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The Effect of a Three-Month Training Program on the Back Kyphosis of Former Male Addicts

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***Abstract*—**Adopting inappropriate body posture during addiction can cause muscular and skeletal deformities. This study is aimed at investigating the effects of a program of the selected corrective exercises on the kyphosis of addicted male patients. Materials and methods: This was a quasi-experimental study. This study has been carried out using the semi-experimental method. The subjects of the present study included 104 addicted men between 25 to 45 years of age. In 2014, these men were referred to one of the NA (Narcotic Anonymous) centres in Kashan in 2015. A total of 24 people suffering from drug withdrawal, who had abnormal kyphosis, were purposefully selected as a sample. The sample was randomly divided into two groups, experimental and control; each group consisted of 12 people. The experimental group participated in a training program for 12 weeks consisting of three 60 minute sessions per week. That includes strengthening, stretching and PNF exercises (deep stretching of the muscle). The control group did no exercise or corrective activity. The Kolmogorov-Smirnov test was used to assess normal distribution of data; and a paired t-test and covariance analysis test were used to assess the effectiveness of the exercises, with a significance level of $P \leq 0.05$ by using SPSS18. The results showed that three months of the selected corrective exercises had a significant effect ($P \leq 0.005$) on the correction of the kyphosis of the addicted male patients after three months of rehabilitation (drug withdrawal) in the experimental group, while there was no significant difference recorded in the control group ($P \geq 0.05$). The results show that exercise and corrective activities can be used as non-invasive and non-pharmacological methods to rehabilitate kyphosis abnormalities after drug withdrawal and treatment for addiction.

***Keywords*—**Kyphosis, corrective exercises, addict, drug withdrawal.

I. Introduction

REDUCED physical activity and poor movement are characteristic of addicts [1]. As it is, addiction is increasing in our country, imposing irreparable damage on people and society [2]. Physical health and optimal posture are very important for living; and its positive or negative changes can affect many other aspects of a person's life. Skeletal abnormalities are caused by a lack of mobility, environmental stimuli, as well as improper movement patterns, all of which negatively impact the psychological, social and physiological performance of individuals [3]. Maintaining spinal alignment and a strong, healthy posture depends on the effective functioning of muscles and ligaments. Any weaknesses in the supporting muscles of the spinal alignment affect posture and can have adverse effects on overall physical health. Left untreated, these mechanical abnormalities may become permanent and uncorrectable [4]. Considering inappropriate motion habits and lack of movement at the time of addiction, an addict will face with weaknesses and musculoskeletal abnormalities. This situation has unfavorable effects on skeletal structure, social and personal life. Kyphosis, also known as curvature of the spine, is a condition that causes a hunching of the back. Weakened muscles, especially the erector spinal muscles and short front chest muscles are its main causes [5], [6]. Nowadays, scientists consider addiction, because of its undesirable effects on memory and a surge in inappropriate behaviors, as a chronic disease and sport is the most effective way to treat this structure. They believe that exercise can be effective on correction, restoration, and reconstruction of damaged neuromuscular tissues [7], [8]. It is reported that playing with physioball has led to kyphosis correction, better balance and life quality for addicts [9]. Also, doing corrective activities to strengthen the vertebral column muscles causes reduction in kyphosis angle after 12 weeks [10], [11]. According to reports, long-term sporting activity decreases allergies to the effects of morphine and narcotics, and removes the physical signs of addicts, for example, the need for drugs, weakness and pain [12]. In a study to test the effects of stretching and strengthening exercises for seven weeks on hyper-kyphosis showed significant improvement in the kyphosis angle [13]. In another study, the same results were obtained through an aerobic and corrective training program [14]. One of the symptoms of kyphosis and lordosis is related to the respiratory system, as it reduces chest volume and the volume of air entering the lungs resulting in poor circulation. The lack of oxygen and nutrients circulating through the body, damages and ultimately destroys body tissue [15], [16]. These irregularities can cause muscle fatigue, deformation of the joints, short and stretched ligaments, unnatural pressure on inter-vertebral discs, short and limp muscles, destruction of the biomechanical balance, a decline in efficiency of body leverage, decline in muscle strength and other factors of physical fitness, cardiovascular disorders, and kidney problems, as well as nerve, muscle and joint pain [17], [18]. The importance of non-drug treatments such as exercise and physical activity in the rehabilitation of former drug users, combined with drug treatment, can decrease the likelihood of returning to addiction and the duration of withdrawal. Given the lack of research on the effects of corrective exercise on addicts during rehabilitation, this research aims to investigate

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the effects of a three-month selected therapeutic program on the correction of kyphosis on former addicts. In this study will propose appropriate guidelines for treatment by recording the changes in the kyphosis of patients. These results will not only facilitate services to patients, but provide wider spread economic and social benefits.

II. Procedure

This quasi-experimental study is performed using pretest-posttest on both the control and experimental groups. The population of this study consists of 104 men in the process of drug withdrawal, ranging in age from 25 to 45, referred to the center of NA groups, Narcotic Anonymous-NA, in Kashan in 2015. After initial identification and screening of the participants using Posture Screen and plumb line, a total of 24 people suffering from drug withdrawal, 24 addicts diagnosed with kyphosis were selected as a purposefully sample and randomly divided into two groups of 12. Inclusion criteria included: 1. kyphosis angle greater than 45 degrees. 2. Not taking related medications. 3. Lack of musculoskeletal disorders and specific disorders except kyphosis and lordosis. 4. Three months after withdrawal. Exclusion criteria included: 1. Chronic diseases, infectious and orthopedic diseases. 2. The use of narcotics and psychotropic drugs. 3. Not participating in a regular training program. It should be noted that that all participants taking part in the study completed the full program. Prior to the start of the training, the process and objectives of the study were explained and all participants gave their informed consent. All participants were examined by doctor and declared fit to participate in the exercise program. A psychiatrist was also available to offer advice and support, and was present for the duration of the exercise programs.

A. Measuring Tools

The height and weight of participants was measured using a digital scale (100-gr accuracy) and a stadiometer (1-cm accuracy), made in Iran. For primary screening and identification of the participants, a posture screen and plumb line are used. To measure the curvature of the thoracic and lumbar of spinal cord, a 60 cm flexible ruler, made in Thailand, are used which has special characteristics such as rapid, inexpensive and non-invasive measurement. Seyedi and colleagues [19] showed that the reliability and validity of using a flexible ruler to measure kyphosis and lordosis is more than 89 % and 92 %, respectively. The validity of the ruler measurements compared to the X-ray was r=0.91, while the inter-examiner reliability was 0.82 [20].

B. Method of Measurement

Posture Screen and plumb line are used to diagnose kyphosis and conduct primary screening on the participants. In this method, participants stand side on and without clothes in front of a posture screen in a standing position with bare feet. In this case, a vertical line in the middle of posture screen should pass from the side of ears, middle of arms, middle of the chest and waist, external central part of the patella and external ankle punctuated by markers on the body of the participants. The participants, whose thoracic and lumbar region is ahead or behind the center line in the primary assessments, had increased thoracic curvature. In assessment of kyphosis, the participants are asked to remove their clothes from the upper part of the body and allow the researcher to determine three vertebras T1 (thoracic), T12 and S2 (sacrum) by observing and touching the spinal column. To find T1 when the participants' upper body was completely bare, they were asked to lean forward from the hips while standing, to expose their vertebra i.e. C7 (Cervical) can be found; and by touching vertebras using fingers, T1 under C7 is marked. Then, the participants are asked to place their hands on the edge of the table while they are semi-flexed forward, setting their weight on their hands to find T12; simultaneously, it is followed by touching the twelfth rib on both sides with the tip of the thumb and following it to the top and to where it disappears inside the body's soft tissues; at this point, the tip of two thumb are connected by drawing a straight line between them; by doing so, location of T12 spinous is determined. If the researcher is still doubtful about T12, while the two fingers of his hand are on the point of doubt (the space between two vertebrae), he should ask the patient to bend forward; if the researcher feels any movement during the bending and striating, the exact place of T12 is shown because the joint place of the pectoral-lumbar vertebras has found. The last marked point is S2, which has the shock appendage at the same level with the upper posterior iliac spines. The subjects were asked to place their weight evenly on both feet and look ahead while the measurements were taken. After determining the desired points, a flexible ruler was placed on thorn appendages of the spinal column to be shaped to the region, ensuring no spaces between the ruler and spine column. The points on the spine were then marked on the ruler. Finally, the ruler was carefully removed and placed on the paper to record the curves, which were plotted using a marker. The distance between the two points L (length) and depth curve H (weight) were measured using a ruler. The measurements obtained were put in $\theta = 4 \arctan (2H/L)$ to obtain the angel of the kyphosis [19]-[22].

C. Exercise Protocol

After determining the two groups, the experimental group participated in a three-month training program, three times per week, with 60-minutes for each session. The control group did not perform any corrective exercises in this period. The experimental group participated in the exercise program prepared for the purpose of the study under the supervision of the researchers. The program consists of exercises and corrective movements that involve strengthening exercises and PNF (Proprioceptive Neuromuscular Facilitation), respectively [3]. Corrective exercises applied in the training program of this study are as follow: strength of the trapezius muscle, rhomboids muscles, straitening the spine and stretching the pectoral muscles. The first weeks of training started with less number repetitions and more rest times. In the following weeks, based on the individual's progress, the number of

repetitions increased and rest times decreased (from 30 to 60 percent of maximum repetitions, a seen in Table I).

TABLE I
APPLIED PROGRAM OF THE REHABILITATION EXERCISES IN THE STUDY

method	objectives	details	Intensity/repetition/duration
strengthening	Increasing strength and endurance of large muscle groups	Lifting of the trunk, head and neck Isometric contraction of trapezius, rhomboids and erector spinal muscles	15 to 30 minutes, 3 to 4 sets, 8 to 12 repetition, or 30 to 60 percent maximum repetition
stretching	Improving the range of motion in joints Improving the flexibility of muscle group	*PNF technique (contraction, releasing muscle tension and contraction of chest muscles in the upper back) Cat stretch stretching of pectorals major and minor muscles	15 to 20 minutes, 3 to 5 repetition, 10 to 30 seconds

D. Statistical Analysis

For the analysis and classification of the data, descriptive statistics are used. For a normal distribution of data, the Kolmogorov-Smirnov test is utilized; and to compare the pre and post-test of both groups, a statistics model analysis of covariance is used. In addition, to compare the measurements of pre and posttest in each group, a paired T-test is used. All of the calculations are carried out by SPSS18 in the level of $p \leq 0.05$.

III. RESULTS

According to the results shown in Table II, the variables of age, weight, and height of the participants in the two groups statically showed no meaningful difference which demonstrates that two groups were randomized properly ($p \geq 0.05$) for the purpose of the study. Furthermore, according Table III, three months of rehabilitation training resulted in a meaningful difference in kyphosis ($p \leq 0.001$) abnormalities in the experimental group ($p \leq 0.05$). Analysis of the findings showed that after having completed the set exercises, the participants' kyphosis angle decreased (9 ± 0.09) (mean ± SD) and with a 21 percent change, while there was no significant difference in the control group ($p \geq 0.05$).

TABLE II
DEMOGRAPHIC FEATURES OF THE EXPERIMENTAL AND CONTROL GROUP

Therapeutic group variable	Experimental Mean ± SD	Control Mean ± SD	P-value
Age (year)	34.40±6.60	33.90±6.02	0.86*
Weight (kg)	68.60±4.10	70.10±3.41	0.39*
Height (cm)	174.50±2.75	174.10±3.78	0.79*

TABLE III
MEAN AND STANDARD DEVIATION OF KYPHOSIS IN EXPERIMENTAL AND CONTROL GROUP

Group	Intervention			Control			
Variable	Pretest Mean ± SD	Post-test Mean ± SD	**p-value	Pretest Mean ± SD	Post-test Mean ± SD	**p-value	*P-value
Kyphosis	50.90±2.9	41.90±2.70	0. ≤001	52.10±3.92	51.70±3.91	0.1	0. ≤001

*Comparing two groups using ANCOVA
**Comparing pre and post-test in each group using the paired T-test

IV. DISCUSSION AND CONCLUSION

Addiction has very serious effects on the health of the individual, on their family life, as well as on the economic, security and cultural development of society. Indeed, addiction treatment means a change in lifestyle of the individual in order to live without harm. These changes include the psychological, physiological and physical aspects of the lives of addicts [23]. After experiencing drug withdrawal, returning and relapsing to drug use is a serious problem during the treatment process. Around 70 percent of drug users return to using drugs within the first year after rehabilitation [24]. Given the above, the importance of sport and physical activity in the rehabilitation of patients with drug abuse problems reduces the likelihood of relapse and the period for withdrawal and rehabilitation is also reduced through this method. The results also suggest the effects are longer lasting. The results showed that after 12 weeks of corrective exercise training on former drugs addicts, three months after withdrawal, the angle of kyphosis and lumbar lordosis of the experimental group had significantly decreased. In addition, it has been shown that along with the increase of strength in extensor muscles of back, the amount of kyphosis decreases [26], [25]. The results of the present study are consistent with the findings of some studies [3], [9], [27], [28] that confirmed improvement in the curvature of the spine through corrective exercises. It seems that strength training affects the length of the tendon of the muscles and causes different skeletal parts to be moved, as well as increasing the stability and strength of the ligaments. On the other hand, stretching exercises act as coordinator of agonist and antagonist muscles. Therefore, these exercises increase the length of the muscles in the concavity side and thereby increase the power of the muscles in the convexity side, so that eventually the level of abnormality decreases [3], [21]. Also, the findings of other studies are consistent with and confirm the findings of the present study [5], [29]-[32]. Strengthening the erector muscles of spinal column is very important for keeping the postural structure of the body; and this type of training can help improve abnormal kyphosis in patients. Therefore, the erector muscles of the spinal column must be strengthened. After the training period, the kyphosis angle of the participants is reduced by strengthening the erector muscles of spinal column, trapezius and rhomboids muscles, as well as flexibility exercises that stimulate the spinal column and affect the relative reform of the shortened muscles. Kazemi and colleagues, in their study, also showed that a program of corrective exercises using a physioball reduces kyphosis in addicts [9]. The findings of their study are

consistent with the findings of the present study. They also argued that strengthening the trapezius and rhomboid muscles and stretching the chest muscles are effective in the reduction of the kyphosis angle [9]. Shavandi et al. also justified the reduction of the kyphosis angle similarly [13]. The findings of this study contrast with the findings of some studies [33], [34]. It seems that age, sex, type of training protocol, difference in participants, as well as lack of simultaneous strength and stretch of the related muscles, are the main reasons for the difference between the findings of the present study and other studies [28]-[30]. According to the findings of the present study, it can be concluded that three months of corrective exercises are effective in reducing the kyphosis of male addicts after rehabilitation treatment (withdrawal). The findings highlight the importance of training and regular corrective exercises in the drug treatment of postural abnormalities of patients after withdrawal as a non-invasive and non-drug method. In addition, the results of this research can facilitate serving these kinds of patients; not only physically, but also provide economic and social benefits, for them, as well as society as a whole.

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