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Investigating the Effects Janda's and Sahrmann's Correcting Exercise Approaches on Trunk Muscles Function in Young Girls with Lower Crossed Syndrome

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ABSTRACT

Background: One of syndromes that arising from muscle imbalances in the sagittal plane is lower crossed syndrome, and characterized by "crossed pattern" of postural dysfunction and lumbopelvic motion. The aim of this study is investigating the effects Janda's and Sahrmann's correcting exercise approaches on trunk muscles function in young girls with lower crossed syndrome.

Methods: The present study was semi-experimental research with a pre-test and post-test design and a control group. The statistical sample of this research was 45 non-athletic young girls' students from 18 to 30 years old in the dormitories of Shahrekord University. They were randomly divided into three groups of 15 subjects of Janda's and Sahrmann's training group and the control group. The muscle function was evaluated with sit and reach test, McGill protocol, and Plank test. The training program consisted of eight weeks and three sessions per week. Data analysis was done using SPSS version 27 software and a one-way ANOVA test at a significance level of 0.05.

Results: One-way ANOVA showed statistically significant difference among the groups for all variables after trainings (P≤ 0.01). The LSD post hoc test revealed that significant differences are between the control group and both training group in all variables (P≤ 0.01), also at sir and reach test and right-side plank test between Janda's approach and Sahrmann's approach corrective exercise groups (P≤ 0.04).

Conclusions: Although stretching and strengthening trainings could be affect and retreat the muscular functions in musculoskeletal abnormalities like that lower crossed syndrome, further neuromuscular and sensorimotor trainings should be considered for better rehabilitation because of changes in muscles coordination and balance in abnormalities.

KEYWORDS

Janda's approach, Lower crossed syndrome, Sahrmann's approach, Sensory-motor exercises, Stretching and strengthen exercises, Trunk muscle function

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Introduction

Posture and movement dysfunction is inherent in us all and occurs in a continuum over time (1). Repeated movements and sustained postures cause tissue changes and which ultimately change movement patterns (2). Kendall et al (1993) maintain that ‘‘the position of the pelvis is the key to good or faulty postural alignment’’. They also state, ‘‘the center of gravity of the body is considered to be slightly anterior to the first or second sacral segment’. The pelvis is in housing the center of gravity of the body, thus plays a central role in control of posture and movement; that its small shifts can effect big changes throughout the body (3). Poor posture is commonly seen in daily life situation which develop many health risks including low back pain and musculoskeletal problems commonly (4). Sedentary lifestyle and neglecting the correct muscular balance within the lumbar pelvis complex can be caused to Lower Crossed Syndrome (LCS) that is very common in today's world (5).

Specific postural changes seen in LCS include anterior pelvis tilt increased lumbar lordosis (2). Deviation is seen due to increased lordosis and slight change in Centre of gravity which lead to change in pelvis alignment (4). This condition can lead to lateral lumbar shift, lateral leg rotation, and knee hyperextension (2). This pattern of imbalance creates joint dysfunction, particularly at the L4-L5 and L5-S1 segments, sacroiliac joint and hip joint (6). LCS results from muscle strength imbalance in the lower segment (7); which creates an S-shaped position in the lower back and the pelvis rim (4, 5) and lead to change in pelvis alignment (4). Also, it referred to as distal or pelvis crossed syndrome (8). The premise of Janda’s muscle imbalance syndromes is that as certain muscle groups differentiate into tonic dominance or phasic dominance, they develop the tendency to either shorten or tighten (tonic dominance) or to lengthen or weaken (phasic dominance). This differentiation is believed to occur primarily during infant development, but will also continue into adult life based on which groups are over-utilized or under-utilized (9). In LCS tightness of the thoracolumbar extensors on the dorsal side crosses with tightness of the iliopsoas and rectus femoris on the frontal side, also Weakness of the deep abdominal muscles ventrally crosses with weakness of the gluteus maximus and medius muscles dorsally (6). Spinal misalignment in this syndrome, impacts muscle strength and range of motion that caused localized muscle spasm and impairs physical abilities (4). If these changes in posture and muscles balance are not treated, they can lead to worsening the condition (7).

Some of the methods used to treat this syndrome include physiotherapy, muscle energy technique, flexibility and muscle strength trainings and sensory motor trainings (4, 6, 8, 10). Exercise is often indicated as one of the main components in the rehabilitation process (11). Among several types of exercise programs, muscle strengthening is important because of the association between muscle weakness, pain, and poor performance (11). Also, sensory-motor training (SMT) is commonly used as a preventive or rehabilitation training method in various sports and rehabilitation environments, especially for musculoskeletal pain (12, 13). In the field of sports medicine, many researchers have recommended and emphasized the importance of flexibility and muscle strength to treat a body imbalance (14). There are two main points of view about muscle imbalance includes Janda's and Sahrmann's approaches. Janda in his approach, focuses on normalize function of all peripheral structures, restoring muscle balance of tight and weak muscles, improving CNS control and programming by increasing proprioceptive flow from the periphery and activate systems that regulate coordination, posture, and equilibrium, as well as Improved endurance refers to coordinated movement patterns. On the other hand, Shirley Sahrmann refers to address muscular component by shortening long muscles, reducing the load on weak or long muscles, supporting weakened or strained muscles, using specific muscles to train the patient to activate specific muscles in a precise manner, and emphasize correct use of muscles in postural positioning activity and functional activity (2). There are limited studies about effects of these two methods on LCS. Rajalaxmi et al (2020) compared the effectiveness of bruegger's exercise program with Janda's approach to treating pelvis crossed syndrome, and found that Janda's exercises were more effective (6). Ghorbani et al (2021) examined the effects of three different exercise types (kinesthetic imagery, Sahrmann's exercises, and combined workouts) on muscle function in connection to lumbar hyper lordosis. According to the results of their study, combined and Sahrmann's exercises modified the electromyographic activity of the lumbo-pelvis muscles, the strength of the abdominal and gluteus maximus muscles, and the flexibility of the erector spinae and hip flexor muscles (15). The researches mentioned above demonstrate the benefits of these two approaches; however, there aren't any studies that compared these two approaches, and there is necessity of comparing these approaches.

On the other hand, sexuality is important in LCS, which Das et al (2017) stated that prevalence of developing LCS among young females is more than young males (16). Although the majority of the direct costs have been attributed to care by medical physicians and non-physicians, it is the indirect costs through absenteeism and social isolation that cause more than 80% of health costs (13). The main benefits of Janda's and Sahrmann's approaches are low-risk trainings and their trainings can be used to perform specialized therapy at home without the need for costly equipment. They also aim to provide non-invasive treatments in the form of exercise to address various ailments. Therefore, the purpose of this study was to investigate the effects janda's and sahrmann's correcting exercise approaches on trunk muscles function in young girls with LCS.

Material and Methods

The present study is a randomized clinical trial registered with the number IRCT20230616058496N1.

Participants

45 non-athletic female students with lower crossed syndrome who were available and qualified based on inclusion and exclusion criteria volunteered to take part in this study. They were randomly assigned to one of three groups: the control group (no exercise), Janda's approach correction exercises group, and Saharmann's approach correction exercises group. The subjects' inclusion and exclusion criteria included ages between 18-30, signed informed consent, voluntarily participate, lumbar lordosis greater than 54 degrees, have anterior pelvis tilt, no history of regular exercise, don't take any special medications, no history of lumbar or pelvis surgery, don't have any type of lower limb deformity, and don't have suffered any kind of injury in the previous six months. Additionally, the individuals were eliminated if they sustained any kind of injury during the training phase, missed more than two training sessions without a break, refused to continue the study, experienced worsening of their condition, or received medical recommendation to stop participating in the study.

Experimental procedure and Measurements

At first, in an introduction meeting, participants were informed about the aims, benefits and possible injuries of the study and they confirmed the consent form if they volunteered to participate in this study. Then before starting the training period, trunk muscle flexibility and endurance were assessed by Sit and Reach test (17), McGill protocol (includes Biering-Sorenson test for Trunk Extensor muscles endurance, Right and Left Side-Plank for Trunk Lateral Flexor muscles endurance) (18) and Plank test (endurance of the abdominal muscles) (19). In this way, the duration of maintaining the position was recorded by the stopwatch. After evaluating the subjects, the Janda's approach group started their exercises based on SMT (Table 1) and the Sahrmann's approach group started their exercises based on stretching and strengthening exercises (Table 2) (2, 20, 21). Also, the control group followed their daily life. The intervention groups did their exercises for eight weeks and three sessions per week. Training sessions included warm-up, main exercises and cool-down. The duration of each training session started at ~30 minutes and increased to ~70 minutes according to the principle of progressive overload during the training period. After eight weeks, all measurements were repeated.

Table 1: Janda's approach exercises protocol

WEEKS EXERCISES	First	Second	Third	Fourth	fifth	sixth	Seventh	Eighth
1- trunk flexion (50˚-70˚)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
2- Pelvis tilt	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
3- standing on one leg	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15

4-quadruped moving forward and backward	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
5- Raising the opposite arm and leg in a quadruped position	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
6- Bridging	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
7- Single leg bridge	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
8- side plunk	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
9- Abdominal bracing	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
10- active bending of the knee 90°	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
11- Half crunch	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15

Table 2: Saharman's approach exercise protocol

	WEEKS EXERCISES	**First**	**Second**	**Third**	**Fourth**	**fifth**	**sixth**	**Seventh**	**Eighth**
Stretching exercises	**1- Gathering one leg and two legs in the stomach**	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	2- Stretching of the rectos femoris muscle	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	3- psoas stretch (kneeling)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	4- Piriformis stretch (pigeon pose)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	5- Piriformis stretch (laying back)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	6- sit and reach	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
Strength training	**1- Strengthening gluteus medius muscle (side-lying clamshell)**	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	2- Strengthening gluteus medius muscle (hip abduction)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	3- femur extension	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	4- top to floor (abdominal contraction)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15
	5- Cat exercise (abdominal contraction)	3*8	3*8	3*10	3*10	3*12	3*12	3*15	3*15

Statistical analysis

Data were normally distributed based on the Kolmogorov-Smirnov test. One-way ANOVA followed by LSD post hoc tests was used to compare the variables among groups. Data analysis was done using SPSS software V.27 with the level of significance set at $p < 0.05$.

Results

Subjects' demographics information presented in table 3. No significant differences were found among groups.

Table 3: Demographic information (mean ±standard deviation).

Group	n	Age (years)	Height (cm)	Mass (kg)	BMI
Janda's approach	15	26.20 ± 3.21	163 ± 0.05	61 ± 9	23.03 ± 3
Sahrmann's approach	15	24.73 ± 2.22	163 ± 0.06	58.37 ± 7.58	21.98 ± 2.54
Control	15	25.93 ± 2.74	164 ± 0.07	63.53 ± 14.3	23.61 ± 4.37

Results of One-way ANOVA revealed significant differences among the groups in the Sit and Reach test, Left Side Plank test and Plank test at baseline ($P \leq 0.02$), but no significant differences were found in other variables among groups (Table 4).

Table 4. One-way ANOVA test results in the pretest

Variables	Group	M ± SD	F	SIG	Post hoc test (Sig)	
					Sahrmann	**control**
SRT	**Janda's approach**	20.67 ± 6.58	5.629	0.007*	0002	0.320
	Sahrmann's approach	28.27 ± 5.20				0.028
	Control	23 ± 7.13				
ETET	**Janda's approach**	22.23 ± 8.25	2.041	0.143	0.081	0938
	Sahrmann's approach	30.47 ± 15.45				0.095
	Control	22.59 ± 13.10				
RSPT	**Janda's approach**	22.17 ± 9.30	2.041	0.143	0.044	0.137
	Sahrmann's approach	14.93 ± 8.62				0577
	Control	16.89 ± 10.59				
LSPT	**Janda's approach**	23.05 ± 12.59	5.363	0.008*	0.003	0.037
	Sahrmann's approach	12.69 ± 5.37				0.297
	Control	16.10 ± 6.11				
PT	**Janda's approach**	36.41 ± 27.48	4.279	0.020*	0.006	0.301
	Sahrmann's approach	17.19 ± 6.62				0.072
	Control	29.45 ± 14.04				

SRT: Sit and Reach Test, ETET: Endurance Trunk Extensor Test, RSPT: Right Side Plank Test, LSPT: Left Side Plank Test, PT: Planck Test.

These differences in pretest are due to random distribution of subjects in groups and were accounted for posttest analysis. Thus, rate of progress was computed and used to compare the groups at posttest at baseline and precisely assess the impact of the interventions (Rate of progress = post – pre). Based on the one-way ANOVA results, statistically significant differences were found among the groups in all variables after the intervention ($P \leq 0.001$). Then the LSD post hoc test revealed that significant differences are between the control group and both training groups in all variables ($P \leq 0.01$), and between Janda's and Sahrmann's groups in sit and reach test ($P=0.001$) and right plank test ($P=0.012$) (Table 5).

Table 5. One-way ANOVA test and LSD post hoc test results in the post test for the variables rate of progress

Variables	Group	POST	Rate of Progress	F	Sig	Post hoc test (Sig)	
		M ± SD	M ± SD			Sahrmann	control
SRT	**Janda's approach**	28.60 ± 7.30	7.96 ± 5.78	21.393	0.0001*	0.001	0.001
	Sahrmann's approach	31.20 ± 5.39	2.93 ± 2.46				0.006
	Control	21.93 ± 7.09	-1.07 ± 1.83				
ETET	**Janda's approach**	46.09 ± 23.99	23.86 ± 21.29	12.568	0.001*	0.642	0.001
	Sahrmann's approach	57.69 ± 22.06	27.23 ± 25.74				0.001
	Control	17.13 ± 10.02	-5.45 ± 6.40				
RSPT	**Janda's approach**	45.30 ± 13.90	23.13 ± 9.26	43.178	0.0001*	0.012	0.001
	Sahrmann's approach	30.13 ± 13.54	15.20 ± 9.99				0.001
	Control	12.67 ± 9.34	-4.22 ± 4.58				
LSPT	**Janda's approach**	42.45 ± 17.15	19.41 ± 14.01	17.799	0.0001*	0.494	0.001
	Sahrmann's approach	29.27 ± 15.67	16.57 ± 13.37				0.001
	Control	13.02 ± 5.90	-3.08 ± 1.99				
PT	**Janda's approach**	52.62 ± 33.95	16.21 ± 16.98	17.578	0.0001*	0.971	0.001
	Sahrmann's approach	33.57 ± 12.46	16.38 ± 11.50				0.001
	Control	21.66 ± 12.99	-7.79 ± 8.65				

SRT: Sit and Reach Test, ETET: Endurance Trunk Extensor Test, RSPT: Right Side Plank Test, LSPT: Left Side Plank Test, PT: Planck Test.

Discussion

The aim of the present study was to investigate the effects Janda's and Sahrmann's correcting exercise approaches on trunk muscles function in young girls with LCS. These study findings showed that, there were significant improvements in the Sit and Reach test, Side Plank test (Right and Left), Plank test, and Trunk Extensor Endurance test after eight weeks of Janda's and Sahrmann's training approaches rather than control group. Also, Janda's approach showed more improvement in Sit and Reach and Right-Side Plank test than Sahrmann's approach.

The current study's findings showed a significant increase in Sit and Reach test score in both training groups than control group, and this increase is significantly greater in Janda's approach than Sahrmann's approach. This test showed flexibility of lumbar extensor and hamstring flexibility that significantly increased in this research by both trainings' approaches. Tightness and immobility at trunk exist in LCS, which should be treated. Many other studies showed effect of training on joint flexibility, but there are limit studies that assessed Janda's and Sahrmann's approaches. In this regard, Kage et al (2015) reported that stretching and strengthening exercises with Janda's approach are beneficial in increasing flexibility of erector spine extensors (22). Chakraborty et al (2019) compared motor control exercises and global core stabilization exercises and they suggested that motor control exercises are more effective on range of motion and function (23). Other authors have suggested that flexibility exercises can improve postural stability and muscle balance (24). According to previous researches, the stretch trainings in sahrmann's approach led to increase flexibility in this group, but our finding shows that there is more flexibility increase in janda's group that haven't any stretching exercise. SMT in janda's approach includes resolving muscular imbalance, facilitating proprioception and somatosensory inputs, and guaranteeing proper motor programming at the central nervous system level (25).

SMT enhance movement system reflective activation, increase dynamic stability by increasing active motor control and reducing undesired motions, promote postural control and enhance coordinate function of muscular system. Actually, it appears that SMT, which aims to realign all of the lower body's joints, particularly trunk joints, creates beneficial changes in these areas (26). Because these training increases the activation of the basic muscles engaged in movement, decreases the coactivation of antagonist muscles, and improves the coactivation of synergistic muscles, it alters both facilitator and inhibitory impulses (24). Tightness in the tissues arises when the nervous system restricts joint motion to prevent damage to the tissues due to a weak core. A probable explanation for this finding is that greater mobility is a result of higher proprioceptive and kinesthetic awareness, which is correlated with improved core stability (27). The less increase in the Sahrmann's group flexibility than janda's group is arising from differences in pretest. Indeed, janda's group were less flexible before training and showed more progression after trainings.

The results of this study for trunk muscle endurance showed that muscle endurance in all side of the trunk increased significantly with both trainings approaches; however, janda's group showed more effective than sahrmann's group at Right Side Plank test. Sobhy (2017) stated in research for eight weeks, the core stabilization exercises are more effective in improving strength and endurance of trunk muscles than the dynamic strengthening exercises in the patients with chronic low back pain (28). Mendiguchia et al (2020) showed a significant increase in trunk endurance performance for the Plank Side test after the 6-weeks of corrective exercise and manual therapy (29). Celenay et al (2017) reported that eight weeks thoracic spine stabilization exercise program increased core muscles endurance in university students (30). Static and dynamic trunk muscles control, which is necessary for both upper and lower limb movement, is provided by the core muscles of the trunk. They built critical link in the neuromuscular system that merging sensory data and motor output to efficiently complete a motor task (31). It has been shown that LCS can be effectively treated by strengthening and stretching the abdomen and gluteal muscles (32). It seems that both training groups significantly enhanced trunk muscle strength and endurance, and despite the lack of statistical significance, in all side the janda's approach is more effective that this differences between training groups, has been showed in right side plank test significantly. Its maybe result of janda's approach mechanism. Trunk motions needs to more coordination among muscles than extremities and for improve trunk function, addition to muscle strength and endurance, muscle coordination and neuromuscular improvement should be considered. It gains more importance when muscle balance and coordination lost in LCS. The Janda's approach includes a careful analysis of muscle imbalance and its role in the perpetuation of the dysfunction. The muscular system lies at a functional crossroads since it is influenced by stimuli from both the CNS and the musculoskeletal systems (22). SMT can be considered as ideal interventions for retraining reaction time and motor control and as a result reducing the probability of re-injury (26).

Sahrmann's approach is based on biomechanical view and contains stretching and strengthening exercises. Strengthening exercises improving available range of motion at joints, increasing tissue extensibility, and enhancing neuromuscular efficiency and mechanically affects the viscoelastic components of neuromyofascial tissue (33). Strengthening exercises stimulate the weak tissue, increase the ability to force production and increase the intra-muscular coordination of specific muscles (33). SMT is a method that aims to eliminate muscle imbalances as a potential peripheral source of nociception by improving proprioceptive acuity in all segments involved in postural movement activities. SMT, however, needs to be distinguished from motor control exercises, in which patients are taught to maintain regular breathing while activating particular deep-layer muscles and decreasing over-activation of the superficial trunk muscles (12). In many musculoskeletal abnormalities, addition to changes in muscles endurance and strength, muscle coordination and balance changed, thus further neuromuscular and SMT trainings should be considered for better rehabilitation. This study has some limitations, such as a small sample size, Single gender society, a time constraint, and a failure to control for poor posture and activity level in daily life, all of which may have an impact on the findings.

Conclusion

The findings of this research showed a significant improvement in flexibility and muscle endurance of the trunk with two janda's and sahrman's approaches. However, despite the lack of statistical significance in all variables, it seems that Janda's approach with focused on SMT is more effective in retrain muscular functions.

Ethical Considerations:

Ethical considerations of current research include informed consent, ensuring participants understand the study and agree voluntarily; anonymity and confidentiality, protecting participants' identities and private information; and avoiding harm, minimizing physical, mental, or social risks.

Compliance with ethical guidelines

The current research protocol was approved by the local ethics committee with the number of R.SKU.REC.1401.003.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript

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«مقاله پژوهشی»

بررسی تأثیر رویکردهای تمرین اصلاحی جاندا و سهرمن بر عملکرد عضلات تنه در دختران جوان مبتلا به سندرم متقاطع تحتانی

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چکیده

هدف: یکی از سندرم‌هایی که از عدم تعادل عضلانی در صفحه ساجیتال ناشی می‌شود، سندرم متقاطع تحتانی است که با "الگوی متقاطع" اختلال عملکرد وضعیتی و حرکت کمری مشخص می‌شود. هدف از این مطالعه بررسی تأثیر رویکردهای تمرین اصلاحی جاندا و سهرمن بر عملکرد عضلات تنه در دختران جوان مبتلا به سندرم متقاطع تحتانی است. پژوهش حاضر از نوع نیمه تجربی با طرح پیش آزمون و پس آزمون با گروه کنترل بود.

روش شناسی: نمونه آماری این پژوهش ۴۵ دانشجوی دختر جوان غیرورزشکار ۱۸ تا ۳۰ ساله خوابگاهی دانشگاه شهرکرد بودند. آنها به طور تصادفی به سه گروه ۱۵ نفری گروه تمرینی جاندا و سهرمن و گروه کنترل تقسیم شدند. عملکرد عضله با آزمون نشستن و رسیدن، پروتکل مک‌گیل و تست پلانک ارزیابی شد. برنامه آموزشی شامل هشت هفته و سه جلسه در هفته بود. تجزیه و تحلیل داده‌ها با استفاده از نرم افزار SPSS نسخه ۲۷ و آزمون ANOVA یک طرفه در سطح معنی-داری ۰/۰۵ انجام شد.

نتایج: آنالیز واریانس یک طرفه تفاوت آماری معنی‌داری را بین گروه‌ها برای تمامی متغیرها پس از تمرین نشان داد ($P \leq 0.01$). آزمون تعقیبی LSD نشان داد که بین گروه کنترل و هر دو گروه تمرین در تمامی متغیرها ($P \leq 0.01$)، همچنین در آزمون نشستن و رسیدن و آزمون پلانک جانبی راست بین گروه‌های تمرین اصلاحی جاندا و سهرمن تفاوت معنی‌داری وجود دارد ($P \leq 0.04$).

نتیجه گیری: اگرچه تمرینات کششی و تقویتی می‌تواند بر عملکردهای عضلانی در ناهنجاری‌های اسکلتی عضلانی مانند سندرم متقاطع تحتانی اثر بگذارد، اما به دلیل تغییر در هماهنگی عضلات و تعادل در ناهنجاری‌ها، باید تمرینات عصبی–عضلانی و حسی حرکتی بیشتری برای توانبخشی بهتر در نظر گرفته شود.

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واژه‌های کلیدی

تمرینات حسی حرکتی، تمرینات کششی و تقویتی، رویکرد جاندا، رویکرد سهرمن، سندرم متقاطع تحتانی، عملکرد عضلات تنه،

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