Escola Superior de SaùdeAtlàntica

Diploma in Physiotherapy

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Final project

COMPARATIVE STUDY OF TWO METHODS FOR THE INHIBITION OF CHRONIC MUSCLE PAIN IN THE CERVICO-THORACIC REGION

Students :

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Dr Samir BOUDRAHEM

Barcarena, 2018-2019

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SUMMARY

Introduction: Chronic cervico-thoracalgia is recurrent in office workers. The people who are victims of it can benefit from various types of care and vary. In this study, we will compare the effects of 2 techniques: the first, more conventional, which is massage by kneading and deep sliding pressure (M3P) and the second, transverse tensioning (METT). If the effects of METT are similar or superior to M3P, then physiotherapists would have an additional or even more effective treatment tool to fight this condition.

Objective: This study aims to highlight the potentially equivalent or even superior efficacy of METT compared to M3P in the treatment of chronic pain in the cervico-thoracic region. The assumed superior quality of METT would be at two levels: a greater decrease in pain phenomena and a maintenance of longer-term effects.

Methods: This is an experimental, controlled and randomized study on a sample of 24 clerical employees divided into two groups: one group with M3P treatment and the other with METT. Each group will perform two sessions per week of therapy at intervals of at least two days for six weeks. The data will be collected every 2 weeks through clinical tests and questionnaires. In order to measure the effects in the medium and long term, these same evaluations will be repeated one month and six months respectively after the end of the treatment.

Conclusion: The existing literature suggests that the physiological effects of METT may be similar to those of M3P. However, M3P does not seem to act in the medium and long term, unlike METT. The METT would have a major impact on the regulation of homeostasis. However, whether for M3P or METT, it is recommended to combine the treatment of cervico-thoracic muscle pain with postural rehabilitation, workplace adaptation and, more generally, the professional environment, as well as the practice of physical activity. This study would allow the physiotherapist to add a string to his bow in the rehabilitation of patients with chronic cervico-thoracalgia.

Keywords: Slip pressure massage and deep kneading, transverse tensioning, chronic cervico-thoracic muscle pain, office workers, homeostasis.

RESUMO

Introdução: A toracalgia cervico-cervical crônica é recorrente em trabalhadores de escritório. As pessoas que são vítimas dela podem beneficiar de vários tipos de cuidados e variam. Neste estudo, vamos comparar os efeitos de 2 técnicas: a primeira, mais convencional, que é a massagem por amassamento e pressão deslizante profunda (M3P) e a segunda, a tensão transversal (METT). Se os efeitos do METT forem semelhantes ou superiores aos do M3P, então os fisioterapeutas teriam uma ferramenta de tratamento adicional ou mesmo mais eficaz para combater esta condição.

Objetivo: Este estudo tem por objetivo destacar a eficácia potencialmente equivalente ou mesmo superior do METT em relação à M3P no tratamento da dor crônica na região cervico-torácica. A suposta qualidade superior do METT estaria em dois níveis: maior diminuição dos fenômenos de dor e manutenção dos efeitos a longo prazo.

Métodos: Trata-se de um estudo experimental, controlado e randomizado com uma amostra de 24 funcionários clericais divididos em dois grupos: um grupo com tratamento M3P e outro com METT. Cada grupo realizará duas sessões por semana de terapia em intervalos de pelo menos dois dias durante seis semanas. Os dados serão coletados a cada 2 semanas por meio de testes clínicos e questionários. A fim de medir os efeitos a médio e longo prazo, essas mesmas avaliações serão repetidas um mês e seis meses, respectivamente, após o término do tratamento.

Conclusão: A literatura existente sugere que os efeitos fisiológicos do METT podem ser semelhantes aos do M3P. Entretanto, a M3P não parece atuar a médio e longo prazo, ao contrário do METT. O METT teria um grande impacto na regulação da homeostase. Entretanto, seja para M3P ou METT, recomenda-se combinar o tratamento da dor muscular cervico-torácica com a reabilitação postural, a adaptação ao ambiente de trabalho e, mais geralmente, o ambiente profissional, bem como a prática de atividade física. Este estudo permitiria ao fisioterapeuta adicionar uma corda ao seu arco na reabilitação de pacientes com toracalgia cervical crônica.

Palavras-chave: Massagem por pressão de deslizamento e amassamento profundo, tensionamento transverso, dor muscular cervico-torácica crônica, trabalhadores de escritório, homeostasia.

CONTENTS

GLOSSARY

ANAES: National Agency for Health Accreditation and Evaluation

CF: Heart rate

FR : Respiratory rate

HAS: High Authority of Health

INRS: Institut National de Recherche et de Sécurité

M3P: Slip pressure massage and deep kneading

METT: Transverse tensioning of the cutaneous and muscular planes

SN: Nervous system

SNA: Autonomic Nervous System

BP: Blood pressure

MSD: Musculoskeletal disorders

I. INTRODUCTION

In France, musculoskeletal disorders (MSD) are admitted to be the first occupational disease in about 20 years (Institut National de Recherche et de Sécurité, 2018). They are multifactorial with biomechanical origins and are linked to "psychosocial and organizational constraints" (INRS, 2018). According to the bulletin issued by la Caisse Nationale d'Assurance Maladie in January 2018, the cost of work stoppages has been rising steadily for the past two years. These problems, which are felt over a long period of time, have a negative impact on employees' productivity (Luime and al, 2005) and are thus lacking in the company. In addition, MSD affect the psychological dimension of individuals is responsible for a decrease in perceived quality of life. The SF-36 questionnaire (Ware and Sherbourne, 1992) provides an objective measure of levels of anxiety, depression and fatigue. Pain is closely related to anxiety (Deng and Cassileth, 2005) and depression (Falkensteiner, 2011).

In addition, the literature reports that MSDs are most common in the neck and shoulders among office workers working in front of a computer (Wu et al., 2012). Indeed, this type of activity leads to postural rigidity of the scapular belt muscles following prolonged isometric contraction. The trapezius is one of the main muscles used in this region. Thus, we limit the study area to trapezoidal insertions: from the occipital line to the tenth thoracic vertebra.

MSD located in this area may present as muscle contractures. Serratrice (2003) defines them as "an involuntary, transient or lasting shortening, painful or not, of one or more striated muscles". This study will focus on chronic painful contractures. Pain is characterized as an "unpleasant sensory and emotional experience, associated with, or described in terms suggestive of, actual or potential tissue damage" (Pascal and Frécon Valentin, 2011). In addition, in 2016, the High Authority of Health (HAS) stressed that a pain, whether recurrent or persistent, is said to be chronic when its duration exceeds three months. It should be noted that in 95% of cases, chronic pain is myofascial in origin (Makanga, 2010). These are part of the group of pains caused by an excess of nociceptions. The latter are characterized by "the activation of the transmission system of nociceptive messages that are responsible for the transmission of pain by excessive

stimulation of nerve receptors" (Douleurs sans frontières, 2018). A nociceptive stimulus can cause a reflex defensive contraction to immobilize the affected segments (Chanussot and Danowski, 2012). As a result, there is a link between decreased or even absent joint mobility and the onset of pain (Travell and Simons, 1998 ; Viel and Blanc, 1978).

The medication proposed for chronic cervico-thoracalgia is essentially for analgesic purposes and does not claim to fight against the causes. In addition, the study of the pharmacodynamics of analgesics shows that the optimal effect of the drug does not exceed six hours after its administration. In non-drug treatments, the goal is to reduce symptoms by directly treating the cause. Workstation ergonomics is one of the central solutions for MSD control (Haldeman et al, 2008). Stress, repetitive strain, and prolonged posture would increase the risk of chronic neck pain (Haldeman et al, 2008). The anteroprojection of the head is particularly highlighted by Loubières and his collaborators (2013) as deleterious. Arranging rest periods, helping to manage stress and alternating between work positions and tasks are a range of preventive measures that can reduce the risk of MSDs occurring in the workplace (Petit, 2017).

Physiotherapy, on the other hand, is essential in the prevention and treatment of these conditions. The HAS recommends, as some authors (Haldeman et al, 2008), active exercises in case of chronic neck pain. It also recommends a number of techniques such as mobilizations and massages (ANAES, 2003).

The massage manoeuvres used such as kneading and deep sliding pressure (M3P) activate several functions. Here we consider its effects on 1/musculoskeletal system (extensibility) (Dryden and Moyer, 2012), on 2/circulatory system (vasodilation) (Dryden and Moyer, 2012), on 3/somesthesic system (analgesic action) (Chauvière, 2002), as well as on 4/parasympathetic nervous system (general body recovery) (Maratosa and al., 2017). The decrease in muscle stiffness is demonstrated by kneading, however this effect disappears when this massage is stopped (Hopper and al., 2005). In addition, studies conclude that massage would have beneficial effects in reducing pain (Lardry, 2002), unlike some studies that state the opposite (Van der Dolder and al., 2012). Beyond this controversy, we question the existence of other therapeutic options. One of these options is the transverse tensioning of the cutaneous and muscular planes (METT). It differs from massages by a precise manual application, as well as by the introduction of a pause time

between each movement performed. This would allow the nervous system to integrate related seismic information (Tremblay, 2015).

The operation begins with the application of a soft and slow surface friction within the elastic limit of the skin. This is followed by a deep static pressure maintained with a slight horizontal tension of the muscular plane for about fifteen seconds. The manoeuvre ends with deep friction on the muscular body so that the physiotherapist's fingers roll over it.

In the same way as M3P, METT would have an action on the autonomic nervous system, with regulation of physiological constants such as decreased heart (CF) and respiratory (FR) rates and blood pressure (BP).

The purpose of this research initiation work is therefore to show the potential effects of an innovative technique to reduce chronic muscle pain. The interest is twofold: to improve the quality of life and reduce health care costs by promoting the resumption of patients' professional activity. We will try to demonstrate that METT treatment of chronic muscle pain is more effective in short, medium and long term than M3P. For this, we will propose an experimental protocol of a duration of six weeks based on the comparison of these two techniques. This manuscript is divided into three parts: the first part will present the theoretical framework useful for understanding this work, followed by a second part where the methodology we have developed will be described and finally a last part where our thoughts and perspectives will be reported on the process of building this document. A conclusion will bring out the key elements of this research.

II. THEORETICAL CONTEXT

II.1. Anatomo-physiological reminders

a. Nervous system

The nervous system is a complex structure that regulates the body's functions. It is composed of two parts: the central nervous system (brain and spinal cord) and the peripheral nervous system (somatic nervous system and the autonomic or vegetative nervous system with its two subsystems: sympathetic and parasympathetic). (Annexe A).

In this thesis, we will first briefly describe the physiological aspect of the conduction pathways of related information and their expression in the body, then, the possible treatments that can be considered depending on the origins of the pain. Depending on the physiotherapist's intervention, the physiological impact will be diverse. Pain sedation via M3P or METT treatment will affect the autonomic nervous system. By definition, this system is "a set of nervous elements that governs the functioning of the viscera and maintains the basic vital functions: breathing, circulation, digestion and excretion". (Delamare, 2012).

b. Sensitive receptors and types of nerve fibres

In the skin, there are various receptors specific to a type of stimulation (Annexe B).

Sensitive receptors are also found in muscles such as Pacini's corpuscles and free endings. The free endings are located in any structure of the body: skin, joint, viscera and muscles. The free terminations collect nociceptive messages, which travel through two families of fibers: Aδ and C (Annexe C).

The conduction rate of the C fibres is low: 1 to 2m/sec due to their amyelinic character. On the other hand, Aδ and Aβ type fibres have a conduction velocity of 5 to 40 m/sec and 100 m/sec respectively (Lazorthes, 1993). When pain appears, for example, in the event of a shock, it is first the Aδ that are activated and then the C (Annexe D).

There is a subtype of C-fibre called "tactile C-fibre" or CT-fibre, which is responsible for transmitting emotional touch information. However, this information is not sent to the sensorimotor cortex, but to the insula, otherwise known as the island cortex.

c. Insula et homeostasis

The insula is a part of the cerebral cortex that is invaginated within the lateral sulcus, formerly called the Sylvius fissure. Few studies explore the functioning of this part of the cerebral cortex. Some studies using functional magnetic resonance imaging (FMRI) have shown the involvement of CT fibres in the activation of the island cortex (Olausson, 2002, 2008; Morisson, 2011).

Homeostasis is the ability to maintain the body's physiological values relatively constant despite internal or external imbalances.

The insula is one of the actors in the maintenance of homeostasis (Oppenheimer, 1992; Critchley, 2005). It participates in communication with the brain on the physiological state of the body, thus allowing the somatic state to be perceived via the posterior part of the insula (Graig, 2003, 2009). It constantly informs the body of internal events such as heart rate or pain (Baliki, 2009).

d. Physiological mechanism of pain

The nervous system governs all our actions or sensations, whether conscious or not, and among them, the integration of painful sensory afferences is really important. The nervous system's means of communication to prevent our body from danger is nociceptive stimuli. All information perceived by the sensory system, whether internal or external, is captured using nociceptive receptors: nociceptors.

The first step in the path of pain is called: transduction. The nociceptive stimuli will be captured by the free endings. Unlike the skin, the muscle has fewer free endings, which may explain the diffuse nature of muscle pain. The information is then transmitted by the ascending sensory pathways to the central nervous system (Baron, 2009) via the C fibres and Aδ : it is the conduction and transmission of the nerve impulse. This influx will reach the outer region of the dorsal horn of the spinal cord. The existence of two types of fibres

that conduct information gives rise to two paths of conduction and transmission: the paleo-spino-reticulo-thalamic bundle composed of C fibres and the neo-spinothalamic bundle composed of Aδ fibres (pathway diagram).

The path taken by the C fibres is the support of the affective and cognitive component of pain while the other path is devoted to sensory-discriminative information of pain. The nociceptive message is modulated during its journey where it can be increased, reduced or interrupted. This mechanism is achieved by integrating the message into the brain.

In addition, if the pain is maintained over time, for more than 3 months (HAS, 2016), due to excessive nociception, or if it is of neuropathic origin or related to a dysfunction in pain control systems without identified injury, it can be described as chronic. In this thesis, the pain concerned is that caused and maintained by muscle contracture.

II.2. The origin of muscle contracture and its relationship to pain, amplitude, and physiological constants

Skeletal striated muscle tissue is a tissue composed of a parallel arrangement of several thousand muscle fibers forming bundles of fibers that are themselves grouped together to form a muscle. The muscle fibre, myofibril, is formed by the contractile structural unit of muscle cells, the sarcomere. The muscle contraction mechanism is made possible by hydrolysis of ATP and by opening the attachment sites linking the myosin head to actin. This opening is done by fixing Ca2+ ions on troponin C.

A muscle contracture is the moment when the muscle fibres remain contracted. The origin of this phenomenon takes shape when there is inhibition of Ca2+ ion recapture. The sarcoplasmic reticulum is the organelle in charge of controlling the storage of these ions, it is thus a homeostatic regulator of intracellular calcium (Rigoard, 2009; Sorrentino, 2011).

In addition, muscle contracture can be explained by the theory of Cinderella fibre syndrome. In 1991, Hägg defines it as "the story of a muscle fibre that never rests, in an individual, without hope of a happy ending". These muscle fibres may be those of the upper trapezius which are characterized by a low excitation threshold. Indeed, it is type I fibres that are continuously recruited during low amplitude efforts and during prolonged

static postures in front of a computer screen for example. This low intensity muscle activity, combined with prolonged contraction, results in the production of nociceptive substances such as noradrenaline or prostaglandin according to the "Brussels model" (Johansson et al, 2003). This model also indicates a decrease in systemic and local blood flow. This would result in an increase in the sympathetic activity of the vegetative nervous system.

The literature (Hägg, 1991 ; Johansson et al, 2003) shows us that isometric contractions of the upper trapezius throughout the day will cause pain, as well as an increase in sympathetic activity, regardless of the person's state of health.

Contracture, and the associated pain, causes muscle shortening resulting in limited range of motion (Simons, 1996 ; Travell and Simons, 1998). This restriction of joint amplitude is present in both active and passive movement, and varies according to the muscle affected. The mono- or polyarticular nature of the muscle, its volume and the amplitude of the associated movement are factors that vary the extent of the restriction of joint amplitude.

II.3. The effects of sliding pressure massage and deep kneading

a. Gate control

Massage has been used for centuries as a first approach to pain. One of the actions of massage is to reduce the pain information by over-soliciting the sensory fibres sensitive to touch: the fibres Aβ. The passage of tactile information is a priority over the nociceptive information conveyed by the fibres Aδ and C. This is explained by an inhibition of the nociceptive nerve message via an inhibitory interneuron (Goutos, 2009). This is the Gate Control theory proposed by Patrick Wall and Ronald Melzack in 1965.

b. Effects of sliding pressure massage and deep kneading

Among a range of techniques already available, we will focus on massage composed of deep sliding pressures (PGP) and deep kneading (PP) allowing in particular the relaxation of muscular tensions. PGPs are manoeuvres that compress and mobilize the soft parts of the underlying planes in the centripetal direction. Secondly, the PP technique is a three-dimensional manoeuvre which, according to Holey and Cook (2011), consists in grasping,

lifting and moving the muscle masses relative to each other by performing a twisting and stretching movement.

M3P is believed to play a role in reducing muscle tension and overall relaxation (Prentice, 2011; Dryden, 2012). This type of massage would have an influence on the muscle tissue by increasing its extensibility and decreasing its stiffness (Prentice, 2011) thus allowing an increase in the joint amplitude (Sefton, 2011). In terms of cardiovascular activity, M3P promotes venous return (Storck, 2007) and reduces heart rate (Moraska, 2008; Lindgren, 2010). And psychosocially, this type of massage would reduce stress and anxiety (Field, 2002; Prentice, 2011).

Martin Verra and Dominique Monnin (2016) note a positive effect of massage on lumbar pain only in the short term. Assuming that muscle tension results from phenomena similar to and not specific to a part of the body, the treatment of low back pain could be extended to cervical pain.

II.4. The effects of transverse tensioning

When performing transverse tensioning of the skin and muscle planes (METT), each movement has its physiological importance. Friction of the skin surface is the first step in METT. During this movement, the somesthesic receptors sensitive to skin stretching, pressure, intensity and duration of the stimulus are activated: these are Ruffini's corpuscles. This family of mechanoreceptors is mainly located in the dermis and their role is to inform the central nervous system of sensory stimuli through the fibers Aβ The tactile C fibres (or CT) can also be used during this manoeuvre. These CT fibres would be activated first to stimulate the regulation of homeostasis by influencing the autonomic nervous system (Gerwin, 2014) (Annexe F) and in particular the parasympathetic nervous system (Maratosa et al., 2017). These fibres are activated by a soft touch and are directly related to the insula (Pawling, 2017). It is assumed that the regulation of Ca2+ homeostasis involved in contractures occurs via the action of the insula stimulated at this stage due to the potential activation of CT fibres.

The application of deep static pressure is the second step in the manoeuvre. The function of this gesture is to reoxygenate and soften the muscle tissue when the tension is released

(Chaitow, 2006). It will be accompanied by an increase in oxygen saturation and blood circulation (Munk, 2012)

The last step of the METT consists of a deep and slow friction on the muscle tissue perpendicular to the fiber axis in the opposite direction to the first step. From a physiological point of view, the indirect stretching of the tendons caused by deep friction activates the Golgi tendon organs (OTG). During this step, the therapist's fingers roll transversely on the muscle and induce a return to the initial position of the muscle tissue at the end of the movement. This last step would induce a relaxation of the muscle tissue in the same way as a reverse myotatic reflex. In the literature, Fernández-de-las-Peñas, César et al. (2006) report an increased decrease in pain in the cervical region due to deep static pressure or transverse friction of muscle fibres on the trapezius. As a result of these three steps, we introduce a break time at defined times (Annexe C) so that the nervous system can integrate the related somesthesic information (Tremblay, 2015).

II.5. Similarity with existing manoeuvres

Due to the non-existence of the METT, we do not have any real evidence to support our assumptions. However, to get an idea of the potential effects of this innovative technique, we can make a comparison with the physiological effects of existing techniques. To do this, we will compare the three movements of the METT with the surface friction, trigger point and hook massage.

a. Surface friction

This massage technique consists in mobilizing a tissue plane (superficial) in relation to another underlying. Fingers should not slip on the skin, but pull it using its elastic capacity with adequate pressure. It restores mobility between planes, defibrosis and creates local vasodilation (Dufour, 1999; Storck, 2007).

b. Trigger point

The treatment of chronic pain by trigger points has characteristics common to our technique. In this method, the therapist exerts ischemic compressions, also called deep static pressures, in muscle tension. During the METT we are not on the contracture, but on the muscle tissue or even the tendon as a whole. Trigger points are precisely mapped in the body. According to Chaitow (2006), trigger point treatment creates a massive blood flow when pressure is released, inhibits the painful message with gate-control, softens compressed tissues over the long term and releases endorphins. According to Renan-Ordine et al. (2011), treatment with deep static pressures could result in a gain in joint amplitude. Deep static pressures on the trapezius (Oliveira-Campelo et al, 2013) and on low back pain (Takamoto et al, 2015) would respectively reduce pain from one week to four weeks after treatment. However, in Takamoto's study, patients suffered from acute and non-chronic low back pain.

c. Hooking

Kooking is a therapy with instrumental assistance, which makes it possible to mobilize the planes of intermuscular slippage. This mobilization is carried out transversely to the direction of the muscle fibres (Vanderwalle, 2012). Despite the use of an instrument for mobilizing structures, this technique is similar to the deep friction of METT, which is practiced manually. It has a mechanical action by releasing myofascial adhesions, as well as a reflex effect by lifting muscle tension and increasing local blood circulation (Veszely, 2000; Aiguadé, 2008; Lévénez, 2009; Vandewalle, 2012).

III. METHODOLOGY

III.1. Objective of the study

In this study, we will compare two techniques: METT and M3P as part of a treatment for chronic cervico-thoracic pain in office workers.

III.2. Hypothesis

Our main objective is to show through the literature the potential benefits of performing METT to treat chronic pain rather than M3P.
Second, we assume that METT has an increased incidence in pain sedation, joint range gain and regulation of physiological constants in the short, medium and long term.

III.3. Type of study

This study is experimental, controlled and randomized. It is experimental, because our study consists in testing the validity of our hypotheses through an experiment conducted in a structure. The result of the latter may or may not validate our assumptions. Our study is randomized because of the random distribution of participants into two groups: control and experimental. The control is carried out by checking that the groups have similar characteristics in terms of age, intensity of perceived pain and since when it appeared.

III.4. Target population and sampling

The target population is active office workers aged 18 to 65.

In order to participate in our study, our sample includes men and women who must work at least 30 hours per week in front of a computer in a sitting position (Nawal, 2013). The pain experienced must be chronic, that is, it must have been felt for at least 3 months. The latter must be muscular and localized in the cervico-thoracic region. The criteria for inclusion, non-inclusion and exclusion are set out in the following table:

Inclusion criteria	non-inclusion criteria		Exclusion criteria
-Age: between 18 and 65 years old: concerns the working population **-Sex:** male and female **-Work:** At least 30 hours/week sitting at his workstation (Nawal, 2013) **-Location of muscle pain:** cervico-thoracic region **-Pain:** Present for at least 3 months	**-Heart problems** **-Fever** **-Pregnancy** **-Phlebitis** **-Cancer:** On the localized area and ask for a medical referral **-Spinal artery test**	**-Skin complaints**: Avoid affected areas to limit spread, wear latex gloves **-Analgesic-based treatment** **-Inflammatory diseases:** On the area to be treated **-Hemophilia**	**-Skin complaints** **-Analgesic-based treatment** **-Pregnancy** **-Inflammatory diseases**: On the area to be treated **-Physical trauma**

Table 1: Presentation of inclusion, non-inclusion and exclusion criteria

The randomized aspect of our study is reflected in the equal probability that each participant will integrate one of the two groups. Our control and experimental groups will include 12 patients (Galindez-Ibarbengoetxea, 2018). The non-inclusion criteria identify the subjects who cannot participate in the study. The exclusion criteria concern subjects who have entered the study, but who are unable to continue it due to inappropriate events.

III.5. Description and justification of the choice of variables and data collection instruments

Variables :

The independent (VI) and dependent (VD) variables are:

VI	Dependent variable (VD)
Type of treatment: - By M3P - By METT	**Pain** (primary judgement criterion)
	Joint amplitudes (secondary judgement criterion) **:** upper cervical spine between the atlas and the axis, as well as that of the lower cervical spine between the lower plateau of the axis and the upper plateau of the first thoracic.
	Quality of life (secondary judgement criterion)
	Physiological constants (secondary judgement criterion) **:** breathing frequencies, heart rates and blood pressure

Table 2: Summary table of dependent and independent variables of the study

Materials and reports:

For this study it is necessary to have: a massage table, massage oil, an individual box with a quiet environment, as well as:

VD		Measuring tools	Measures
Pain		EVA : Visual scale Analogue	Judgmental measurement of subject's pain on a visual scale from 0 to 10 (Scott and Huskisson, 1974)
		NDI : Neck Disability Index	Questionnaire specific to cervical pain (Vernon and Mior, 1991)
Quality of life		SF-36	Measurement of the perception of the subject's quality of life as a whole
Joint amplitudes		Arthrodial protractor goniometer	Flexion/Extension, Inclinations and Rotations of the neck joints
Physiological constants	**TA et FC**	Wrist blood pressure monitor	
	FR	On palpation	One minute by focusing on the chest.

Table 3: Tools for measuring dependent variables : Follow-up assessment

- In this paper, we use the EVA Visual Analogue Scale (Annexe G) to assess the patient's subjective pain. It consists of a 100 mm line bounded by 2 ends that describe on the left side an absence of painful sensation and on the right side a sensation of maximum intensity / intolerable. The results of this scale are scores out of ten. A high score indicates greater pain. This test is validated in acute and chronic pain situations (Agence Nationales d'Accréditation et d'Évaluation en Santé, 1999). He was shown faithful by Huskisson in 1983.

- The Cervical Disability Scale: Neck Desability Index or NDI (Annexe H) is a questionnaire consisting of 10 items: pain, personal care, lifting and carrying loads, reading, headaches, concentration, work, driving, sleep and leisure. The results are expressed as a percentage: a high value indicates a higher disability.

Vernon and Mior (1991) presented the following interpretation:

- 0 à 8 % : no incapacity
- 10 à 28% : mild disability
- 30 à 48% : moderate disability
- 50 à 64 % : severe disability
- 70 à 100% : complete disability

It is the most commonly used self-assessment measure for neck pain.

NDI is considered a valuable tool for measuring cervical pain and disability in patients with acute or chronic neck pain (Estrade, 2018).

- ❖ Quality of life is assessed by the SF-36 questionnaire (Annexe I). This tool includes eight categories of questions: physical aspect, emotional aspect, vitality, mental health, general health, physical activity, social functioning and pain. With a total of eleven questions and thirty-six items (Leplège, 1998). A high score indicates a better quality of life.
- ❖ The transparent Protractor Arthrodial Goniometer (Annexe J) has been specially designed to measure cervical rotation, flexion, extension and inclinations of the neck. Manual direction finding is valid and reliable (Nussbaumer et al, 2010). During the measurement, the patient sits without leaning against a chair.
- ❖ Physiological constants such as heart rate and blood pressure are measured by an electronic wrist monitor (Annexe K). They allow the display of the blood pressure at plus or minus 3mmHg and the pulse rate with a margin of + or - 5% depending on the brand (NMmédical, 2019). During this measurement, patients are in the supine position and relax, they should not speak. We wait at least two minutes before taking the data. We believe that this period of time allows the patient to relax.
- ❖ The respiratory rate is done visually. We need a stopwatch. The patient is in supine position and closes his eyes to relax. We should not interact with the patient to avoid an unconscious change in respiratory rate. We count the breaths (chest lift) for one minute. The measurement begins about 1 minute after the patient is in this position. We believe that this period of time allows the patient to relax.

III.6. Procedures and applications

Procedure:

We selected a number of 24 patients, based on the literature (Galindez-Ibarbengoetxea, 2018). We provided them with a clinical check-up (Appendix A) in order to meet our inclusion and non-inclusion criteria. An important point of this assessment was the test of the vertebral artery. To do this, we place the subject's head outside the table, then extend it, followed by an inclination and a homolateral rotation for both sides. The test is positive if nausea or any other symptoms associated with vertebro-basiliary insufficiency appear. Symptoms can be: a change in vision, dysarthria, ataxia, dizziness or even hemianesthesia. The positive test contraindicates the manipulation of the cervical spine. Subsequently, the selected subjects sign the informed consent form (Appendix B). Patients are randomized and controlled according to the number of people involved in the study.

The study is conducted twice a week, at least two days apart, over a period of six weeks, or twelve sessions (NGAP, 2018). We will always pick up our patients in the same order and at the same time. This helps to establish a certain routine and thus avoid possible oversights of the subjects.

The duration of a session is 30 minutes as recommended by the Regional Socioprofessional Commission of Physiotherapists of Rhônes-Alpes in 2016. Thus, during the first session, each patient will have to complete two questionnaires (NDI and SF36), assess his pain (EVA), and the therapist will have to measure neck amplitudes and physiological constants. This data collection will be done every two weeks in order to objectify a potential evolution.

The patient should not be stressed and pressed for time when completing the questionnaires in order to minimize errors in data collection. We make sure that the patient is calm and relaxed before taking measurements. This procedure will always be carried out in the same way to avoid distorting the results.

Once the data is collected, we can begin the care. We do not have a placebo group. As for the experimental group, we hope to have a more efficient method.

Before starting our manoeuvres, we place our patients in an individual box, on a massage table in a ventral position, with their heads in the hole provided for this purpose, with a

cushion under the kick to relax the back chain. A personal sheet is placed on the table to meet hygiene requirements. The box is closed to get the quiet environment you are looking for. Subjects will be shirtless so that we can perform our techniques. We will also need massage oil so that the manoeuvres do not irritate patients' skin during M3P.

After all these precautions, we will perform either M3P or METT on our patients in the cervico-thoracic region. These techniques are described in the following summary table:

	Control group: 12 subjects	**Experimental group: 12 subjects**
Duration of treatment	6 weeks	6 weeks
Number/duration of a session	2 sessions per week / 30 minutes	2 sessions per week / 30 minutes
Techniques used	**M3P**: Massage with deep sliding pressures (PGP) and deep kneading manoeuvres (PP). - PGP: A manoeuvre that consists of sliding your hands over the teguments while trying to compress essentially the striated muscle tissue. -PP: A three-dimensional manoeuvre that consists of lifting the muscle tissue and mobilizing it by a regular movement combining torsion and elongation.	**METT:** Transverse tensioning of the cutaneous and muscular planes, which are linked in the following way: - Surface friction of the skin perpendicular to the axis of the muscle fibres in one direction with the thumbs or index fingers. - Deep static pressure of the thumbs or index fingers at the edge of the treated muscle tissue. - Gentle and deep friction on the treated muscle tissue perpendicular to the axis of the muscle fibres in the direction opposite to the surface friction.

Table 4: Summary table of the procedure to be followed

Being non-invasive, our manoeuvres will not have any harmful impact on the subjects. We will recall our subjects one month, and 6 months after the end of the experiment in order to collect data again and thus realize the relevance of our results in the medium and long term.

III.7. Protocole

The full METT and M3P protocol is attached as an appendix (Appendix C).

III.8. Description of the data processing method

Measurements are taken every two weeks during the six weeks of treatment to ensure optimal follow-up even during the study. This allows us to see if there are any changes.

Short-term observable results are studied at the end of the 6-week treatment period. Mid-term effects will be measurable one month after treatment and long-term effects will be measurable 6 months later. This leads us to a 7.5 month study.

The values collected are subject to descriptive statistics such as the mean and standard deviations. The use of the Student test is also used and allows us to compare the average values of our variables. The Statistica 13.3 software will be used to better process the data collected. Through this software, we will be able to check if our data follow the normal law by analyzing the distribution of the lastest one. The test most likely to justify this normality is called: Shapiro-Wilk test (Henderson, 2006). This test is perfectly in line with our study due to the small size of our sample. It will determine whether the null hypothesis is validated, which implies that the sample comes from a normally distributed population.

IV. CRITICAL REFLECTIONS AND CONCLUSION

Our body is constantly under the control of the nervous system. Any perceived stimulation is integrated in order to inform him/her of changes in his/her internal and external environment. The conduction of information is prioritized according to its priority: between two sensory stimuli, we perceive the one with the highest intensity as a priority. This is why it is important to know how to communicate with the nervous system. According to the literature previously mentioned, the three movements similar to those of the METT (surface friction, trigger point and hook) are used without a break time during their application. The same is true for M3P, which runs continuously. We believe that this continuous stimulation of the receptors is not adequate for the time required for somatosensory integration. Sensitive nerve impulses cannot be properly treated by the central nervous system due to the abundance of related information received. In addition, the literature mentions an ephemeral effect of M3P treatment (Hopper et al., 2005) related to the overload of information to be processed by the nervous system. We therefore assume that M3P reaches its treatment limits in the medium and long term due to a global, non-specific and unsustainable action on the body.

METT would potentially be one of the most effective techniques for optimally stimulating the nervous system. The slowness and precision of the gestures performed during the manoeuvre would be intended to send distinct and targeted information. In order to optimally integrate the related influxes, we introduce a break time following each series of movements (Appendix C) allowing the nervous system to develop an appropriate response. To potentiate the effects of METT, a pause should have been made between each point, something that is impossible to do in a 30-minute session as in our protocol. Homeostatic equilibrium is one of the adapted responses that can be considered when the internal equilibrium is disrupted. It results in the regulation of physiological constants. With the method set out in Part III of this thesis involving METT, it would be possible to objectify this response by measuring these constants and deduce its impact on homeostasis.

Chronic pain related to contractures is a good example of homeostasis dysfunction, because the muscle fibres affected cannot respond to the control of the nervous system. To support our claims, our study measures the impact of METT on pain through EVA. Pain sedation is expected to be at least equivalent to M3P. Knowing that pain influences quality of life, range of motion (Chaitow, 2006; Renan-Ordine, 2011) and the values of physiological constants studied, it is assumed that METT would have a long-term impact on these parameters at least equivalent to M3P.

We established a protocol based on massage as an element of comparison. Nowadays, massage remains one of the predominant tools in the treatment of chronic pain related to contractures. It is a technique that has proved its worth but which, however, remains controversial on certain points, particularly on its long-term effectiveness. This is why we have been looking for a reliable and efficient alternative.

However, we have decided to treat exclusively with M3P and METT. It would seem that to have beneficial effects in the long term, it would be wise to combine this treatment with daily physical activity. The High Authority on Health (ANAES, 2003), as well as Haldeman et al. (2008), agree in this direction by advocating active movements and physical activity in the treatment of chronic neck pain. This is why active movements of the cervico-thoracic region (flexion/extension, rotation, inclination), as well as posturology exercises could undoubtedly perpetuate our expectations. In addition, whether it is for the prevention or care of chronic neck pain, the business world should also ensure the ergonomics of workstations, as well as the management of tasks and stress of their employees.

However, it is important not to overlook any problems that may be encountered in this study. Inequality may occur in the random distribution of patients in each group. There is a time gap in the onset of chronic pain between each patient. Moreover, due to the small size of the study, we cannot generalize the potential results expected. It is possible that some subjects may wish to withdraw from the study, or others may be excluded: this allows us to say that our workforce must be larger.

An error when taking measurements can also occur. Indeed, an error can be made when taking measurements with the arthrodialprotractor goniometer. Rigour in the therapist's measurements is essential in the quality of the data retrieved from one week to the next. This remark is also equivalent for the measurement of respiratory rate. In addition, the

assessment is time-consuming. By haste, the assessment can be done hastily and careless errors can be made by the therapist or the patient. Indeed, the patient may fill out the questionnaire too quickly and tick a box without taking the time necessary for reflection, or the physiotherapist may make mistakes in his measurements.

It is also possible that an instrument is not calibrated correctly, or that the patient is unable to attend a session. We would then have one less session or one less measurement.

In addition, the implementation of the treatment and the techniques performed may differ depending on the therapist's experience. Indeed, a therapist may be more or less efficient in the practice of M3P or METT. As a result, the results obtained could be distorted. The METT requires precision in the manoeuvres as well as rigour in the pause time between each series of points.

Finally, after 6 weeks of treatment, a relationship of trust was established between the patients and the therapist. It is not unthinkable that patients may have wanted to promote the completion of the work: when scoring the pain or completing the questionnaire, some may have unconsciously minimized their pain or its impact in order to obtain a progression in measurements.

Attendance in data collection is necessary to optimally apply our study because of the large number of assessments to be carried out during the study. This substantial harvest is carried out every two weeks for each patient, as well as one and six months after treatment. This implies regularity on the part of the practitioner and the subjects.

Through this study, we have tried to provide additional insights into the treatment of chronic muscle pain in the cervico-thoracic region of office workers. We have tried to justify in the literature that METT would be more effective than M3P. Due to adequate stimulation, METT would be a potentially more efficient alternative in the treatment of these pains than a massage based on sliding pressures and deep kneading. Indeed, our innovative technique may have a greater impact on pain sedation. It would also allow a better amplitude gain, a better quality of life, as well as a regulation of physiological constants. In addition, these beneficial effects would last longer than M3P. We believe that these benefits could continue into the medium to long term. The combination of other treatments based on physical activities, postural exercises and workstation adaptation could potentially have a positive impact on duration.

In order to prove the stimulation of the targeted brain areas mentioned during the application of METT, it would be interesting to practice our method under the control of a functional MRI. This imaging would also prove the insula's involvement in the practice of transverse tensioning.

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APPENDIX

Appendix A :

Clinical Evaluation

Name/ First name :

Each item must be checked for the person to be selected:

-Office employee:

-At least 30 hours a week sitting in front of a computer:

-Muscle pain in the cervico-thoracic region every day for at least 3 months:

The patient is not included in the study if one of the following items is checked :

-Heart problems:

- Fever :

- Pregnant women :

- Phlebitis

- Cancer: On the localized area and ask for a medical referral:

- Skin disorders: Avoid affected areas to limit spread, wear latex gloves:

- Treatment based on analgesics:

- Inflammatory diseases in the area to be treated:

- Hemophilia:

- Positive vertebral artery test:

Appendix B : Informed consent form to be completed by the subject

Informed consent form

Protocol: **COMPARATIVE STUDY OF TWO PROCEDURES IN THE FRAMEWORK OF THE INHIBITION OF CHRONIC MUSCULAR PAIN IN THE CERVICO-THORACICAL REGION**

I, the undersigned, Mrs/Ms/Ms/Ms..... gives my informed consent, after having received the necessary information, indications and contraindications concerning the treatment plan to be carried out by the students in physiotherapy Patoz Florent/Sempere Romain and Meuland Guillaume, after clinical assessment and having obtained satisfactory answers to my questions concerning these procedures.

In addition, I am informed that:

- My identity and results will be treated confidentially

- I can request additional information about the study at any time

- I can leave the firm at any time

Done in duplicate, on.....

Attention! This form, which is very brief, is in no way a foolproof protection in the event of a problem with a patient. It will just be one more piece of evidence, which, when added to the patient record, will demonstrate that you have fulfilled your obligation to obtain informed consent prior to care.

Patient's signature

(preceded by the mention read and approved)

Practitioners' signature

Appendix C : Protocol to be followed

	Control group: 12 subjects	Experimental group: 12 subjects
Duration of treatment	6 weeks	6 weeks
Number/duration of a session	2 sessions per week / 30 minutes	2 sessions per week / 30 minutes
Techniques used	**M3P**: Massage with deep sliding pressures (PGP) and deep kneading manoeuvres (PP). - PGP: A manoeuvre that consists of sliding your hands over the teguments while trying to compress essentially the striated muscle tissue. -PP: A three-dimensional manoeuvre that consists of lifting the muscle tissue and mobilizing it by a regular movement combining torsion and elongation.	**METT:** Transverse tensioning of the cutaneous and muscular planes, which are linked in the following way: - Surface friction of the skin perpendicular to the axis of the muscle fibres in one direction with the thumbs or index fingers. - Deep static pressure of the thumbs or index fingers at the edge of the treated muscle tissue. - Gentle and deep friction on the treated muscle tissue perpendicular to the axis of the muscle fibres in the direction opposite to the surface friction.

The entire staff will be seen between Monday and Tuesday and will be reviewed Thursday and Friday in order to perform the sessions per week with a beat of 2 days between sessions. Every week, at the end of the 2nd session, we will carry out a review in order to see the most precise evolution possible. Each patient is identified and numbered by a number.

Monday	Tuesday	Wednesday	Thursday	Friday
1	13		1	13
2	14		2	14
3	15		3	15
4	16		4	16
5	17		5	17
6	18		6	18
7	19		7	19
8	20		8	20
9	21		9	21
10	22		10	22
11	23		11	23
12	24		12	24

METTs: numbers 1 to 6 and numbers 13 to 18

M3Ps: numbers 7 to 12 and 19 to 24

The METT movement is composed of 3 specific steps:

Soft friction, deep static pressure and deep friction.

- The first movement is made with a slow speed and a light pressure in order to achieve a skin credit by pulling it.
- Once at the limit of its elastic capacity, the fingers penetrate vertically and deeply into the outer edge of the treated fabric. This is followed by horizontal tensioning applied for at least 15 seconds on this edge.
- Finally, after 15 seconds, a constant, gentle and slow transverse pressure is applied in the opposite direction to the first movement.

The direction of this manoeuvre is illustrated by arrows on the diagrams. These arrows correspond to the third part of the movement and therefore the first part of the movement is in the opposite direction to the arrows. It can be done with index fingers or thumbs depending on the accessibility of the tissues.

If the thumbs are used, the first step is to the practitioner and the third step in the opposite direction. If the indexes are used, the movement is reversed.

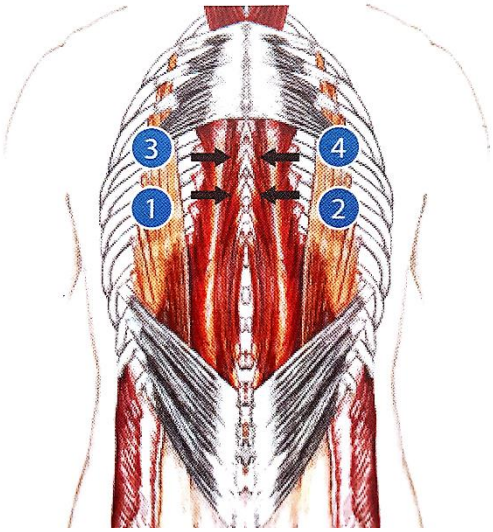
The protocol is carried out by following a succession of points mapped and divided into 5 series, always starting on the left side: the upper back, neck, neck, shoulders and finally the trapezius, with a minimum break time of two minutes between each series.

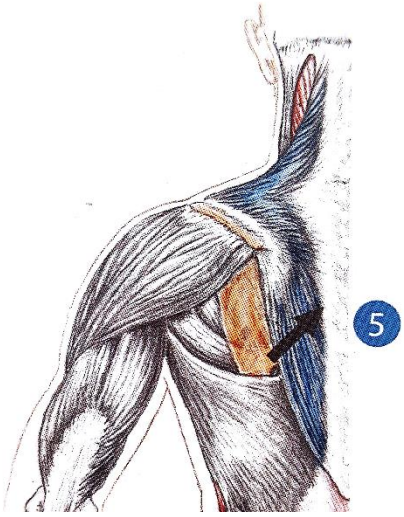
The points indicated on the diagrams must be reproduced on each side.

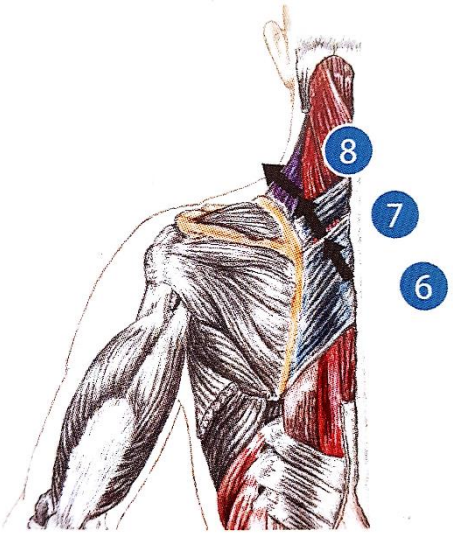
- 1st round: 12 points = 6 min
- 2nd round: 8 points = 4 min
- 3rd round: 6 points = 3 min
- 4th round: 6 points = 3 min
- 5th round: 6 points = 3 min

With a two-minute break between each series, or 29 minutes of treatment.

1st series: Upper back composed of 12 points



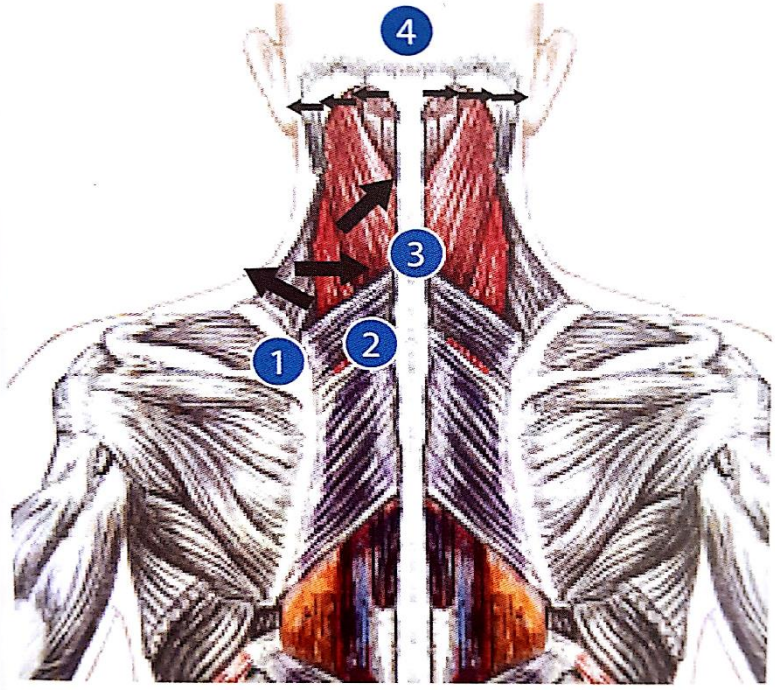




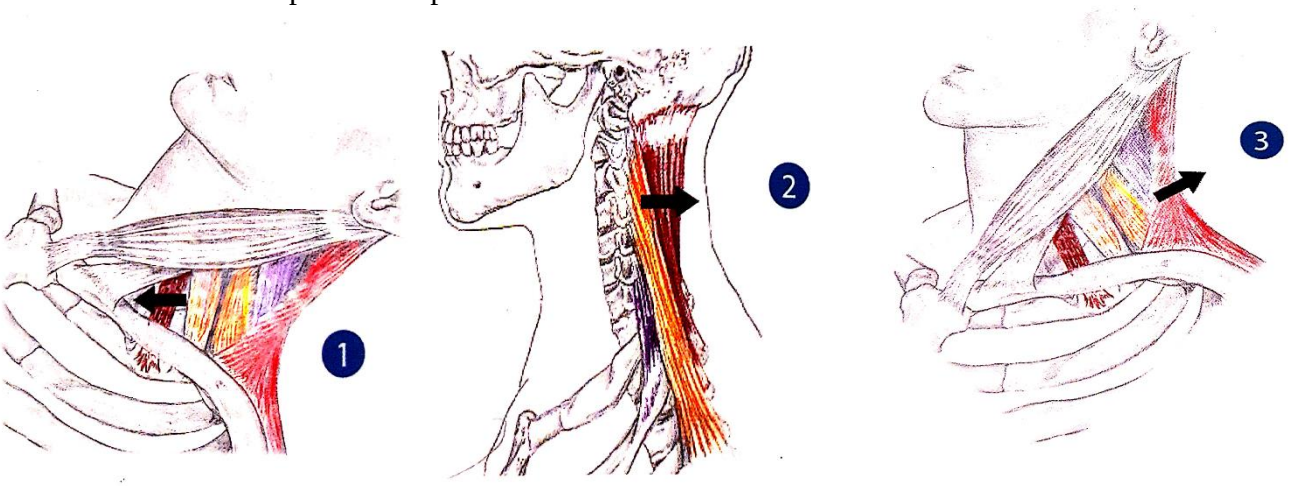
- Movements 1 and 4: Longissimus thoracic left
- Movements 2 and 4: Longissimus thoracic right
- Movement 5: Lower left trapezoid
- Movement 6: Large left Rhomboid
- Movement 7: Small left Rhomboid
- Movement 8: Left scapular lift
- Movement 9 to 12: The same movements from 5 to 8 but on the right

2nd series: Neck made up of 8 points

- Movement 1: Left scapula lift
- Movement 2: Splenius of the left neck
- Movement 3: Splenius of the left head
- Movement 4: Left occipital line
- Movements 5 to 8: The same movements from 1 to 4 but on the right

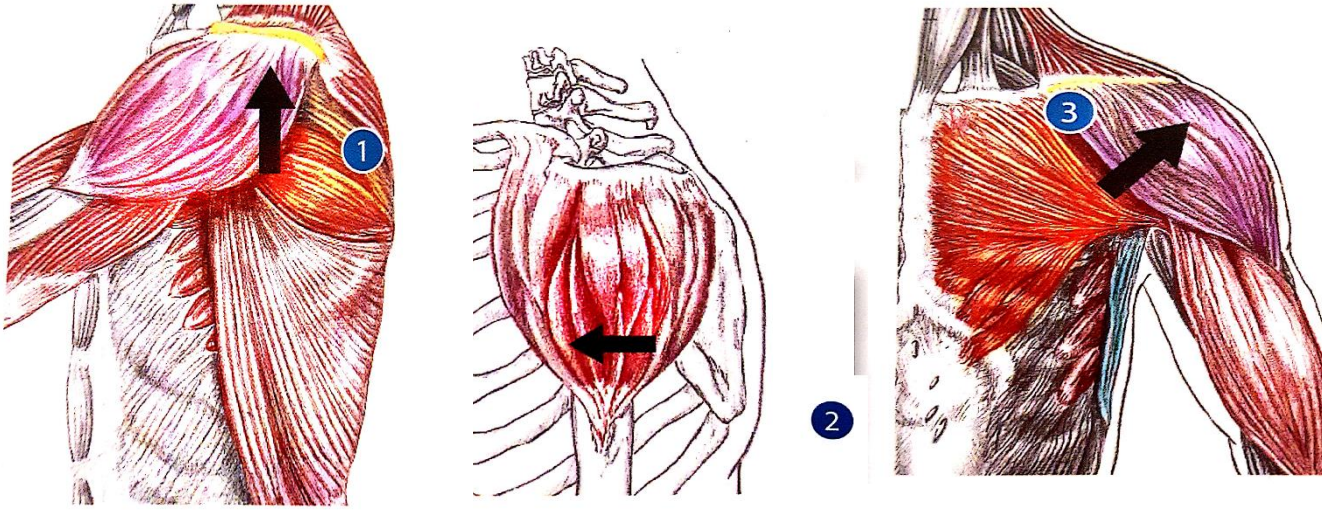


3rd series: Neck composed of 6 points



- Movement 1: Anterior, middle and posterior scenes
- Movement 2: Semi-spiny of the left head
- Movement 3: Splenius of the left head
- Movement 4 to 6: The same from 1 to 3 but on the right

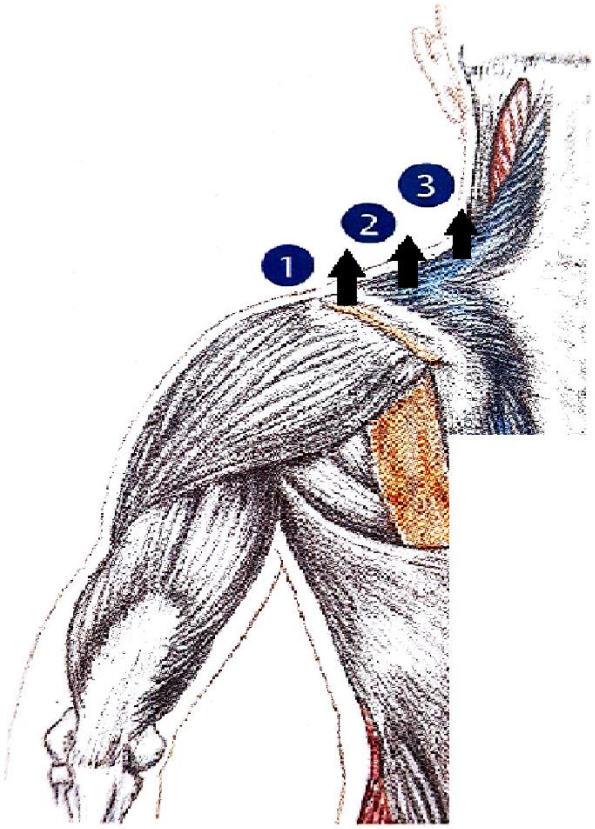
4th series: The shoulders composed of 6 points



- Movement 1: Left deltoid, posterior beam
- Movement 2: Left deltoid, medium beam
- Movement 3: Left deltoid, anterior beam
- Movement 4 to 6: Same from 1 to 3 but on the right

5th series: The trapezes composed of 6 points

- Movement 1: Distal third of the upper left trapezius
- Movement 2: Middle third of the upper left trapezius
- Movement 3: Proximal third of the upper left trapezius
- Movement 4 to 6: Same from 1 to 3 but on the right side



The M3P

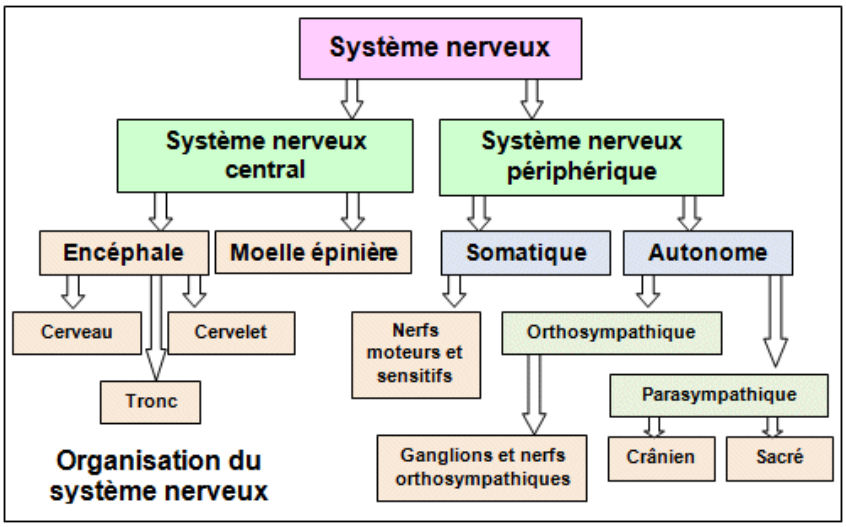
M3P: Massage with deep sliding pressure (PGP) and deep kneading (PG)

- PGP = Maneuvers that involve sliding hands over the integument while seeking to compress essentially striated muscle tissue and incidentally peri-articular soft tissue

- PG = Maneuvers that consist in grabbing, by lifting, the muscle tissue and mobilizing it by a regular movement combining pressure, elongation and torsion. (Three-dimensional manoeuvre)

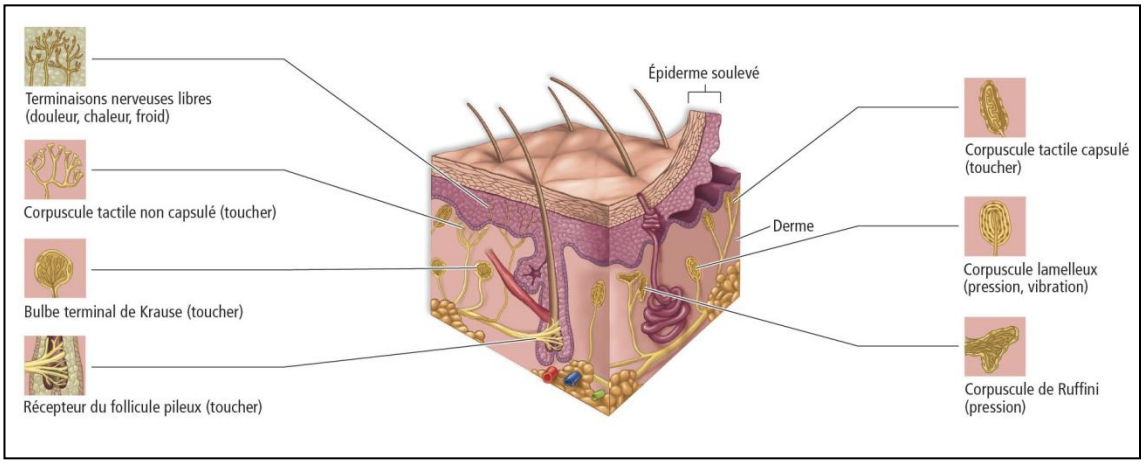
ANNEXES

Annexe A: Organization of the nervous system



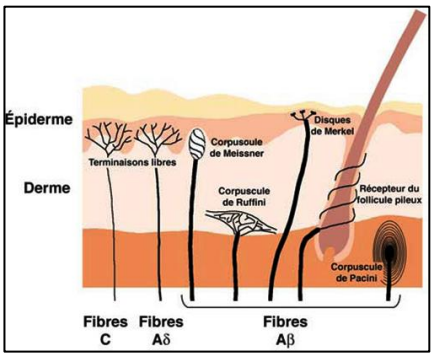
Organizational diagram of the nervous system (Thomsen, C. 2014)

Annexe B : Organization of the different skin receptors



Organizational diagram of skin receptors (Sylvia, S.; Windelspecht, M. 2014)

Annexe C : Diagram of cutaneous nerve fibres with their receptors



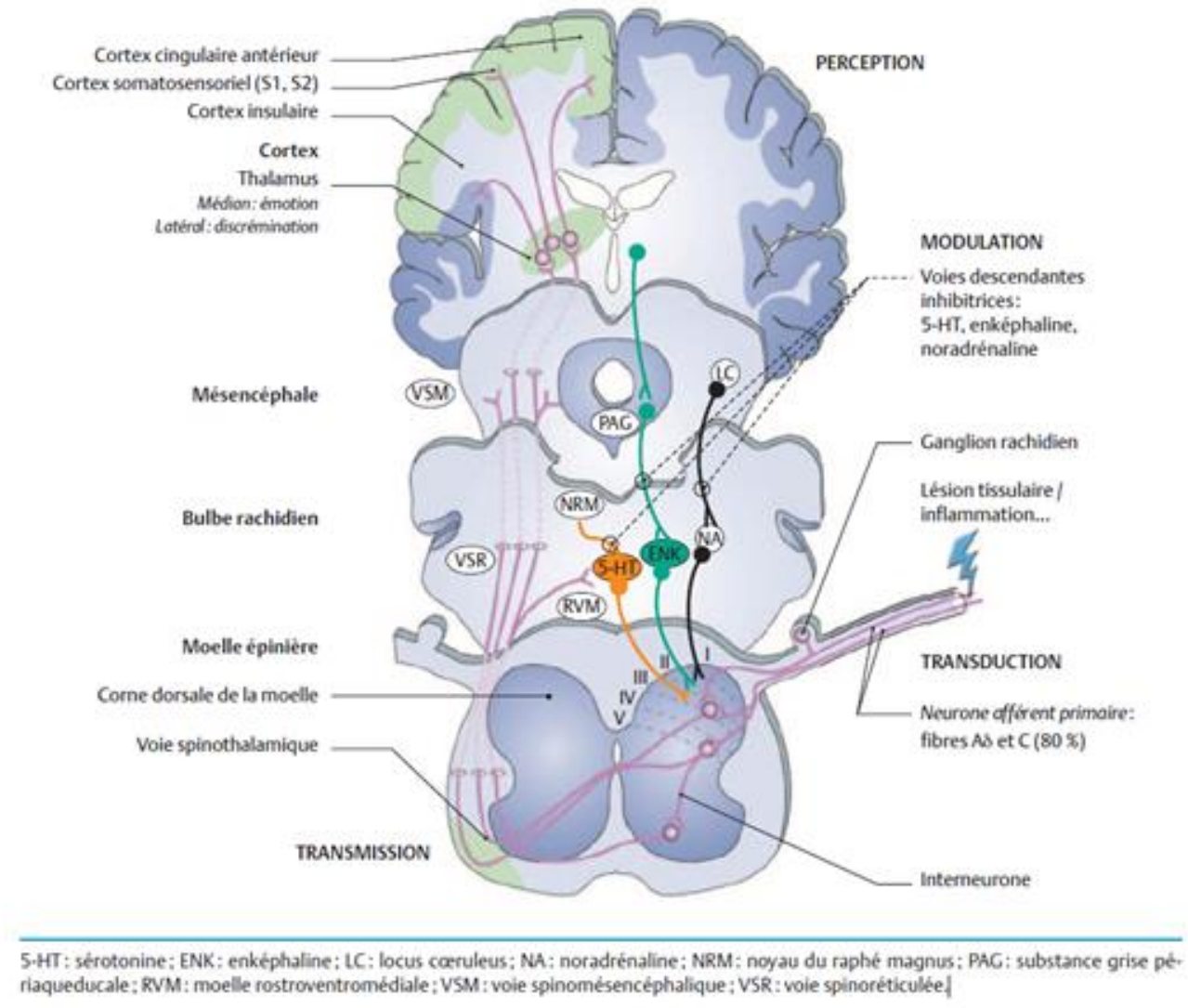
Representation of skin mechanoreceptors and nerve fibre types (Gardner, E.P., 2010)

Annexe D : Characteristics of cutaneous nerve fibres

Types de fibres	**Aβ**	**Aδ**	**C**
Diamètre (microns)	*5-15 µm*	*1-5 µm*	*0,3-1,5 µm*
Gaine de myéline	+++	+	-
Vitesse de conduction *(mètre/seconde)*	*40-100 m/s*	*5-40 m/s*	*1-2 m/s*
Récepteurs périphériques	*Spécialisés, encapsulés*	*Mécanonocicepteurs Terminaisons libres*	*Nocicepteurs polymodaux Terminaisons libres*
Stimulus spécifique	*Pression légère*	*Pression forte*	*Pression forte T° > 45°C Chimique*
Sensation produite	*Tact, proprioception*	*Douleur rapide*	*Douleur lente*

Explanatory table of the various types and properties of nerve fibres (Lazorhes, Y., 1993)

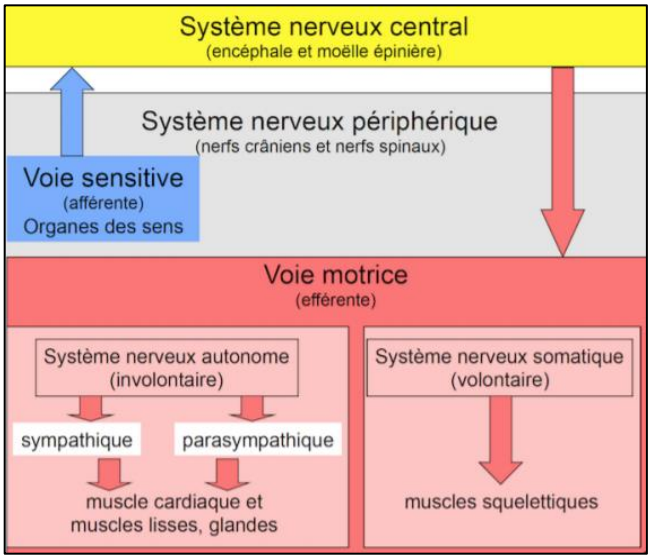
Annexe E : Schematic representation of the pain pathways



5-HT : sérotonine ; ENK : enképhaline ; LC : locus cœruleus ; NA : noradrénaline ; NRM : noyau du raphé magnus ; PAG : substance grise périaqueducale ; RVM : moelle rostroventromédiale ; VSM : voie spinomésencéphalique ; VSR : voie spinoréticulée.

The various transmission pathways of nociceptive nerve impulses (Field, 2004)

Annexe F : Exchange between the peripheral nervous system and the central nervous



Organization of related and efferent nervous exchanges (Elaine, N.)

Annexe G : Visual analogue scale

Pain index measured between 0 and 10 (*Agence Nationale d'Accréditation et d'Évaluation en Santé,* 1999)

Annexe H : Échelle d'incapacité cervicale : Neck Disability Index

Neck Disability Index

Office Use Only
Name _____
Date _____

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and **mark in each section only the one box that applies to you**. We realise you may consider that two or more statements in any one section relate to you, but please just mark the box that most closely describes your problem.

Section 1: Pain Intensity

☐ I have no pain at the moment
☐ The pain is very mild at the moment
☐ The pain is moderate at the moment
☐ The pain is fairly severe at the moment
☐ The pain is very severe at the moment
☐ The pain is the worst imaginable at the moment

Section 2: Personal Care (Washing, Dressing, etc.)

☐ I can look after myself normally without causing extra pain
☐ I can look after myself normally but it causes extra pain
☐ It is painful to look after myself and I am slow and careful
☐ I need some help but can manage most of my personal care
☐ I need help every day in most aspects of self care
☐ I do not get dressed, I wash with difficulty and stay in bed

Section 3: Lifting

☐ I can lift heavy weights without extra pain
☐ I can lift heavy weights but it gives extra pain
☐ Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table
☐ Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned
☐ I can only lift very light weights
☐ I cannot lift or carry anything

Section 4: Reading

☐ I can read as much as I want to with no pain in my neck
☐ I can read as much as I want to with slight pain in my neck
☐ I can read as much as I want with moderate pain in my neck
☐ I can't read as much as I want because of moderate pain in my neck
☐ I can hardly read at all because of severe pain in my neck
☐ I cannot read at all

Section 5: Headaches

☐ I have no headaches at all
☐ I have slight headaches, which come infrequently
☐ I have moderate headaches, which come infrequently
☐ I have moderate headaches, which come frequently
☐ I have severe headaches, which come frequently
☐ I have headaches almost all the time

Section 6: Concentration

☐ I can concentrate fully when I want to with no difficulty
☐ I can concentrate fully when I want to with slight difficulty
☐ I have a fair degree of difficulty in concentrating when I want to
☐ I have a lot of difficulty in concentrating when I want to
☐ I have a great deal of difficulty in concentrating when I want to
☐ I cannot concentrate at all

Section 7: Work

☐ I can do as much work as I want to
☐ I can only do my usual work, but no more
☐ I can do most of my usual work, but no more
☐ I cannot do my usual work
☐ I can hardly do any work at all
☐ I can't do any work at all

Section 8: Driving

☐ I can drive my car without any neck pain
☐ I can drive my car as long as I want with slight pain in my neck
☐ I can drive my car as long as I want with moderate pain in my neck
☐ I can't drive my car as long as I want because of moderate pain in my neck
☐ I can hardly drive at all because of severe pain in my neck
☐ I can't drive my car at all

Section 9: Sleeping

☐ I have no trouble sleeping
☐ My sleep is slightly disturbed (less than 1 hr sleepless)
☐ My sleep is mildly disturbed (1-2 hrs sleepless)
☐ My sleep is moderately disturbed (2-3 hrs sleepless)
☐ My sleep is greatly disturbed (3-5 hrs sleepless)
☐ My sleep is completely disturbed (5-7 hrs sleepless)

Section 10: Recreation

☐ I am able to engage in all my recreation activities with no neck pain at all
☐ I am able to engage in all my recreation activities, with some pain in my neck
☐ I am able to engage in most, but not all of my usual recreation activities because of pain in my neck
☐ I am able to engage in a few of my usual recreation activities because of pain in my neck
☐ I can hardly do any recreation activities because of pain in my neck
☐ I can't do any recreation activities at all

Score: ___/50 **Transform to percentage score x 100 = %points**

Scoring: For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5. If all ten sections are completed the score is calculated as follows:
Example: 16 (total scored)
50 (total possible score) x 100 = 32%

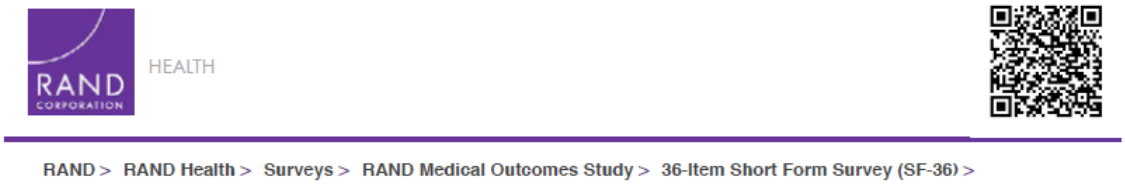
If one section is missed or not applicable the score is calculated: 16 (total scored)
45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 5 points or 10 %points

NDI developed by: Vernon, H. & Mior, S. (1991). The Neck Disability Index: A study of reliability and validity. Journal of Manipulative and Physiological Therapeutics. 14, 409-415

Neck Disability Index (Vernon et Mior, 1991)

Annexe I : SF-36 Quality of Life Questionnaire



RAND > RAND Health > Surveys > RAND Medical Outcomes Study > 36-Item Short Form Survey (SF-36) >

36-Item Short Form Survey Instrument (SF-36)

RAND 36-Item Health Survey 1.0 Questionnaire Items

Choose one option for each questionnaire item.

1. In general, would you say your health is:

- 1 - Excellent
- 2 - Very good
- 3 - Good
- 4 - Fair
- 5 - Poor

2. **Compared to one year ago**, how would you rate your health in general **now**?

- 1 - Much better now than one year ago
- 2 - Somewhat better now than one year ago
- 3 - About the same
- 4 - Somewhat worse now than one year ago
- 5 - Much worse now than one year ago

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	○ 1	○ 2	○ 3
4. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	○ 1	○ 2	○ 3
5. Lifting or carrying groceries	○ 1	○ 2	○ 3
6. Climbing **several** flights of stairs	○ 1	○ 2	○ 3
7. Climbing **one** flight of stairs	○ 1	○ 2	○ 3
8. Bending, kneeling, or stooping	○ 1	○ 2	○ 3
9. Walking **more than a mile**	○ 1	○ 2	○ 3
10. Walking **several blocks**	○ 1	○ 2	○ 3
11. Walking **one block**	○ 1	○ 2	○ 3
12. Bathing or dressing yourself	○ 1	○ 2	○ 3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health?**

	Yes	No
13. Cut down the **amount of time** you spent on work or other activities	○ 1	○ 2
14. **Accomplished less** than you would like	○ 1	○ 2
15. Were limited in the **kind** of work or other activities	○ 1	○ 2
16. Had **difficulty** performing the work or other activities (for example, it took extra effort)	○ 1	○ 2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	Yes	No
17. Cut down the **amount of time** you spent on work or other activities	○ 1	○ 2
18. **Accomplished less** than you would like	○ 1	○ 2
19. Didn't do work or other activities as **carefully** as usual	○ 1	○ 2

20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

- ○ 1 - Not at all
- ○ 2 - Slightly
- ○ 3 - Moderately
- ○ 4 - Quite a bit
- ○ 5 - Extremely

21. How much **bodily** pain have you had during the **past 4 weeks**?

- 1 - None
- 2 - Very mild
- 3 - Mild
- 4 - Moderate
- 5 - Severe
- 6 - Very severe

22. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

- 1 - Not at all
- 2 - A little bit
- 3 - Moderately
- 4 - Quite a bit
- 5 - Extremely

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
23. Did you feel full of pep?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
24. Have you been a very nervous person?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
25. Have you felt so down in the dumps that nothing could cheer you up?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
26. Have you felt calm and peaceful?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
27. Did you have a lot of energy?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
28. Have you felt downhearted and blue?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
29. Did you feel worn out?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
30. Have you been a happy person?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
31. Did you feel tired?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6

32. During the **past 4 weeks**, how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

○ 1 - All of the time

○ 2 - Most of the time

○ 3 - Some of the time

○ 4 - A little of the time

○ 5 - None of the time

How TRUE or FALSE is **each** of the following statements for you.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
33. I seem to get sick a little easier than other people	1	2	3	4	5
34. I am as healthy as anybody I know	1	2	3	4	5
35. I expect my health to get worse	1	2	3	4	5
36. My health is excellent	1	2	3	4	5

ABOUT

The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

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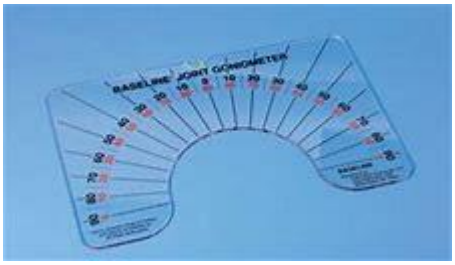
Santa Monica, California 90401-3208

SF-36 French Questionnaire (Leplège, 1998)

Annexe J : Arthrodial protractor goniometer



Measurement of joint amplitudes of the cervical region via the arthrodial protractor goniometer (Baseline Products, 2008)

Annexe K : Electronic wrist blood pressure monitor

Blood pressure and heart rate measurement (NMedical, 2019)