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Integration of Core Strengthening and Respiratory Techniques in Physiotherapy for Recreational Weightlifters: A Case Study

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ABSTRACT

Background: Core weakness and improper breathing patterns are common risk factors for Weightlifting injuries. By incorporating targeted exercises and breathing techniques into Physiotherapy programs, practitioners can help mitigate these risks and promote long-term musculoskeletal health among weightlifters. The aim of the study is to investigate the effect of Integrating Core Strengthening and Respiratory Techniques in Physiotherapy for Weightlifters.
Methodology: The subjects were given a combination of four routines, namely crunches, rotating crunches, supine leg and arm raise, prone bridge. The training protocols were done twice every week for 30 Minutes for a period of 4 weeks; all the exercises were performed immediately after a standardized 10-minute warm-up that included jumping jacks, lunges, shoulder and trunk rotation
Results: Following the intervention, improvements were observed in muscular endurance across various torso muscle groups, as indicated by increased performance in plank tests and McGill's torso muscular endurance test battery. Muscle balance ratios also showed favourable adjustments post-intervention.
Conclusion: The study concludes that a combination of four exercises-crunches, crunches with rotation, supine leg and arm raises, and prone bridging-alongside simultaneous deep breathing aids weightlifters in enhancing their core strength.

Key words: Core Strengthening, weightlifters, breathing exercises, McGill's torso muscular endurance test battery.

INTRODUCTION

There is renewed interest in core strengthening in rehabilitation. Often, the term includes lumbar stabilization and related therapeutic exercise programs. Basically, these terms are used to describe the muscle control required around the lumbar spine to sustain functional stability. The "core" is often explained as a box with abdominal muscles at the front, Para spinals and gluteal at the rear end; diaphragm forming a roof; while pelvic floor and hip girdle muscles form base. The core is emphasized because it serves as a muscular corset that stabilizes the body and spine both during limb movement and without it[1].

The core is located at the heart of the functional kinetic chain. In alternative medicine, it is often called "powerhouse," or a basis or engine of all limb movement. The practice of strengthening or activating these muscles is promoted for the purpose of

preventing and rehabilitating a number of lumbar spine disorders and musculoskeletal problems and enhancing athletic performance. However, there are not many studies that have been conducted on stabilisation exercise programmes with respect to their relationship with core musculature changes[2].

Certain muscles are important to assess in core stability and core strength. These include the transverses abdominis, rectus abdominis, external oblique, internal oblique, erector spinae, quadratus lumborum and latissimus dorsi. What these abdominal muscles contribute to stability is governed by their capacity to generate flexion movements, lateral flexions as well as rotation and control external forces that may lead to spinal extension and flexion or rotation. Importance of the RA muscle therefore believe that this muscle requires high activation levels before it begins bracing the spine against heavy loads as you would see it during pushing or lifting of heavy weights. The EO and IO have a lower threshold of recruitment and mostly contribute to posture and stability[3].

Patients are managed through core stabilization exercises that activate local muscles by using the transverse abdominis (TrA) isometric contractions in addition to co-contractions of the TrA and lumbar multifidus to achieve segmental control over primary stabilizers. The diaphragm, which is responsible for inspiration, has a role in lumbar spine stability especially during postural activities. During normal breathing patterns, proper activation of the diaphragm causes lower ribs to be pushed outwards thus providing room for an increase in intra-abdominal pressure. The TrA acts like a corset stretching fascia; it helps to build intra-abdominal pressure thereby assisting in stabilizing and unloading lumbar spine muscles. Studies have indicated that diaphragm fatigue is prevalent among people; this consequently decreases pulling forces exerted by the transverse abdominis (TA) on the fascia thereby compromising stability of the lower back[4].

This type of training is often known to include traditional exercises which generally take up body weight for instance: static or dynamic contractions carried-out in different positions like, lateral, supine or others. These mostly start with isolated movements and progressively move on to more complex sequences such as crunches, sit-ups, or planks (prone or lateral). However such exercises causes repeated flexions and lateral bandings particularly crunching that results into compression of the vertebra at high levels of lumbar overload hence can potentially injure an individual's spine.[5].

There is a shortage of research in evaluating the relationship between core stability and athletic performance. Though some studies have suggested that core stability and strength can enhance performance, they were primarily based on assumptions derived from basic testing. According to Reported, balance and core stability are very important for good performances in almost all games or activities. This is because many sports are three-dimensional movements where by to maintain effective core instability, it is important for athletes to be strong in hip and trunk muscles. Good balance is required in certain sports while others need force production or body symmetry but all need good core stability along the three planes of movement. It is believed that lack of core strength and stability results into poor techniques making athletes prone to injuries[6].

Because these muscles assist in core stability exercises, breathing techniques which engage the respiratory muscles are critical for abdominal training. The diaphragm is activated during several resistance training exercises, including sit-ups. Studies have also shown that respiratory muscles are important for diverse activities that do not primarily involve breathing. Breathing being an intrinsic pattern closely associated with human movement, its inadequacies may lead to muscle imbalances and alterations in motor control, thus affecting general motor quality.[7].

There have been only a handful of publications so far that have evaluated the influence of breathing concerning abdominal routines. Our hypothesis is that the simultaneous performance of exercises that involve global stretching postures beneficial to enhance the respiratory system's efficiency and breathing exercises may have a positive impact both on core function and body movement.[8].

METERIAL S AND METADOLOGY

A 23-year-old male amateur weightlifter and bodybuilder was selected for this study. He demonstrated strong physical endurance across various tests, including the Plank Endurance test where he showed impressive stamina, McGill's Torso Muscular Endurance Test Battery which highlighted his sustained capabilities in trunk extensor, trunk lateral, and trunk flexor endurance tests, and assessments of muscle balance ratios which indicated favourable symmetry and performance across different muscle groups.

Assessment: Physical Fitness Assessment of a 23-Year-Old Male Amateur Weightlifter and Bodybuilder. He demonstrated strong physical endurance across various tests. In the Plank Endurance test, he held the position for an impressive 5.26 minutes. McGill's Torso Muscular Endurance Test Battery further revealed his capabilities: he sustained the Trunk Extensor Endurance Test for 2.30 minutes, and both sides of the Trunk Lateral Endurance Test for 4 minutes each, his performance in the Trunk Flexor Endurance Test was notable at 3.34 minutes. Muscle balance ratios were calculated with a Flexion: Extension ratio of 0.84, indicating a slight preference towards flexion endurance. The Right-side bridge: left-side bridge ratio was balanced at 1.0, while the Side-bridge (each side): Extension ratio showed symmetry with Ratios of 1.0 on both sides.

Intervention: This type of common exercise was selected in which spontaneous breathing rhythm frequency (inhalation takes one second and exhalation again one second long) is preserved in the following way:

1. Crunch: The subject lies on his back with knees bent, feet on the floor, and hands resting on the chest. During inhalation, shoulders are lifted off the ground; during exhalation, the subject returns to the starting position
2. Crunch with rotation: The subject lies on his back with knees bent and feet on the floor. During exhalation, the trunk is lifted and rotated; during inhalation, the subject returns to the starting position.
3. Supine leg and arm raise: The subject lies on his back with dumbbells extended towards the ceiling, legs lifted at 90 degrees. Lower one dumbbell overhead and extend the opposite leg towards the floor, maintaining back contact. Inhale deeply, exhale slowly through pursed lips for core stability and coordination.
4. Prone bridge: The subject begins prone in a "table position" with knees under the hips and arms under the shoulder; on inhalation, the right leg is simultaneously lifted straight out and behind, and the left arm is lifted straight out in front.

The subjects received a combination of four protocol which includes crunch, crunch with rotation, supine leg and arm raise, prone bridge. Training protocols were done for 30 Minutes twice per week for 4 weeks; all exercises were performed after a standardized 10-minute warm-up consisting of jumping jacks, lunges, shoulder and trunk rotations.

RESULT

Comparison between outcome measure was done by pre and post intervention. There was significant improvement in the outcome measure. The patient presented the plank test showed an improvement from 5.26 to 6.15 seconds. McGill's torso muscular endurance test battery results indicate increases in several areas: the trunk flexor endurance test improved from 3.34 to 4.25 units, while the trunk lateral endurance test showed gains with left side results going from 4 to 4.40 and right side from 4 to 4.55 units. Additionally,

the trunk extensor endurance test demonstrated enhancement from 2.30 to 3.14 units post-intervention. These findings collectively highlight improvements in muscular endurance across different torso muscle groups following the intervention. After the intervention, the muscle balance ratios have shown: 1.45 to 1.35 in the flexion: extension ratio, from 1 to 1.03 in the right side bridge: left side bridge ratio, from 1.74 to 1.45 in the right side bridge: extension ratio, and from 1.74 to 1.40 in the left side bridge: extension ratio.

Outcome measure	Pre-intervention	Post- intervention
Plank test	5.26	6.15
McGill's torso muscular endurance test battery		
Trunk Flexor Endurance Test	3.34	4.25
Trunk Lateral Endurance Test	4(L), 4(R)	4.40(L), 4.55(R)
Trunk Extensor Endurance Test	2.30	3.14

DISCUSSION

This study was designed to investigate the effect of integrating core strengthening and Respiratory techniques in physiotherapy for weightlifters. Based on the study's results, the intervention involving a combination of exercises (crunches, crunches with rotation, supine leg and arm raises, and prone bridging) demonstrated improvements in muscular endurance across various torso muscle groups. Specifically, the plank test showed enhanced performance from 5.26 to 6.15 seconds, while McGill's torso muscular endurance test battery indicated improvements in trunk flexor, trunk lateral, and trunk extensor endurance. Muscle balance ratios also showed favourable adjustments post-intervention. The procedure involved administering the exercise protocol twice a week for 30 minutes over a span of 4 weeks, preceded by a 10-minute warm-up. Exercises were performed with a controlled breathing rhythm (1 second for inspiration and 1 second for expiration), emphasizing core stability and coordination. The conclusion drawn from the study suggests that this combination of exercises, coupled with synchronized deep breathing, effectively enhances core strength among weightlifters. This finding underscores the importance of structured exercise routines incorporating both strength training and breathing techniques for improving muscular endurance and overall physical fitness.

One of the findings was the enhancement in lower limb stability among weightlifters after engaging in core strength exercises. The study revealed that participants exhibited better dynamic stability, particularly in movements assessed by the y-Balance test. This improvement suggests that core strength training effectively reinforces the foundational stability necessary for weightlifting activities, potentially reducing the risk of lower limb injuries and enhancing overall movement control.[1]

The discussion emphasizes the critical importance of core strength training, particularly highlighting disparities observed between boys and girls in the eight-pole abdominal bridge test. Despite expectations of minimal gender gaps, significant differences exist, underscoring the necessity for focused core strength development among female athletes. This finding suggests a crucial area for improvement that could enhance sports performance and competitive outcomes among girls in provincial sports schools and amateur training programs. Addressing these disparities is essential, given the uneven levels of core strength across different sports disciplines like volleyball, weightlifting, classical wrestling, and judo, where less than half of athletes exhibit excellent core strength. This underscores the imperative for tailored training approaches that prioritize core strength enhancement to optimize athletic potential and mitigate injury risks across diverse sporting disciplines.[3]

CONCLUSION

The study concluded that a combination of four exercises-crunches, crunches with rotation, supine leg and arm raises, and prone bridging-alongside simultaneous deep breathing aids weightlifters in enhancing their core strength.

Declaration

Ethical Approval: The study was approved by the institutional Ethical Committee

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REFERENCES

1. Akuthota V, Nadler SF. Core strengthening. Archives of physical medicine and rehabilitation. 2004 Mar 1; 85:86-92.
2. Hibbs AE, Thompson KG, French D, Wrigley A, Spears I. Optimizing performance by improving core stability and core strength. Sports medicine. 2008 Dec; 38:995-1008.
3. Bi W, Zhao Y, Zhao H. Abdominal core muscle strength training in weightlifters. Revista Brasileira de Medicina do Esporte. 2023 Feb 13;29:e2022_0594.
4. Li W. Abdominal core strength training in young students. Revista Brasileira de Medicina do Esporte. 2023 Jan 20;29:e2022_0584.
5. Cavaggioni L, Ongaro L, Zannin E, Iaia FM, Alberti G. Effects of different core exercises on respiratory parameters and abdominal strength. Journal of physical therapy science. 2015;27(10):3249-53
6. Petrofsky JS, Cuneo M, Dial R, Morris A. Muscle activity during yoga breathing exercise compared to abdominal crunches. Journal of Applied Research in Clinical and Experimental Therapeutics. 2005 Nov 1;5(3):501.
7. Miketa T, Ivančić N, Kuzmanić B. Relationship of breathing exercises with improvement of postural stability in healthy adults. Acta kinesiologica. 2017 Aug 1;11(2):59-62.
8. Masroor S, Tanwar T, Aldabbas M, Iram I, Veqar Z. Effect of Adding Diaphragmatic Breathing Exercises to Core Stabilization Exercises on Pain, Muscle Activity, Disability, and Sleep Quality in Patients with Chronic Low Back Pain: A Randomized Control Trial. Journal of Chiropractic Medicine. 2023 Dec 1;22(4):275-83.

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