JRSR 6 (2019) 148-152

Journal of Rehabilitation Sciences and Research

Journal Home Page: jrsr.sums.ac.ir

Case Report

The Effect of a Corrective Exercise Program on Upper Crossed Syndrome in a Blind Person

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ARTICLE INFO

Article History:
Received: 01/10/2019
Revised: 30/10/2019
Accepted: 03/11/2019

Keywords:
Kyphosis
Abnormalities
Blindness
Spine
Exercise therapy

Please cite this article as:
Roshani S, Yousefi MR, Sokhtezari Z, Khalil Khodaparast M. The Effect of a Corrective Exercise Program on Upper Crossed Syndrome in a Blind Person. JRSR. 2019;6(3):148-152. doi: 10.30476/jrsr.2019.83417.1044.

ABSTRACT

Blindness is one of the most common and important groups of sensory disabilities with physical complications including kyphosis, forward head and round shoulder. The purpose of the present study was to investigate the effect of a corrective exercise program on the upper crossed syndrome in a blind person. The patient was a 19-years-old blind congenital male. He referred for abnormalities of the upper quarter trunk. The corrective exercise program was performed for 12 weeks by maintaining a proper posture and sitting posture with the emphasis on the balance of muscles involved in the upper cross syndrome. After the training intervention, kyphosis improved from 45 to 41 degrees, round shoulder from 40 to 48 degrees and forward head from 57 to 40 degrees. Therefore, regular long-term corrective exercises by providing feedback to maintain the correct posture of the body can be improved, and prevent from common blinds deformities.

Introduction

The increasing advances in science and technology, despite all the benefits, was brought to humanity, and in the case of the demands of it or not, have endangered one of the most important principles of life, health, and one of the achievements of this disability. Disability is also one of the achievements of this world that damages the blind and visually impaired children health [1]. Since the sense of vision, as the strongest source of perception in the external world, is responsible for the transmission of 80-90% of the information entered into the brain, even mild disruptions to its functions could result in severe abnormalities in physical, mental, and motor development [2]. On the other hand, visual disability is one of the disabilities, which frightened the people mostly because it is more visible than other disabilities and their role in social relationships [3]. The blind and deaf have used head and face gestures in an attempt to convey meaning and to communicate with others and with the environment, essentially compensating for verbal and visual communication deficits with physical gestures, especially head and face, this leads to overuse of the head and neck muscles [4]. In addition, healthy people can imitate others by learning how to keep their bodies straight; therefore, they are aware of the mirror images of their bodies, and through observation, practice different shapes that Self-monitoring gains the feedback needed to modify and modify their movements [5]. Also, one of the factors of muscle strength is visual acuity. Knowledge of body components and their range, lateral superiority and proper orientation are essential skills for body. The blinds are slower to acquire skills due to the lack of well-being sense and may be prone to a variety of functional-muscular disorders, if there is no compensatory training. These disorders cause muscular imbalance on both sides

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of the body and make one susceptible to musculoskeletal abnormalities [6]. These abnormalities are conditions, which were caused by muscle imbalance, due to a poorly positioned body [7]. According to Karel Lewit (1994), muscle imbalance usually occurs before functional dysfunction [8]. V Janda (2013), also describes this muscle imbalance as a condition in which some muscles become inhibit and weak and others become short and stiff. Such imbalance can bring changes in tissues, which may cause inappropriate movement patterns in the individual. Such conditions can eventually cause side effects such as pain and inflammation. Janda attributes these predicted patterns to a large extent, due to the immobile conditions and repetitive tasks. He called a pattern that encompasses the neck, the upper part of the thoracic spine and the shoulder joint, the Upper Crossed Syndrome. In this syndrome, mainly the posterior superior muscles in the neck and the anterior neck, which are tonic, are short and the anterior deep muscles of the neck and posterior shoulder girdle, which are mainly phasic, are inhibited and weakened. This condition is caused by the changes in the elevation, protraction and abduction of the shoulder by increasing the angle of forward head and hyperextension of the upper part of the cervical spine, which are often associated with forward head, round shoulder, protracted scapulae, and thoracic kyphosis [9, 10]. Two forward head and kyphosis deformities are common malformations in the blinds. Based on the previous studies, blind subjects with sagittal plane deformities, including kyphosis and forward head [11]. Forward head with a prevalence of 66%, kyphosis with a prevalence of 28.45% and round shoulder with a prevalence of 34.02% in blind Iranian veterans [12]. Bad posture and its direction affect the physical activity and lead to increased stress on supportive structures as well as the habitual bending or falling in individuals [13]. Therefore, the optimum mechanical condition of the body and the energy consumption in daily life and exercise have particular importance. Achieving the optimal good posture condition in blind people with upper crossed syndrome is difficult, due to the lack of corrective visual feedback [14]. Recent studies have shown the impact of using an exercise therapy program to address the problem of muscle imbalance and disorders associated with the upper crossed syndrome in the disabled and non-disabled people [15-17]. Various studies have been separately carried out by applying the stretch and strength training methods on the forward head, round shoulder and kyphosis abnormalities [18]. However, the presence of the above three deformities indicates the presence of upper crossed syndrome. The abnormalities associated with the Upper Crossed Syndrome in the context of a positional chain reaction are intimately related to each other, and it does not appear that individual modification of each of them, has appropriate scientific justification, individually and locally [15]. There is no exception in restoring the muscle balance and correcting the visual abnormalities of the blind person. Up to now, no research has been done on blind upper crossed syndrome. However on other handicapped people, including those with spinal cord injury, Roshani et al. (2018) found the effect of functional training useful [15]. The lack of the comprehensive exercise program for the prevention and treatment of muscular imbalance and the upper crossed syndrome as one of the potential side effects of blind people on the one hand, and also the attempt to improve the rehabilitation methods as well as improving the quality of life and reducing the effects of blindness, the researcher intended to determine the effect of these exercises on the upper crossed syndrome in the blind person by the physical exercises intervention.

Case Report

This case study was a pre-posttest design on a 19-year-old congenital blind student male with the upper crossed syndrome who was referred to Ilam Science and Movement Health Center in summer 2018. At first, the blind received some information about the purpose of the study and how the measurements were performed to the blind, to participate in the present study. Then, by filling out a consent form and having no other diseases such as fractures and cardiovascular disease, was enrolled in the study. Individual and general information of the subjects were recorded and after evaluation of forward head, kyphos and round shoulder angle, and finally the exercise protocol was performed. A 60 cm flexible ruler was used for measuring the kyphosis. In this technique, the researcher retrieves the reference points, which comprises two vertebrae as followings: the second thoracic, the 12th thoracic, and places the flexible ruler on the specified points to assume the arched shape of the back. Draw the arc created on the ruler on the paper and calculate the angular rate of the kyphosis angle was conducted using the relation $\theta = 4\text{Arc tang } 2h / l$ (Figure 1) [19]. Side view imaging was used to measure the angle of forward head and round shoulder (Figure 2). Thus, after taking the angle image between the seventh cervical spine line and the tragus ear appendage specified by the marker associated with the perpendicular line, it was measured as the amount of forward head angle using the Kinova software, which indicated a reliability of 0.88 for forward head rate [20, 21]. Also, the angle between the acromion points line and the vertebral appendage the seventh cervical spine with the horizon line was considered as the amount of round shoulder with a reliability of 0.91 for round shoulder in this method [20-22].

After measurements were performed using the flexible ruler and Kinova software, the blind person conducted a 12-week corrective exercise protocol. These exercises include 5 minutes of warm-up and cool-down, 15 minutes of stretching exercises (upper trapezoid, levator scapula, pectoralis major and minor and latissimus dorsi), 20 minutes of resistance training (deep bending neck muscles, middle and lower trapezius, rhomboid, serratus anterior), and 15 minutes of integrate training (combo ball movement by pulling the neck, lifting the upper limb in forearm and leg, one-handed trunk rotation, cobra movement on the Swiss ball and simultaneous movement of the chin tuck was done with the help of a researcher [15].

Figure 1: measurement of thoracic spine curvature by flexible ruler

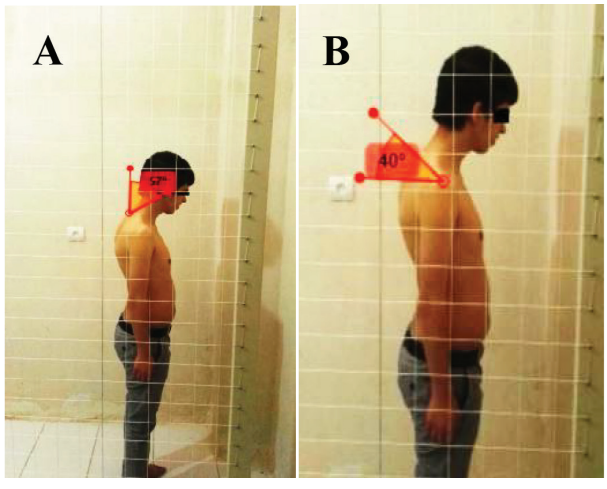

Figure 2: measurement of forward head and round shoulder angles using the side view imaging method. (A). Shows the measurement of the forward head (B). Shows the measurement of the round shoulder

In addition, throughout the implementation of the principle of overload training, considering the principle of adaptability of the exercise, it was performed for persons with disabilities with an understanding of the intensity of exercise pressure [15]. An example of exercises (Figure 3) and how the exercises developed (Table 1) are provided.

Table 2, presents the personal information of the subject, and Table 3 provides information on the degree of forward head and round shoulder angles and kyphosis in the pre- and post-test.

Discussion

Because vision is crucial for the development of postural reflexes [23], in the absence of the vision sense, half of the information, which normally reaches the brain, is deleted [24]; therefore, lack of vision can affect the motor development and musculoskeletal posture of the blind person. In other words, blindness makes one susceptible to motor problems such as muscle weakness, impaired awareness of body parts and body components, and postural deformities [6]. Although in the blind person, the tactile and auditory senses have improved and developed [25]; however, they play less role in maintaining the body's biomechanics [26]. According to the theory of motor control, sensory information plays an important role in the creation and coordination of movements, and the two most important sources of sensory information are proprioceptive sense and vision in this process. The intimate connection of these two sources is such that the proprioceptive sense of information sends information about the movement characteristics of the body such as: direction and position

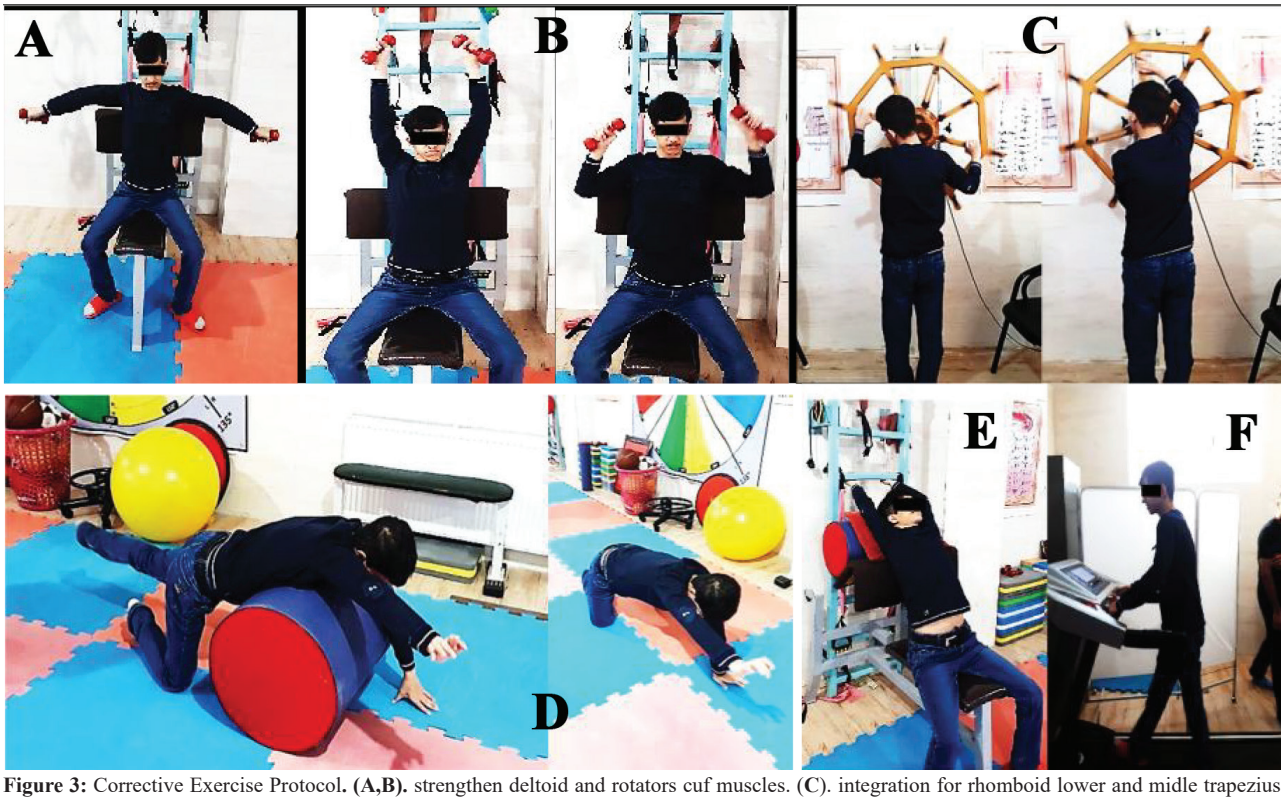

Figure 3: Corrective Exercise Protocol**. (A,B).** strengthen deltoid and rotators cuf muscles. (**C**). integration for rhomboid lower and midle trapezius (**D**). integration for extensors and neck muscles (**E**). stretching of pectoralis muscles (**F**). example of functional exercises

Table 1: Corective exercise programe

Stretching Exercises 1-4 Week (Three Days a Week)				
Term	**Repeat**	**Cycle**	**Number (in weeks)**	**Muscle / Stance**
30 seconds	1-4	1	Three days per week	Upper trapezius stretching
30 seconds	1-4	1	Three days per week	Levator scapula stretching
30 seconds	1-4	1	Three days per week	SCM stretching
30 seconds	1-4	1	Three days per week	Latissimus dorsi stretching
30 seconds	1-4	1	Three days per week	Pectoralis stretching
Resistance Training Week 5-8 (three days a week)				
Rest	**Rhythm**	**Repeat**	**Cycle**	**Exercise**
0	2/2/4	10-15	1-2	Trapezoid Lower Section
0	2/2/4	10-15	1-2	Trapezoid middle section
0	2/2/4	10-15	1-2	Middle and Lower Trapezoid
0	2/2/4	10-15	1-2	Deep flexor of the neck
0	2/2/4	10-15	1-2	rhomboid
0	2/2/4	10-15	1-2	Serratus anterior
Integrated Exercises Week 9-12 (Three Days a Week)				
Rest	**Rhythm**	**Repeat**	**Cycle**	**Exercise**
30 seconds	Slow	10-15	1-2	Move the combo ball by pulling the neck
30 seconds	Slow	10-15	1-2	Raise the upper extremity in the fours and feet
30 seconds	Slow	10-15	1-2	One-handed shoveling with trunk rotation
30 seconds	Slow	10-15	1-2	Cobra move on Swiss ball

Table 2: the subject's Personal information

Age	Height	Weight
19	158	48

Table 3: Information on the amount of forward head and round shoulder and kyphosis of the subject

Variable	Pre-test	Post-test
Forward head	57	40
Round shoulder	40	48
Kyphosis	45	41

in space, direction of the body, speed of muscle activity to the central nervous system, and vision as a support for accurate performance [27]. The investigated participant in this study was a blind individual, who was excluded from the support. Therefore, he was expected to be weak in performing the movements correctly. The same issue will muscular imbalance that will lead to postural musculoskeletal disorders over time and repeating the wrong patterns. Due to the postural of the deformities in this study, the lack of orthopedic and neurological origin in the development of lifestyle abnormalities in any culture (muscle weakness, body alignment disorder and bad posture) are in common [28, 29].

Due to the prevalence of forward head, round shoulder and kyphosis in blinds people [12], and also poor visual feedback or the lack of that, correction of these abnormalities is difficult [14]. However the effect of corrective exercises on these abnormalities was shown in the present study, the results are consistent with those of Lynch et al, (2010) [30], Najafi and Behpour (2012) [31]. Of course, this research has been done on abnormalities associated with the upper crossed syndrome in people without disabilities. No evidence of impact of exercise therapy on blind upper crossed syndrome was found, but positive effects of corrective exercise have been reported in disabilities with spinal cord injury [15]. In the present study, the effect of exercises with emphasis on weak muscle strengthening and shortened stretching in upper crossed syndrome, and then performing integrated exercises to achieve better performance in the blind person was investigated. Because forward head is associated with the increased kyphosis angle and round shoulder position, these conditions cause a relative increase in the elevation, protraction, inferior rotation and anterior tilt of scapula [18]. The purpose of Exercises is correcting these conditions, which have been considered. On the other hand, because of the poor body posture and skeletal abnormalities, one has to perform specific joint movements and body posture in a specific position and mutually executing these repetitive movements, and body posture plays a critical role in increase of the musculoskeletal abnormalities. Therefore, it is believed that correction of these abnormalities should be performed based on the functional activities and in the form of integrate movements, to affect the whole body chain. Thus, the effect of the activation phase, which consists of integrate movements, has been able to play an important role in improving the status of these patients. Due to long standing and the wrong position of sitting, standing and posturing the wrong posture in a blind person, it is possible to disrupt the balance of the upper one quarter body muscles, and because of the imbalance in the upper quarter, the syndrome is likely to develop the upper crossed syndrome. Raises the crotch and since the upper crossed syndrome is associated with three deformities including forward head, round shoulder and kyphosis [15]. Therefore, the exercises used in this study were comprehensively and simultaneously based on these three deformities. Blind people need to pay particular attention to their muscle balance during sitting, standing and performing movements by correcting their head, neck and back posture.

The use of spinal stabilization exercises as a low cost

and easy way to return patients with spinal injuries to daily activities, and that with increased stability between adjacent vertebral segments, increased stress on the spine was controlled, which also improved the patients' daily functional activities and prevented postural deficits [15]. In addition, in the blind people, strength training increases the focus on a group of muscles, and consequently, increases the level of awareness of how one member interacts with other members, which ultimately develops the blind person ability in controlling the wrong posture patterns. Accordingly, this was validated by a research by AkbarFahimi et al. (2009), by examining the impact of exercise therapy on musculoskeletal disorders in blind students [7]. Research limitations include lack of control patient's daily movements, control of nutrition, and lack of independence in performing functional and integration movements.

Conclusion

Designing and executing a rigorous and targeted program of corrective exercise, including stretching, strengthen, and integrating of the spine and shoulder that can regularly be performed, can have a beneficial effect in reducing the abnormalities related to the upper crossed syndrome in the blind people. Such features can be observed in the current research corrective exercise program. The program was designed to shorten the stretching of the muscles, strengthen the weak muscles as much as possible, with all the exercises at the same time, and therefore, achieved the desired coordination by performing the integrated exercises. As a result, it is recommended that these corrective exercises can be used regularly to prevent and correct the upper crossed syndrome in blind people.

Acknowledgment

We would like to acknowledge and thank the blind and their families for their contribution to the advancement of this research.

Conflict of interest: None declared.

References

1. Gasperetti B, Milford M, Blanchard D, Yang SP, Lieberman L, Foley JT. Dance Dance Revolution and EyeToy Kinetic modifications for youths with visual impairments. J Phys Educ Recreat Dance. 2010; 81(4):15-55.
2. Ayvazoglu NR, Oh HK, Kozub FM. Explaining physical activity in children with visual impairments: A family systems approach. Except Child. 2006; 72(2):235-48.
3. Celeste M. Play behaviors and social interactions of a child who is blind: In theory and practice. J Vis Impair Blind.2006; 100(2):75-90.
4. Fernandez-de-Las-Penas C, Alonso-Blanco C, Cuadrado ML, Pareja JA. Forward head posture and neck mobility in chronic tension-type headache: a blinded, controlled study. *Cephalalgia*. 2006; 26(3):314-9.
5. Ferrell K. Visually impaired infants & childhood. J Vis Impair Blind. 1995; 85:40-1.
6. Bouchard S, Tetreault M. The Motor development of blind people. J Vis Impair Blind. 2000; 105:8-10.
7. Akbarfahimi N, Jadidi B, Shahi Z, Jadidi H. The impact of exercise therapy on the musculoskeletal abnormalities of blind boy students of 12-18 years old at Tehran Mohebbi blind school. Faslnamahi Kumish. 2009; 10(4):307-13
8. Lewit K. The functional approach. Orthop J Sports Med. 1994;16(3):73-4
9. Moore MK. Upper crossed syndrome and its relationship to cervicogenic headache. J Manipulative Physiol Ther. 2004; 27(6):414-20.
10. Janda V. Muscle function testing. Elsevier; 2013; 230-58
11. Alotaibi AZ, Alghadir A, Iqbal ZA, Anwer S. Effect of absence of vision on posture. J Phys Ther Sci. 2016;28(4):1374-7.
12. Nejati V, AMINI R, Soroush MR, MASOUMI M. Evaluation of the prevalence of musculoskeletal dysfunctions in blind veterans in Iran. Iran J War Public Health. 2009; 53-91
13. Kendall FP, McCreary EK, Provance PG. Muscles: testing and function with posture and pain. book, 5 Th Ed. LWW. 2005; (2):207-391
14. Chusid JG. Correlative neuroanatomy and functional neurology.1979; 55-6-113.
15. Roshani S, Mahdavinejad R, Ghanizadehesar N. The effect of a NASM-based training protocol on upper cross syndrome in paraplegia spinal cord injury patients. J Ilam Univ Med Sci. 2018; 25(6):73-85
16. Roshani S, Rostamizalani F, Ghanizade N, Mohammad Ali nasab Firozjah E, Sokhtezari Z. Study of the Persistence Effect of two Exercises Controlling the Scapula and Corrective Movements on Neck Pain and Angle of Head in Males with forward Head. J Ilam Univ Med Sci. 2019; 27(1):148-60.
17. Rostamizalani F, Ahanjan S, Roshani S, BagherianDehkordi S, Fallah A. Comparison of the Effects of Three Corrective Exercise Methods on the Quality of Life and Forward Head of men with Upper Cross Syndrome. J Paramed Sci Rehabil. 2019; 8(1):26-36
18. Page P, Frank C, Lardner R. Assessment and treatment of muscle imbalance: the Janda approach. J Orthop Sports Phys Ther. 2012; 41(10):799-800
19. Rajabi R; Samadi H; book Corrective Movement Laboratory; University of Tehran Publications; fourth edition. 2019; 25-63
20. Raine S, Twomey L. Posture of the head, shoulders and thoracic spine in comfortable erect standing. Aust J Physiother. 1994; 40(1):25-32.
21. Thigpen CA, Padua DA, Michener LA, Guskiewicz K, Giuliani C, Keener JD, Stergiou N. Head and shoulder posture affect scapular mechanics and muscle activity in overhead tasks. J Electromyogr Kinesiol. 2010; 20(4):701-9
22. Silva AG, Johnson MI. Does forward head posture affect postural control in human healthy volunteers? *Gait Posture*. 2013; 38(2):352-3
23. Carroll TJ. Blindness: What it is, what it does, and how to live with it. Little, Brown. 1961; 78-91
24. Stambough JL, Dolan D, Werner R, Godfrey E. Ophthalmologic complications associated with prone positioning in spine surgery. J Am Acad Orthop Surg Glob Res Rev. 2007; 15(3):156-65.
25. Noh JW, Park BS, Kim MY, Lee LK, Yang SM, Lee WD, Shin YS, Kang JH, Kim JH, Lee JU, Kwak TY. Differences in two-point discrimination and sensory threshold in the blind between braille and text reading: a pilot study. J Phys Ther Sci. 2015; 27(6):1919-22
26. Alotaibi AZ, Alghadir A, Iqbal ZA, Anwer S. Effect of absence of vision on posture. J Phys Ther Sci. 2016; 28(4):1374-7
27. Assaiante C, Mallau S, Viel S, Jover M, Schmitz C. Development of postural control in healthy children: a functional approach. Neural Plast. 2005; 12(2-3):109-18
28. Laughlin MH. physical activity in prevention and treatment of coronary disease: the battle line is in exercise vascular cell biology. Med Sci Sports Exerc. 2004; 36(3):352-62.
29. Blanksby DC. Visual therapy: A theoretically based intervention program. J Vis Impair Blind.1992; 39-66.
30. Lynch SS, Thigpen CA, Mihalik JP, Prentice WE, Padua D. The effects of an exercise intervention on forward head and rounded shoulder postures in elite swimmers. Br J Sports Med. 2010; 44(5):376-81.
31. Najafi M, Behpoor N. Effects of corrective exercise program on scapula and shoulder joint in women with rounded shoulders abnormalities. J Sports Med. 2012; 9(4):31-47.