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THE ROLE OF TOUCH IN  
MANUAL THERAPY – AN INTEGRATIVE LITERATURE REVIEW

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# THE ROLE OF TOUCH IN MANUAL THERAPY – AN INTEGRATIVE LITERATURE REVIEW

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The objective of this study was to identify the role of touch in the context of manual therapy as an intervention. For this purpose, the importance of the skin was addressed as to provide a wider understanding of the topic. In addition, investigations of the effects manual therapy on pain were questioned.

The method used to write this thesis was an integrated literature review with resemblance to a systematic literature review. Relevant articles published from 2006 to 2016 established a preliminary inclusion criterion. Moreover, the search was conducted using three databases: PubMed, Science Direct and a collection of references mentioned in the body of the text. Mesh Terms included the combination of “manual therapy” AND “skin”, “manual therapy” AND “therapeutic touch”, “chronic pain” AND “therapeutic touch”, “neuropathic pain AND the skin” In addition to manual assessment of the included references by the author of this thesis.

It can be asserted that the role of touch in manual therapy stems from an individual, psychophysiological response to the interaction between the therapist and the client. Furthermore, activation of the c-fiber system using pleasurable touch in manual therapy provides an opportunity for pain management, somatosensory activation and building rapport in the physiotherapeutic settings.

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## 1 INTRODUCTION

The topic of touch and the skin has been the interest of researchers and manual therapists alike, with the shared goal of better understanding the relationship between treatments used and their perceived results. Surely, it is of practical essence when working as a clinician, to participate in a variety of manual therapy courses and seminars in order to acquire new professional tools and be able to address the vast spectrum of client needs.

Therefore, various techniques of manual therapy are under ongoing research in order to validate their attributed benefits; however, in certain cases, even when evidence is lacking and results challenge the existing assumptions, course participation grows and sound clinical reasoning is cast aside, thereby raising questions regarding the current paradigm. (Parreira Pdo et al. 2014, 90).

For this purpose, the thesis will question the contemporary consensus of manual therapy by exploring possible affects and effects of touch, an element that is integral to all forms of manual interventions, as well as the skin, an organ in charge of the perception, interpretation, propagation and response regulation of touch. In addition, the limitations of manual therapy as an intervention must also be addressed as part of this investigation. (Lumpkin et al. 2010, 237-238).

Interestingly, research regarding the skin may provide new information regarding pain mechanisms and its possible treatments; for example, a nerve-based approach targeting afferents or critical evaluation of prevalent interventions for neuropathic clients. (Lloyd et al. 2015, 321). Coincidentally, the international federation of orthopedic manipulative physical therapy convention has taken place in July of this publication year, starring prominent physiotherapy figures such as Brian Mulligan, Lorimer Moseley and others (Jesse 2016). Manual therapists attending the convention were perplexed with the contradictory evidence and mechanisms behind some of the interventions; for instance, Brian Mulligan spoke of biomechanically influencing structures through manual therapy, whereas Lorimer had proposed the biopsychosocial model; a wider perspective of pain treatment via manual therapy and noted its limitations.

It is beyond the scope of this thesis to systematically review every technique of manual therapy and report the results; nevertheless, by questioning the current neurophysiological understanding underlying common manual therapies' analgesic effect, we should be able to understand the attributed benefits it can claim.

Regardless of which type of manual therapy intervention is chosen, an interaction with the skin of the client via touch is a form of communication with their nervous system. Hence, an acknowledgement of the peripheral mechanoreceptors found in the skin and activated through touch is essential for the physiotherapist.

The following thesis is also an attempt to provide relevant information for manual therapists considering an intervention in clinical settings. For further information regarding the complexity of the skin, one may pursue further education.

## 2 SKIN

### 2.1 The structure of the skin

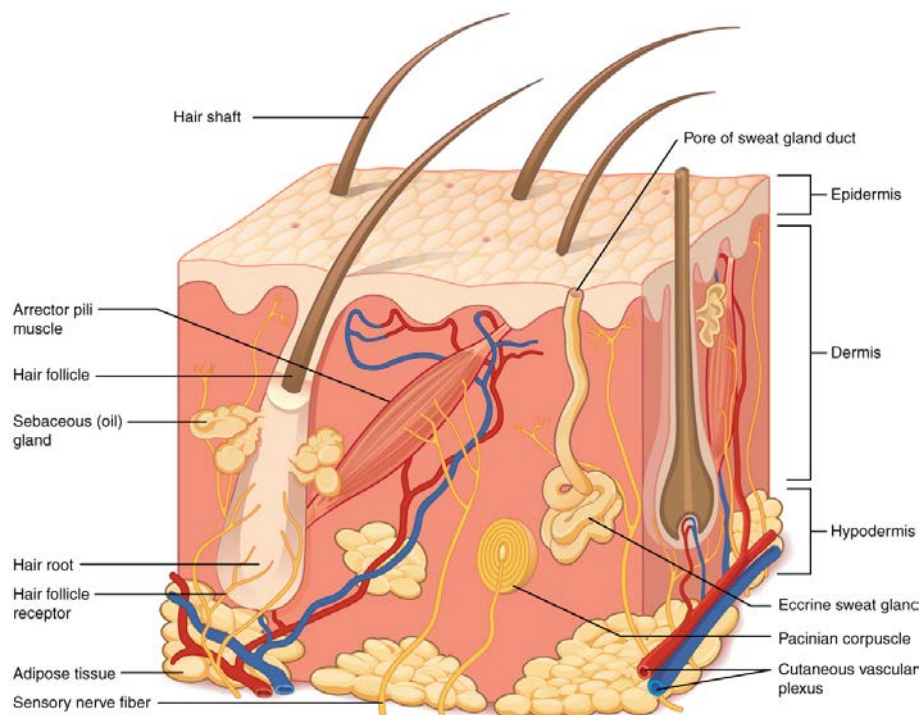


Figure 1. The different layers of the skin (the website of Openstax)

The skin is the largest organ in the human body, in fact, it consists 6% of our total body weight, with many functions to play in our mundane survival against both external and internal threats; the layers of the skin can be classified from superficial to deep (Figure 1), with the main role of retaining homeostasis. (Tobin 2006, 52-53.)

The top layer of the skin is the Epidermis – described as the superficial layer, albeit lacking in vascular supply, it offers protection from UV Rays of the sun and houses sensory cells called Merkel cells (MC) allowing sensitive manipulation of objects with the fingers by recognizing edges and curves. Another function of the MC is the release of a hormone called glutamate, which is an excitatory neurotransmitter in the brain. In excess, this hormone induces chronic pain changes by hyper sensitizing neuronal structures. For example, receptors known as nociceptors, which are prevalent in the free nerve endings reaching the epidermis, shape the perception of pain and warn of possible harmful stimuli. However, these receptors can often become hyper sensitized. (Lumpkin et al. 2010, 243-244; Tobin 2006, 53-54).

The Dermis – houses the vascular, neural and lymphatic system as well as the skins' various glands and sensory nerve receptors; this layer consists mostly of fibroblast proteins which are the essential cells in maintaining structural integrity of tissues (Tobin 2006, 58). The receptors of this layer consist of Pacinian and Meissner corpuscles (Figure 2) that are vibration, pressure and touch receptors. In addition, Ruffini corpuscles serve as mechanoreceptors specialized in recognizing skin stretch or sustained pressure, whereas lanceolate endings sense hair movements (e.g. sensing an ant walking on our skin) (Tobin 2006, 53).

Hypodermis – A deep, adipose rich tissue layer that connects the dermis to the skeletal tissue and houses the deepest structures and receptors of the skin. Overall, it seems that the skin is fairly simple in the function of its receptors, however, even in its deepest layer each receptor has a specific firing rate that affects its sensory response and function; For instance, in the hypodermis, Pacinian receptors and Meissner corpuscles fire in cases of sustained touch and are thought to release neurotransmitters to shape their response according to the level of pressure applied. (Lumpkin et al. 2010, 237; Tobin 2006, 53).

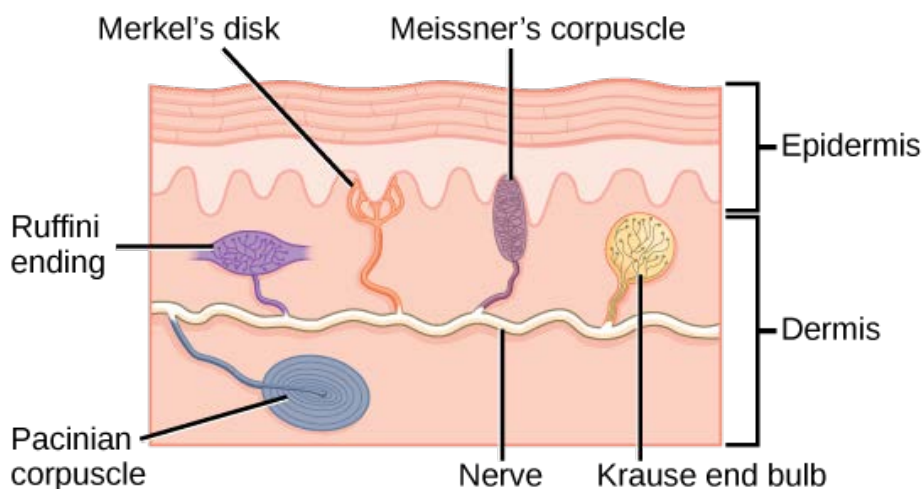


Figure 2. Somatosensory receptors of the skin (the website of Openstax)

## 2.2 Hormones and affects

In greater detail, the somatosensory receptors of the skin can sense a change in the homeostasis of the human skin by distinguishing a variety of tactile inputs and affect the neurons by closing and opening sensitive ion channels. (Lumpkin et al. 2010, 241). In addition to its input differentiation, the skin produces hormones such as endorphins, gender hormones, melatonin, serotonin and thyroid stimulating hormone receptors alongside immune system secretions necessary for retaining homeostasis. (Garrison et al. 2012, 135; Tobin 2006, 63-65).

Even the human hair follicle, used to be thought of as non-essential, plays a role in the release of hormones for itself in events related to tissue stress. Hence, a remarkable variety of hormonal secretions (e.g. sex steroid hormones, corticotrophin-release hormone) and immunological responses occur in many levels, with anti-inflammatory agents such as KOR, suppressing the T-lymphocytes secretion (i.e. white blood cell) or alternatively promoting inflammatory agents such as MOR. Furthermore, unmyelinated C type fibers trigger as a response to light touch in the hairy skin. (Bigliardi et al. 2009, 428; Tobin 2006, 61).

Another aspect of the skin is its interpretation of stimuli via motivational-emotional pathways for touch during interpersonal contact, thus making the skin a communicating organ with the outside world, thereby coining the term “the outside of our brains” (Morrison et al. 2010, 306).

Empirically, this exemplary brain-skin relationship is seen between the epidermis and peripheral nerve fibers, where opioid receptors are abundant. Interestingly, opioid receptors encouraged research due to their attributed modulation of immune cells and analgesic effect. Clinically, it is worth considering that the peripheral nervous system receives its sensory input from the skin's entire surface and this in turn affects the cell differentiation, migration, and immune system secretions of cytokeratin and cytokine expressed in the human epidermis. (Bigliardi et al. 2009, 424-426).

### 3 TOUCH

#### 3.1 Definition

Touch is a sense that helps us discriminate the location of a stimulus on the skin surface, explore objects, identify and manipulate objects. It is also connected with the sense of one self. Fundamentally, touch is classified as dynamic when it is “continuous movement over the skin from one point to another, and can often be repetitive, as in stroking, rubbing and caressing” or simple when “brief, intentional contact to a relatively restricted location on the body surface of the receiver during a social interaction” It has been shown that simple touch can induce an altruistic effect, thus promoting compliance, which can be utilized in clinical settings when building the therapist-client rapport, regardless of how old or verbally communicative the client is. (Morrison et al. 2010, 306).

Alternatively, pleasurable touch is further classified to (a) interpersonal touch, (b) grooming, (c) massage and (d) relief by itch. Interpersonal touch is essential for proper cognitive development in mammals and its presence or absence can have long-lasting effects. In addition, it can promote neurogenesis of cells in the dorsal root ganglion (Figure 3) following injury, plays a part in subtle communication between people, and is rated as more pleasurable than self-touch. (Lloyd et al. 2015, 323-323; Morrison et al. 2010, 307).



Grooming is a social mammalian phenomenon mediated by the hormone of affinity, oxytocin. Surprisingly, the techniques used by Swedish massage have shown similarity to grooming, and could account for the hormonal release of dopamine in manual interventions where pleasurable touch is used (Testa et al. 2016, 2). Lastly, the relief of itch by scratching has also shown to activate our somatosensory map even without an existing itch stimulus. (Lloyd et al. 2015, 323-323; Morrison et al. 2010, 307).

### 3.2 The physiology of touch

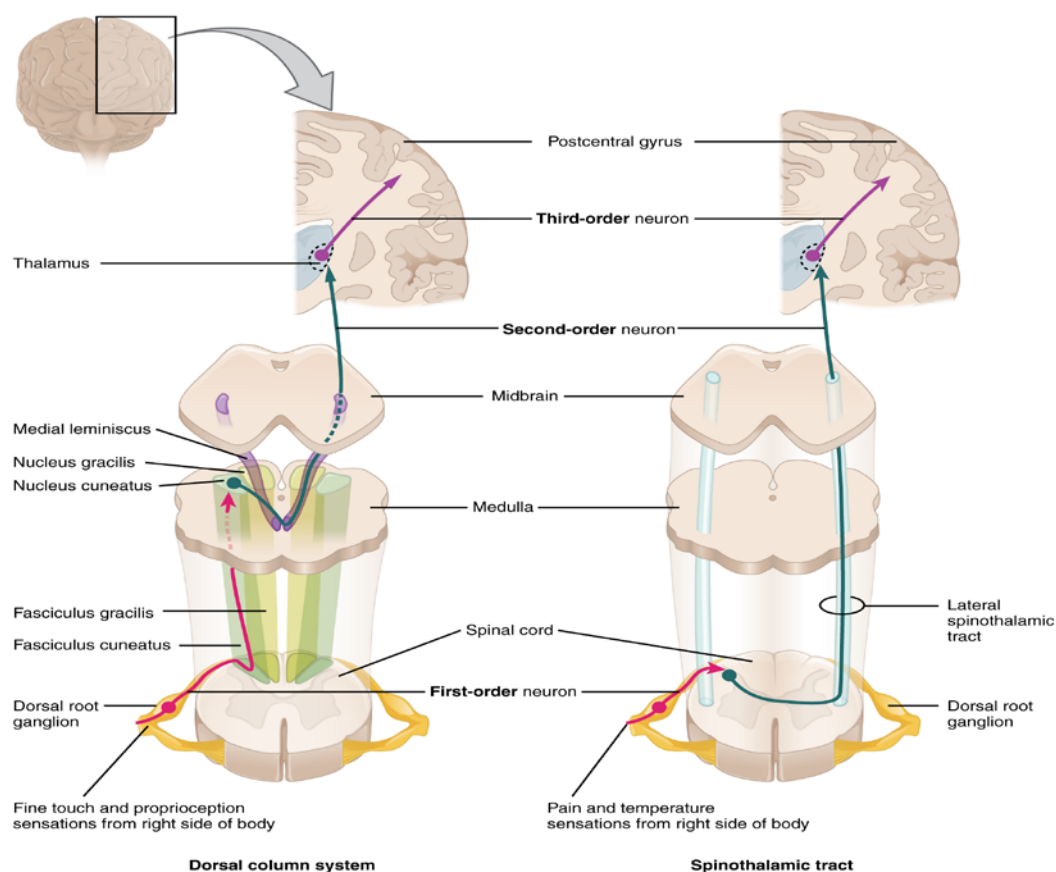


Figure 3. The Dorsal root ganglion (DRG) from the peripheral nervous system projecting to the central nervous system (CNS) (website of Openstax)

The understanding of touch must consider its neurophysiological interpretation by the central, peripheral and autonomic nervous system. In addition, investigation of how the different types of touch affect the brain's response will aid in choosing the manual therapy intervention technique that will *primum non nocere* (Lorimer 2013).

The sensory neuron fibers are grouped to  $A\beta$ ,  $A\delta$  or  $C$ -fibers (Table 1) they reside in the Dorsal root ganglia in the spinal nerves (Figure 3) and are classified according to their myelin thickness, mechanical threshold and stimulus specific responses. For example,  $A\beta$  myelin-rich afferents are responsible for sensing light touch and are low-threshold, whereas  $C$ -fibers and  $A\delta$  afferents are unmyelinated or thin in myelin, are nociceptor based with high threshold and project to the central nervous system through the DRG (Figure 3) Exceptionally, there are also low threshold  $C$  fibers that are below the nociception range which offer clinicians an opportunity to treat clients without pain aggravation or perhaps avoid posttreatment pain altogether. (Lumpkin et al. 2010, 3).

Table 1. Classification of sensory fibers.

Classification	Mechanical threshold	Receptors	Myelin	Sensation
$A\beta$	Low	Muscle spindles Meissner corpuscle Merkel receptor Pacinian corpuscle Ruffini ending Hair receptor	Heavy	Proprioception Superficial touch Deep touch Vibration
$A\delta$	High	Nociceptors	Low	Pain Temperature
$C$	High/Low	Nociceptors	Low/None	Pain Temperature Itch Light touch

$C$  fibers are abundantly found in the hairy skin, especially in the face and arms, and are associated with interoceptive feelings such as itch or pain which effect the internal organs. Furthermore, using these pleasant touch receptors activates certain parts of the brain that are associated with reward, grooming, addiction, food cravings and the placebo effect. Among these are the orbitofrontal cortex, posterior & anterior insula, pregenual ACC, prefrontal cortex, inferior parietal lobe, cerebellum and ventral striatum. Bearing in mind that different body sites respond to the same touch stimuli differently,

with the head being most sensitive. (Lloyd et al. 2015, 1-3; Loken et al. 2009, 1; McCabe et al. 2008, 7-8).

Finally, even the sight of touch results in neuromodulation. In the McCabe et al. study (2008, 7-8) where cream described as rich moisturizing cream was being applied to another participant while the teste was watching, similar areas of the teste's brain, including the parietal area 7, orbitofrontal cortex and S1 were activated. However, when the rich cream was applied to the teste, different somatosensory representations were activated, with primarily the middle and posterior insula.

### 3.3 The psychology of touch

Psychological theories suggest that touch is a powerful tool that promotes genuineness and openness in the therapeutic relationship. Certain psychological theories such as Gestalt therapy use touch to improve self-esteem and general psychological well-being. However, there are contradicting opinions claiming that touch can create a power differential between the client and therapist or that touch may also be misunderstood as sexual. (Jones et al. 2014, 1-2).

Moreover, lack of touch negatively affects the behavior of mammals, whereas an ample amount can positively affect the alleviation of stress or anxiety. More importantly, touch is a mediator of social communication, increasing the liking of a person or place and promotes trust in the social context. Therefore, it is not surprising then that empathy is also related to touch; where the mere sight of another's painful experience brings distraught to the 'uninvolved' spectator. Thus, relationships are affected by touch, where anxious individuals report an increase need for secure bonds providing the alleviation from the anxiety felt otherwise. Simply put, touch can be used to convey or understand thoughts and feelings, as well as regulate them. (Morrison et al. 2010, 305-307).

## 4 PAIN

### 4.1 Definition

As of November 2016, the international association for the study of pain has revised the definition of pain as follows: “pain is a distressing experience associated with actual or potential tissue damage with sensory, emotional, cognitive and social components” (Williams et al. 2016 ,2420-2423). Pain is then an output from the nervous system affecting various domains. For instance, when an individual puts his or her hand above the fire; it is the sensation of immediate threat, sent from the peripheral nervous system to the CNS and back, causing the hand to be withdrawn and thus protect the tissue from additional noxious input. In effect, the barrage of nociceptive input when the hand was burnt above the fire, activates the touch receptors (through sensory C and A $\beta$  fibers), which send the signal of threat through the DRG to the dorsal horn and up the lateral spinothalamic tract (Figure 3) all the way to the cortex through the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> order neurons to interpret the sensation as harmful, then descends to the hand with the command of removing the hand from the fire. (Gifford 2014, 56-61).

Evidently, pain does not necessarily correlate with the state of the tissue following an injury. From an evolutionary perspective, pain represents an implicit awareness of the body that a certain tissue is in danger and is a protective mechanism. (Lorimer 2013).

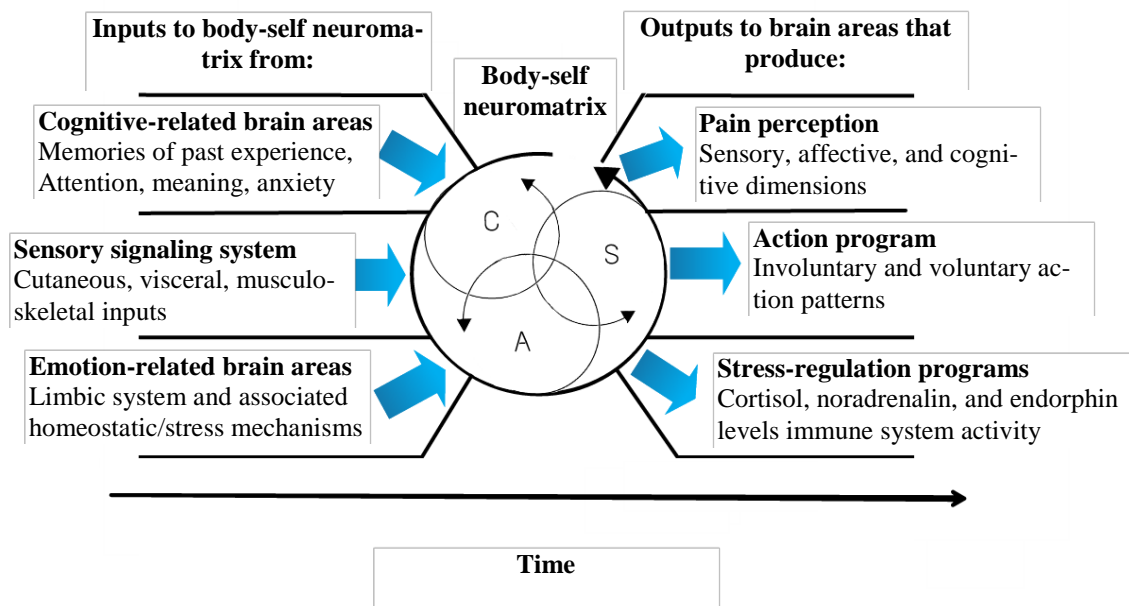


Figure 4. Sensory, affective and cognitive factors influencing pain (Redrawn from "Pain and the Neuromatrix in the brain" by R. Melzack, 2001, *Journal of dental education*, 1382)

Additional physiological factors that influence pain following injury can be inflammatory mediators, increased tissue temperature and blood flow that increase the summation of nociceptive activity. The perception of pain is also influenced by anxiety, expectation and attitude of the individual regarding his or her own pain among other factors (Figure 4). It is not surprising then that a pain behavior occurs to alter postural and voluntary muscles after the injury (Lorimer 2013).

Overall, the topic of pain has been widely researched among the physiotherapy community and is accepted as an integral part of client education. In fact, it is acceptable that pain is a complex subjective quality and in the therapeutic context, belittling or giving too much importance to the clients' pain can be a detrimental factor for recovery. (Morrison et al. 2010, 311).

## 4.2 Classification of pain

Traditionally, acute pain was defined as “the normal, predicted physiological response to an adverse chemical thermal or mechanical stimulus... associated with surgery, trauma and acute illness” (Carr et al. 1999, 2051). This definition provides an expected progression for an acute pain state without considering the factors discussed (Figure 5). On the other hand, a chronic pain state occurs when the acute pain threat persists over 3 months, resulting in altered representation of painful body parts in the primary sensory cortex map. In turn, these changes effect motor control since body control relies on the adjacent somatosensory map to produce unhindered, quality movements. (Lorimer 2013; Vardeh et al. 2016, 51). Fillingim et al. (2016, 245) of the American pain society includes chronic pain condition diagnoses such as central and peripheral neuropathic pain, musculoskeletal pain, orofacial and head pain, visceral, pelvic and urogenital pain as well as disease associated pains.

Acute and chronic pain are classification of 4 pain states: Nociceptive, inflammatory neuropathic and centralized. Nociceptive pain is a localized pain, occurring due to increased activation of high threshold mechanoreceptors following an injury or increased mechanical forces. On the other hand, inflammatory pain is the result of inflammatory mediators such as cytokines among others. These signaling molecules sensitize nociceptors to produce pain. The cardinal symptoms of inflammatory pain are redness, warmth and swelling of the affected area. (Vardeh et al. 2016, 52-53).

The work of Wall (1991, 632) suggests 7 characteristics of neuropathic pain: the pain is described as ongoing, with little influence by peripheral stimuli, a sensation of lancinating spontaneous stabs triggered by an innocuous stimulus and a reduced sensitivity to stimuli. Moreover, some pains may appear immediately after a nerve injury and other with delay. Provocation of pain requires repetition of the stimulus and demonstrates a delay and build up after the beginning of the stimulus.

Neuropathic pain is physiologically complex to treat; manifesting in several bouts per day or is ever-constant. Contemporarily, lesions are classified as focal or systemic based on pathology, and structure (i.e. fibre density) does not significantly correlate with pain. For example, localized nerve lesions produced the highest pain ratings of

the two when the fibre density of the epidermis was mildly reduced, whereas in the case of systemic lesions, significant reduction of fibre density at sub epidermal and dermal fibre did not produce greater pain ratings. Clinically, light touch (i.e. allodynia) was perceived as painful in clients with localized lesions far more than systemic lesions (i.e. 12/19 and 4/17 respectively) and is perceived as less pleasant in hereditary autonomic neuropathy type V. (Morrison et al. 2011, 1116-1119; Schley et al. 2012, 1418-1423; Sommer 2012, 1345).

Centralized pain is exceptional in that it is not triggered by a noxious stimulus, inflammation or damage in the nerves. Therefore, the mechanism is that of reduced central inhibition by the interneurons previously described (Figure 4) For example; pathologies such as fibromyalgia or irritable bowel syndrome are considered central sensitivity syndromes. (Vardeh et al. 2016, 56).

## 5 MANUAL THERAPY

Manual therapy is a hands-on treatment for musculoskeletal conditions that is utilized by health care providers internationally. It is used for evaluation as well as treatment and involves palpation of structures, which is an adjunct used to determine which intervention in the manual therapy world is most suitable for the individual client. Following evaluation, the palpable findings are addressed according to the healthcare professional performing the examination. These findings are named: lesions, subluxations, somatic dysfunctions or hypo mobile joints. The treatments used are spinal manipulations and mobilizations to address the aforementioned structural abnormalities. (Bahram 2016).

Contemporarily, in the case of chronic low-back pain, manual therapy has been shown to produce a moderate effect at best and mechanisms of common interventions are repeatedly debunked by studies. Such is the case of the mechanisms underlying the effects of kinesiotaping, purporting importance to the direction and convulsions of the skin in certain positions while taping. The application allegedly promotes an increase of lymphatic fluid and blood flow. Nevertheless, when quantified, these claims did not

alter pain intensity or disability after 4 or 12 weeks in a significant manner. (Parreira Pdo et al. 2014, 36-37).

Ostensibly, when choosing manual therapy as an intervention, words of importance and technique (e.g. velocity and pressure applied) must target specific sensory afferents. As clinicians, considering the previous experience, treatment expectation, culture, as well as the area and type of pain treated (e.g. chronic, neuropathic or acute) will affect treatment outcomes. In effect, manual therapy is activating the cortical representation of the treated area to increase body awareness and thus affect pain levels. (Lorimer 2013).

Moreover, the chosen wording of an intervention, such as rich or basic cream resulted in a top-down effect (i.e. orbitofrontal, pregenual ACC and ventral striatum), giving great significance to our verbal presentation of an intervention; we also know that the experience of being touched, activates the somatosensory map more effectively than its sight or when self-touch is utilized (e.g. sensory rehabilitation for stroke survivors) (McCabe et al. 2008, 7-8; Morrison et al. 2010, 310).

In practice, affective touch top-down effects are achieved by lightly touching the client, at medium (i.e. 1-10 cm/s) stroking velocity over the skin for a period of up to 5 minutes. Consequently, light touch releases endorphins to reduce stress, anxiety and depressive symptoms by decreasing heart rate, heart rate variability, systolic blood pressure and chronic pain levels. (Lumpkin et al. 2010, 10; Lloyd et al. 2015, 323-324; Lindgren et al. 2010, 105-110).

On another note, the bodily responses of clients receiving light touch are affected by the therapist's fingertip size, spacing of finger print ridges and the client's epidermal stiffness. This perhaps can explain some of the variability seen in research regarding manual therapy outcomes for the same intervention, when different therapists of the same skill level are being assessed. (Lloyd et al. 2015).

According to a study by Lloyd et al. (2015, 323-324) acknowledges c-fiber systems as possible targets for affecting chronic pain conditions (e.g. atopic dermatitis, burns,



stroke patients and other sensory dysregulation illnesses) through affective touch interventions. In conjunction with our interventions, considering prospective pharmacological options to target ion channels or genes (e.g. TRPC1 and SCN9A) related to central sensitization may provide additional tools in the future. (Garrison et al. 2012,548; Lumpkin et al. 2010, 1-7).

## 6 PURPOSE AND OBJECTIVE OF THE THESIS

The purpose of this thesis is to provide information for practitioners about the role of touch in manual therapy. Therefore, exploration of the role of the skin is necessary, for it is the medium where touch occurs. Moreover, this thesis clarifies the neurophysiological mechanisms of pain and the attributed effects manual therapy can have on pain alleviation.

There is a large body of contradictory evidence in recent years regarding the effects of manual therapy on pain. This thesis is an attempt to find a common ground between prevailing approaches, through the investigation of touch. The research question of this literature review is as follows:

1. What is the role of touch in manual therapy?

## 7 INTEGRATIVE LITERATURE REVIEW

### 7.1 Clarification of methodology

In this thesis, the chosen research method is that of an integrative literature review, including three databases. Nevertheless, the thesis includes an inclusion and exclusion criteria with the purpose of increasing the reliability of the study, thereby having resemblance to a systematic literature review. The contrast between the study and sys-

tematic literature review is elaborated in the following paragraphs. A systematic literature review provides level 1 evidence and is used in modern medical healthcare research. Its goal is to provide comprehensive evidence summaries for busy clinicians. A systematic review should include the PRIMSA and AMSTAR guidelines if they wish to decrease the risk of bias associated with the systematic review. A systematic review should include the PICO search strategy which stands for Population focused on, intervention researched, and comparison. This is done by using for example randomized controlled trials and outcome. The goal of this strategy is to retrieve relevant studies. Following the search, there is an inclusion and exclusion process of the literature selected, followed by assessment of the quality of the included studies. (Sayers 2008, 136).

A literature review is based on updated studies and presents a professional point of view. Moreover, there must be a study in the chosen subject and the study may include between two to several studies. To write a literature review, one must define a topic and audience, search and re-search the literature, take notes while reading, choose the type of literature you wish to write, keep the review focused but make it of broad interest, incorporate critical thinking, find a logical structure, make use of feedback, include your own relevant research but remain objective and stay up to date. In this integrative literature review, the information regarding the searching for the database, keywords and time of publication served as inclusion and exclusion criteria, with resemblance to a systematic literature review. (Pautasso 2013, 1-3).

In addition, an integrative literature review synthesizes information using quantitative methods as well as critical analysis, synthesis of new knowledge on the topic, logical and conceptual reasoning and serves as a catalyst for further research. The integrative review tells a story by critically analysis of the literature. This involves the history and origins of the topic along with main concepts while examining the relationships of an issue and providing critique. Critical analysis allows for reconceptualization of information that has been overlooked, using the concept of critique; which is used to identify knowledge that should be created or improved in the current literature. (Whittemore et al. 2013, 549-551).

The synthesis of new knowledge includes old and new ideas to create a better understanding of the topic in question. It is a creative process that produces a new model or conceptual framework or other concept informed by the author of the review. There are a few strategies to form the synthesis; among them are research agenda or conceptual framework that present a new perspective on the topic and metatheory explaining a body of theory. (Torraco 2005, 363). The importance of logical and conceptual reasoning is the basis of the arguments and explanations used in an integrative review. The aforementioned relies on a description of how it was developed from the literature review, including the interrelationships and the reasoning process used to present the theoretical framework. (Torraco 2005, 363).

## 7.2 A checklist for writing an integrative literature review

There are several questions to be answered before conducting an integrative literature review and questions to be asked while writing an integrative review:

- a. What type of review article will be written?
- b. Is there a need for the integrative review?

Organizing an integrative review requires a coherent conceptual structuring of the topic as well as sufficiently describing the methods used in the literature review.

Producing an integrative literature review:

- c. Does the article critically analyze existing literature on the topic?
- d. Does the article synthesize knowledge from the literature into a significant, value added contribution to new knowledge on the topic?
- e. What forms of synthesis are used to stimulate further research on the topic?
- f. Does the article describe the logical and conceptual reasoning used by the author to synthesize the model or framework from the review and critique of the literature?
- g. Are provocative questions for further research presented to capture the interest of scholars?

### 7.3 The checklist report

This review article will be an integrative literature review with characteristics reminding of a systematic analysis. As such, it includes an inclusion and exclusion criteria and a presentation of the searching process. The integrative review provides an opportunity to answer a qualitative question with both a quantitative and qualitative answer. Without the structure of the integrative review, critical information on the topic would have been left out due to the uncompromising requirements of a systematic literature review. This review thesis is organized and presented using topics related to the research question. The investigation of contributing factors provided a broad understanding of the topic.

The methods used in this integrative literature review have been described in a flow chart presenting a literature searching process with the goal of providing better transparency. This review deals with critical evaluation of existing literature on the effect of touch in manual therapy. It is written from a prospective physiotherapist's viewpoint and summarizes the up-to-date information regarding the topic, in addition to considering the clinical implication of the research. The review synthesizes knowledge from 3 different databases and objectively reaches a conclusion that may affect physiotherapy practice if utilized. Moreover, this article integrates the newest research about the topic and synthesizes it with the old.

This form of research agenda was chosen for making this review as to provide the relevant clinical information for the reader. Furthermore, the reader is encouraged to continue the research regarding the topic in question, with the goal of clarifying the role of touch in manual therapy. Finally, the text itself is provocative and calls for a re-evaluation of age old premises in the world of manual therapy as well as beckons new research in the topic.

## 8 RESULTS

### 8.1 Searching strategy

The manual searching process was conducted on the 11<sup>th</sup> of November (2015), included the material that had already been gathered by (Website of Diane Jacobs 2016) (Table 2) and PubMed literature review using Mesh Terms; these terms included manual therapy AND skin, manual therapy AND therapeutic touch, chronic pain AND therapeutic touch, neuropathic pain AND the skin (Table 3). The choice of mesh terms correlated with the thesis topic in an equivalent manner so that both the skin and touch are assessed in relation with manual therapy. In addition, on the 4<sup>th</sup> of September 2016, the database of Science direct was included in the search process, only for the terms manual therapy AND therapeutic touch. The content of the abstracts had to contain relevant information regarding the therapeutic qualities of touch or the skin and publication year did not exceed that of 10 years for all of the articles searched.

On a final note, the searching process considered the database of Diane Jacobs, Science direct and PubMed (Figure 5); this in turn provided a wider perspective on the topic, to provide greater reliability and contradictory evidence.

Table 2. Preliminary inclusion and exclusion criteria from DNM references based articles

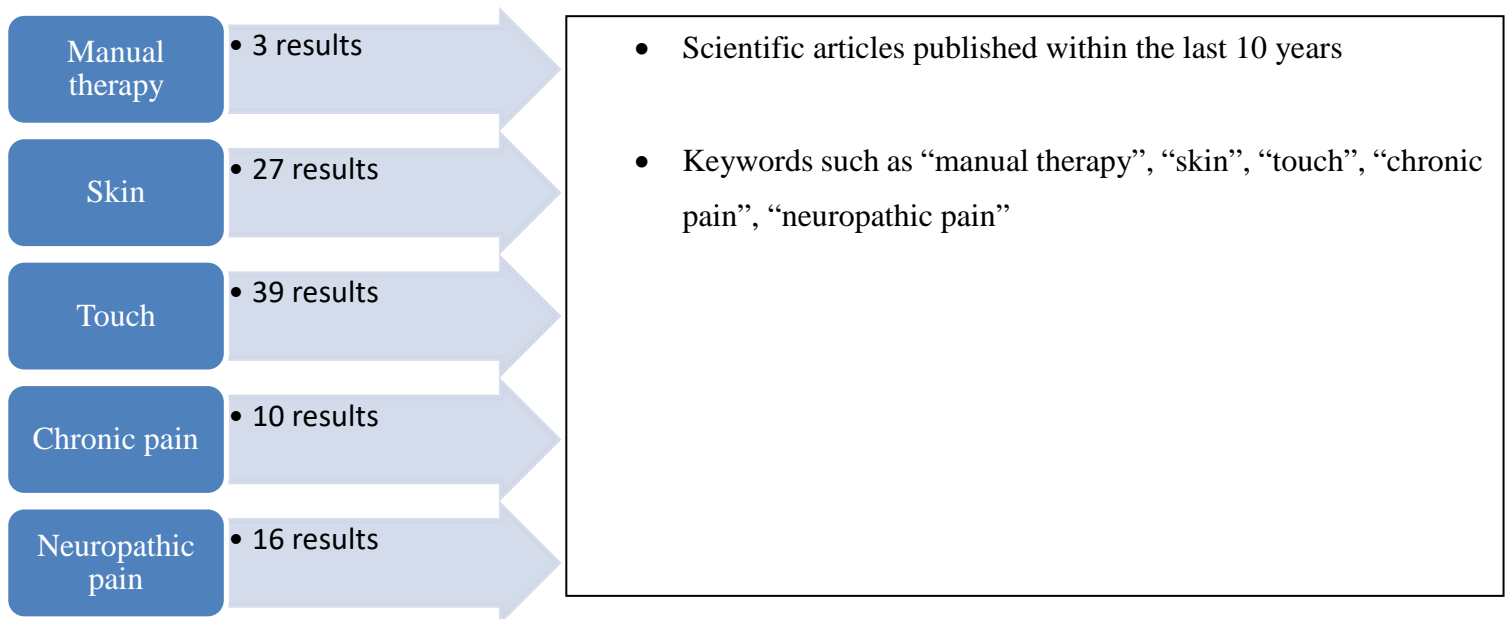
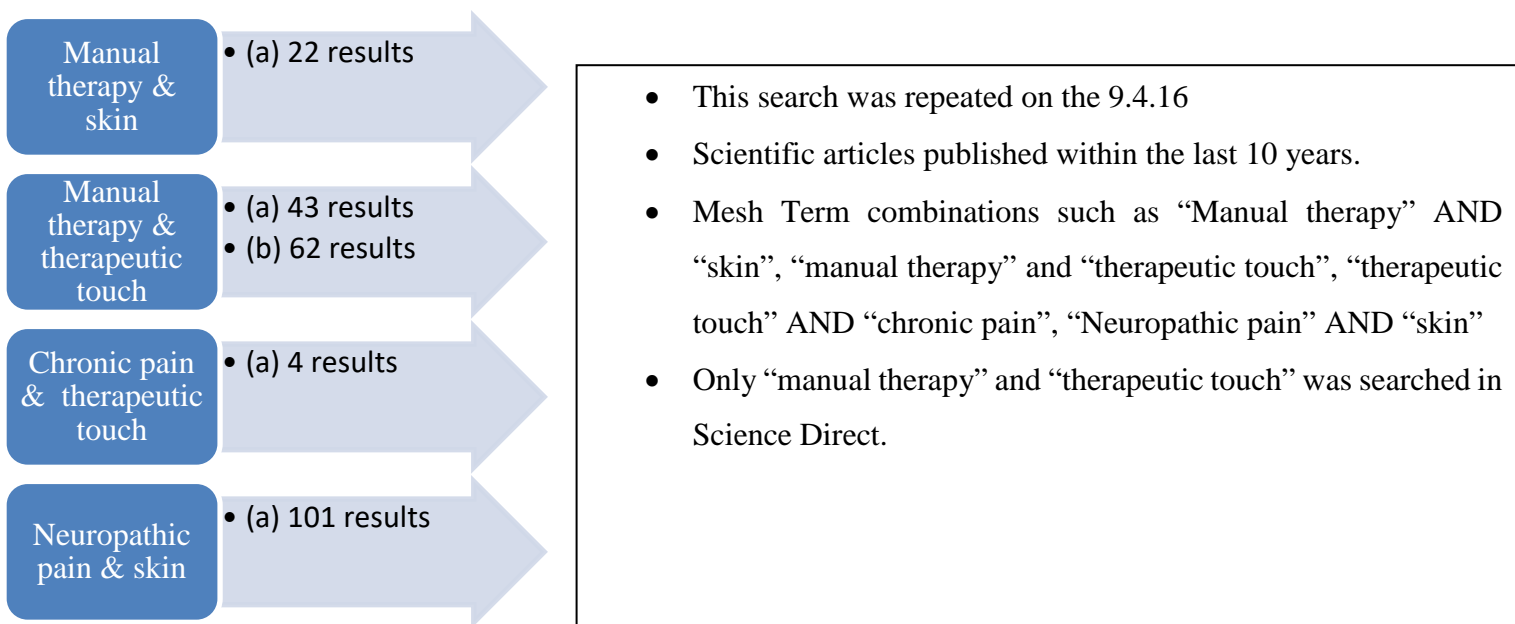


Table 3. Inclusion and exclusion criteria from (a) PubMed and (b) Science Direct based articles



The integration of information using 3 databases displayed in a transparent manner including the process of this integrative literature review:

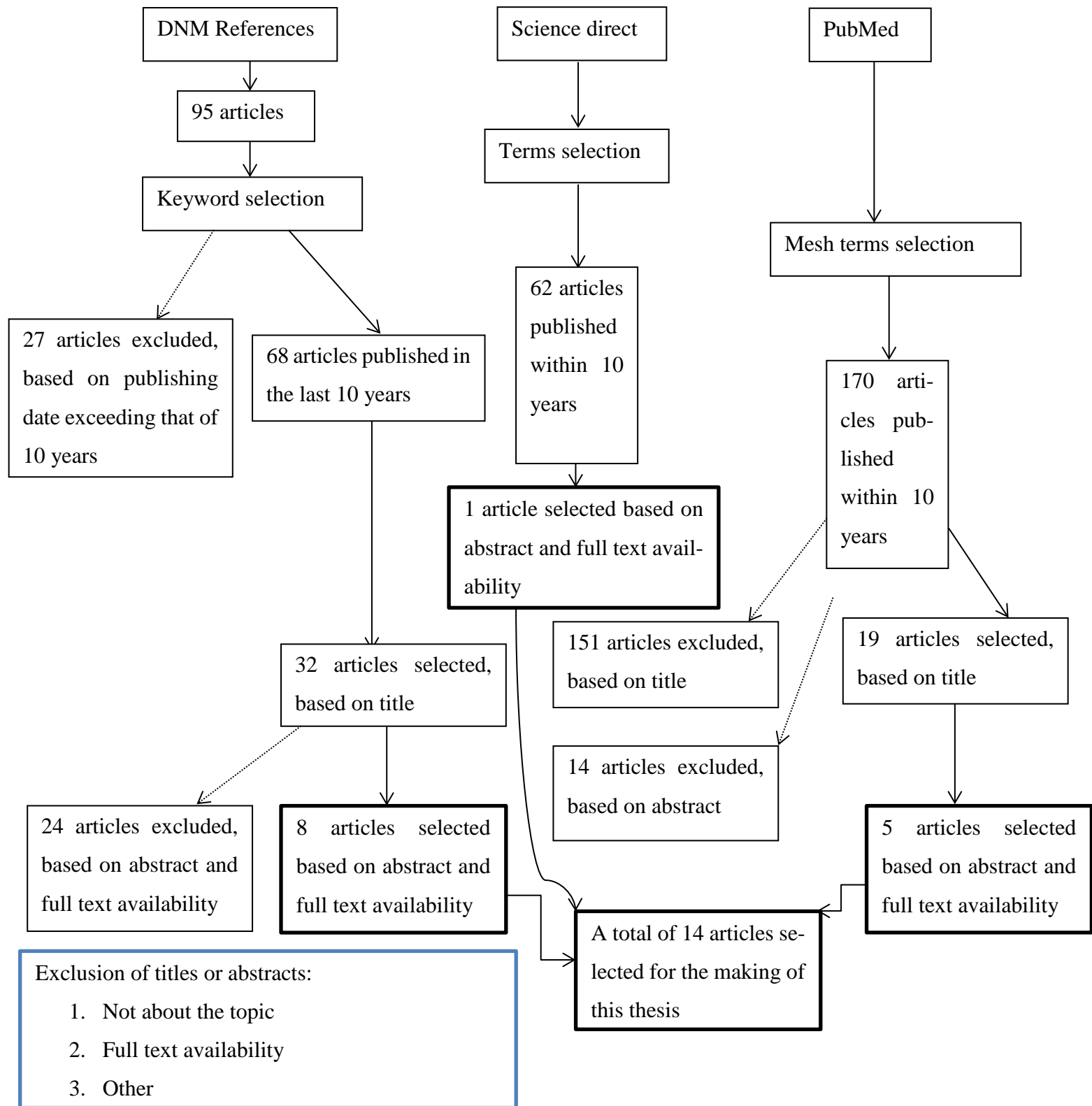


Figure 6. Selection of literature

## 8.2 The role of touch in manual therapy

The role of touch in manual therapy is intertwined with that of the skin, offering an opportunity to promote or inhibit pain; it is then the therapists' understanding regarding the neurophysiological effects of touch on client populations which consequently should guide the choice of manual intervention. Moreover, touch can be used to activate the somatosensory map effectively when applied and should be integrated in the early stages of the physiotherapy sessions due to its trust-building effect. Evidently, the areas of the brain associated with placebo and reward pathways are activated when affective touch is being used in conjunction with promising verbal presentation of a manual therapy intervention.

In practice, touch can be utilized in manual therapy to release a variety of hormones associated with pleasure. These hormones temporarily decrease chronic pain as well as alleviate symptoms of stress, anxiety and depression in as little as 5 minutes of an intervention. Nevertheless, touch has its limitations as an intervention, where certain neuropathies such as hereditary autonomic neuropathy type V (HANTV) perceive touch as unpleasant.

## 9 CONCLUSION AND DISCUSSION

The personal limitations of this literature review may have impacted the quality and results of the thesis. For example, the knowledge of biochemistry required for the understanding of the articles surpassed that of my proficiency level which may have left out relevant information regarding the transferability of the study's results. Secondly, the use of a pre-made database of references in conjunction with PubMed and Science Direct does not imply the highest level of methodological quality and should be ethically considered. Lastly, the mesh terms did not include acute pain as part of this thesis and should be included in future studies.



On another note, the quantitative assessment of affective touch was difficult to muster from the databases searched as it is relatively an understudied research topic. Furthermore, PubMed search did not yield many manual therapy interventions using the chosen keywords and one should critically interpret the transferability of the results of K-tape study, since 78% of the participants were women in their 50. Unfortunately, in the case of neuropathic pain alleviation through manual therapy, research regarding other neuropathies than HANTV was not found in this literature review, thus warranting further research.

Initially, the idea of the thesis was to perform a literature review about a manual therapy intervention of light touch named “DermoNeuroModulation” which integrates the database used in this thesis. Fortunately, the opportunity to participate in a professional course concerning the aforementioned intervention was made possible in May of 2016. Nevertheless, specific research regarding the intervention in specific is nonexistent and required a change of topic. Therefore, a questionnaire regarding the importance of the skin, sent to manual therapists working in Finland and Israel was another proposition; however, this did not ensue after consultation with the authors tutor. Finally, the role of touch and the skin in manual therapy was brought up as a relevant and applicable topic of research.

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