

A survey on postural deviation and flexibility of blind and sighted girls when compared with the normal situation

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Abstract: Purpose: Blindness is a factor that limits the body movements and it may cause sedentary complications in blind people. The goal of this study was to evaluate postural status and muscles flexibility in the blind and sighted girls. **Material and Method:** This cross-sectional comparative study was carried out on 40 blind and sighted girls with the range of 20 to 30 years. The group of blind was included 20 blind girls who were studying in the Khazaneh Rehabilitation Center, and they agreed to attend in the study. The other group was included 20 student sighted girls whose BMI were matched with the blind group. To evaluate postural status and muscles flexibility, a number of physical tests carried out such as: lordosis, kyphosis, scoliosis, shoulder depression, forward head posture, and passive knee extension and illiotibial band. For statistical analysis data were analyzed using Chi-square test. **Results:** The findings showed that 30% of the candidates of the two groups did not have any disorders. 20% of the blind subjects showed one or more disorders. 5% of the sighted subjects showed one or more disorders. There were significant differences in some of the tests between the blind and sighted subjects including lordosis, kyphosis, scoliosis and hamstring shortening ($P>0.05$) However in the other tests there were not significant differences between the two groups. **Conclusion:** Based on this study flexibility and postural status demonstrated to be affected by vision and in some of the tests such as kyphosis there is a significant differences between the two groups, in addition, the pattern of changes and disorders are different in the two groups, that is, the common disorders in the blinds was kyphosis. **Ethical approval:** This study was approved by the ethics committee of Semnan University of Medical Sciences.

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Introduction

Physical condition and flexibility are the main physical fitness indices that help human health and its reduction would increase vulnerability of the motion system and causes skeletal anomalies. It was reported that changes in muscle movement and direction would increase abnormal biomechanis pressure on the joint and in such condition, blood flow is reduced and tissue restoration will be longer in damages condition (1).

Sensory systems such as vision play an important role in movement skills and overall situation and shape of body. Studies have shown that central nervous system is involved in maintaining proper body position and doing movement skills according to the information which receives from proprioception, visual, tactile and auditory senses (2, 3). Impairment in various senses such as vision causes movement and coordination performance degradation, and given the general decline in physical mobility in the blind than sighted people, the blind

are more likely to have physical adverse conditions (4).

Kisner and Colby (2002) have suggested that muscles which are stretched or shortened in the body's normal condition are weakened and provide the context for postural changes in the individual (5). Studies on various individuals indicate factors related to creation and start of postural disorders.

In a study on the blind, it has been demonstrated that movement patterns in the chronic blind (those that so many years have passed form their blindness) is different from the blind in recent years (6). In 2010, Nicolas et al have reported that visual stimuli are effective on the posture (7).

It has been in the sighted people that if superficial and deep neck muscles are not activated and used equally, it will affect neck stability and cause neck posture weakness (8).

In another study which was conducted on two groups of blind and sighted people in order to compare their dynamic postural stability, postural

stability difference was reported in the two groups. This study has also shown that dynamic postural stability is greatly affected by vision (9). People who do not use visual stimuli, pressure to the soles are more and cause early fatigue in the neck muscles (10).

Although there are many studies on flexibility and normal and abnormal physical conditions in the sighted people (1, 2), there are few studies on posture and flexibility in the blind; so we sought to study physical condition on blind people. The aim of this study is to evaluate physical condition and flexibility of muscles in the blind compared with the sighted people.

Methodology

This is a descriptive-comparative study which was conducted on 40 blind and sighted girls with 20-30 age range. The girls were chosen because of their better accessibility and cooperation, while testers were female. The blind group was 20 of blind girls of Tehran department of treasury who had the inclusion criteria and was willing to participate in this study; and the sighted group was 20 female students who aligned with the blind group in terms of Body Mass Index (BMI). 20 people were chosen as the sample because of limitation in the selection of blind samples that were eligible to participate in this study and also willing; moreover, non-random simple sampling was used due to limitation in the sampling method.

All girls with visual disorder training in the treasury rehabilitation center were enrolled in the study; the sighted group was selected according to the study condition among volunteer girl students and staff of the dormitory of the Medical Sciences University of Semnan. The dormitory girls were selected through announcement in the dormitory and their referral. Also diseases and disorders that may affect normal physical condition, for example people who had a history of heart disease or suspected of cardiovascular disease or movement disorders in the two groups were excluded from the study. It is noteworthy that sighted people were selected such that can be matched with the blind in terms of Body Mass Index (BMI).

All volunteers signed consent forms; meanwhile the permit for this study was received from the organization of social welfare and Treasury Rehabilitation center.

To compare the two groups, some effective indices in mobility and flexibility skeletal structure were regulated based on a questionnaire and the following measurements were performed; these indices were:

Forward head posture (FHP)

Kyphosis

Lordosis

Scoliosis

Right & left shoulder depression

Right & left iliotibial band

Right & left hamstring

Measurements were done by two experienced physiotherapists who were not interested in this study. Valid and common methods were used to measure each of indices (11, 12, and 13). The method is described as follows.

The test results were recorded when they were confirmed by the two physiotherapists for further validity, and suspected and disputed causes were eliminated.

Testing procedures:

Forward head posture (FHP)

1. Based on observation and measurement of the neck from the wall, the person stands such that her back was in contact with the wall. And tester measured the distance from the deepest part of the neck to the wall; normally, it was 4-8 centimeters.

Kyphosis

Based on observation and using plummet line, kyphosis was determined in individuals. In these people if the main dorsal was behind the plummet line, kyphosis was recorded.

Lordosis

Based on observation and using plummet line, lordosis was determined in individuals. The person was at the side of plummet line, if major part of lumbar from the side was ahead of plummet line, it was recorded as lordosis.

Scoliosis

For scoliosis, observation, forward bending and lateral bending was used; so that when bending forward if there were non-symmetric parts including waist and shoulders folds and shoulders bulge, and if the person in standing position with straight knees bent to the sides, and also if bending movement range to the sides was not identical, it was recorded as scoliosis.

Left and right shoulder depression

Observation was used in studying shoulders depression, and non-symmetric cases were recorded; i.e. if shoulders were not on one level and a shoulder was lower, it was recorded as shoulder depression.

Iliotibial band and tensor fascia lata

The flexibility of the Iliotibial band and tensor fascia lata was conducted based on Ober test. Such that the person was in the side; the lower knee was slightly bent to stabilize the hip joint and pelvis was fixed by the examiner, then passively the upper leg was taken to the abduction and extension while bending or straightening the knee, leg was dropped keeping hip

extension and without any rotation on it to fall on the bed passively. If there is a short, leg remained in abduction, illiotibial band is loosed by bending the knee and flexibility of fascia lata was revealed.

Right and left hamstring

Passive knee extension test: the subject in the supine position, while a small pillow is under her head lying on the bed, then femur trochanter, femur external epicondyl, knee joint line and ankle external malleolus were marked by a marker. When measuring a limb, the opposite limb was taken completely flat by a different person. The tested limb was taken at 90° angles between thigh and knee. Then leg was lifted passively until tightness is felt and was considered normal up to 20 degrees less than complete opening, and more than it was recorded as short.

Minitab statistical software was used for data analysis. To compare the indices between the two groups, chi-square test was used. Also the two groups of sighted and blind people were volunteers for conducting this study. Frequency percentage of skeletal and frequency anomalies were investigated in the two groups based on a number of determined indices; and number of people in each group having one or more anomalies mentioned in the questionnaire was recorded and anomalies in both groups were compared statistically.

Results

Number of participants in the blind group having postural and flexibility disorders based on indices of this study was compared with the sighted group. Chi-square test was used to compare indices in the two groups and the following results were obtained. The results of these tests have been listed in Tables 1, 2 and 3.

The prevalence of kyphosis, scoliosis, and short left and right hamstring in the blind group were more than the sighted group.

The two groups were compared to investigate kyphosis index and results demonstrated that number of people that have kyphosis in the blind group is significantly higher than the sighted group ($p<0.05$). kyphosis was most common among the blind.

In terms of having scoliosis, results showed that number of blind having scoliosis is significantly higher than sighted people ($p<0.05$).

To investigate lordosis index, the two groups were compared with each other and results demonstrated that the blind group has a significant difference with the sighted group in terms of having lordosis; and number of participants in sighted group having lordosis is significantly higher than the blind group ($p<0.05$). Also lordosis was most common among sighted girls.

In terms of left and right shoulder depression, number of sighted people having shoulder depression in both sides was more than the blind but the difference was not significant.

In terms of having short left and right hamstring, there was a significant difference between the two groups; and number of sighted people having short left and right hamstring was significantly higher than the sighted group ($p<0.05$).

In terms of short illiotibial band, number of the blind was more than the sighted group, but the difference between the two groups was not significant. Also none of the blind group had short illiotibial band.

Moreover, results of this study demonstrated that 30% of volunteers in each group didn't have any type of structural disorders. 20% of the blind had at least one or more structural disorders; and 5% of the sighted group had at least one or more structural disorders.

Table 1: frequency distribution of musculoskeletal dysfunction in the blind and sighted people

Type	blind		sighted	
	Frequency	Percent	Frequency	Percent
FHP	4	20%	5	25%
Kyphosis	14	70%	3	15%
Lordosis	8	40%	15	75%
Scoliosis	5	25%	1	5%
Rt shoulder depression	6	30%	7	35%
L. shoulder depression	5	25%	8	40%
Rt illiotibial band	2	10%	0	0
L. illiotibial band	2	10%	0	0
Rt. hamstring	10	50%	4	20%
- L. hamstring	12	60%	3	15%

Table 2: chi-square test results related to skeletal disorders in the two blind and sighted groups

Type	Chi-sq	df	P-Value
FHP	0.14	1	0.075
Kyphosis	12.38	1	0.000*
Lordosis	5.01	1	0.025*
Scoliosis	4.33	1	0.037*
Rt shoulder depression	0.11	1	0.736
L. shoulder depression	1.03	1	0.311

* P<0/05 was considered significant.

Table 3: chi-square test results related to muscular flexibility in the two blind and sighted groups

Type	Chi-sq	df	P-Value
Rt illiotibial band	2.11	1	0.147
L. illiotibial band	2.11	1	0.147
Rt hamstring	3.96	1	0.047*
L. hamstring	8.64	1	0.003*

* P<0/05 was considered significant.

Discussion

This study that was conducted to compare physical condition and muscle flexibility in the blind and sighted girls demonstrated that in both studied groups, there are some degrees of anomaly and movement limitation and totally it's higher in the blind.

The results of this study are consistent with some of previous studies conducted on healthy people: a study conducted in 2004 on healthy girl students in Semana indicated that majority of guidance girls in the statistical population had structural disorder at least in one area of the body (14). In the present study, it was also indicated that most of sighted girls had structural disorder at least in one area of the body. In this study, the most common structural disorders in the blind girls were kyphosis and in the sighted girls was lordosis. It is likely that these disorders are due to overall body condition. This study is consistent with some other studies; in the study by Gerr on the sighted people, it has been reported that fixed physical position may cause change in the posture (15). Moreover, proper physical activity will prevent from inappropriate physical condition (16).

It seems that in the blind given that their overall body condition is protective and leaning forward, the possibility of kyphosis development is higher in them; and in the sighted people, wrong habits and weight pressure may cause lordosis development in them (1).

In the present study, the least statistics of postural disorders is related to short ITB which is 10% in the blind girls and zero in the sighted girls.

Several previous studies confirm findings of the present study that blindness affects posture of

individuals. In a study in Turkey conducted on two groups of blind athletes and sighted non-athletes to evaluate and compare dynamic postural stability, it was reported that dynamic postural stability is affected by vision. They also stated that there is a significant difference between the two blind and sighted groups. Also blind athlete group has higher postural stability than sighted non-athlete group (9).

Moreover, in another study on elderly sighted people, it was reported that vision is effective in creating muscular stability (17).

A study conducted in Japan on patients confirms part of the present study. In that study the severity of common lumbar lordosis and sacrum tilt has been reported (18). In the present study, the most common complication in the sighted people has also been reported to be lordosis. The reason of the difference in the methodology and features of statistical population may be relevant.

In a study by Morris et al (1992) on young patients having spinal and extremity pain, right shoulder depression was the most common. Results of this study are not consistent with any findings of the two blind and sighted groups in the present study. The reason may be related to different features of statistical population including that in the present study none of the two groups had musculoskeletal problems (19).

Pitt-Brook has described mechanisms of posture change as: skeletal disorders related to a continuous isometric contraction in a specific muscular group that causes extreme fixed posture in the person (20). Recent studies have also demonstrated that visual stimuli affect posture of healthy people and neck pain (17).

In the present study, although different postural pattern have been reported in the two blind and sighted groups, there has also been abnormal posture in both groups, which is probably due to the issue that vision has an important role on other sensory receivers in human, and has a significant impact on human's balance (21, 22). Moreover, balancing system of body can adapt itself with new positions, and movements and body position are done based on the new positions (23). In addition one acquired disorder (in age of two years) may affect completely the body structure (24).

Limitations: in doing some tests for accurate diagnosis and grading, radiology and photography were required which weren't done due to lack of volunteers' consent and other limitations; and given the existing tools and common practices only disorders were detected and their rate wasn't determined.

For selecting volunteers, given the administrative limitations, cooperation of students in Semnan was used in the framework of standards of this study. Methods like BMI were also used for more compatibility between the two groups and reducing error.

Conclusion:

According to results of this study, flexibility and posture are affected by vision; and in some tests such as kyphosis, there was a significant difference between the two groups. Moreover, the results demonstrated that changes and postural disorders pattern is different in the two blind and sighted groups; i.e. kyphosis is most common in the blind and lordosis in the sighted people.

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