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Traditional Thai Massage: A case study of the assessment of musculoskeletal disorders in Chaloeysak-Wat Pho Massage Therapists

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Abstract

This study is designed to evaluate the physiological strain of Chaloeysak-Wat Pho Massage therapists. In Thailand, the 'Chaloeysak' or 'Wat Pho' Massage is a popular method especially for tourists which subsequently contributes to the employment of massage experts. The massage is built on the centuries-old cultural heritance of manual therapies in which deep muscle massage removes myofascial pain and discomfort. However, techniques used in physical rehabilitation classic medical physiotherapy such as manual traditional massage methods include risks for the biomechanical system of the therapists. At present, work-related musculoskeletal disorders (WRMSD) are a wide spread and persisting cause of health issues because of intensive and repetitive muscle work. Thirty experienced female therapists voluntarily participated in this project, each performing a 45-60 minute treatment followed by 15 minute rest. Patients were tourists who agreed to experience the advantages of a traditional Wat Pho Thai massage relaxation treatment. The study assessed the impact of the traditional therapies on the physical condition of the massagers by evaluating the total cardiovascular load, the local muscle strain and the subjective perceived problems. Compared to standard set thresholds, the results revealed for the set treatment conditions a safe physiological strain for the Chaloeysak or Wat Pho massage therapists ($p < 0.05$). In the actual conditions, the Chaloeysak massage therapists are safe from WRMSD risks when performing their job and the introduction of a resting period of 15 minutes after each treatment allows them to recover from the physiological strain. This rest period could be introduced into a WRMSD-prevention strategy for the Thai massage business.

Keywords: *Chaloeysak massage, physiological strain, work-related musculoskeletal disorders, WRMSD, Wat Pho Massage, Thai Massage*

1. Introduction

1.1 Work-related musculoskeletal disorders (WRMSD)

For decades, a category of work-related musculoskeletal disorders has affected the quality of life for subjects active in repetitive physical activities. The occupational injuries and diseases have effects that are far-reaching, decreasing the quality of life for not only the employees who perform the repetitive tasks, but also the socio-economic and technical aspects of the management and the associated social security systems. These disorders may be less obvious and only result in disturbances in normal function, but the overall effects are no less serious. The complexity of WRMSD-issue requires a multi-disciplinary approach, but is currently not implemented because of missing the necessary expertise.

WRMSD are the result of imbalanced active 'man-at-work' systems and refer to the permanent bound-up interactions between humans (psycho-somatic, physical, intellectual capacities) and their operational demands (workload intensity, duration, environmental conditions) in specific occupational settings.

Imbalances in these systems lead to 'disorders', which may include not only the objectively observed outcomes such as reduced productivity, low efficiency, injuries, diseases and social conflicts, but also a series of less clearly definable disturbances in the operators' behavior. Fatigue, feelings of discomfort, stiffness, pain, and other subjective complaints are consequences which affect the intrinsic individual capacities due to overstressed working conditions.

At present, the WRMSD are tackled by the classic post factual health and safety approaches:

The first policy -- the most urgent -- concerns the treatment of the patient: i.e. restoring

(as much as possible) their physical capacity and saving their employment. Actually the diagnosis and treatment are well-covered by highly qualified and well organized medical as well as para-medical disciplines (Chulkov, 2011).

Where 'rehabilitation' had originally a 'manual' character, it has quickly entered the slip-stream of the technical evolution (equipment and tools using mechanical and electrical energy, such as electrotherapy and nerve stimulation via electro-magnetic resonance, phototherapy, ultra sound, thermo- and cryotherapy, galvanic stimulation etc.). Despite this progress, medics and paramedics using manual therapies are still confronted with awkward and abnormal postures requiring intensive forces from their hands and fingers (Björksten & Jonsson, 1977; Bork et al., 1996; Cromie, Robertson, & Best, 2000; Oberg, Sandsjo, & Kadefors, 1994; Punnet & Wegman, 2004).

A second strategy concerns the technical prevention linked to management and engineering: analyzing the working conditions in order to detect the causes for injuries or diseases and to develop structural, technical, and organizational improvement measures to avoid identical risks in the future. If elimination of the risks at the source is not possible, individual and/or collective protective devices could be introduced, as well as behavioral conditioning guidelines, rules and directives.

International organizations such as ILO, ISO, WHO and other national authorities promoted these classic 'prevention' strategies through worldwide ad-hoc campaigns. These included a series of guidelines, rules and directives aimed at reducing performance related injuries. Additionally, specific prevention experts introduced 'ergonomic' MSD risk-reducing features and offered advice for work-related risks (Keyserling & Chaffin, 1986; Kroemer, 1989; Kuorinka et al., 1987; OHSCO, 2007; OSH, 2010; OSHA, 2000).

The classic 'cause-injury' approach (useful and necessary) has undoubtedly contributed to more safe and healthy occupational conditions, however there is problem of practical efficiency and implementation. Because the analysis and the development of appropriate measures for the cases are time consuming and due to specific conditions, cultures and contemporary levels in development, the proposed preventive measures are sometimes missing the point.

Despite the large database of these 'accidental' cases amassed during the last decade, available and preventive measures were introduced and controlled, but no substantial progress in WRMSD occurrence has been realized.

Reports still show a lifetime prevalence of about 80% in the overall EU- adult population with an incidence rate of about 40% for musculoskeletal disorders in industrial work over the last 5 years (Bevan, Passmore, & Mahdon, 2007).

The therapists delivering the treatment for these ailments are not themselves immune to the very same ailments. Cromie, Robertson, and Best (2000) cited a lifetime incidence rate of 91%, of which about 17% of the professionals left the profession entirely. Risks concerning body parts crucial to the message process were reported: Low Back Pain (45.0%) , wrists and hands (29.6%) and neck (24.7%), (Bork et al., 1996). These figures, although in different, but comparable settings, are confirmed by many other authors (Albert, Currie-jackson, & Duncan, 2008; Albert et al., 2006; HimaBindu & Thiruppathi, 2014; Jang, Chi, Tsauo, & Wang, 2006; McMahon, Stiller, & Trott, 2006; Rambabu & Suneetha, 2014).

From all recognized disorders appearing in jobs and tasks, the causal factors referred to the physical overload of the involved body parts, (e.g. over-exertion, heavy, repetitive and intensive efforts) resulting in physical fatigue and a frequent appearance of microtrauma affecting the human muscular system tendons, ligaments, joints, etc. (Kroemer, 1989).

1.2 Traditional massage

Manual massage therapies have existed for millennia and their roots can be found across all cultures. The oldest traces date from 2330 BC, as found in the tomb of Akmanthor in Egypt., Additionally, Jivaka, Lord Buddha's physician described the treatment in the Buddhism's Pali Canon, about 5th century BC. In Europe, Hippocrates from Kos (460 BC) advocated manual massage. However, but the Chinese Huangdi Neijing traditional Eastern massage methods were introduced in 1793 by a Christian Jesuit named Pierre-Martial Cibot. Until 1900, traditional massage was viewed as quackery but with progress in science, physiotherapy gained importance in the mid 1900's, and acceptance has been boosted in recent years as the possibilities grew and people became aware of the advantages. According to the American Massage Therapy Association, people make more visits each year to alternative care practitioners (629 million) than to primary care physicians (386 million), (Wilkowski, 2004).

The philosophical backgrounds of Thai massage are based on the belief that a person's health

and well-being relies on the balance of life energy or "Prana" in Thai. Any obstruction in the Prana flow can cause discomfort or illness to a person. As the 'Sen Sib' lines are the major energy channels throughout the body, these need regular maintenance to avoid stagnating blockages.

The long historical foundation serves as proof of the biomechanical. Although the nature of the disorders have changed due to different demands placed on the workers following the industrial and technical revolutions, the body may still be overexposed to physical exertion., (Albert et al., 2006; 2008, Bork et al., 1996; HimaBindu & Thiruppathi, 2014; McMahon et al., 2006;). Most of the in-professional surveys of therapists were collected via questionnaires such as by Jang et al. (2006) who reported that 71.4% of the responders experienced work related problems in a 12 month period, of which 50.3% concerned fingers and thumb problems, 31.7 % shoulders, 28.6% wrist, 25.5 neck; 23.6% forearms and 19.3% lower back.

Although the knowledge of the problems and their seriousness is the basis for prevention, most publications were focused on the impact on the 'patients' referring to the parts of the body affected with soft tissue sprains, fibromyalgia, arthritis, tendonitis etc., mostly overlooking the underlying cause: muscle fatigue.

In traditional massage techniques, physical work is focused on relieving tension along the energy lines by manual actions on muscles, tendons, ligaments, fascia, skin, joints, or other connective tissues, lymphatic vessels, and/or gastrointestinal system. During the massage, the therapist is exposed to an awkward static postural load combined with rapid and slow movements which ask for different amplitudes over a certain treatment time.

The Chaloeysak (CS) method or Wat Pho Massage, and also named as 'Folk style', (Tyroler, 2013) includes a progressive series of flowing exercise movements to loosen and stretch the body in combination with acupressure (deep muscle pressure) at a certain number of points (selected out of the approximately 200 acupressure points in the body).

The therapist uses both thumbs, forearms, elbows, knees and feet and the kneading can be robust and very thorough, reaching a very deep level. The patient's body is treated in laying, prone, and/or sitting postures. The duration of a full massage is approximately 30-60 minutes.

2. Objective

The objective of this study was to evaluate physiological strain and MSD risks in female Wat Pho Massage therapists at work and at recovery period.

3. Materials and methods

3.1 Subjects

Participation criteria included gender (female), an age range between 25-55 years, Thai massage work experience of at least 3 years, and the participant being free of underlying diseases such as DM, hypertension, heart diseases, no musculoskeletal problems nor being under treatment for musculoskeletal problems. Thirty well qualified massage therapists participated voluntarily. Their average professional experience was 10 years in the Chaloeysak (CS)-Wat Pho Massage which is a wide spread method. In some other projects and for pathologic cases, the method is also applied as a supplement to acupuncture.

One therapist treated one volunteering 'patient' in the project. Therapists (all female and average aged of 37 years) were all free of any biodynamic disorder (Table 1). Patients were healthy tourists who visited the Wat Pho temple for muscle relaxation massage. The duration of massage varied between 30-60 minutes.

The experienced therapists wore light-loose clothing that did not hinder the necessary movements. They were informed about the project objectives, principles and procedures and signed an informed consent form.

The activities of the therapists started with preparation of materials and products, followed by massage of the body parts, in the sequence of the upper extremities (UE), the lower extremities (LE), lay at left (LL), and finishing with the right side (LR). The body postures during massage are in laying prone position for trunk and limbs, sitting for the neck and shoulder region, and handling the materials when finishing the treatment, followed by a recovery sitting period of 15 minutes.

3.2 Work related musculoskeletal disorders – assessment principles

For WRMSD-prevention the emphasis is put on the pre-risk detection of early symptoms appearing during the inherent job work-phases. These refer to a work-related overload which affect the normal body functioning and are cognitively or unconsciously perceived as discomfort during the job performance. These subjective experiences (part of self-training and self-education) are important as they precede more

serious effects that result in negative experiences, such as task-interrupting effects. Because of the downstream effects to patient, therapist, and management these performance criteria are essential in prevention strategies.

To promote the implementation of the subjective experiences in a formal action program, a scientific *objectification* of the subjective experiences becomes a prerequisite.

This can be obtained by assessing the impact of workload (task, organization, and environment) on the psychosomatic operators *during* the job-performance. These assessments would be especially be focused on the cardiovascular and muscular systems, as well as a numerical complaints evaluation.

The validation of the potential risks is then realized by comparing the results with reliable thresholds related to a relevant cumulative muscle strain (at present experimentally designed) and proposals could be translated into operational feedback (Yoopat, 1999; Yoopat, 2004; Vanwonterghem, 2009; Vanwonterghem & Intaranont, 1993).

The evaluation of physiological and muscular overexertion due to repetition in tasks, adverse postures, intensive pressure, etc. has an objective to extend the period of cumulative acidosis which precedes the disorder by an indefinite time. This cumulative period evolves from the onset of physiological strain up to the appearance of a WRMSD, with subjective complaints followed by symptoms (pain, loss of power, physical inability) persisting from the end of the shift up to weeks, months or even longer (Aminoff, & Ilmarinen, 1998; Kroemer, 1989; Louhevaara, Smolander, Aminoff, & IImarinen,).

A 'preventive' risk-assessment notes the communication of the negative experiences as soon as they appear and is based on the reactions of the exposed employees. Such a *'participative'* contribution results in a better insight in the problems, offering possibilities for improvement, and contributing to an improved social climate in the professional categories involved (Hignett, Wilson, & Morris, 2005; Koukoulaki, 2000; Laing et al., 2005; Nagamachi & Imada, 1995; Wilson & Heaines, 1994)

3.3 WRMSD assessment factors and tools

The perceived problems were globally assessed by the Visual Analogue Score (VAS), (Gould, 2001), which reflects the perceived discomfort, e.g. pain on a linear scale from '0' – 'no pain', to 10 – 'worst pain'. The VAS-tool is quite analogous to the Borg's RPE-scales (Rating scale of Perceived Exertion, Borg, 2013) which was especially developed for clinical diagnosis of chest pain, angina, musculoskeletal pain, breathlessness and dyspnea. VAS values may vary from 2–3 as light pain sensation, 3-5 for "mild pain", to 5-6 painful, 7-8 sever pain, 9-10 very heavy to the worst pain; pain may be replaced by the notion 'fatigue'.

The cardiovascular strain involved in the energy provision of muscles is from respiration and circulation directly linked to the muscle performances and waste (lactate, acidosis) removal via oxygenation (oxygen consumption (VO_2) (Kroemer,1989). The classic assessment is then obtained by heart rate which evolves linearly with VO_2 uptake for which a generally accepted shift limitation is set at 1/3 VO2max (Bugajska et al., 2011; Yoopat, 1999).

The cardiac response is based on heart ratemeasured by means of a portable device (Polar, Electro Oy, Finland)and is expressed as relative load (% to the maximal allowed level) to attenuate the important inter- and intra-individual variations to the physical condition, the reactions to isotonic/isometric muscle contractions and to the environmental climate.

Because heart rate is strongly dependent on age, the Cardiovascular Load (%CVL) is expressed as a relative percentage value, rather than the absolute maximal level (207 – 0.7.age), used by Robergs and Landwehr (2002) in standardized static dynamic activities. The %CVL is calculated by '100 [(HRW-HRR) / (HRmax8h)]' in which HRW represents the heart rate during the effort, HRR is the heart rate at rest, and HRmax8h is the maximum allowed rate for 8 hours of work [1/3 (220-age)+ HRR] (Yoopat, 2004; Vanwonterghem, 1993). The CVL values of less than 30% are considered as a low-cardiac load (no problems), and values between 30% - 60% correspond with moderate to severe load. For these moderate CVL activities, improvement measures on a medium term timeline should seek to reduce exposure time and/or eliminate environmental overload. CVL values over 60% are considered a serious risk, indicating that measures should be taken in the short term (weeks). For CVL values of 80% - 100% no activity should be allowed without immediate actions. Exceeding CVL 100% is not allowed and work should be interrupted instantly.

Muscle capacity and muscle strain is measured by surface electromyography (EMG) of the electro-

potentials of active muscles registered in average and raw modes by means of the portable EMG-recorder (ME3000P), and processed with the MEGAWIN software (both equipment and software from MEGA Electronics Ltd., Finland). The results are expressed as microvolts (AEMG, in µV) for the intensity of workload and as median power frequency (MPF) for fatigue (fatigue in Hz - MPF) (Enoka et al., 2011; Hägg & Melin, 2003; Hummel et al., 2005; Enoka et al., 2011), and have been used in several studies assessing the effects of traditional massage on patients (Vanwonterghem, 1985; Vanwonterghem, 2009; Vanwonterghem, Yoopat, & Maes, 2012), (Yoopat, Maes, Poriau, & Vanwonterghem, 2015). Muscle strain has been measured during the massage-performance to express the muscular activity of the therapy (AEMG µV, ΔMPF (Hz) and (%). The impact of workload on the body has been measured by means of maximal muscle tests before and after the massage to assess the loss potentials. Four muscle groups were selected:

The M. Trapezius (superior parts) at the left (LT) and right (RT) side, as well as the M. Deltoidei left (LD) and right (RD) which are utilized for maintaining the posture and stabilization of shoulders in order to transmit additional body weight to the forearms and hands if an increased pressure is required, or in wide amplitude movements.

For the evaluation of EMG data, the following criteria were applied:

- The maximal voluntary contraction, MVC, (µV, microvolts) before and after massage treatment. The initial MVC counts as a baseline for the maximal power/capacity in order to attenuate the inter- and intra-individual differences (Yoopat et al., 2015).

- The Trapezius muscle: MVC was obtained from a maximal lift of shoulder girdle effort against a resistance given by a neutral observer in both left and right sides of the body. The Deltoid muscles: MVC was obtained by maximal lift by the shoulder in front of the body as high as possible against a neutral observer

- The average muscle load, AEMG (the means of µV *during* work) is the criterion for workload intensity (in µV) during the performance. A level below the 10% MVC threshold is generally accepted as a safe MSD level (Björksten & Jonsson, 1977) >10 - < 15% acceptable for a normal shift but with strong fatiguing (Deeb, Drury, & Pendergast, 1992: Hägg & Melin, 2003). At levels over 15% MVC, more intensified fatiguing occurs which may affect the performance, such as movement accuracy, efficiency, and productivity. Over 30% is considered excessive fatiguing and the intensity may become critical (Yoopat et al., 2015).

- Fatigue (ΔMPF – median power frequency test are measured during: a) *massage treatment and* b) *after a recovery period of 15 minutes.* MPF obtained from a Fourier analysis of the raw EMG signals is generally used to indicate a temporary muscle dysfunction. A shift toward lower frequencies is a sign of fatigue due to reduced fiber conduction velocity (Bigland-Ritchie, Donovan, & Roussos, 1981; Murata, Uetake, Matsumoto, & Takasawa, 2003). A shift toward higher positive values indicates an increase in capacity because of an obvious 'warm-up'- effect. A smaller negative value (after) may refer to a restoration in capacity, but the muscles are still in a fatigue status.

3.4 Data analysis

The results of the parameters were analyzed by descriptive statistics in terms of the means (M) and standard error (SE). The differences between the periods of the massage methods were evaluated using paired t-tests with a confidence interval of 95% and a significance level of $p < 0.05$.

4. Results

The individual characteristics and perceived strain (VAS) of the volunteering therapists are summarized in Table 1.

Table 1 Physical characteristics and perceived strain (VAS) of Wat Pho Massage therapists (N=30)

	Mean	SD	Min	Max
AGE (years)	36.83	5.15	22	43
Height (cm.)	159.03	6.06	147	170
Body weight (kg)	65.16	13.04	43.6	90.1
BMI ($kg.m^2$)	25.56	4.45	18.15	36.37
Rest heartrate (bpm)	78.87	12.20	56	105
Work experience (yrs.)	10.20	3.28	5	15
Perceived VAS	5.80	1.80	1	10

The individual characteristic of female Wat Pho Massage therapists shows the normal basic biodynamic condition. They rated perceived VAS from work at mild pain level (Borg, 2013). The results of the performed activities are presented in Table 2.

Table 2 Cardiovascular load (CVL), Muscle strain (%MVC) during massage treatment and during recovery period **(**Mean ±SE)

Tasks	CVL (%)	Muscle Strain (%MVC)			
		Left Trapezius	Right Trapezius	Left Deltoid	Right Deltoid
Preparation	38.54[a] ± 3.63	5.87[a] ± 0.59	5.59[a] ± 0.70	3.48[a] ± 0.51	4.17[a] ± 0.73
Upper extremities	22.42[a] ± 2.33	4.51[a] ± 0.67	4.05[a] ± 0.89	6.82[a] ± 3.16	5.30[a] ± 1.77
Lower extremities	18.94[a] ± 3.26	5.21[a] ± 0.66	4.84[a] ± 0.76	4.58[a] ± 0.78	4.07[a] ± 0.55
lay left side	21.99[a] ± 2.11	5.94[a] ± 0.55	4.81[a] ± 0.82	3.93[a] ± 0.41	3.35[a] ± 0.25
lay right side	23.22[a] ± 2.02	5.67[a] ± 0.70	5.39[a] ± 1.36	3.81[a] ± 0.55	3.48[a] ± 0.27
Prone	22.24[a] ± 2.37	5.11[a] ± 0.63	4.21[b] ± 0.70	3.93[a] ± 0.41	3.85[a] ± 0.42
Neck & shoulder	30.82[a] ± 1.81	7.87[a] ± 1.07	6.59[a] ± 1.66	7.85[a] ± 2.86	4.36[a] ± 0.27
Handling material	34.21[a] ± 1.76	6.08[a] ± 0.66	5.09[a] ± 0.82	4.56[a] ± 0.49	4.00[a] ± 0.41
Recovery	12.30 ± 1.52	3.68 ± 0.32	3.17 ± 0.43	1.64 ± 0.12	1.38 ± 0.13
Total time	21.33 ± 1.81	5.22 ± 0.44	4.37 ± 0.52	3.67± 0.43	3.29 ± 0.27

[a] =Significantly different from recovery at $p < 0.01$, [b] = Significantly different from recovery at $p < 0.05$

Physiological strain represented as cardiovascular load (%CVL) and muscle strain (%MVC) are compared to set thresholds and the results indicated that most of the massage treatment activities are within the safe limits, ie. %CVL lower than 30% (21.3%). The only activities that did not exceed this threshhold were 'Preparation' and 'Keeping materials or handling material' with workstrains below the 10% MVC threshold. The treatment of neck and shoulder muscles showed the highest scores in Trapezius and Deltoids with some higher values at the left side of the body but remained at safe levels (see Table 2).

4.1 Fatigue analysis

The Fourier fatigue analysis of the raw EMG signals of Trapezius and Deltoid muscles shows results opposite to %MVC (see Figure 1, and Figure 2). The negative fatigue results were found during preparation, during massage lower part of body (LEFAT), upper part of body (UEFAT), keep material (KEPTFAT) and during recovery.

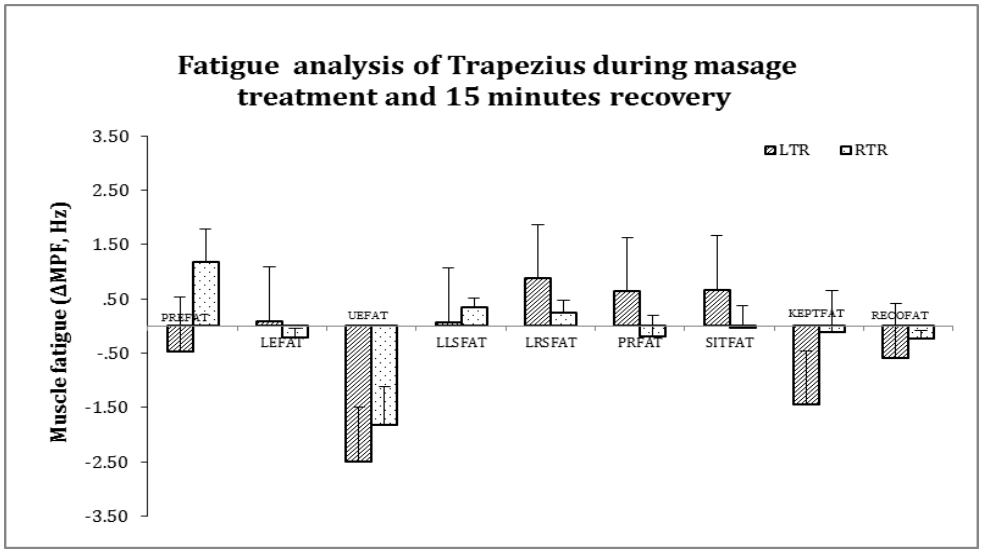

Figure 1 Fatigue analysis of Trapezius muscles during massage treatment and 15 minutes recovery

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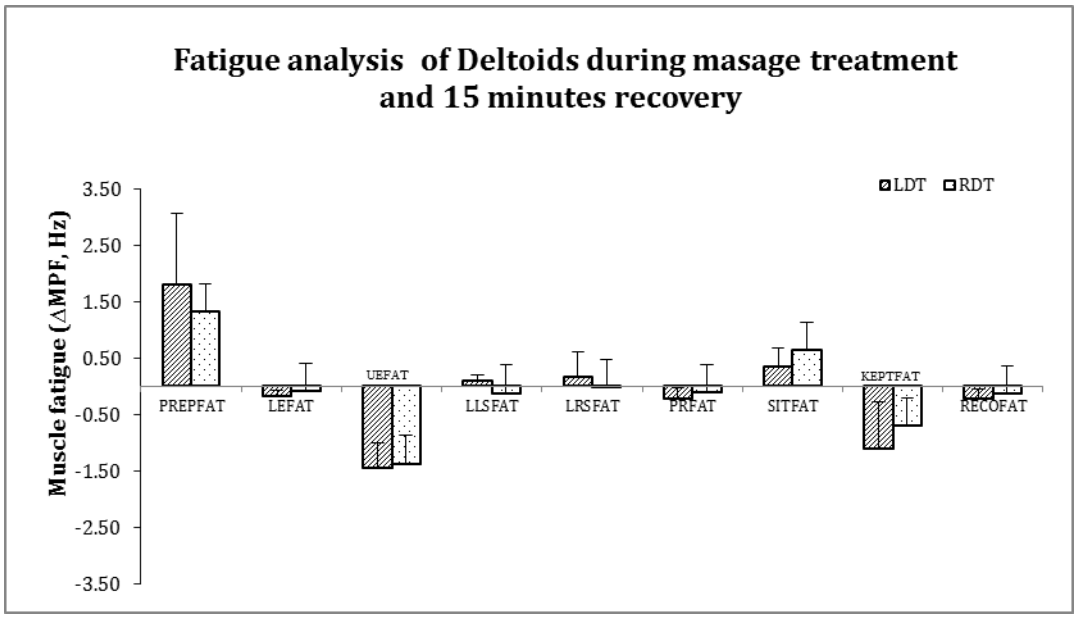

Figure 2 Fatigue analysis of Deltoids during massage treatment and 15 minutes recovery

4.2 Muscle capacity

When the MVC of the 4 muscles is compared before and 15 minutes after the massage treatment, it was found that the muscle capacity of all of muscles was lower than before massage indicating some capacity loss from incomplete recovery after 15 min.

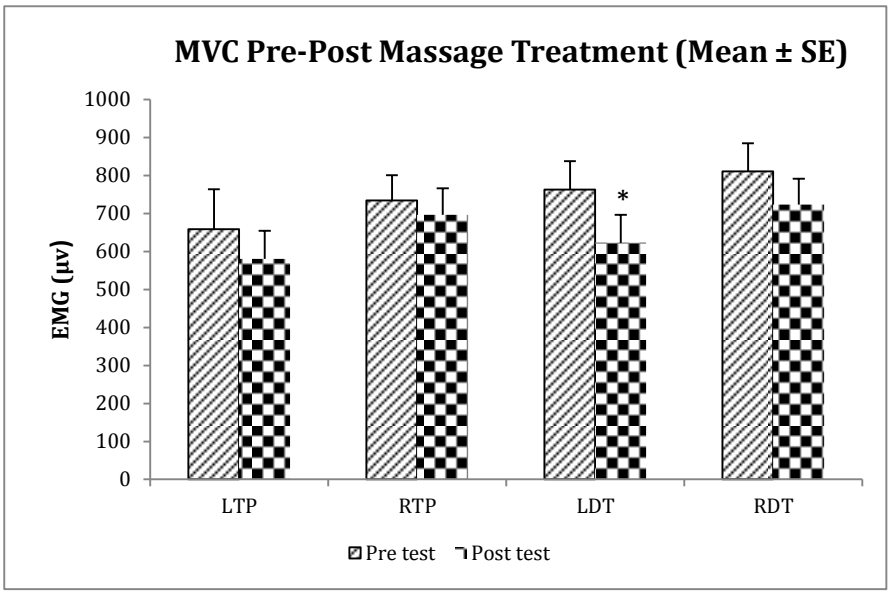

Figure 3 Muscle capacity test (MVC) of massage therapists before and after massage treatment
*Significant different between Pre and Post massage treatment at $p < 0.05$

5. Discussion and conclusion

The evaluation of the physical characteristics of the participating subjects revealed that all subjects were in a good healthy condition. The perceived strain and the objective data showed an agreement between the subjective VAS and the objective %CVL and %MVC. The physiological strain showed that for most treatment activities the cardiovascular system remained within a safe range (below 30%), with some minor negligible exceptions. The muscle strain was below the safe 10% MVC-limit in all activities (Borg, 2013; Häg and Melin, 2003; Oberg et al., 1994; Yoopat, 2004). However the Fourier analysis from the calculated MPF revealed minor differences in the fatigue-level during some activities.

The results showed that the intensity in the M. Trapezius is higher at the left side in all activities, and also persists up to 15 minutes in recovery for the 4 muscles. However, the level of importance is at low impact-level and can be neglected. The left Deltoid also follows somewhat the same tendency but at lower intensity. This may be a consequence of the repetitive cumulative effects in the work-combinations (more dynamic work in arm-movements and more static muscle contractions in the shoulder muscles during treatment), although the differences are quite small (Albert et al., 2006; Alpert et al., 2008; Bork et al., 1996; HimaBindu & Thiruppathi, 2014; McMahon et al., 2006; Punnett & Wegman, 2004).

In the future, the sensitivity of fatigue-detection should be reconsidered in a different test setting with modified workload, e.g. different combinations of 'intensity and duration', or changing the number of successive therapies (e.g. 3, 4, or more), to detect some waste accumulation in the active muscles. It has been found that the growing waste (acidosis) has an asymptotic development. Depending on certain levels of MVC % (>40 - 45%) plot of acidosis can go from linear accumulation to asymptotic, reaching critical levels in a much shorter time (Vanwonterghem, 2009).

Besides the assessment of the energetic aspects of each part of the massage activities in the therapy (composition -e.g. succession of different parts - in the used methods), the effects of successive periods of 'non-activity' between patients could be increased. The recovery in the cumulative fatigue as well as the effects of daily or weekly programming of the massage sessions should be considered. The muscle intensity required by the Chaloeysak massage technique as used in this project, concerning the impact on shoulders and arms movements, shows that there are no explicit risk levels and the set recovery times are sufficient to manage the muscular fatigue at low level. In this project. the assessment used techniques that could serve as a basic methodology for future research projects in which the mentioned proposals could be inserted.

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