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Analysis of the Effect of Inhaling Orange Essential Oil on Self-Confidence and Competitive Anxiety of Female Athletics Comparing with Relaxation

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Abstract

Background: *This study aimed to investigate the effectiveness of inhaling orange essential oil on self-confidence and anxiety, and comparing with relaxation method in female futsal players.*
Methods: *This study was a quasi-experimental one with pre and post-tests. The statistical population of the study consisted of all female futsal teams in regional competitions, the youth category of the East-Azerbaijan province. Using available sampling, 3 teams that can reach that level were selected. Then, were randomly divided into 3 groups of relaxation, orange essential oil, and control. The intervention programs were held in 8 weeks (two sessions per week, and each session was 15 minutes). To assess, the competitive state anxiety questionnaire (CSAI-2) was used, and covariance method in SPSS software25 was used for analyzing the data.*
Results: *Results showed that there are significant differences between experimental and control groups concerning cognitive anxiety and somatic anxiety. According to the findings, this amount was more significant in the aromatherapy group. Also, results revealed a significant increase in confidence in aromatherapy and relaxation groups, so that no superiority was seen among the groups. This was while no significant difference was reported in any scale of the control group.*
Conclusions: *Based on the results, the use of aromatherapy as a simpler and more effective method is recommended to coaches and officials of sports teams.*

Keywords: Cognitive anxiety, Physical anxiety, Aromatherapy, Relaxation, Self-confidence
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Introduction

Entering into the communication and information era makes the presence and influence of a phenomenon as anxiety in human life is increasingly felt; the field of sports science is no exception to this effect. Competitions in sports matches are always accompanied by high levels of anxiety and arousal; by analyzing studies in recent decades, due to the imposition of anxious and stressful demands and the impact on their motivation, the relationship between competitive state anxiety and athletes' performance has received much attention among psychological researchers.[1] Anxiety background studies have defined this phenomenon as a feeling of stress and less tranquility as a result of stressful environmental demands which are associated with arousal and indicate an inconsistency between environmental demands and the athlete's ability to encounter those demands.[2,3] The problem occurs when the arousal feeling increase, according to the Yerkes-Dodson law, can improve performance up to a certain point in the athlete and then leads to degradation. On the other hand, according to the zone of the optimal functioning, each athlete prefers optimal anxiety range that performs best in this particular area. When athletic exceed its normal limit, it will lead to unpleasant experiences and enhance mistakes in performance.[4]

Martens et al. (1990) introduce anxiety as a multidimensional science that is a set of two-dimensional connections between cognitive anxiety, somatic anxiety, self-confidence, and athletic performance.[5] According to this theory, somatic and cognitive anxiety have various impacts on athletes' performance.

In this theory, somatic anxiety is physiological changes due to the experience of factors such as fear of failure, exercise's require, emotional needs, spectaculars and personal problems that cause symptoms such as increased Respiratory rate so dispose of much carbon dioxide, racing heart rate, increased blood pressure, increased blood sugar, decreased skin resistance, dry mouth, dilated pupils, low levels of alpha wave activity in the brain, and severe muscle tension.[6] Cognitive anxiety, on the other hand, is defined as negative expectations and concerns about personal abilities during a competition. All of these signs in sports are often perceived as a threat so that it leads to a decrease in self-confidence,[7] lack of concentration and attention focus,[4] disrupt in physical movement system[7] and increase the incidence of injuries and finally may lead to quitting sports.[2] The direct negative relationship between somatic anxiety and athletes' performance has been proposed in various studies based on theories of attention. This theory explains that cognitive resources are occupied by disturbing and negative thoughts, and these negative thoughts do not allow access to the source of attention for the in-progress task. In addition, based on processing efficiency theory (Eysenck and Calvo, 1992), anxiety and negative thoughts lead to reduced attention to performance-related cues which can fill the capacity of working memory with more irrelevant mental effort concerning the task and all of them cause to the destruction of performance.[8]

Self-confidence has been identified not only as a degree of belief in the encounter of task challenges but also as an effective factor in decision making in times of anxiety.[7,8] In

addition, under the high pressure of sports competitions, high self-confidence will allow athletes to raise their tolerance threshold against a high level of arousal during competitions before its negative impact on performance.[3,9] Further studies have proven that increasing the level of self-confidence in athletes will help them significantly in creating and maintaining a positive attitude towards their level of anxiety.[3] Therefore, learning skills to control tensions and overcome anxious and stressful situations of competitions will allow the athlete to be able to control his mental and dominate himself in different situations; because psychological control improves the performance of sports activities.[4]

By relying on these reasons, sport psychology has represented the right solution. Its suggestion is using a kind of physical and mental skills such as relaxation and Aromatherapy.

Over the past few decades, relaxation introduced as a combination of cognitive-behavioral and psycho-physical interventions in the field of psychology. It is considered as part of coping and non-drug skills to control the tensions and guarantees the performance.[3,10] Among the various techniques introduced in this field, Jacobsen's progressive muscle relaxation (PRM) technique (1938) due to the simultaneous significant positive effect on controlling anxiety and increasing physiological and psychological benefits were chosen in this research.

Relaxation exercises reduce the stimulatory effects of the sympathetic system and create a balance between mental functions and excitement.[11] In addition, applying this method leads to the creation of appropriate physical and psychological responses such as improving blood circulation,[12] reducing stress and anxiety and improving performance,[10,11,13] reduction of depression through positive attitude,[14] reduction of fear,[15] reduction of migraine pain,[16] reduction of premenstrual syndrome symptoms,[17] increase the speed of improving injuries,[12] increase self-confidence,[3] and improve the general health.[11]

On the other side, in today's world, along with industrial supplements, aromatherapy is used as ergogenic aids in sports competitions.[18] In aromatherapy, volatile oils are extracted from plants and used in assorted ways like a massage on the skin, inhalation, and bathing. In the inhalation method, aromatic substance through neural cells in noise molecules reaches the olfactory area in the brain, which is closely related to the limbic system (the center of emotion control) and exerts its inhibitory or stimulatory effect. It should be mentioned that depending on the aromatic type, the neural cells, there will be released many various neuron-transmitters such as Encephalin, Endorphin, Noradrenalin, and Serotonin, and these make the emotional responses.[13,18] Orange is a plant of the citrus family (Rutaceae) that is considered one of the native citrus fruits of Iran. Oils are found in the skin of oranges, which include D-limonene (C10H16), decyclic aldehyde and linalool, and DL-terpineol, some flavonoids which reduce blood cholesterol and anxiety.[19]

Studding histories indicated that citrus sinensis have a significant effect on declining stress and anxiety in cardiovascular,[18] dental,[20] and hemodialysis patients,[21] has a positive effect on vital signs[20,22] and parturition problems, [23] play antispasmodic, anti-cancer, and anti-flatulence role, improve digestion, and antihypertensive, stimulates the central nervous system,[24] reduces depression,[25] and has anti-inflammatory, antimicrobial, and antifungal in skin lesions.[19]

Also, in the field of exercise as a painkiller in muscle soreness due to training,[26] improving sleep quality, mood, team performance of female volleyball players[27] and the positive effect on the activity of the heart, ventricular function, and systolic blood pressure in girls during exercise[28] are other benefits of using this method.

Considering the inseparable and permanent presence of anxiety in sports events and according to these interventions have not been studied together with elite athletes, the present study aimed to investigate the effect of orange essential oil inhalation on competitive anxiety in female futsal players. It was performed and its effectiveness was measured in comparison with the relaxation method to be a way to help the efficient performance in athletes and to introduce a new field for researchers.

Materials and Methods

This semi-experimental study is being carried out in 45 female futsal players with pre and post-test plans. Our sample has been selected by available sample method, but these 3 futsal teams must be having inclusion criteria like being one of the teams that qualified for the Tabriz youth league, the average age of player should be between 18-25 years old, all players should have enough experience at least in provincial games, and all players having a healthy olfactory system. Exclusion criteria were players mustn't take certain medications (such as sedatives), players have an allergy to fragrances, problems with the olfactory system, and dropping out of the study. It should be noted that the control trial code of this study is UMIN000045536.

After selecting samples and putting them into 3 groups of 15 players as the experimental group (included aromatherapy and relaxation) and control group by accident and before starting of program permission was obtained by researcher and informed them about their right to withdraw from the study at any time. Then, the experimental groups learned how to use orange essential oil progressive muscle relaxation (PMR) during the first session. The experiment was done in 8 weeks (2 training sessions per week) for 15 minutes in each session. During this period, the control group did their routine program. Before and after the intervention, about 10 minutes before starting of the competition in all of the groups (experimental groups and control group), Martins competitive anxiety inventory (CSAI-2) was given to participants and was asked to answer the questions according to their feelings of that moment. Data was collected in pre-test and post-test in the same way.

Participants completed a questionnaire on demographic information (age, having special physical disease, educational level).

The second questionnaire is Martins competitive anxiety inventory (CSAI-2). This multidimensional structure questionnaire consists of 27 items with 4 response options (from very much=4 to never=1) that have got three subscales: cognitive anxiety, somatic anxiety, and self-confidence. This scale was employed in sport competitive situations. Concerning the reliability of the scale, Cronbach's alpha coefficient for all of the questionnaires is achieved at 0.83 and α=0.82 for cognitive anxiety scale, α=0.76 for somatic anxiety scale, and α=0.73 for the self-confidence scale.[3]

Progressive muscle relaxation (PMR): To relax, the progressive muscle relaxation (PMR) method which was developed by Jacobsen in 1938 was used. Athletes can do it easily because it does not need a specific time, place, technology, and equipment. This method is based on the principle that muscle tension and recovery for 30 min. It makes body and mind are greatly relieved from any tension and anxiety by the physiological response of the human body to irritating thinking.[29]

Regarding the orange essential oil, after consultation with experts, we choose Barij Essential oil company and the orange oil. It consists of at least 18 mg of limonene per milliliter. 10 drops of orange essential oil were poured on the cotton and glued to the player's nose with paper glue. Players training in this position for 15 min on the exercise days.

To analyze the data, SPSS25 was conducted. Descriptive statistics were used to calculate the mean and standard deviation indices. In the inferential statistics section, the Kolmogorov-Smirnov test was used to ensure the normal distribution, and the Leven test was used to determine the homogeneity of variances. To estimate the effect of relaxation and aromatherapy on the research variables, using the statistical test of covariance. The significant level was set at 0.05.

Results

Sample characteristics of 44 participants (in average age 21±3 years old with average experience 7±2 years old) who took part in the study, one of the players in aromatherapy eliminated because had an allergy to orange oil.

The statistical assumption was tested before checking the normality of scores of CSAI-2. The results of the Kolmogorov-Smirnov test showed that the distribution of data was normal at a significant level of 0.05.

According to the purpose of the study, the means and standard deviations of competitive anxiety, aromatherapy, and relaxation scores for all participants at pre-test and post-test measurements were analyzed (table 1).

Our covariate by interventional methods is not statistically significant at all (F (2,24)=0.290, Pvalue=0.760 to state competitive anxiety, F (2,24)=2.070, Pvalue=0.148 to somatic anxiety, F (2,24)=3.120, Pvalue=0.062 to cognitive anxiety, and F (2,24)=1.838, Pvalue=0.181 for self-confidence). This means that the regression slopes for the covariate don't differ between treatments: the homogeneity of regression slopes assumption seems to hold almost perfectly. Next, our data need to satisfy the homogeneity of variance assumption. Its results are shown F (2,27)=0.983, Pvalue=0.387 for state competitive anxiety, F (2,27)=3.563, Pvalue=0.054 for cognitive anxiety, F (2,27)=2.707, Pvalue=0.176 for somatic anxiety, and F (2,27)=0.491, Pvalue=0.617 for self-confidence. It means that we don't reject the null hypothesis of equal error variances. Our data meet the homogeneity of variances assumption and this means we can confidently report the other results.

In table 2, there was a significant difference in mean competitive state anxiety F (2,26)=42.290, Pvalue=0.0001 between both interventional methods. The partial Eta squared value indicates the effect size and should be compared with Cohen's guidelines (0.2 – small effect, 0.5 – moderate effect, 0.8 – large effect). It can be seen that for anxiety the effect size is near the large. Moreover, a significant effect was observed between the experimental groups and control group in mean cognitive anxiety, somatic anxiety, and self-confidence groups with different effect sizes for each factor are 52%, 58%, and 46%, respectively, which shows the difference in the dependent variable caused by the methods.

The results of the LSD test showed that the rate of physical and cognitive anxiety in the aromatherapy and relaxation group (without any particular superiority in one method) is significantly lower than the control group. However, observations have shown that the confidence factor in the aromatherapy and relaxation group (without any particular superiority in one method) is significantly higher than the control group.

Table 1. Means and typical deviations of competitive state anxiety inventory-2 (CSAI-2) scores

Variables	Aromatherapy group (n=13)		Relaxation group (n=13)		Control group (n=13)	
	Pre-test M ± SD	Post-test M ± SD	Pre-test M ± SD	Post-test M ± SD	Pre-test M ± SD	Post-test M ± SD
Somatic anxiety	13±0.84	10.6±0.54	13.8±0.91	11.8±0.64	14±0.78	13.5±0.79
Cognitive anxiety	13.8±0.98	10.8±0.68	14±1.02	11.6±0.85	14.20 ±1.25	13.9±1.16
Self-confidence	19.9±1.90	23.3±1.90	18.9±1.44	22.4±1.75	20.7±1.30	21.4±1.57

Table 2. The result test of between subjects

source	F	Sig	Partial Eta Squared
Somatic Anxiety	14.544	0.0001	0.528
Cognitive Anxiety	18.370	0.0001	0.586
Self-confidence	11.275	0.0001	0.464
State competitive anxiety	42.290	0.0001	0.765

Discussion

One of the goals that sports psychology pursue, improving the performance in sports by using the methods of this science. The results of the present study showed that the scores of competitive anxieties in the dimensions of cognitive and somatic anxiety in compared to before the intervention decreased. Thus, the present results do replicate what has been observed in previous studies both in aromatherapy method researches like Fakari et al.'s (2015) study on labor anxiety,[3] Hasanshahi et al. (2020) on women in dental office,[13] Kanani et al., (2012) on hemodialysis patients,[20] Torabi et al. (2017) on girls during exercise,[21] is also consistent and in relaxation method researches like Khabiri et al. (2017) in the sample of professional wushu practitioners,[28] Hashemzadeh et al. (2011)[30] and Jafari et al. (2015)[31] in among heart patients, Malik et al. (2019)[32] and Esfahani and Ghezel (2012)[33] among physical education students, Mehrsafar et al (2016)[34] between individual and team athletes, Hamzeh et al.'s (2017) in women basketball players,[35] Liang et al. (2020) among track and field athletics,[36] Rizal et al. (2019) in the archery team,[37] Sakhare et al. (2018) among athletes in the fields of badminton, karate, table tennis and skating,[38] and Singh and Singh Deol (2018) on speed and endurance track and field athletes.[39]

The results of this research on the significant reduction of cognitive and somatic anxiety after the intervention can be explained not only by the individual zones of optimal functioning (IZOF) model but also by the type of sport. In futsal, which is classified as an open and complex sports skill, improves the level of performance of athletes by reducing the level of anxiety. This topic confirmed the results of the tournament standings (second and fourth in their groups). We almost claim that by using these interventions, athletes achieved positive results by controlling their anxiety level and keeping it within their zones of optimal functioning (IZOF). The relaxation response is a physiological phenomenon that is activated by the parasympathetic nervous system and the result is a reduction in anxiety by facilitating the secretion of endorphins. Following muscle relaxation and the conversion of sympathetic dominance to parasympathetic, athletic feel more comfortable and relaxed for a longer time and will be less irritable in future activity.[40] In addition, according to Hashemzadeh et al. (2011), by using relaxation techniques in anxious situations, the person will gain correct knowledge and logical awareness of the situation and his interpretation of the situation will be safer and less threatening30. In this regard, according to Mehrsafar et al. (2017), relaxation technique is one of the action-based coping strategies and emphasizes the athlete's action and reaction against stressors and anxiety factors.[41] It can reduce anxiety in people by increasing the positive emotions associated with exercise. The mechanism of that according to Golmohammadi et al (2018) is as follows: applying effective coping strategies prepares the athlete for active confrontation with competitive anxiety and makes strengthens the right hemisphere of a person by creating positive perceptions during the training and activating that area and finally reducing the level of anxiety.[10]

On the other hand, regarding the effectiveness of the aromatherapy method, not only based on everything mentioned before but also according to the results of Abdi et al. (2018),[18] Ozgoli et al. (2011),[24] and Babashahi et al. (2012)[42] manuscripts, the effect of this method by adjusting neurotransmitters in the olfactory bulb with a direct effect on the limbic system to transmit sensory information to higher centers of the brain. It acts as a drug on the brain and nervous system. Of course, in various approaches, according to Fakari et al. (2015)[13] and Hasanshahi et al. (2020),[20] inhalation of oil improves blood circulation and respiration. So, we can claim it plays a major role in body homeostasis activities and reduces anxiety levels.

However, the results of the present study of aromatherapy are not supported by the study of Holm and Fitzmaurice (2008).[43] Their study aimed to determine the effect of music therapy, aromatherapy, and a combination of two methods on the anxiety of adults who accompany children in the emergency department in the hospital. They announced no effect of inhaling orange essential oil on anxiety. It has been possible that apply a different method of essential orange oil. Because most people in the aromatherapy group were pointed out that did not notice the orange scent emitted from the electrical device, which may indicate the need for a stronger diffuser or a more amount of oil. Also, the hospital had an airflow system designed to continuously circulate the air that can reduce the aroma. Therefore, according to these claims, it can be said that in such circumstances, there was no possibility of successful aromatherapy.

Regarding self-confidence, it didn't report a significant difference between both experimental groups and the control group, according to the results after the intervention of the methods. This score increase was reported to be more significant in the aromatherapy group than in the relaxation one. In search of databases, the present results confirm previous findings in various sports (team and individual) between elite and Amateur groups by Neil et al. (2012), Khabiri et al. (2017), Esfahani and Ghezel (2012), Jones et al. (1991).[3,9,33,44]

In explaining this result, based on the Jones claim (1991) and then with the confirmation of Norouzi and Mohammadi (2018), the athletes of the group who have less somatic anxiety have more self-confidence.[44,45] This not only returns to explain that being in a group has acted as a source of anxiety control but also increases self-confidence by feeling the support and encouragement from the other group members. Besides studying the background of coping methods in sports psychology, it is possible to be said that using these techniques in calming the mind from annoying thoughts and indirectly releasing muscle tensions causes relaxation and has a positive effect on increasing self-confidence.

Mind is a factor that has a positive effect on the ability and disability, and the success and failure of an athlete. Applying effective coping strategies such as relaxation and aromatherapy prepares the athlete for active coping with competitive anxiety and helps him to the better manner and be able them to manage crises situation during play. In this study, it was proved that players by using these strategies be able to have a positive evaluation of the symptoms of anxiety experienced in the competition and conclude that anxiety is also a controllable

factor. This expectation of the athlete's positive coping, that is, the feeling of being able to control the situation with available sources of coping, reduces the possibility of negative excitement.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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