T.C.
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(GRADUATION PROJECT)

Effects of the Connective Tissue Manipulation on the Fine Motor Skills

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DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

Ceren Durmuş

Signature

DEDICATION

I would like to dedicate my thesis to my beloved and loving parents Ayşe and Baki Durmuş and my sister Derya Durmuş.

ACKNOWLEDMENT

I would like to express deepest appreciation to Assistant Professor Şule Demirbaş who continually provide us all support and guidance which makes this project possible. I am extremely grateful to her for providing these opportunities.

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LIST OF SYMBOLS/ABBREVIATIONS

CTM Connective Tissiue Manipulation (Massage)

SBP Sistolic Blood Pressure

DBP Diastolic Blood Pressure

RPS Right hand Pinch Strength

LPS Left hand Pinch Strength

RGS Right hand Grab Strength

LGS Left hand Grab Strength

DPB Dominant hand Perdue Pegboard score

NPB Non-dominant hand Perdue Pegboard score

BPB Both hands together Perdue Pegboard score

APB Assembly Perdue Pegboard score

SD Standard Deviation

ÖZET

Ceren D. (2016). Konnektif doku masajının ince motor beceri üzerindeki etkisinin incelenmesi. Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Fizyoterapi ve Rehabilitasyon Bölümü Lisans Tezi. İstanbul 2016.

Bu çalışmaya Ekim-Aralık 2015 tarihleri arasında, Yeditepe Üniversitesi öğrencilerinden 19-26 yaş aralığında gönüllü 25 sağlıklı genç yetişkin katılmıştır.

Çalışmamızda olguların demografik özelliklerini incelemek amacıyla anket kullanılmıştır. Ankette olguların demografik özelliklerinin yanı sıra fiziksel aktivite alışkanlıkları, sigara kullanımı, bilinen hastalıkları ve devamlı kullandıkları ilaçlar sorgulanmıştır. Fiziksel değerlendirmede manuel spigmanometre ile kan basıncı ölçümleri alınmış, avuç içi ve parmak ucu kavrama kuvveti ölçümleri için Pinch Track ve Grab Track Commender ölçüm cihazları kullanılmıştır. İnce motor beceri değerlendirmesi standart Purdue Pegboard Battery ile kılavuzundaki yönlendirmelere uygun yapılmıştır. Ölçümler alındıktan sonra olgulara 10 seans konnektif doku masajı uygulaması yapılmış ve son seansın ardından fiziksel değerlendirmeler tekrarlanmıştır. Tüm veriler uygun istatiksel yöntemlerle analiz edilmiştir.

Bu çalışmanın sonucunda konnektif doku masajının, sistolik ve diastolik kan basıncı üzerinde anlamlı bir etkisi bulunamamıştır. Konnektif doku masajının sağ ve sol el parmak ucu kavrama ve sol el avuç içi kavrama kuvveti üzerinde artış sağladığı bulunmuştur. Sağ el avuç içi kavrama kuvvetinde artış gözlenmiştir ancak bu artış istatiksel olarak anlamlı değildir. Konnektif doku masajı seansları sonrasında Perdue Pegboard alt görev skorlarında iki el ile yapılan alt görev dışında istatiksel olarak anlamlı artışlar kaydedilmiştir. İki el ile yapılan görev skorunda artış gözlenmiş ancak istatiksel olarak anlamlı bulunmamıştır.

Anahtar Kelimeler : Konnektif doku masajı, ince motor beceri

ABSTRACT

Ceren D. Investigation of effects of connective tissue manipulation on the fine motor ability. Yeditepe University, Faculty of Health Sciences, Department of Physiotherpy and Rehabilitation,Undergradute Thesis.

The study included 25 young healthy adults between 19-25 years old who studying at Yeditepe University and they involved to the study on a voluntary basis.

The demografic features of the subjects were taken with questionnaire included demographic features, but also it included questions about physical activity habbit, smoking, any known diseases and medications. For physical evaluation, blood pressure measurements taken by manuel sphygmomanometer, grab and pinch strength evaluated by Pinch Track ve Grab Track Commender measurement devices. Fine motor skills evaluated with Purdue Pegboard Battery and administered according to the instructions in the test manual. These measurements took before and after 10 CTM treatment sessions. All data were analyzed by appropriate statistical methods.

Connective tissue manipulation has no meaningful effects on systolic and diastolic blood pressure. Connective tissue manipulation makes increases on right and left hand pinch strength and left hand grab strength. Also makes increases on right hand grab strength but this increase is not statistically meaningful. After the connective tissue manipulation sessions there is a statistically meaningful increases at the scores of all Perdue Pegboard subtasks except both hand together subtask. Increase at the both hand together subtask score is found statisticaly meaningless.

Key words : Connective tissue manipulation, fine motor skill.

1. INTRODUCTION & PURPOSE

Connective tissue massage (CTM) is a manipulative technique that facilitates the diagnosis and treatment of a wide range of pathologies. Observation and subsequent manipulation of the skin and subcutaneous tissues can have a beneficial effect upon tissues remote from the area of treatment. These effects appear to be mediated by neural reflexes that cause an increase in blood flow to the affected region together with suppression of pain. The assessment of the patient and the clinical decision-making that directs treatment is based on a theoretical model that assumes a reflex effecton the autonomic nervous system which is induced by manipulating the fascial layers within and beneath the skin to stimulate cutaneo-visceral reflexes. CTM is becoming accepted more widely as research confirms the claims of an expanding population of practitioners.

CTM appears to work via a reflex effect on the autonomic nervous system which is induced by manipulating the fascia layers within and beneath the skin. There is some evidence that CTM produces physiological effects on the body. Regarding clinical effectiveness however, very few well designed controlled trials have been published using CTM, but these studies do indicate clinical benefit in relation to pain and peripheral circulation. This reflects the clinical experience of CTM users and the physiological understanding of how CTM works.[1]

Fine motor skills are the coordination of groups of small muscles to complete a task or to participate in an activity. [2]

The term ‘fine motor’ means ‘small muscles’. Fine motor skills involve the use of the small muscles in the fingers, hand and arm to manipulate, control and use tools and materials. Hand-eye coordination, where a person uses their vision to control the movements and actions of their small muscles, is also an important component of fine motor skill development. [3]

The aim of the study is to investigate the effect of connective tissue massage on fine motor skills.

2.THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Definition and development

Connective Tissue Manipulation (CTM) is a manual reflex therapy which was originally known as Bindegewebsmassage. It was developed in Germany from the1930s onwards, spread throughout Europe and was introduced to the UK in the 1950s as Connective Tissue Massage [4], as the term massage was thought to be misleading in this context. The terms are used synonymously in the literature.

Dicke, a German physiotherapist, made the first therapeutic attempts on herself.While suffering from circulatory impairment to her right leg, which resulted in endarteritis obliterans and a suggested amputation, she found connections between her affected leg and subcutaneous tissue in her pelvic region.Trying to relieve the lower back pain accompanying her condition, she applied pulling strokes in to the painful areas and palpated tissue tightness over the pelvis. The tension lessened gradually and simultaneously she felt waves of warmth going into her affected leg,as well as sensations of pins and needles. In further treatments she incorporated the area around the trochanter and the iliotibial tract and within three months established satisfactory reduction in her symptoms. After recovery she systematically observed her patients and soon could point out areas of tension in the connective tissue on certain patients. These areas of tension were present then the patient was suffering from malfunctioning organs.[5]

Dicke spent the rest of her career exploring the technique which she named bindegewebsmassage and which was further developed and researched by Teirich-Leube and Kohlrausch. [6]

The powerful clinical efects of CTM ensured that it gained a well established place within European physiotherapy. It was introduced to the British National Health service by Maria Ebner, a physiotherapist, in the 1950s. Today, the technique is showing renewed interest amongst those manual therapists who are open to `alternative' and complementary concepts but enjoy placing them within an anatomical and physiological context. As a reflex therapy technique, CTM requires the therapist to begin treatment in areas well away from the symptomology and to assess the needs of the patient in a holistic way, in order that the full extent of the zonal involvement may be recognized and treated. The reflex zones which CTM utilizes are the only ones which can be seen, palpated and which have a clear anatomical relationship to the dysfunctional structure. [6]

CTM is a reflex therapy which utilizes a shear force at connective tissue interfaces in the skin to stimulate autonomic nerve endings and to restore balance between the sympathetic and parasympathetic components of the autonomic nervous system. The strokes are applied to reflexes zones known as Head's zones which can be seen and palpated. [5]

It has been known since the beginning of the century that visceral disease can cause changes in well defined areas of the body surface. Head described cutaneous hyperalgesia in areas of the body supplied by neurones whose processes terminate in the spinal cord at the same segmental level as those neurone processes innervating affected viscera. In these areas the patient is sensitive to touch or pressure, heat or cold. The alterations in the cutis are known in literature as "Head zones".. They appear during the acute phase of disease and disappear with its normalization. [7]

The zones are present between the dermis and hypodermis in acute states and between the dermis and fascia in chronic states. The changes may include trophic changes, swellings, thickenings, indurations and hyperalgesia. They occur in the dermatomes which share the same segmental distribution as the sympathetic supply of the associated organ. [8] The zones reflect `facilitated segment' activity as described by Korr [9] and Upledger [10] in which irritation in any structure within a spinal segment facilitates the synapses within it, thus altering the level of activity in other structures which share the same segmental innervation.

The point of stimuli convergence is thought to be the Wide Dynamic Range (WDR) neuron, originally isolated by Pomerantz et al.and found in lamina V of the spinal cord. These neurons respond to influences from viscera, muscle and skin and hyperactivity in any of these structures would lower the synaptic threshold of the WDR, `facilitating' the whole segment and the resultant observable and palpable connective tissue changes would denote acute or chronic segmental disturbance.[11]

The zones provide useful information in patient assessment and selection, for example, zonal presence is indicative of autonomic disturbance and suggests that the patient may respond favourably to CTM. The more numerous the zones, the more widespread is the autonomic disturbance. They also help with the clinical decision making process, with regard to progression of treatment. There is some evidence for interrater reliability of zone recognition.[12]

2.2 AUTONOMIC NERVOUS SYSTEM

Many body functions we are not routinely aware of are controlled by our autonomic nervous system. The neurons of the autonomic system innervate gland cells, cardiac muscle, and smooth muscle to regulate physiologic functions such as sweating, blood pressure, and heart rate. There are three divisions of the autonomic nervous system: the sympathetic system, the parasympathetic system, and the enteric system. Sensory signals are relayed through autonomic neurons to ahigher processing center in the brain, which interprets the signals and sends a corresponding neural signal to either increase or decrease a certain function. The sympathetic and parasympathetic systems act in opposition to each other, as will be discussed below. The autonomic nervous system is always functioning, and most of the time a balance is achieved between the sympathetic and parasympathetic divisions regarding their influence on bodily functions. At certain times of the day and for certain functions, one division will have more influence than the other.

2.2.1 Sympathetic System

The phrase “fight or flight” is often used to summarize the function of the sympathetic nervous system. Essentially, the sympathetic nervous system acts to maximize the resources used by the body when presented with a stressful or threatening situation. For instance, blood vessels constrict in less critical organs such as the skin and gastrointestinal tract to make more blood available in muscles for exertion. The sympathetic system also increases heart rate and heart contraction force and relaxes and opens lung airways. At the same time that these functions increase, less survival-critical functions such as digestion decrease. Most sympathetic neurons release a neurotransmitter called norepinephrine, which along with its close relative epinephrine can bind to two types of receptors on receptor organs: alpha and beta adrenergic

receptors.The neurons that control the sympathetic system arise primarily from the spinal cord and ganglia (masses of neuron cell bodies) that lie outside of the spinal cord. Many of the functions influenced by the sympathetic system can be activated individually and in a graded fashion. This is helpful when exercising at the gym, so that your heart rate and breathing rate increase, but your pupils don't dilate and the hair on your skin doesn't stand on end as if ready for a fight.

2.2.2 Parasympathetic System

The parasympathetic system counterbalances the sympathetic system and puts the body into a "rest and digest" mode to conserve energy. When the parasympathetic system is exerting influence, there is an increase in salivation and secretion of digestive enzymes and a decrease in heart rate and airway diameter. The neurons that transmit information for the parasympathetic system mostly originate in the brainstem, although elimination functions are influenced by neurons that originate in the lowest (sacral) portion of the spinal cord. Almost all parasympathetic neurons release a neurotransmitter called acetylcholine, which can bind to two types of receptors on the effector organs: muscarinic receptors and nicotinic receptors.Humans can voluntarily control some of the parasympathetic impulses that are received, most notably urination and defecation. In contrast, there is very little voluntary control over sympathetic impulses. Certain functions are influenced by the sympathetic system but not by the parasympathetic system, including sweating, blood vessel dilation, and release of epinephrine by the adrenal medulla. [13]

Central control of the sympathetic and parasympathetic outputs involves several interconnected area distributed throughout the neuraxis. This central autonomic network (CAN) has a critical role in moment to moment control of visceral function, homeostasis, and adaptation to internal orexternal challenges.The functions of the CAN are organized in four hierarchical levels that are closely interconnected: spinal,bulbopontine, pontomesencephalic, and forebrain levels. [14]

The spinal level mediates segmental sympathetic and sacral parasympathetic reflexes and is engaged in stimulus specific patterned responses under the influences of the other levels. The sympathetic output is critical for main tenance of arterial pressure, thermoregulation, and redis tribution of regional blood flow during stress and exercise. The sympathetic output originates from preganglionic neurons located in the thoracolumbar spinal cord at the T1–L2 segments primarily in the intermediolateral cell column. The parasympathetic outputs are represented by a cranial component originating from the nuclei of III, VII, IX, X cranial nerves and a sacral component originated from neurons located in the lateral gray matter at the S2–S4 segments. [15-16]

2.3 The technique

CTM uses a specialised stroke in which a gentle shear force is applied to the connective tissue interfaces in the skin. The strokes are very speciacally applied to bony attachments of fascia, or where fascia is superficial. A characteristic `cutting' sensation is produced which is indicative of the fascial layer being stimulated. The stroke must be modified to ensure that discomfort is not produced, i.e. it should not be painful. To prepare the tissues for the fascial stroke, the skin technique, the subcutaneous technique or the flat technique can be used. [17]

The stroke is highly specific in two ways. Firstly, the hand positions are important to ensure that sufficient and appropriately-directed traction is exerted at the tissue interfaces. The most effective ways are through the pad of the longest (usually middle) finger or the ends of the thumbs. Secondly, as the aim is to reach the fascial interface, patterns of strokes are used to enable access to the deep fascia where it lies directly under the skin.This avoids uncomfortable side effects of treatment. Once the active (visible, palpable and symptomatic) or silent (visible, palpable but asymptomatic) Head’s zones are identified, they are linked to the symptoms to build a hypothesis of causation. A treatment plan is developed and the contraindications of acute inflammation, active infection, malignancy, unstable blood pressure/heart conditions,

haemorrhage, early or late stage pregnancy, menstruation and use of anxiolytic drugs are excluded.[18]

2.4 Clinical effects

There is a dearth of clinical CTM research but its uses are known from clinical experience which has found it to successfully treat; circulatory problems, visceral dysfunctions, pain, particularly sympathetic pain, nerve root pain ,gynaecological and hormonal,disorders, anxiety.
These clinical problems fall into one of three categories: segmental (visceral conditions and sympathetically-maintained pain); suprasegmental (hormonal and anxiety disorders) and mechanical (local pain) which assists us in attempting to establish how CTM works.

The initial patient assessment requires a holistic subjective interview to determine symptomology and how the patient feels, behaves, sleeps and functions viscerally. This helps to establish the level of autonomic imbalance and sympathetic or parasympathetic dominance. The findings of the objective assessment indicate segmental and suprasegmental involvement, chronicity and causative factors through zone recognition, with broader objective testing establishing markers for improvement and outcome measures. The position of zones guide the therapist through a course of treatment, for example, the strokes may be applied dermatomally for nerve root pain, locally for mechanical pain, segmentally for visceral problems or suprasegmentally for anxiety, hormonal disorders or a high level of sympathetic irritability.[12]

The physiological effects of CTM are both local and general. Local effects include release of histamine from mast cells which leads to a triple response, local swelling and arteriolar dilatation mediated by local axon reflexes. The increased blood flow to the region assists the resolution of subacute or chronic inflammation and reduces pain by removing nocigenic chemicals from the tissues. The mechanical distor tionsproduced by CTM strokes help to mobilize connective tissue and improve function in much the same way as traditional massage.[19]

The value of CTM lies with the capacity to induce more generalized alterations in physiological state, and for this reason the technique has become used more widely. Effects appearing in the deep tissue distant from the site of superficial stimulation are mediated by the autonomic nervous system and are expressed as changes, usually an increase, in blood flow and a reduction of pain. CTM appears to affect the parasympathetic system preferentially. Others consider that, after a delay, the sympathetic system is also stimulated. Little good quality research verifies these statements, although in one such example the authors report that CTM applied to the sacral region increased blood flow to the foot measurably, thus supporting the earlier observation of Dicke. [20-21]

The full potency of CTM can be experienced if the technique is applied incorrectly and the basic principles not followed. This produces adverse reactions which may include palpitations, dizziness, and fainting although these are avoidable.

Horstkotte et al. found that, following a course of CTM, 18 male patients demonstrated an increase in peripheral blood flow which exceeded that of the control group who received the conventional drug therapy of the time. [22]

Kaada and Torsteinbo measured vasointestinal polypeptide levels after CTM to determine whether this powerful vasodilator is responsible for the increased blood flow. However, levels were not found to be significantly raised during CTM. [23]

A rise in sympathetic activity during CTM was shown in the study undertaken by Kisner and Taslitz. They studied the efect of one treatment on nine healthy volunteers. The efects of CTM on normal subjects are often weak, as could be expected and clinical experience shows that CTM is followed by increased parasympathetic activity which is utilized therapeutically. Delayed responses were not measured in this small sample. Reed and Held studied sequential CTM in an older sample of, again, healthy subjects.

No significant changes in heart rate, skin temperature, galvanic skin response or mean arterial blood pressure were recorded. The measures were taken during treatment and the subjects were asymptomatic. Future research should measure the eects of sequential treatment and delayed responses in symptomatic individuals and current technological methods of autonomic measures should be used.[24-25]

The autonomic balancing responses to CTM can be useful in the treatment of anxiety.

McKechnie et al. found that anxious patients responded favourably to CTM. Autonomic function was found to move towards a parasympathetic direction across individual measures but no significant results were shown across the whole group (n=5).[26]

Most recipients would agree that CTM is not comfortable, and as such the strokes may also activate the 'descending pain suppression mechanism. Noxious stimuli pass from the periphery to the brain, initiating reflex activity leading to the release of endogenous opiate substances in the spinal segment at which the pain bearing nerves enter. Analgesia thus induced lasts longer than that arising due to pain-gating.[27-28]

Fine motor skills are the coordination of groups of small muscles to complete a task or to participate in an activity

These muscle groups are concentrated in three main areas: the face (which includes the mouth, the eyes, and the ears), the hands, and the feet.[29]

Many researchers have acknowledged the importance of fine motor development and have included fine motor skills as a component in studies and assessments focused on school readiness and scholastic adjustment

A lack of fine motor development can affect many aspects of your daily life. We use our fine motor skills to complete almost every tast during the day-daily living skills (eating, dressing, housework) ,writing, reading, playing and using objects. Without development of appropriate fine motor skills, children can have difficulties in school and adults can have difficulties in their job.[30]

3.METHOD AND MATERIAL

3.1. INDIVIDUALS

25 young adults included on a voluntary basis. The study included healty volunteers who were 60% (n=15) of male and 40% of (n=10) female.. Mean age of subjects were 21,68 ± 1,8 year (min 19, max 26) studying at the Yeditepe University who involved to the study on a voluntary basis.

Inclusion criteria

- Young healty adults
- Studying in the Yeditee University
- Participating to the study in a voluntary basis

Exclusion criteria

- Any known cronical disease

3.2. METHOD

3.2.1. Evaluation

The data collected from self report, paper based, cross-sectional questionnaire.The questionnaire focus on demographic items such as age, gender, body weight, height, tobacco smoking chronic diseases, use of any drug.

Subjects blood pressure evaluated by manuel sphygmomanometer. Pinch and grab strenght evaluated with Pinch Track Commender and Grib Track Commender by Tech Medical. A sum result of the three measurements calculated to obtain composite result of the pinch and grab strenght evaluation.

3.2.1.1. Purdue Pegboard Measurment

Fine motor skills evaluated with Purdue Pegboard Battery. The standardized Purdue Pegboard Battery is an assessment of fine motor skills and administered according to the instructions in the test manual. The pegboard (model 32020, Lafayette instrument, US) had two rows of 30 holes. Participants asked to take pegs of 1 mm diameter and 25 mm in length from a bowl at the top of the pegboard and place them in the row of holes indicated by the tester. Following a series of practice trials, participants will given 30 s to place as many pegs as possible; first with their dominant hand, then with their non-dominant hand and finally with both hands together. The score reported the number of pegs placed for each respective condition. In the assembly subtask, participants asked to put together an assembly of a peg, a collar and two washers, working with both hands together. In this subtask participants given one-minute to complete as many ‘‘assemblies’’ as possible. The score reported the number of parts assembled. A sum-score of the three pegboard subtasks calculated to obtain a composite measure of fine motor skill. [31]

These measurements took before and after 10 CTM treatment sessions.

3.2.2. CTM Application

CTM applied in total of 10 treatment sessions at volunteers homes and Yeditepe University Physical Terapy and Rehabilitation Department practical laboratuary. During the treatment, subjects seated in an erect position without back support, with their hips, knees, and ankles positioned at 90 degrees and with their thighs and feet fully supported. A pillow placed on subjects lap for forearm support.
All strokes applied three times on each sides.

3.2.2.1. Basic Region

1-Short strokes of iliac crista. Begins lateral region of the sacrum, ends below of the spina iliaca anterior superior.
2- Long stroke to the lateral side of the sacrum
3- Three- four shourt strokes to the sacro-lumbal angle.
4- Three long strokes on the ilium from medial to lateral.
5-Five short strokes from L5 to T12. The strokes applied obliquelly area berween lumbal vertebraes transvers spinouses from lateral to medial.
6- Long subcostal stroke.

3.2.2.2. Lower Thoracal Region

1-Short strokes from lateral to the medial applied along the lateral side of the Latissumus Dorsi muscle. Strokes begins from iliac crista ends at the axillary border.
2- Five short strokes from T12 to T7, strokes applied obliquelly area between spinouses process of the thoracal vertebraes over the erector spinas.
3-Five long strokes from between first and second ribs to the scapula applied on every intercostal gap/space.
4- One long stroke beneath the lower angle of scapula, from upper-lateral to the medial-upper.

3.2.2.3. Interscapular Region

1- Seven oblique short strokes applied from T7 to C7

2-From T7 to C7, berween two scapula seven transverse strokes applied.

3- Three- four short strokes applied around the spinous process of C7.

3.2.2.4. Scapular Region

1-Same as the fourth stroke of the lower thoracal region.

2-Short strokes of the vertebral side of the scapula from medial to lateral.

3- One long stroke applied along the vertebral side of the scapula from down to up and one long stroke applied along the lateral side of the scapula from down to up.

4- a) short strokes applied on the lateral of the vertebral side of the scapula from lower angle

to the spina scapula.

b) short strokes applied on the inferior border of the spina scapula from medial to lateral and down to up.

c) short strokes applied on the superior border of spina scapula from medial to lateral, from up to down.

5-a) One long stroke along the superior border of the spina scapula

b) Three long strokes that fill the interspinouses fossa.

3.2.2.5. Cervical Region

1- Same as the third stroke of the interscapular region

2- From C7 to C1, six oblique short strokes applied.

3-Between C7 to C1, six transvers long strokes applied.

4- From front to back short strokes applied on Trapezius muscle's anterior margin.

5- From lateral to medial one long stoke applied along the Trapezius muscle's anterior margin.

Front 1- Three- four short strokes applied inside the neck triangle.

2- From down to up one long stroke applied on the Sternocloidemasteideus muscle's posterior margin.

3.2.2.6. Deltoid

1- From origio to insertio short strokes applied on the posterior margin of the Deltoid muscle.

2- From origio to insertio short strokes applied on the anterior margin of the Deltoid muscle.

3- Along the Deltoid muscle's posterior margin one long stroke applied.

4- Along the Deltoid muscle's anterior margin one long stroke applied.

5-Two- three short strokes applied toward to the acromial protrusion.

6- Transvers long strokes at the both direction applied on the insertio of the deltoid muscle.

7- Along the shoulder joint capsul insertion from axilla to behind proximal region of the joint one long stroke applied.

8-Along the shoulder joint capsul insertion from axilla to front strokes applied on the front side of the joint.

3.2.2.7. Biceps

1- From up to down long strokes applied Biceps muscle's distal region on the medial and the lateral sides of tendon.

2-Two sides of the biceps tendon to the anterior fossa of elbow short strokes applied.

3.2.2.8. Forearm

1- From distal to proximal four long strokes applied on the antecubital fossa; first stroke applied on the medial margin of the Bracioradialis muscle. Other three strokes applied along the lateral side of the Flexor carpi radialis, palmaris longus and flexor carpi ulnaris muscles toward the medial epicondyle.

2- Four long strokes applied toward to wrist along the between tendons of the same muscles from proximal to distal.

3.2.2.9. Wrist

1- From proximal to distal four short strokes applied between the palmar tendons.

2- From proximal to distal four short strokes applied between the extansor tendons.

3.2.2.10. Hand

1- To palmar side of the hand, along the tenar, hipotenar rises and interosseal gaps/spaces six long strokes applied.

2-Transverse long strokes applied on the flexor retinaculum.

3- Dorsal side of the hand, four long strokes applied along the interosseal gaps/ spaces.

3.2.2.11. Fingers

From proximal to distal one long stroke applied to the palmar side of each finger. [32]

The application end with pectoral and iliac crista stroke and subcostal long stroking.

4. STATISTICAL ANALYZE

4.1. STATISTICAL ANALYZE

We used ‘Statistical Package Analyze for Social Sciences’ (SPSS) version 21.0 for data analyses in our study. Desciriptive staticts, mean ± standart deviation (X ± SD) were gahtered. The level of significance were accepted as $p \leq 0,05$. Paired t test was used to understand the relation between before and after measurments of pinch strength, grab strength and assembly Perdue Pegboard values. Wilcoxon Signed Rank Test used to understand the relation between before and after measurments of sistolic and diastolic blood pressures and Perdue Pegboard results.

5. RESULTS

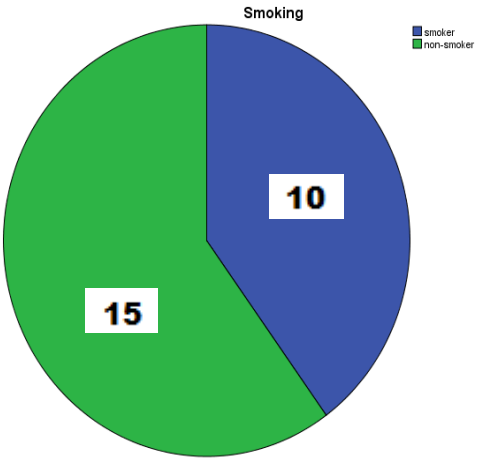
DESCRIPTIVE STATISTCS

Demographic Features

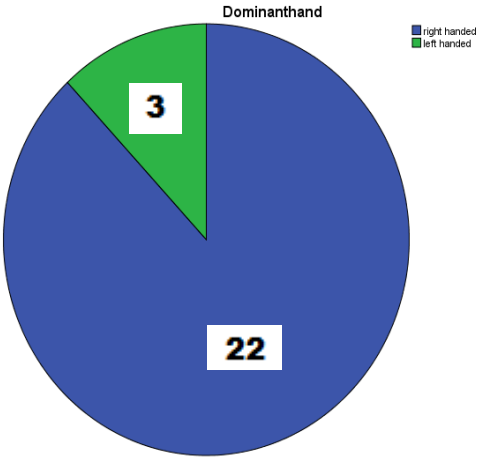
The study included 25 healty volunteers who were 60% (n=15) of male and 40% of (n=10) female.. Mean age of subjects were 21,68 ± 1,8 year (min 19, max 26).

Table1 : Demographic Features of Volunteers

Weight	73,04 ±10,57 (55-104) kg			
Height	174,12 ± 11 (157-197)cm			
Class		Frequency	Social Security	Frequency
	first	6	yes	24
	second	5	none	1
	third	6	Regular Exercise	
	senior	8	yes	2
Gender			none	23
	male	15		
	female	10		
Any known disease			Regular Medicine	
	yes	0	yes	1
	none	25	none	24



Shema 1: Distribution of smoking habbit



Shema 2: Distribution of dominant hand preference

Table 2: Blood pressure measurments

	Before	After	z value	p value
SBP	11,46± 0,88 (9-13)	11,62± 0,52 (10,5-12,5)	-1,08	0,27
DBP	7,12 ± 0,84 (5,5 - 9)	7,44 ± 0,66 (5 - 8)	-1,6	0,1

(SBP: sistolic blood pressure, DPB: diastolic blood pressure)

To compare measurements of blood pressure before and after the CTM we used Wilcoxon Signed Ranks Test. There is no meaningful change between blood pressure measurements according to Wilcoxon Signed Ranks Test. ($p > 0,05$)

Table 3: Pinch and Grab Strength measurments

	Before	After	t value	p value
RPS	**18,29 ± 5,74 (10,4- 25,6)**	**20,11 ± 5,16 (10,8 - 31)**	**-3,06**	**0,005**
LPS	**17,16 ± 5,11 (8 - 25,6)**	**18,51 ± 4,9 (11,5 - 29)**	**-2,45**	**0,02**
RGS	75,04 ± 18,92 (39 - 121)	78,08 ± 26,52 (20 - 140)	3,36	0,33
LGS	**68,24 ± 15,68 (41 - 104)**	**73,12 ± 18,25 (43 - 120)**	**-2,14**	**0,001**

(RPS: Right hand Pinch Strength, LPS :Left hand Pinch Strength , RGS :Right hand Grab Strength, LGS : Left hand Grab Strength)

To compare measurements of pinch and grab strenght we used Paired Samples t test and for significance we choose $p \leq 0,05$. For RPS, LPS and LGS there is a minor changes between the before and after measurements and these diffirences are statistically meaningfull ($p \leq 0,05$) First measure of RGS is 75,04, after the manipulations it is 78,08 so there is an increase but this change is not statistically meaningfull ($p > 0,05$)

Table 4: Perdue Pegboard Results

	Before	After	z value	p value
DPB	**16,12 ± 2 (12 - 21)**	**17,1 ± 2,13 (14 - 22)**	**-2,8**	**0,005**
NPB	**14,64 ± 2,15 (11 - 20)**	**15,80 ± 2,17 (11 - 21)**	**-0,321**	**0,001**
BPB	12,28 ± 2,13 (7 - 17)	13,04 ± 2,42 (8 - 19)	-1,83	0,06
			t value	p value
APB	**36,28 ± 6,94 (20 - 48)**	**39,76 ± 6,31 (22 - 50)**	**-1,62**	**0,001**

(DPB: Dominant hand Perdue Pegboard score , NPB : Non-dominant hand Perdue Pegboard score , BPB Both hands together Perdue Pegboard score , APB: Assemblies Perdue Pegboard score)

To compare measurements of DPB, NPB and BPB we used Wilcoxon Signed Ranks Test and for comparing APB results we used Paired Samples t test and for significance we choose $p \leq 0,05$. For all Perdue Pegboard subtasks except BPB, between before manipulation and after manipulation scores there is minor changes however these increases are found statistically meaningfull ($p \leq 0,05$). Increase on the BPB score is not statistically meaningfull ($p > 0,05$).

6. DISCUSSION

There is some experimental evidence that CTM produces a measurable physiological response. CTM has been shown to affect peripheral blood flow in a study which belongs to Horstkotte et al of 18 men producing an immediate reduction in blood flow, followed by an increase after two weeks.

Holey et al. reported evidence of CTM producing an immediate moderate increase in diastolic blood pressure (BP), but not in systolic BP, heart rate or foot temperature.
Kisner and Taslitz also provided evidence that CTM produces increased sympathetic activity, and their data also suggest that the main effect was on diastolic BP rather than systolic.

Reed and Held reported no CTM effect on mean arterial BP, however they did not report any actual data, and they did not differentiate between diastolic and systolic BP. [33]
In our study we did not found significant CTM effect on diastolic and systolic blood pressure. ($p > 0,05$)

There is not enough information about CTM's relationship with fine motor skills, grab and pinch strength in literature as we research. In this study we observed CTM has favourable effects on RPS, LPS and LGS ($p \leq 0,05$). However, we did not achieve meaningful increases on RGS ($p > 0,05$). Maybe this is related to inequality of the dominant hand preferences of subjects. We also found favourable CTM effects on Perdue Pegboard results on subtasks DPB, NPB and APB ($p \leq 0,05$) but increase on BPB subtask is not statistically meaningful.($p > 0,05$)

On the other hand our study has limitations for instance even our volunteers has small age interval there is no equal sex distribution and high rate of smoking. Additionally, we did not follow-up volunteers for investigate long term effects. After all, there is not much studies that deals with CTM effects on fine motor skills, so we hope to contribute to literature in this subject.

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