Effect of Stretching and Strengthening Exercises (Janda's Approach) in School Going Children with Lower Crossed Syndrome

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Abstract

Objective: The main objective of the study was to find out the effect of stretching and strengthening exercises (Janda's Approach) in School going children with lower crossed syndrome.

Method: Students between the ages 11 to 15 years were screened for lower crossed syndrome and 41 students were having lower crossed syndrome and are selected for the study. The treatment program was conducted for 2 weeks, scheduled 5 sessions per week. The outcome measures were manual muscle testing of the abdominal muscles and gluteal muscles and Thomas test which were recorded before and after treatment sessions.

Results: There was increase in strengths of abdominal muscles and gluteal muscles after 4 weeks treatment (p value < 0.0001) which was statistically significant and there was reduction in tightness of hip flexor muscles (p value < 0.0001) which was statistically significant.

Conclusion: On the basis of results of our study we concluded that stretching and strengthening exercises (Janda's Approach) are effective in treating lower crossed syndrome in school going children.

Keywords: *Lower crossed syndrome, low back pain, school going children, Janda's approach, Low back pain management.*

Introduction

Lower Crossed Syndrome is characterised by tight hip flexors and lower back muscles crossed with weak abdominals and gluteus muscle.[1] The tightness of the thoraco-lumbar extensors on the dorsal side crosses with tightness of the illiopsoas and rectus femoris. Weakness of the deep abdominals ventrally crosses with weakness of the gluteus maximus and medius.[1]

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Before the age of 20 low back pain is uncommon among children and adolescents.[2] The annual incidence of low back pain in children of age between 11 to 15 gets increasing from 11.8% to 21.5% over a period of 5 years.[3] Birger et al concluded that 85% of low back pain has an origin due to muscle imbalance due to long term postural faults called lower crossed syndrome.[4] Prevalence of lower crossed syndrome in school going children at age 11 to 15 is 21% and 29% of school going children are at risk of having lower crossed syndrome in future.[5]

Two types of muscles are present in our body:

(i) Postural muscles: illiopsoas, quadrates lumborum etc,

(ii) Phasic muscles: abdominals, hip extensors etc.

Postural or static muscles have tendency to tighten and phasic or dynamic muscles develops weakness.[1,6]

Lower crossed syndrome is one in every of the threatening mixtures of biomechanical muscle imbalance because of excessive stress it places on the structures of lower back. This postural imbalances develops a chronic pain condition of lower back that becomes more difficult to correct in later stages.[7]

At school during class and at home in front of television children spend more time in seated position.[8] Sedentary time of children increases with age.[9] Children aged 4-15 years are seated for an average 7-8 hours a day.[8] Senior school children aged 13 to 16 years were seated 78.7% of their time in the classroom.[10]

Due to prolonged sitting postures like sitting at a desk in school all day, the hip flexors become shortened or tight. This results in inhibition of gluteals. The lumbar lordosis increases due to the tight hip flexors.[11]

The ergonomically designed furniture decreases the activity of lower and middle back muscles which lessens muscular fatigue if the posture is maintained for prolonged time such as during school hours.[12] Muscular function is replaced by the seat while sitting. Muscular inactivation for prolonged time leads to weakening of the corresponding muscles.[8] Sitting in the same posture for a long time puts physiological strain on the muscles, the ligaments & the discs.[13] During classes children adopt different postures regardless of postural variations created by ergonomically designed furniture.[14] Even if children preferred ergonomically designed furniture prevalence of low back pain is not altered.[13]

If lower crossed syndrome remains untreated, it can result in obesity and low back pain in future. Sedentary behaviour may contribute to anxiety and depression and also has been shown to be a risk factor for certain cardiovascular diseases. It is also linked to high blood pressure and elevated cholesterol levels. Sitting too much can cause a decrease in skeletal muscle mass.[15]

The physiotherapeutic treatment currently being used to treat lower crossed syndrome includes[16,17]

- Postural training/functional training in which patient is told to avoid all postures and activities that exacerbate lumbar lordosis.
- Myofacial release or manual therapy for tight structures
- Modalities like ultrasound, laser therapy and thermotherapy are also used.

According to the Janda's Approach, the treatment should be organised into three stages:

1. **Normalization of the peripheral structures:** This includes restoration of proper postural alignment thorough postural and ergonomic education and correcting the biomechanics of a peripheral joint.
2. **Restoration of muscle balance:** Restoring normal muscle length must first be addressed before attempting to strengthen a weakened muscle.
3. **Facilitation of afferent system and sensory motor training:** This training improves movement coordination and promotes ideal mechanical loading of biological structures.[18]

The Janda's approach is effective in normalising the lordosis curvature, increasing strength of weak abdominals and weak gluteals and increasing the length of tightened hip flexors and back extensors.[19]

Physiotherapy treatment with Janda's approach might help to prevent secondary changes and prevent future consequences and enhances optimal muscle function and to improve postural alignment of the lower back. And also can help children, teachers and their parents by making them aware about lower crossed syndrome and its future consequences.

Thus, present study is designed to find effectiveness of Janda's approach in school going children with lower crossed syndrome to make them aware about this muscular imbalance and need to get proper and timely management through professional Physiotherapists.

Materials and Methodology

Study Design: Comparative Study, sample size: 41, Place of study: schools in Karad, sampling method: simple random sampling, study duration: 3 months

Participants:

Inclusion Criteria: Both boys and girls willing to participate in the study between the age group of 11 to 15 years and diagnosed with Lower Crossed Syndrome by a Certified Physiotherapist/Orthopedician.

Exclusion Criteria: History of spinal trauma, Joint dysfunction in past 3 months or congenital deformities at hip or lumbar region, Recent fracture to related joints

in past 6 months, History of abdominal, hip or lumbar surgeries in past 3 months and Not willing to participate in the study.

Outcome Measures:

1. Manual muscle testing of abdominal muscles and gluteal muscles[20]
2. Thomas test[20]

Procedure: After getting ethical clearance by Institutional ethics committee, students on the basis of inclusion and exclusion criteria were selected for the study. Boys and girls were assessed in an assessment room in presence of a female attender. Manual Muscle Testing of abdominals and gluteal muscles was assessed. After that Thomas test was performed to rule out the hip flexor tightness causing the anterior pelvic tilt. The data from both the outcome measures was collected. After examining all the students those having lower crossed syndrome were taken into a group.

Warm up exercises were done followed by stretching protocol for the iliopsoas, rectus femoris and erector spinae along with strengthening of the abdominals and the gluteal group of muscles for 10 repetitions of 3 sets.[18] After that cool down exercises were given.

Exercise Protocol[21]:

1. Passive Hip Flexor Stretch 30 seconds hold 3 repetitions on each side
2. Thoracolumbar extensors stretch 30 second holds 3 repetitions
3. Abdominal Curl ups with hands at side 10 repetitions 2 sets

   Progression:

   - Abdominal curl up with arms crossed
   - Abdominal curl ups with hands behind head
4. Pelvic bridging 10 seconds hold 10 repetitions 2 sets

   Home Exercises:

   - Lunges: 10 seconds hold 10 repetitions 2 sets for each side
   - Abdominal curl ups 10 repetitions 2 sets
   - Pelvic bridging 10 second hold 10 repetitions 2 sets[21]

The treatment protocol was set for 5 sessions in a week for 2 weeks. After the 10 sessions outcome measures were recorded and data analysis was done by comparing pre and post values.

Results

1. **Age & Gender Distribution:** As shown in table no.1, out of the total 41 students 19 students were girls and 22 students were boys. It is observed that the number of students affected is seen increasing as the age increases.
2. **Abdominal Muscle strength:** As shown in table no. 2, the mean abdominal muscle strength pre intervention was 3.244 which increased to 4.951 post intervention. The p value by paired t- test was found to be <0.0001 which was extremely significant.
3. **Gluteal Muscle Strength:** As shown in table no. 3, the mean gluteal muscle strength pre intervention was 2.854 which is increased to 4.976 post intervention. The p value by paired t test was found to be <0.0001 which was extremely significant.
4. **Thomas Test:** As shown in table no. 4, the mean tightness of hip flexor pre intervention was 15.610 which was reduced to 5.244 post intervention. The p value by paired t test was found to be <0.0001 which was extremely significant.

Table No. 1: Age and gender distribution

Age	Boys	Girls
11	2	0
12	3	0
13	6	0
14	6	8
15	5	11
Total	22	19

Table No. 2: Parameters of abdominal muscle strength

Parameters	Pre Mean ±SD	Post Mean ±SD	Mean Difference	t value	P value
Abdominal Strength	3.244 ±0.5823	4.951 ±0.2181	1.707	21.350	<0.0001

Table No. 3: Parameters of gluteal muscle strength

Parameters	Pre Mean ±SD	Post Mean± SD	Mean Difference	t value	P value
Gluteal Strength	2.854 ±0.3578	4.976 ±0.1562	2.122	41.012	<0.0001

Table No. 4: Parameters of Thomas test

Parameters	Pre Mean ±SD	Post Mean± SD	Mean Difference	t value	P value
Thomas Test	15.610 ±1.656	5.244 ±1.090	10.366	50.350	<0.0001

Discussion

This study was focused on effectiveness of stretching and strengthening exercises (Janda's Approach) in school going children with lower crossed syndrome. In these total 41 students of age 11 to 15 years were taken. The age group most affected was 13-14 years. In a recent study it's been found that prevalence of lower crossed syndrome in school going children of age 11 to 15 years is 21% and 29% of school children of same age are at risk of developing lower crossed syndrome in future.[5] In a study it's been found that the time spent by children in a seated position is average 7-8 hours a day, which consists of 6-7 hours in school, 1-2 hours in tuitions, 1 hour in front of television. This time reaches its peak in between 11 to 15 years.[8]

Prolonged sitting can cause hip flexor tightness which causes anterior pelvic tilt which increases lumbar lordosis. This causes weakness of gluteal muscles and abdominal muscles. This pattern of muscular imbalance gives rise to low back pain[11] which is termed as Lower Crossed Syndrome by Janda.

Prevalence of lower crossed syndrome is more in boys which is 22% as compared to girls which is 18% in school going children of age 11 to 15 years.[5]A previous study was done in young adults of age 21 to 31 years in which they found out that prevalence was more in females as compared to males.[7] In our study, out of the 41 students 19 were females and 22 were male students. Male prevalence is found to be more as compared to females. The consequences of lower crossed syndrome can be obesity and Low back pain in the future. Insufficient levels of physical activity in growing years are major factors to overweight and obesity.[15] Sedentary behavior is likely to facilitate sedentary lifestyle in later years.[22]

Mean abdominal muscle strength pre intervention was 3.244 ±0.5823 which is fair on the manual muscle testing score. In a study Mc ceary proposed that in the erect position, anterior pelvic tilt and a lordotic posture is permitted by abdominal muscle weakness.[23] After strengthening abdominal muscles for 10 sessions with abdominal curls ups with progression the mean strength of abdominal muscles was increased with mean 4.951 ±0.2181 which is normal on the manual muscle testing score. The mean gluteal muscle strength pre intervention was 2.854 ±0.3578 which is poor to fair on manual muscle testing score. After strengthening the gluteal muscles with pelvic bridging the mean strength was increased to 4.976 ±0.1562 which is normal on manual muscle testing score. The exercises stimulated the muscles fibres to recruit all the motor units which increase its strength.[24] Therefore it can said the reason for increasing the strength may be a result of strengthening of specific group of muscles.

Mean hip flexor tightness pre intervention was 15.610 ±1.656 which reduced to 5.244 ±1.090 after stretching for 10 sessions. In stretching the tension in the muscles is reduced and muscle spindle fibres are stretched which increases its length.[25] Therefore it can be the reason for normalising the length of tightened muscles. A previous study was done, in which the authors concluded that stretching of tight muscles and strengthening of weak muscles are beneficial in normalizing the strength of abdominals and gluteals and increasing flexibility of hip flexors and Thoracolumbar extensors.[19] Janda's approach hypothesized that restoring muscle length of a tight muscle spontaneously facilitate a weak antagonist. The normalization of muscle length should be followed by specific strengthening, movement re-education and endurance training. Once peripheral structures are normalized, muscle balance is restored.[1,26] Therefore, in the presence of tight antagonistic muscles; restoring normal muscle length must first be addressed before attempting to strengthen a weakened muscle.[19]

Another observation of this was, teachers, parents and students were not aware about their conditions or symptoms of lower crossed syndrome. They were not aware about the consequences of lower crossed syndrome in future and role of physiotherapy in treating this condition. This study can help to create awareness about the condition and the role of physiotherapy in treating it.

Conclusion

On the basis of the results of our study, it was concluded that stretching and strengthening exercises (Janda's Approach) was significantly effective on children with lower crossed syndrome.

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Conflict of Interest: The authors declare that there is no conflict of interest concerning the content of the present study.

Reference

1. Janda V. Muscles and motor control in low back pain: Assessment and management. In Physical therapy of the low back. New York: Churchill Livingstone; 1987.253-78
2. Kelsey JL, Golden AL, Mundt DJ. Low back pain: prolapsed intervertebral disc. Rheum Dis Clin North Am.1990;16:699-716
3. Burton AK, Clarke RD, McClune TD, Tillotson KM. The natural history of low back pain in adolescents. Spine 21.1996:2323-2328
4. G T Jones, G J Macfarlane. Epidemiology of low back pain in children and adolescents. Arch Dis Child. 2005;90:312-316
5. Kale SS, Gijare S. Prevalence of lower crossed syndrome in school going children of age 11 to 15 years. IJPOT 2019 Apr-Jun; 13(2): 176-179.
6. Parashar P, R Arunmozhi, Kapoor C. Prevalence of low back pain due to abdominal weakness in collegiate young females. IJPT.2014;2(1):86-88
7. Das S, Sarkar B, Sharma R, Mondal M, Kumar P, Sahay P. Prevalence of lower crossed syndrome in young adults: A cross sectional study. Int. J. Adv. Res.2017 Jun;5(6):2217-2228
8. Justyna Drzal-Grabiec, Slawomir Snela, Justyna Rykala, Justyna Podgorska, Maciej Rachwal. Effect of the sitting position on the body posture of children aged 11 to 13 years. Work. 2015;51(4):855-862.
9. Saunders. T.J, Chaput. J.P, Tremblay. M.S. Sedentary behaviour as an emerging risk factor for cardiometabolic diseases in children and youth. Can J Diabetes. 2014;38:53-61.
10. Dillon. J. School furniture: standing and sitting postures. Building Bulletin. 1976.
11. Dhanani S, Dr. Tarpan Shah. A survey on prevalence of lower crossed syndrome in young females. IJPSH.2014;1:2249-5738
12. Marscall. M, Harington. A.C, Stelle. J.R. Effect of work station design on sitting posture in young children. Ergonomics. 1995;38(9):1932-1940
13. Troussier. B, Tesniere. C, Fauconnier. J, Grison. J, Juvin. R, Phelip. X. Comparative study of two different kinds of school furniture among children. Ergonomics. 1999;42(3):516-526
14. Murphy. S, Buckle. P, Stubbs. D. Classroom posture and self-reported back and neck pain in schoolchildren. Applied Ergonomics. 2004;35:113-120.
15. Hills AP, King NA, Armstrong TJ. The contribution of physical activity and sedentary behaviours to the growth and development of children and adolescents: implications for overweight and obesity. Spots Medicine. 2007;37(6): 533-546.
16. Diduch DR, Brunt LM. Sports hernia and athletic pubalgia-diagnosis and treatment. New York: Springer; 2014
17. Grace S, Deal M. Textbook of remedial massage. Australia: Elsevier; 2012
18. Phil Phage, Clare Frank, Robert Lardner. Assessment and Treatment of Muscle Imbalance: The Janda Approach.
19. Kage V, Putti BB. Effectiveness of stretching and strengthening exercises (Janda's Approach) in subjects with postural backache: a randomized controlled trial. Int J Physiother Res 2015;3(6):1301-1306
20. Magee D. Orthopaedic physical assessment. Saunders. 6th Ed. 2016; pg. 578,724,725,729
21. Kisner C, Colby L.A. Therapeutic exercise: Foundations and Techniques. 5th Edition. Philadelphia: F.A. Davis Company; 2007. Pg no. 448, 468,673,679.
22. Epstein LH, Paluch RA, Gordy CC, et al. Reinforcing

value of physical activity as a determinant of child activity level, Health Psychology 1999;18: 599-603.

23. Kendall FP, McCreary EK, Kendall HO. Muscles, testing and Function: testing and function.3rd Edition. Philadelphia: Lippincott Williams and Wilkins; 1983.
24. Kraemer WJ, Looney DP. Underlying Mechanisms and physiology of muscular power. Strength and conditioning Journal, 2012;34(6): 13-19.
25. Page P. Current concepts in muscle stretching for exercise and rehabilitation. Int J Spots Phys Ther 2012;7(1):109-119.
26. Janda V. Postural and phasic muscles in the pathogenesis of low back pain. Proceedings of the 11th congress of international society of rehabilitation of the disabled. 1968, Dublin Ireland. 553-554.