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Postural assessment for people with severe visual impairment

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Abstract. According to Latvia's statistical data, for the first time during the period from 2005 up to 2011, more than 3115 people were registered with the eye and it's parts diseases. The aim of the study was to assess postural parameter for people with severe visual impairment. The study involved visually impaired Social Care Center "JUGLA" occupiers, with the 1st and the 2nd visual impairments disability group. Participants were interviewed, posture was assessed (Kendall) and anthropometric measurements were taken. The majority – 53.6% the study participants were 1st group visual handicaps (mean age 47.9 ± 10.6 years). 82.1% the study participants had a straight backbone in the frontal plane. The cervical spine of 10.7% the participants had a normal position in the sagittal plane, for 32.1% the participants normal position was observed in the thoracic spine and for 39.3% – in lumbar spine. Faulty postural alignment in frontal and sagittal plane was equally often observed for the 1st as well as for the 2nd group visual handicaps. The most common postural type in the sagittal plane for the participants was kyphotic – lordotic posture.

Introduction

According to Latvia's statistical data, for the first time during the period from 2005 up to 2011, more than 3115 people were registered with the eye and it's parts diseases [1]. Our vision may be affected by different internal and external factors [2, 3]. But compensation mechanisms, formed as a result of serious visual failure, often may lead to postural changes [4].

Visual organ injuries are the most common cause of unilateral blindness in people of working age [5]. What is interesting, that other research has shown that men are more prone to such a injuries [6].

Certainly over the years the structure the eye itself can physiology change, which may cause a deterioration of the visual function [7, 8]. However more important we should look at conditions that influence vision as complication of other disease as an example – diabetes. Approximately 12% the insulin - dependent diabetic patients in Latvia with disease duration of more than 30 years is completely blind [5], that indicates a dilatory diagnosis and by that followed complications of the disease [9].

Body posture is one of the indicators that reflect the human physical and musculoskeletal development as well as professional movements [10]. Therefore, it is useful to look into changes that occur after a deterioration in vision.

Other research has shown how the visual defect affects body perception [11–16]. Even motor development varies between sighted and blind children [17, 18].

Blind and visually impaired people to explore the world use primarily touch and hearing. Sensory perception is an important mechanism that influences the stability of orthostatic as for the blind as well for the sighted people [19].

Materials and methods

The main objective of the study was to assess postural parameter for people with severe visual impairment. Study design was a quantitative, descriptive prospective study that includes: observation, measurement and survey.

Participants were interviewed with 10 open – type questions, about their presence of the disease, lifestyle and leisure activities.

Posture was assessed, and postural type was stated according to the Kendall's instructions [20].

To ensure the objectivity of the study different anthropometric measurements were taken – body height, weight, leg length and the shoulder blades medial side distance to the backbone were measured etc.

Patient selection, inclusion and exclusion criteria

The study involved visually impaired Social Care Center "JUGLA" occupiers with the 1st and the 2nd visual impairments disability group.

Inclusion criteria were that the person should be:

- 1st or 2nd group vision handicap
- aged 25 to 60 years
- hearing.

Exclusion criteria were that the person should not have:

- mental disorders
- communication disorders
- amputations or serious musculoskeletal changes resulting from injury or disease.

Results

The study enrolled 28 participants. 15 of participants were men and 13 women (mean age 47.9 ± 10.6 years). Participants average height for men was 176.0 ± 10.2 cm and for women it was 16.5 ± 7.0 cm. Men's average body weight was 76.5 ± 18.8 kg and women's 72.0 ± 15.8 kg.

The majority – 53.6%(15) the study participants were 1st group visual handicaps. More than half of participants disability occurred in early childhood – 51.7%(16) and – 42.9%(12) as a result of illness or injury.

Measuring an individual's weight and height, the body mass index (BMI) was set. 46.4%(13) had normal Body mass index,14.3%(4) had it decreased and 39.3%(11) had it increased. Normal and decreased BMI was more common in men.

Only 28.6%(8) of participants engaged in some physical activity – mainly walking. 17.9% were totally inactive. A sedentary lifestyle occurs more frequently among women.

As the most frequent collateral illnesses among the participants was diabetes, hypertension, coronary heart disease, epilepsy and liver cirrhosis.

Posture in frontal plane

53.6%(15) of the participants had changed head position in the frontal plane, 73% of them had head lateroflexion to the right, and the remaining 27% had head lateroflexion to the left.

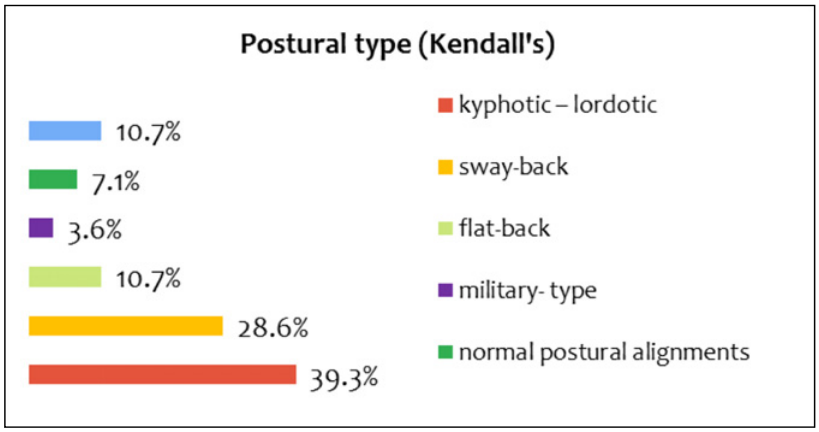

Figure 1. Backbone in the sagittal plane, postural type.

35.7%(10) had head rotation about a vertical axis (horizontal plane) – 83.3% of them to the right and 16.7% to the left.

57.4%(16) of the participants experienced shoulder girdle asymmetry in the frontal plane. Right shoulder elevation, occurring three times more often than the left shoulder elevation.

Only 21.4%(6) of the cases both shoulder blade positions were normality and symmetry placed to both body sides.

The average shoulder blade medial side distance to the backbone is 8.25 ± 1.1 cm.

Right scapular position changes were observed in 71.4%(20) of cases – 40% of them were shoulder blade protraction, 40% upward rotation, 25% elevation and 5% depression. Scapular position changes could have been combined with each other. Spearman test shows that there is a strong correlation between disability group and the right scapular position ($p < 0.05$, $r = 0.39$).

82.1%(23) of the study participants had a straight backbone in the frontal plane. 10.7%(3) curvature in the thoracic spine 7.1%(2) had curvature in the lumbar spine. Spine changes could have been combined with each other.

Posture in sagittal plane and postural type

The cervical spine 10.7%(3) of the participants had a normal position in the sagittal plane.

89.3%(25) the participants had changed head position in the sagittal plane, of them, to 50%(14) head protraction were observed, 7.1%(2) – flexion, 14.3%(4) – extension. In 14, 3%(4) cases head protraction combined with extension, and 3.6%(1) protraction combined with flexion.

75%(21) the participants experienced shoulder girdle asymmetry in the sagittal plane.

Kyphotic – lordotic posture was observed in 39.3%(11) of the participants, sway-back posture for 28.6%(8), flat-back posture for 10.7%(3), military- type posture for 3.6%(1) of the participants. Only two participants had normal postural alignments in the sagittal plane. 10.7%(3) of the participant posture parameters didn't fit to any Kendall pattern of postural alignment."Figure 1"

Faulty head, neck and shoulder alignment in frontal and sagittal plane was equally often observed for the 1st as well as for the 2nd group visual handicaps. There were no statistically significant difference in, participants age, visual impairments disability group and postural type ($p > 0.05$).

Discussion

Our data are consistent with findings of investigation by the h. Fjellvang, [21]. That there are head's and cervical spine changes in the sagittal plane, for people with visual impairments. There are significant changes in the position of blades and shoulder girdle asymmetry, which are different between the left and right side of the body. Normal scapular position frequently occurs on the left side of the body. Scapular position asymmetry might be explained by the context of the lead hand, especially for people who are visually impaired and use the touch to explore the surrounding area.

In order to objectively assess the visual impact of the musculoskeletal apparatus, more homogeneous group of participants should be made, with a narrower age range, homogeneous in the leisure and physical activity equivalent.

Everyone, including the visually impaired population, have many different factors affecting posture, but I think the upper body changes can be explained by lack of physical activity, self awareness and motivation (especially if you're social care center resident in Latvia).

It's difficult to determine whether directly low vision affects posture or participants sedentary lifestyle. It could be useful to compare results with group of people without visual defect's but also with sedentary lifestyle.

Conclusions

- Low vision affects mainly the upper body postural changes, as often as in the frontal as well as in the sagittal plane.
- Postural changes were observed for the 1st as well for the 2nd group visual handicaps.
- The chosen leisure activities of the participants did not facilitate proper posture maintenance.

References

[1] Centrālās statistikas pārvaldes. Rīga, (2011).
[2] K. Hornaček, MD. Basal, Though Overlooked Factors Affecting Posture in Therapeutic Riding. XI. ITRC, (2003).
[3] B. L. Day, M. J. Steiger, P. D. Thompson and C. D. Marsden. Effect of vision and stance with on human body motion when standing : implications for afferent control of lateral sway. J. of Phys. 479–499 pp., (1993).
[4] D. Graeme. An observation of adults with visual impairments carrying out copy – typing tasks. B.& I. Techn. 22, 3, May 141–153 pp., (2003).
[5] G. Laganovskas. *Acu slimības*. Nac. apg., 374. lpp., (2008).
[6] L. Radecka, G. Laganovska. Pirotehnikas radītās acu traumas. RSU Zin. Konf. (2008).
[7] R. Vaļkova. *Acu slimības*. Rīga, Zv.ABC, (1990).
[8] A. Požarnovs. Sab. vesel. strategija. Rīga, (2010).
[9] Kalniņa. Latvijas cukura diabēta slimnieku reģ. d. Latvijas Diabēta fed., (2010).
[10] S. Umbraško. Skolēnu stājas un pēdas parametru vērtējums kā fiziskās attīstības rādītājs gadsimtu mijā. PD, Rīga, (2005).
[11] N. K. Myrth. Alice without a looking glass: blind people and body image. A. & M., 7, 3., 277–299 pp., Dec., (2000).
[12] E. M. Ashikali, H. Dittmar. Body image and restrained eating in blind and sighted women: A preliminary study. Body Image. Mar; 7(2): 172–5, (2010).
[13] A. K. Magnusson, G. Karlsson. The Body Language of Adults Who Are Blind. SJODR 10, 2.71–89 pp., (2008).

[14] R. D. Easton, A. J. Greene. P. DiZio and R. J. Lackner. Auditory cues for orientation and postural control in sighted and congenitally blind people. EBR, 118, 4 / February, (1998).
[15] J. Solovjova. Balsta un kustību aparāta līdzsvara funkciju traucējumu profilakse pirmsskolas vecuma bērniem ar pavājinātu redzi. LSPA zin. r., Rīga, (2001).
[16] M. Uchiyama, S. Demura. Low visual acuity is associated with the decrease in postural sway. Tohoku J Exp Med. Nov; 216(3): 277–85, (2008).
[17] B. Roder, F. Rosler, C. Spence. Early vision impairs Tactile Perception in the blind. CB **14**, 2, 20 January, 121–124 pp., (2004).
[18] P. D. Miller. Fitness programming and physical disability. DS, USA, (1995).
[19] H. G. Palm, J.Strobel, G. Achatz, F. von Luebken, B.Friemert. The role and interaction of visual and auditory afferents in postural stability. Oct; 30(3): 328–33. Epub, Jul 9, (2009).
[20] F. P. Kendall, McCreary, Provance, Rodgers, Romani. Muscle testing and function with posture and pain. 5th ed. Lippincott Williams & Wilkins, (2005).
[21] H. Fjellvang, B. Solow. Craniocervical postural relations and craniofacial morphology in 30 blind subjects. AJOO&DO, **90**, 4, October, 327–334 pp., (1986).