers: a randomized single-blind placebo-controlled study.
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3. Lindgren L; Rundgren S; Winso; Lehtipalo S; Wiklund U; Karlsson M; Stenlund H; Jacobsson; Brulin C (2008) Physiological responses to touch massage in healthy volunteers.
4. Morhenn V; Beavin LE; Zak PJ (2012) Massage Increases Oxytocin and Reduces Adrenocorticotropin Hormone in Humans.
5. Noto Y1; Kudo M; Hirota K (2010) Back massage therapy promotes psychological relaxation and an increase in salivary chromogranin A release.
6. Rapaport MH; Schettler P; Bresee C (2012) A Preliminary Study of the Effects of Repeated Massage on Hypothalamic-Pituitary-Adrenal and Immune Function in Healthy Individuals: A Study of Mechanisms of Action and Dosage
7. Rapaport MH; Schettler P; Bresee C (2012) A Preliminary Study of the Effects of a Single Session of Swedish Massage on Hypothalamic-Pituitary-Adrenal and Immune Function in Normal Individuals
8. Smith L; Keating M; Holbert D; Spratt D; McCammon M; Smith S; Israel R (1994) The effects of athletic massage on delayed onset muscle soreness, creatine kinase and neutrophil count: A preliminary report.
9. Weerapong P; Hume P.A.; Kolt G.S (2005) The mechanisms of massage and effects on performance, muscle recovery and injury prevention.

## 7.2 EXCLUSION ARTICLES:

1. Arkko PJ; Pakorinen AJ (1983) Effects of whole body massage on serum protein, electrolyte and hormone concentrations, enzyme activities and hematological parameters.
2. Billhult A; Lindholm C; Gunnarsson Rb; Stener-Victorin E (2008) The effect of massage on cellular immunity, endocrine and psychological factors in women with breast cancer – a randomized controlled clinical trial.
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6. Field T; Peck M; Krugman S; Tuckel T (1998) Burn injuries benefit from massage therapy.
7. Field T; Scafidi F; Grizzle N (1996) Massage and relaxation therapies' effects on depressed adolescent mothers.
8. Garner B; Philips LJ; Schmidt HM; Markulev C; O'Conner J; Wood SJ; Berger GE; Burnett P; McGorry PD (2008) Pilot study evaluating the effect of massage therapy on stress, anxiety and aggression in a young adult psychiatric inpatient unit.
9. Hernandez RM; Field T; Krasnegor J; Theakston H (2001) Lower back pain is reduced and range of motion increased after massage therapy.
10. Hernandez RM; Ironson G; Field T; Hurley J; Katz G; Diego M; Weiss S; Fletcher MA; Schanberg S; Kuhn C (2004) Breast cancer patients have improved immune and neuroendocrine functions following massage therapy.
11. Ironson G; Field T; Scafidi F (1996) Massage therapy is associated with enhancement of the immune system's cytotoxic capacity.
12. Kaada B; Torstein (1989) Increase of plasma beta-endorphins in connective tissue massage.

13. Karagozglu S; Kahve E (2013) Effects of back massage on chemotherapy related fatigue and anxiety: Supportive care and therapeutic touch in nursing.
14. Khilnani S; Field T (2003) Massage therapy improves mood and behavior of students with ADHD.
15. Listing M; Krohn M; Liezmann C; Kim I; Reissbauer A; Peters A; Klapp F. Burghard; Rauchfuss M (2010) The efficacy of classical massage on stress perception and cortisol following primary treatment of breast cancer.
16. Mackay N; Hansen S (2004) Autonomic nervous system changes during Reiki treatment: a preliminary study.
17. Moyer Ca; Seefeldt L; Mann ES; Jackley LM (2011) Does massage therapy reduce cortisol? A comprehensive quantitative review.
18. Sefton J; Yarar C; Carpenter D; Berry J (2011) Physiological and clinical changes after therapeutic massage of the neck and shoulders.
19. Tachibana K; Ueki N; Uchida T; Koga H (2012) Randomized comparison of the therapeutic effect of acupuncture, massage, and tachibana-style-method on stiff shoulders by measuring muscle firmness, VAS, pulse and blood pressure.
20. Toth M et al (2013) Massage therapy for patients with metastatic cancer: a pilot randomized controlled trial.
21. Wikström S; Grunnorsson T; Nordin C (2001) Tactile stimulus and neurohormonal response: Pilot study.
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23. Woods DL; Beck C; Sinha K (2009) The effect of therapeutic touch on behavioral symptoms and cortisol in persons with dementia.
24. Woods D; Dimond M (2002) The effect of therapeutic touch on agitated behavior and cortisol in persons with Alzheimer's disease.





## **PART 2: RESEARCH PROTOCOL**

### **1. INTRODUCTION**

During our study 'Rehabilitation Sciences and Physiotherapy' we studied different types of therapeutic touch, such as massage therapy. However, more attention was paid to the rehabilitation and exercise aspect. Therapeutic touch and massage therapy have become a secondary aspect in physiotherapy.

Our literature study demonstrates that massage therapy adds value to the rehabilitation and physical well-being of patients. We can state that massage therapy results in a decrease in heart rate (Noto et al., 2010; Lindgren et al., 2010) and cortisol (Rapaport et al., 2012; Lindgren et al., 2010; Smith et al., 1994; Weerapong et al., 2005). We noticed an increase in oxytocin in multiple articles (Morhenn et al., 2012; Rapaport et al., 2012).

After we found out possible advantages of massage therapy in our literature study, we wanted to know the opinion from several physiotherapists. With specific attention to the fact why these physiotherapists would or wouldn't use hands-on therapy. We think it is important to refresh the idea that hands-on therapy does have an additional value and therefore we believe it is important to explore the motives for (not) making use of hands-on therapy.

The second part of our study contains a qualitative questionnaire. This consists of interviews that we will have with a physiotherapist. The physiotherapist will be chosen by using criteria that are selected in advance.



## **2. GOAL RESEARCH**

### 2.1 RESEARCH QUESTION:

"Why do therapists decide to use 'therapeutic touch' in their treatment?"



### 3. METHODS

#### 3.1 STUDY DESIGN:

During this study we will use a qualitative research design on an 'Interpretative Phenomenological Analysis' (IPA). The main goal of IPA is to check how people experience certain phenomena and which physiological interpretation these experiences may have.

Data will be collected through interviews with selected physiotherapists. They will be asked to complete an informed consent in advance, which guarantees the anonymity of the physiotherapists.

#### 3.2 PARTICIPANTS:

Ten participants will be selected on inclusion criteria.

##### Inclusion criteria:

- Physiotherapist:
  - o Physiotherapists who apply hands-on therapy (n=5)
  - o Physiotherapists who apply hands-off therapy (n=5)
- Working in Flanders, Belgium
- More inclusion criteria will be determined later

#### 3.3 INTERVENTION:

In this study we will be interviewing physiotherapists who are selected based on certain criteria, which will be drafted in advance. The interview will take 45-60 minutes and will be taped by two thesis students with a recorder. Afterwards everything will be written down and included into part two of the thesis.

#### 3.4 OUTCOMES:

The primary aim of this study is to demonstrate the importance of 'touch' in manual therapy. We will try to answer this research question by using the conducted interviews with physiotherapists. Other information concerning therapeutic touch will also be included in part two of our thesis.

#### 3.5 DATA ANALYSES:

Thanks to IPA only useful information will be selected, which will then be used in the analyses. This will happen by the scheme of D. Howitt (2013).

##### Step 1:

Collecting the data.

##### Step 2:

All important information will be collected and written down.

Step 3:

Information obtained from interviews has to be compared and combined with the gathered information from the literature study. Constant comparison is required during this step.

Step 4:

The different important topics should be summarized.

Step 5:

Different topics can be put together in order to find possible connections.

Step 6:

A schematic presentation from all topics that came out of the analyses will be created.

Step 7:

Different cases and research of similar subjects will be analysed.

Step 8:

Each important topic that we came across during analysis will be described. Each topic will be illustrated with the exact quotes from the interview transcripts. This is a common approach in qualitative research.

3.6 MEDICAL ETHICS:

The application form for the medical ethics committee will be handed in.

#### 4. TIME PLANNING

This is a possible planning for the second part of our thesis:

	September 2013	October 2013	November 2013	December 2013	January 2014	February 2014	March 2014	April 2014	May 2014
Participants search	★	★							
Conduct interviews		★	★	★					
Data analysis					★	★			
Data processing							★	★	★





## 5. REFERENCE LIST

1. Howitt, D. (2013). Introduction to Qualitative Methods in Psychology. London: Pearson.
2. Lindgren L; Rundgren S; Winso; Lehtipalo S; Wiklund U; Karlsson M; Stenlund H; Jacobsson; Brulin C (2008) Physiological responses to touch massage in healthy volunteers.
3. Morhenn V; Beavin LE; Zak PJ (2012) Massage Increases Oxytocin and Reduces Adrenocorticotropin Hormone in Humans.
4. Rapaport MH; Schettler P; Bresee C (2012) A Preliminary Study of the Effects of Repeated Massage on Hypothalamic-Pituitary-Adrenal and Immune Function in Healthy Individuals: A Study of Mechanisms of Action and Dosage
5. Rapaport MH; Schettler P; Bresee C (2012) A Preliminary Study of the Effects of a Single Session of Swedish Massage on Hypothalamic-Pituitary-Adrenal and Immune Function in Normal Individuals
6. Smith L; Keating M; Holbert D; Spratt D; McCammon M; Smith S; Israel R (1994) The effects of athletic massage on delayed onset muscle soreness, creatine kinase and neutrophil count: A preliminary report.
7. Weerapong P; Hume P.A.; Kolt G.S (2005) The mechanisms of massage and effects on performance, muscle recovery and injury prevention.



## **APPENDIX:**

### APPENDIX 1:

Overview quality assessment checklists:

#### **RCT checklist: (4 articles)**

1. What is the effect size?
2. Did the groups get randomized?
3. Was the randomization blinded?
4. Were the patients blinded for the intervention?
5. Were the effect raters blinded?
6. Were the groups comparable at the start of the trial?
7. Was there any loss to follow up?
8. Did all subjects receive the treatment they were intended to get?
9. Did all subjects have the same treatment, except for their intervention?
10. Is there a concrete and well-formulated research question?

#### **Preliminary study checklist: (3 articles)**

1. What is the effect size?
2. Is there in the article a clear research question formulated?
3. Does the article contain a clear definition of massage therapy?
4. Are the population groups described clearly in the article?
5. Are the in-and exclusion criteria clear?
6. Were the groups comparable at the baseline?
7. Did the groups get randomized?
8. Are the results described clearly in the article?

#### **Review checklist: (2 articles)**

1. Is there a concrete and well-formulated research question?
2. Is the search performed adequately?
3. Is there a clear definition of massage therapy in the article?
4. Are the in- and exclusion criteria clear?
5. Was the quality assessment performed well?
6. Are the results described clearly in the article?
7. Are the results valid and applicable?



APPENDIX 2:  
Data extraction

Author Title Year	Study Design	Goal	Population Sex Age	Intervention	Comparison	Massage location	Results
Morhenn et al. Massage Increases Oxytocin and Reduces Adrenocorticotropin Hormone in Humans 2012	RCT	1.To study the effects of massage on oxytocin	95 Healthy participants Mixed gender Mean age: 21,36	-Participants get 15 minutes of moderate pressure Swedish massage on their upper backs  -3 massage therapists massaged all participants in the intervention group  -Blood was drawn to measure biomarkers	-Control group had to rest by sitting in chairs for 15 minutes  -This happened in the same room where the massages happened, but on different days	Upper back	-Increase in oxytocin of 17% -Women did not release more oxytocin than men
Rapaport et al. A Preliminary Study of the Effects of Repeated Massage on	Preliminary report	1.Main goal is to study the effects of frequency in massage therapy on	45 Healthy participants Mixed gender Mean age: ?	-Once-a-week Swedish massage therapy	-Once-a-week light touch  -Twice-a-week	?	-There are cumulative effects of massage therapy and light touch, and these differ according to the frequency of

<p>Hypothalamic– Pituitary–Adrenal and Immune Function in Healthy Individuals: A Study of Mechanisms of Action and Dosage 2012</p>		<p>biologic actions 2.Effects of massage on oxytocin 3.Effects of massage on cortisol (plasma and salivary) 4.Effects of massage on total lymphocytes</p>		<p>-Twice-a-week Swedish massage therapy  -Blood draw and saliva swab to measure biomarkers</p>	<p>light touch</p>		<p>intervention  <u>Once-a-week massage:</u> -A mean increase in lymphocyte cell types -A mean decrease in cytokines -Small positive effect-size differences in oxytocin, AVP and salivary cortisol -Small negative effect-size differences in ACTH and plasma cortisol  <u>Twice-a-week massage:</u> -Moderate treatment effect sizes for total lymphocytes, with a small decrease -Moderate effect size differences for cytokines -OT remained stable -Salivary cortisol decreased -Plasma cortisol remained stable</p>
<p>Rapaport et al. A Preliminary Study of the Effects of a Single</p>	<p>Preliminary report</p>	<p>1.Main goal is to study the effect of a single session of</p>	<p>53 Healthy participants Mixed gender</p>	<p>-Participants received massage during 80 minutes</p>	<p>Participants in control group had to rest in the</p>	<p>From shoulders to feet</p>	<p>-No increase in OT -Small decrease in salivary cortisol</p>

Session of Swedish Massage on Hypothalamic–Pituitary–Adrenal and Immune Function in Normal Individuals 2012		Swedish massage on oxytocin, CORT and lymphocytes	18-45 years old	-6 trained therapists and massage educated gave MT	same setting		-Small decrease in serum cortisol
Lindgren et al. Physiological responses to touch massage in healthy volunteers 2010	RCT	1.To study the effects of massage on stress responses 2.Effects of massage on saliva cortisol 3.Effects of massage on heart rate	22 Healthy participants Mixed gender Mean age: 28,2	-Participants got massage therapy  -Massage therapy consisted of stroking movements on ventral and dorsal side of hands and feet during 80min.  -MT was performed by specially trained staff members	Participants rested in the same setting	On hands and feet	-HR decrease that maintained over 65 minutes -Reduction in saliva cortisol in both groups. There was a greater reduction in massage group, but it wasn't a significant reduction
Arroyo-Morales et al. Massage after exercise – responses of immunologic and	RCT	1.Main goal is to study the effects of massage therapy on endocrine and	60 Healthy participants Mixed gender University students	Participants had to do an exercise program after which they got	-Sham electro therapy (placebo)	Whole body massage	-No effects on salivary cortisol

endocrine markers: a randomized single-blind placebo-controlled study 2009		immune functions after intense exercise		massage therapy during 40 minutes  -All massages were given by the same therapist			
Noto et al. Back massage therapy promotes psychological relaxation and an increase in salivary chromogranin A release 2010	RCT	1.To study the effects of back massage therapy on psychological relaxation  2.Effects of back massage on salivary chromogranin A release	25 Healthy participants Female Mean age: 21,8	Standardized massage therapy of the back during 10 minutes	/	Back	-STAI score decreased after massage therapy -Heart rate decreased after the massage therapy -Salivary amylase and cortisol levels did not change after massage therapy -Chromogranin A increased after the massage therapy. Indicating massage therapy has an immunologic function
Weerapong et al. The mechanisms of massage and effects on performance, muscle recovery and injury prevention. 2005	Review	1. To discuss the effects of massage on performance, recovery and muscle injury prevention	Healthy participants Mixed gender	Massage therapy	/	Whole body massage	-Increase in skin and muscle temperature -No change in total muscle blood flow -Cortisol decreases in the massage group  <u>Back effleurage:</u> -Heart rate, blood pressure



							and skin temperature increase after MT. This indicates an increase in autonomic arousal level.  <u>Swedish back massage:</u> -No significant changes in BP, pulse and temperature.
L. Smith et al. The effects of athletic massage on delayed onset muscle soreness, creatine kinase and neutrophil count. 1994	Preliminary report	1. To study the effects of a sport massage, administered two hours after eccentric exercises, on DOMS and creatine kinase (CK)	14 Healthy active untrained males. Intervention group: 20.1 years. Control group: 18.8: years.	Massage: after 2 hours of following the exercise, a 30 minute sports massage was given. Lotion was used.	Placebo: exercise+ the application of lotion after 2 hours and rest.	Arms, elbow, wrist	1) DOMS within the massage group reported reduced levels 2) CK with the massage group displayed reduced levels 3) The neutrophils stayed longer in the massage group. 4) Cortisol showed a reduction in the massage group.
Geoffrey C. Goats Massage, the scientific basis of an ancient art: part 2. Physiological and therapeutic effects	Review	/	/	Massage therapy	/	Whole body	-Gentle massage therapy increased blood flow -Forceful massage therapy also increases blood flow, but has longer lasting effects than gentle MT -MT relieves patients' pain



APPENDIX 3:

List of excluded articles and reason for exclusion:

Author + Year + Title	Reason for exclusion
846 articles	Title and abstract did not match our research question
Arkko PJ; Pakorinen AJ (1983) Effects of whole body massage on serum protein, electrolyte and hormone concentrations, enzyme activities and hematological parameters.	Text was not applicable to our topic
Billhult A; Lindholm C; Gunnarsson Rb; Stener-Victorin E (2008) The effect of massage on cellular immunity, endocrine and psychological factors in women with breast cancer – a randomized controlled clinical trial.	Exclusion based on pathology
Bost N; Wallis M (2006) The effectiveness of a 15 minute weekly massage in reducing physical and psychological stress in nurses.	Exclusion based on pathology
Debackere M; Peeters G (1960) Release of hormone induced by massage of the seminal vesicles and ampullae in the ram.	Text was not applicable to our topic
Field T; Hernandez-Reif M; Diego M; Schanberg S; Kuhn C. (2005) Cortisol decreases and serotonin and dopamine increase following massage therapy.	Exclusion based on pathology
Field T; Peck M; Krugman S; Tuckel T (1998) Burn injuries benefit from massage therapy.	Exclusion based on pathology
Field T; Scafidi F; Grizzle N (1996) Massage and relaxation therapies' effects on depressed adolescent mothers.	Exclusion based on pathology
Garner B; Philips LJ; Schmidt HM; Markulev C; O'Conner J; Wood SJ; Berger GE; Burnett P; McGorry PD (2008) Pilot study evaluating the effect of massage therapy on stress, anxiety and aggression in a young adult psychiatric inpatient unit.	Exclusion based on pathology
Hernandez RM; Field T; Krasnegor J; Theakston H (2001) Lower back pain is reduced and range of motion increased after massage therapy.	Exclusion based on pathology

Hernandez RM; Ironson G; Field T; Hurley J; Katz G; Diego M; Weiss S; Fletcher MA; Schanberg S; Kuhn C (2004) Breast cancer patients have improved immune and neuroendocrine functions following massage therapy.	Exclusion based on pathology
Ironson G; Field T; Scafidi F (1996) Massage therapy is associated with enhancement of the immune system's cytotoxic capacity.	Exclusion based on pathology
Kaada B; Torstein (1989) Increase of plasma beta-endorphins in connective tissue massage.	Text was not applicable to our topic
Karagozgu S; Kahve E (2013) Effects of back massage on chemotherapy related fatigue and anxiety: Supportive care and therapeutic touch in nursing.	Exclusion based on pathology
Khilnani S; Field T (2003) Massage therapy improves mood and behavior of students with ADHD.	Exclusion based on children
Listing M; Krohn M; Liezmann C; Kim I; Reissbauer A; Peters A; Klapp F. Burghard; Rauchfuss M (2010) The efficacy of classical massage on stress perception and cortisol following primary treatment of breast cancer.	Exclusion based on pathology
Mackay N; Hansen S (2004) Autonomic nervous system changes during Reiki treatment: a preliminary study.	Text was not applicable to our topic
Moyer Ca; Seefeldt L; Mann ES; Jackley LM (2011) Does massage therapy reduce cortisol? A comprehensive quantitative review.	Exclusion based on children Exclusion based on pathology
Sefton J; Yazar C; Carpenter D; Berry J (2011) Physiological and clinical changes after therapeutic massage of the neck and shoulders.	Text was not applicable to our topic
Tachibana K; Ueki N; Uchida T; Koga H (2012) Randomized comparison of the therapeutic effect of acupuncture, massage, and tachibana-style-method on stiff shoulders by measuring muscle firmness, VAS, pulse and blood pressure.	Text was not applicable to our topic
Toth M et al (2013) Massage therapy for patients	Exclusion based on pathology

with metastatic cancer: a pilot randomized controlled trial.	
Wikström S; Grunnorsson T; Nordin C (2001) Tactile stimulus and neurohormonal response: Pilot study.	Full text not available
Wilkinson DS; Knox P; Chatman J; Johnson TL; Barbour N; Myles Y; Reel A (2002) The clinical effectiveness of healing touch	Text was not applicable to our topic
Woods DL; Beck C; Sinha K (2009) The effect of therapeutic touch on behavioral symptoms and cortisol in persons with dementia.	Exclusion based on pathology
Woods D; Dimond M (2002) The effect of therapeutic touch on agitated behavior and cortisol in persons with Alzheimer's disease.	Exclusion based on pathology



APPENDIX 4:



FACULTEIT  
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PROGRESSION FORM MASTER THESIS PART 1

DATE	CONSULTATION MOMENT	AUTOGRAPHS
18/10/2013	-Start-up master thesis and analysis of the research topic -Analysis regarding the procedure needed to perform the literature study.	Promoter: Calsius Joeri/Courtois Imke Student: Aerts Cleo Student: Rouvrois Jonas
16/12/2013	-Analysis of the current working method and key words used in the literature study -Quality assessment	Promoter: Calsius Joeri/Courtois Imke Student: Aerts Cleo Student: Rouvrois Jonas
31/1/2014	-Analysis and update of the currently performed literature study	Promoter: Courtois Imke Student: Aerts Cleo Student: Rouvrois Jonas
04/04/2014	-Finalizing the literature study and discussion regarding possible pitfalls -How to start writing the master thesis and the finalization.	Promoter: Calsius Joeri/Courtois Imke Student: Aerts Cleo Student: Rouvrois Jonas

## Auteursrechtelijke overeenkomst

Ik/wij verlenen het wereldwijde auteursrecht voor de ingediende eindverhandeling:

**Neurofysiological effects of therapeutic touch**

Richting: **master in de revalidatiewetenschappen en de kinesitherapie-revalidatiewetenschappen en kinesitherapie bij musculoskeletale aandoeningen**

Jaar: **2014**

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**Rouvrois, Jonas**

Datum: **24/08/2014**