Effect of using a Composition of 4 Essential Oils on Self-Esteem, Training Quality and Pain Score in Athletes from the Moroccan National *Poomsae* Team

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ABSTRACT

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Keywords: essential oils, moroccan poomsae team, pain, fatigue, training quality.

Classification: NLM Code: QV 740

Language: English

Great Britain Journals Press

London Journal of Medical & Health Research

Volume 25 | Issue 8 | Compilation 1.0

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I. INTRODUCTION

Taekwondo (Poomsae) is a martial art that combines different components of other oriental martial arts. Poomsae is played with the hands and legs. The legs contain a large group of muscles, which can provide a more powerful impact [1,2]. The technical training of the Poomsae athlete aims to improve the techniques of movements special to this sport. During general technical training, the athlete rebuilds the funds of mobility and impulse which are essential to him in the practice of Poomsae. During specific technical exercises, the athlete aims to master the particular techniques and deepen his sports specialization, resulting in Developing the necessary skills and abilities [3-5]. The techniques used in Poomsae are subdivided according to the following notions: positions, movements, strikes, acrobatic and complicated defense actions and coordination actions [2,4].

Taekwondo is a sport that requires from athletes to exert effort and explosive strength in a short time. It may cause a range of lower extremity injuries and fatigue, thereby reducing athletes' achievement. In extreme cases, an injured athlete will be in the possible need to abandon his professional activity [6].

Before, during and after competition or training, athletes must deal with physical factors, including fatigue, and psychological factors, including negative emotions and mental pressure [7]. Athletes' adaptation skills are a determining factor in their performance, knowing that these skills have an influence on their personal and professional lives [8]. The state of muscle fatigue is determined as the capacity of each muscle fiber to contract its limit and results from excessive physical activities or cyclic exercises [7].

Recovery is an important phase aimed at restoring athletes' physical condition to its normal state before competition or training [9].

Essential oils have shown abilities to improve athletic performance by controlling psychological states, increasing alertness, and reducing physical and mental fatigue [10]. Athletes can use these oils for curative and preventive purposes.

In aromatherapy, essential oils used as therapeutic agents are highly concentrated compounds extracted from stems, fruits, flowers, leaves, roots, or resins [11]. The inhalation of volatile plant materials has been used for centuries in complementary and alternative therapies with the aim of balancing the mental and physical health of humans. Essential oil or also called volatile oil is a concentrated hydrophobic liquid made up of volatile compounds extracted from plants. Application of essential oils is done in 3 ways: by inhalation through the olfactory system and skin, by topical application of essential oil to the skin, and by consumption, including drinking [12]. In general, essential oils contain chemical compounds that have either stimulating or sedative effects depending on their chemical compounds working as a whole. The chemical compounds contained in essential oils include monoterpenes, sesquiterpenes, ethers, alcohols, ketones, phenols, acids, esters and aldehydes [13].

Volatile particles can pass through various parts of the body, by diffusion, via the respiratory system [14] and through oral consumption. Essential oils and their metabolites are absorbed and transported throughout the body via the bloodstream. Once the components of essential oils are in the body, they exert their effects through three different modes of action: biochemical (pharmacological), physiological and psychological [15].

These oils have properties that can be used in accelerating recovery by reducing the incidence of fatigue and boosting the energy level of the mind and body enhancing self-esteem and self-confidence of athletes. Thus, the therapeutic use of essential oils has become recognized as a valuable therapy aimed at improving sports performance and general well-being [16].

This study aims to determine the effect of using a mixture of 4 essential oils on training quality, self-confidence, fatigue and pain in athletes of the Moroccan national poomsae team. Other factors were studied: self-esteem, depression, insomnia and back pain.

II. MATERIALS AND METHODS

2.1 Materials

The choice of the national poomsae team was based on complaints made by players about pain felt before or after training sessions or after their performances in national or international events.

The choice of essential oils to use in this composition was following a series of consultations with a naturopath qualified in sports medicine and taking into account the health conditions of the athletes and their specificities.

The protocol of this study was to use the composition of the essential oils chosen in the form of a mixture of the dilution of the essential oils in an oil carrier. The mixture was used in the form of a delicate massage on the painful area 3 times a day for 2-3 days' maximum.

2.2 Methods

This study used an experimental design with a control group and pre-and post-test group. The sample consisted of 25 athletes. The essential oils used were marjoram sweet, rosemary, basil and chamomile roman blended in proportions of 2:3:1:1. They were mixed with a carrier oil composed of avocado oil (75%) and sesame oil (25%) and they were diluted to 5% after blending. The data were analysed using SPSS program.

2.3 Numeric Rating Scales

The numerical pain rating scale consists of a series of numbers rating the intensity of pain, usually from 0 to 10, with 0 meaning "no pain" and 10 "the worst pain imaginable" [17].

Fatigue numeric rating scale consists of a series of numbers rating the intensity of fatigue during exercise, typically from 0 to 10, with 0 meaning "no fatigue felt" and 10 meaning "tremendous difficulty continuing the exercise" [18].

Training quality and self-esteem by interrogating the athletes on their evaluation before and after using essential oils.

III. RESULTS

Table 1. shows the results of ANOVA analysis. ANOVA test analysis showed a significant difference between the two groups studied.

Table 1: Test Anova 1 Factor Analysis

		Sum of squares	ddl	Mean of squares	F	Signification
AGE	Inter-groupes	.000	1	.000	.000	1.000
	Intra-groupes	5153.333	22	234.242		
	Total	5153.333	23			
GENDER	Inter-groupes	.000	1	.000	.000	1.000
	Intra-groupes	5.833	22	.265		
	Total	5.833	23			
selef esteem	Inter-groupes	273.375	1	273.375	30.439	.000
	Intra-groupes	197.583	22	8.981		
	Total	470.958	23			
DEPRESSION	Inter-groupes	10.667	1	10.667	18.526	.000
	Intra-groupes	12.667	22	.576		
	Total	23.333	23			
BACK PAIN	Inter-groupes	3.375	1	3.375	33.000	.000
	Intra-groupes	2.250	22	.102		
	Total	5.625	23			
PAIN	Inter-groupes	54.000	1	54.000	66.000	.000
	Intra-groupes	18.000	22	.818		
	Total	72.000	23			
FATIGUE	Inter-groupes	66.667	1	66.667	50.000	.000
	Intra-groupes	29.333	22	1.333		
	Total	96.000	23			
Sleep perturbation	Inter-groupes	13.500	1	13.500	28.742	.000
	Intra-groupes	10.333	22	.470		
	Total	23.833	23			
TRAINING QUALITY	Inter-groupes	37.500	1	37.500	79.839	.000
	Intra-groupes	10.333	22	.470		
	Total	47.833	23			
SELF CONFIDENCE	Inter-groupes	18.375	1	18.375	47.097	.000
	Intra-groupes	8.583	22	.390		
	Total	26.958	23			

As shown on table 2, the normality test showed that the age and pain parameters follow the normal distribution, unlike the rest of the parameters studied. Thus, other tests are necessary.

Table 2: Normality Test Analysis

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistics	ddl	Signification	Statistics	ddl	Signification
Age/Eo Yes or No	14	,260	2				
	17	,260	2				
	20	,260	2				
	21	,260	2				
	22	,260	2				
	24	,319	6	,056	,683	6	,004
	28	,260	2				
	40	,260	2				
	56	,260	2				
	62	,260	2				
Gender/Eo Yes or No	Male	,332	14	,000	,646	14	,000
	Female	,329	10	,003	,655	10	,000
Self Esteem/Eo Yes or No	12	,307	4		,729	4	,024
	15	,385	3		,750	3	,000
Depression/Eo Yes or No	Sometimes	,360	7	,007	,664	7	,001
	Often	,455	8	,000	,566	8	,000
Back Pain/Eo Yes or No	Yes	,485	15	,000	,499	15	,000
	Light Pain	,319	6	,056	,683	6	,004
Fatigue/Eo Yes or No	Slithly Fatigue	,519	9	,000	,390	9	,000
Sleep Perturbation/Eo Yes or No	One Night	,504	7	,000	,453	7	,000
	2 Nights	,524	10	,000	,366	10	,000
Training Quality/Eo Yes or No	Acceptable Quality	,385	3		,750	3	,000
Self Confidence/Eo Yes or No	Acceptable	,435	7	,000	,600	7	,000
Pain/Eo Yes or No	Light Pain	,319	6	,056	,683	6	,004

Table 3 shows the analysis of parameters not following the normal law. Since the assumption of normality was not met, the Wilcoxon test was used. Thus, the significant effect of the use of essential oils is observed. The paired groups test (t test) will be carried out for the two parameters following the normality law as shown in table. 4.

	Eo Yes or No - Gender	Eo Yes or No - Selef Esteem 0-30	Eo Yes or No - Depression	Eo Yes or No - Back Pain Yes No	Eo Yes or No - Fatigue	Eo Yes or No - Sleep Perturbation	Eo Yes or No - Training Quality	Eo Yes or No - Self Confidence
Z	-,577[b]	-4.291[c]	-3.754[c]	-,655[c]	-4.319[c]	-2.914[c]	-3.976[c]	-4.041[c]
Asymptotic Signification (Bilateral)	,564	,000	,000	,513	,000	,004	,000	,000

a. Wilcoxon test
b. Based on negative ranks
c. Based on positive ranks

Table 4: Paired Samples t-test

		Paired Differences					T	Ddl	Sig. (Bilateral)
		Mean	Standard Deviation	Average Standard Error	95% Confidence Interval Of The Difference				
					Lower	Superior			
Paire 1	Age - Eo Yes or No	28,833	14,977	3,057	22,509	35,158	9,431	23	,000
Paire 2	Pain - Eo Yes or No	3,500	2,226	,454	2,560	4,440	7,702	23	,000

Similarly, the use of essential oils had a significant effect on age and pain between the two studied groups.

Aromatherapy significantly affected the studied parameters between the experimental groups.

The results showed that aromatherapy has major effects on decreasing pain and fatigue levels, increasing self-esteem, self-confidence and improving training quality. Based on our experiment's findings, we suggest that aromatherapy can be an effective alternative method to address the various types of stress and discomfort experienced by athletes before and after training sessions and competitions.

IV. DISCUSSION

The results showed that aromatherapy has major effects on decreasing pain and fatigue levels, increasing self-esteem, self-confidence and improving training quality. Based on our experiment's findings, we suggest that aromatherapy can be an effective alternative method to address the various types of stress and discomfort experienced by athletes before and after training sessions and competitions.

As a result, a positive effect of the 4 essential oils used on the pain and fatigue of Taekwondo athletes in Morocco is declared.

Rosemary, an aromatic plant whose scientific name is *Rosmarinus officinalis L.*, belonging to the *Lamiaceae* family. *R. officinalis L.* is a Mediterranean aromatic shrub well known for its evergreen leaves and medicinal properties. This particular variety is distinguished by its high content of cineole, a chemical compound also called eucalyptol, which gives it specific properties [19]. Rosemary has various pharmacological properties to treat diseases, including the treatment of Alzheimer's disease [20] and its hepatoprotective abilities [21]. Thanks to its analgesic and anti-inflammatory properties, rosemary essential oil is often used to treat muscle pain, joint pain and tension. Rosemary, especially in its cineole form, is an excellent adaptogen, it can help combat mental and physical fatigue, as well as stress. Rosemary essential oil can be extracted by steam distillation from fresh twigs

and leaves. A previous study by Sienkiewicz et al. [22] revealed that the main compounds of rosemary essential oil include *1,8-cineole* (46.4%), *camphor* (11.4%), and *α-pinene* (11.0%). in addition to some terpene compounds in small quantities (*Borneol, Linalool*, etc.). Rosemary essential oils can be extracted through steam distillations of twigs and fresh leaves.

Common sage or *Salvia officinalis* is one of the species of *Salvia*. Sage is well known for its medicinal properties and has been used since ancient times to treat various ailments. It contains essential oils, flavonoids, tannins, and phenolic acids, which give it powerful therapeutic properties [23]. A 2017 study reported that the main compounds in *Salvia officinalis* essential oil included *camphor* (25.14%), *α-thujone* (18.83%), *1,8-cineole* (14.14%) %) and *viridiflorol* (7.98%) [24]. The pharmacological properties of sage essential oil are antioxidant, anti-inflammatory, antimicrobial, anticancer, calming and anxiolytic and sage essential oil also serves as cleansing agents (antiseptic and antibacterial) [25].

In addition, sage essential oil appears to improve emotions and cognitive functions in humans. the results of the study by Moss et al. [26] revealed that sage essential oil improved mood and memory performance after sage essential oil inhalation compared to the control group without essential oil [26]. Gaballah and al., [27] measured the effect of sage consumption on the respiratory functions of football players. Researchers have suggested that sage essential oil promotes high-intensity, repeated exercise [28].

O. basilicum, Basil essential oil is known for its high content of phenolic and flavonoid components, including *chlorogenic acid, gallic acid, rutin, quercitrin, isoquercitrin, rosmarinic acid, caffeic* and *kaempferol* and other bioactive compounds, giving it a wide range of therapeutic properties. It is used for its anti-inflammatory, antibacterial, antifungal, calming, digestive, and antioxidant properties, and is often used in aromatherapy to treat various conditions, ranging from digestive disorders to stress and anxiety [29].

Basil oil (including sesame oil as a vehicle) has been specifically recommended for relieving joint pain [30, 31]. Research has demonstrated its excellent antioxidant properties [32], attributed to its high content of polyphenols and flavonoids [33]. Many studies have confirmed these anti-nociceptive [34, 35] and anti-inflammatory properties [36-38] of this medicinal plant.

Therefore, the topical application of basil oil thrice daily over a period of 4 weeks can effectively improve the clinical symptoms of knee osteoarthritis, which is considered an efficient method for managing this condition [39, 40].

The improvement in clinical symptoms of knee osteoarthritis suggests that the peripheral antinociceptive activity of the plant is associated with the inhibition of pain mediators such as prostaglandins [39, 40].

Chamomile nobile (L.) All. (Asteraceae), widely known as *Roman chamomile*, is a perennial herb native to southwest Europe, it is considered a medicinal plant and cultivated throughout Europe and also in Africa. The plant was given the name *"nobile"* (Latin, noble) for its greater therapeutic effectiveness than *Matricaria recutita L.* (German chamomile) [41]. The use of traditional *Roman chamomile* in medicine is especially linked to its supposed smooth muscle relaxing effect. Anti-inflammatory properties and heat shock protein stabilizing effects of the *flavonoids apigenin* and *quercetin,* as well as the anti-inflammatory properties of *α-bisabolol, guajazulene,* and *chamazulene* have been reported in preclinical studies [42-44].

The results of the study of *Roman chamomile (A. nobilis)* essential oil indicated that the volatile oils possessed high antioxidant activity [45] and it was in good agreement with its higher phenolic content. As revealed by mass spectrometry analysis, the potent antioxidant capacity of aqueous extracts of *A. nobilis* may result from the presence of *quinic* acid and *caffeic* acid derivatives [46].

In an open clinical study carried out on 54 patients suffering from chronic bronchial asthma,

A. nobilis showed anti-asthmatic effects, it induced a significant increase in the values of forced expiratory volume in the first second (FEV) and forced volume capacity (FVC) with a marked decrease in the frequency of asthma attacks [47]. Which can be helpful to athletes with special cases or to improve the VO2max (maximum oxygen consumption) capacities.

Jeong et al. (2000) reported that aromatherapy shortened the time needed for recovery by reducing the sensation of pain in the arms and legs. These effects are thanks to muscle relaxation. As a result, aromatherapy has been reported to improve athletic performance. Aromatherapy and acupressure to acupoints significantly reduced the creatine phosphokinase (CPK) levels [48].

Therefore, aromatherapy is known to alleviate symptoms related to imbalance in the autonomic nervous system [49]. With regard to the release mechanism of the stress hormone catecholamine, Langer (1980) reported that decreased stress and awakening were observed after simultaneously inhaling relaxation oil, which is made of lavender and clary sage known to reduce blood pressure and stress, and stimulation oil, which is made of lemon and rosemary. It can be inferred that inhaled aromatic oil scents affect the adrenal glands [50].

The results showed that aromatherapy using essential oils was the most effective method for reducing fatigue and lowering stress hormone levels [51].

Fatigue is reduced during exercise thanks to aromatherapy and essential oils. Although the participants exercised under the same conditions for the same duration and with the same intensity, they rated the exercise less difficult during the second experiment and reported that the time passed more quickly [52].

Participants showed an improvement in their feelings after exercise. This is an important issue in sports sciences and has been verified by numerous studies [53]. In other words, the improvement in a person's feelings when exercising will consequently result in the desire to continue exercising.

V. CONCLUSIONS

The results showed that aromatherapy has major effects on decreasing pain and fatigue levels, increasing self-esteem, self-confidence and improving training quality. Based on our experiment's findings, we suggest that aromatherapy can be an effective alternative method to address the various types of stress and discomfort experienced by athletes before and after training sessions and competitions.

As a result, a positive effect of the 4 essential oils used on the pain and fatigue of Taekwondo athletes in Morocco is declared.

Aromatherapy is a booster for maintaining the four components of sports performance. Athletes can enjoy the benefits of essential oils, including healthy respiratory function, clear breathing, better sleep quality, more energy, rapid recovery, reduced muscle and joint pain, increased concentration and a healthy emotional state. Essential oils appear to be very effective in reducing physical and mental fatigue, promoting sports performance and promoting the recovery of athletes. *Rosmarinus officinalis L.* (rosemary), *basilicum*, Basil essential oil, and *Salvia officinalis L.* (sage) accelerate sports recovery and relieve fatigue while improving physical performance and concentration. *Roman chamomile* essential oil improves physical performance while promoting sports performance and physical functions. Therefore, athletes benefit from applying essential oils to help them maintain and improve their overall athletic performance. There are still other essential oils which have not yet been the subject of study of their effects on sports performance. Future research is needed to apply their benefits to sports performance.

Conflicts of Interest: The authors declare no conflict of interest.

ACKNOWLEDGMENTS

The authors would like to thank the research coordinators at the recruitment center especially Madiha Bahouq, Hanane Bahouq, Ali Amassnaou and Driss Elhilali for their expertise and technical contribution.

Declarations

The authors declare that this work is not part of any project and has not received any funding.

Funding

not applicable.

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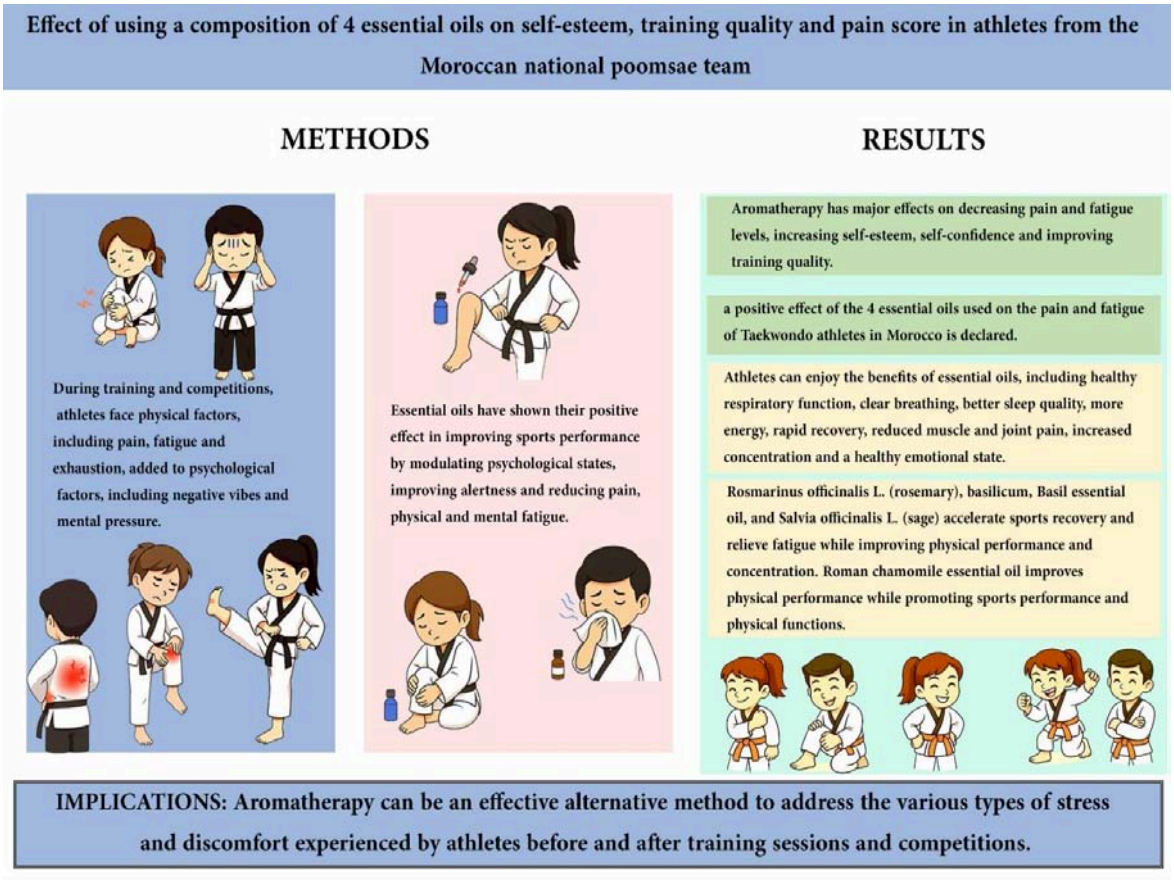

Graphical Abstract