European Proceedings of
Educational Sciences
EpES

www.europeanproceedings.com

e-ISSN: 2672-815X

DOI: 10.15405/epes.23045.41

EDU WORLD 2022
Edu World International Conference Education Facing Contemporary World Issues

PREVENTIVE STRATEGIES FOR SPINAL INJURY IN YOUTH HANDBALL PLAYERS

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Abstract

Competitive sport life can be seen as an arena where you must prove the highest abilities and sometimes the impossible of human body. To achieve such competency in a specific sport area takes time, effort and sometimes, at some point in career, an injury. A controversial issue appears to be: how to prevent injuries in sports? This paper underline the role of prevention of wide spectrum of spinal injuries and highlights the inherent weakness of immature spine of youth players that can may be a disadvantage not only for lesions which mirror at young age but also in adults. Youth handball athletes cannot and should not be regarded as adult players. The young athlete's musculoskeletal system is constantly changing and this can be one of the possible causes of injuries. When different and specific types of forces act on spine with specific limitations in young players, it is very important to maintain a good core stability to protect the spine and its surrounding structures. An injury prevention program have been developed to improve core stability and to reduce sports-related injuries at youth handball players. The specific advantages of a good core stability are discussed in depth with a particular focus on spine injuries prevention.

Keywords: Corestability, handballplayers, injury

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Selection and peer-review under responsibility of the Organizing Committee of the conference
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1. Introduction

Particularly, there is a scarcity of information on the prevalence and incidence of spinal injuries, partly due to the resilience of high competition players who always want to train and play so they do not lose their place in the team (Rocha, 2018). Several path mechanism of lower back disorders among athletes have been described that may predict or be susceptible for back pain such as lumbar spondylolysis, facet joint disorders, muscle, fascia and its insertion disorders, lumbar intervertebral disc herniation's and sacroiliac joint disorders (Kaneoka, 2015).

There is a host of spinal injuries and problems that are associated with competitive sport and the most common condition spinal pain is low back pain (Mitchell et al., 2016). It is known that one of the building blocks which contributes to less frequent of low back pain is physical activity and sport participation. This statement is relevant only until the first time appearance of back pain, once pain occurs, sport activities might increase the persistent, severity of pain and its recurrence (Rocha, 2018). The question remains how can we prevent it from occurring in the first place?

1.1. General risk factors

A combination of educational approaches of understanding the risk factors may be a good way to prevent musculoskeletal injury in sports. In an attempt to add some clarity to understand why injury occur, therisk factors were divided into intrinsic and extrinsic risk factors that may affect the athlete at some point and causing an injury (Meeuwisse & Bahr, 2009).

There are internal (intrinsic, body-related) factors that contribute to an occurrence of an injury such as gender, age, body growth, body weight, malalignment, various anatomical abnormalities and side differences in anatomy, muscles imbalances and tightness, insufficient strength, reduced flexibility and general joint laxity. Most of external factors are due to improper training and environmental factors such as climate, surface, equipment and level of competition (Peterson & Renstrom, 2017).

The connection between high training volumes and intensities that immature spine structures of youth players undertake to achieve sporting performance put the athlete in a risky situation to a spinal structures injury (Donatelli & Thurner, 2014). More recent research include the impact of repeated participations in sport in terms of the etiology of an injury (Peterson & Renstrom, 2017).

1.2. The youth spine

It is growth that distinguishes youth players from adult. The growing process is a complex and well-synchronized phenomenon with a hierarchical pattern that organizes the different types and rates of growth in various tissues, organs, and individuals over time (Dimeglio et al., 2022). When it comes to the spinal developmental process, some several factors may have an influence on mechanism and associated injuries in the young athlete.

A juvenile characteristic is that, during the developmental process to a fully maturing spine, the bone growth tends to develop more quickly than the surrounding muscles, ligaments, tendons and fascia tissue (Rocha, 2018). Another important youth spine characteristics include a greater elasticity of the disc

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and surrounding ligaments which allows for greater flexibility, musculature immaturity resulting in reduced strength and the incomplete ossification of spine portions.

These combination of incomplete ossification, increased flexibility and muscle weakness may result in altered mechanism and greater potential for injury (Donatelli & Thurner, 2014). The interaction between sport-specific forces and constantly changing anatomy of youth players may predispose the athlete to injury.

2. Problem Statement

When the back is submitted to stress forces, the physiology and biomechanical principles that rule general population are the same for handball players (Rocha, 2018). In order to decrease the mechanical stress, it is thought to be essential to maintain the proper spinal alignment and the spinal segmental stability (Kaneoka, 2015). In order to reveal this dynamic entity of low back pain in handball players we must understand the muscles function and their importance for stabilizing the lumbar spine.

The spinal stabilizing system consists in the passive musculoskeletal subsystem which includes vertebrae, facet articulations, intervertebral discs, spinal ligaments, and joint capsules. The second is the active musculoskeletal subsystem which includes the muscles and tendons surrounding the spinal column. The third subsystem is the neural and feed-back subsystem which consist of the various force and motion transducers, located in ligaments, tendons, and the muscles, and the neural control centers (Panjabi, 1992; Studnicka & Ampat, 2021).

The spine provides structural support, enables trunk movement, and protects neural elements (Snyder et al., 2022) but the stiffness allows the spine to support loads and this essential stiffness is what the core muscles provide (McGill, 2017). Thus, the definition of core muscles includes all the attach the pelvis, spine, the ribcage and also those muscles that cross the hips (McGill, 2017).

But why core training is so essential for injury resilience and performance enhancement? The explanation has four components:

i. proximal stiffness (meaning the lumbar spine and core) enhances distal athleticism and limb speed;
ii. a muscular guy wire system is essential for the flexible spine to successfully bear load;
iii. muscular coactivator creates stiffness to eliminate micro movements in the joints that lead to pain and tissue degeneration;
iv. abdominal arm or is necessary for people in some occupational, combative, and impact situations (McGill, 2015)

The trunk muscles are important for ensure sufficient stability of the spine against perturbation from external load, sustain postures as well for sustain movement. The trunk muscles were classified into a local and global system in order to better understand how the muscular system acts on the stability of spine. The local muscle system includes the deeper muscles which controls directly lumbar segmental stabilization and have their origin or insertion points either directly or indirectly on the lumbarvertebrae. The global muscle system includes those muscle that do not directly attached to the vertebrae (Bergmark, 1989). Recently, it is suggest that isometric core training is superior to dynamic training for enhancing torso stiffness (Lee & McGill, 2015; Okubo, 2015).

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These studies provide information that allows us to propose effective exercises for enhancing co-activation of the local and global muscles and improve the complex coordination of trunk muscles activity for both injury resilience and performance enhancement that is important during sports.

3. Research Question

Given the information that suggest the importance of local muscle activity in providing stability of the spinal segments, would be beneficial for youth athletes to involve a specific core training in their traditional athletic training program.

The isometric core training program was applied on 16 youth handball players. The McGill torso muscular endurance test battery was used to examine changes in core muscular endurance (Figure 1). All subjects were trained between October 2021 and January 2022 during 3 workout per week. The players were measured before and after 4 month training. After the initial data collecting, the players received a program training based on their specific muscle limitations (Table 1).

Table 1. Four-month sisometric core training program

Exercise	Sets x repetitions	Frequency
Bird dog with right arm and left leg lift (each side)	4x10 per side	3 workout per week
Elbow-toe plank with right arm and left leg lift (each side)	4x10 per side	
	4x10 per side	
Dead bug	4x10 per side	
Single leg bridge (each side)	3x1’	
Side plank (each side)	2x10	
Swiss ball donkey	2x10	
Swiss ball bridge		

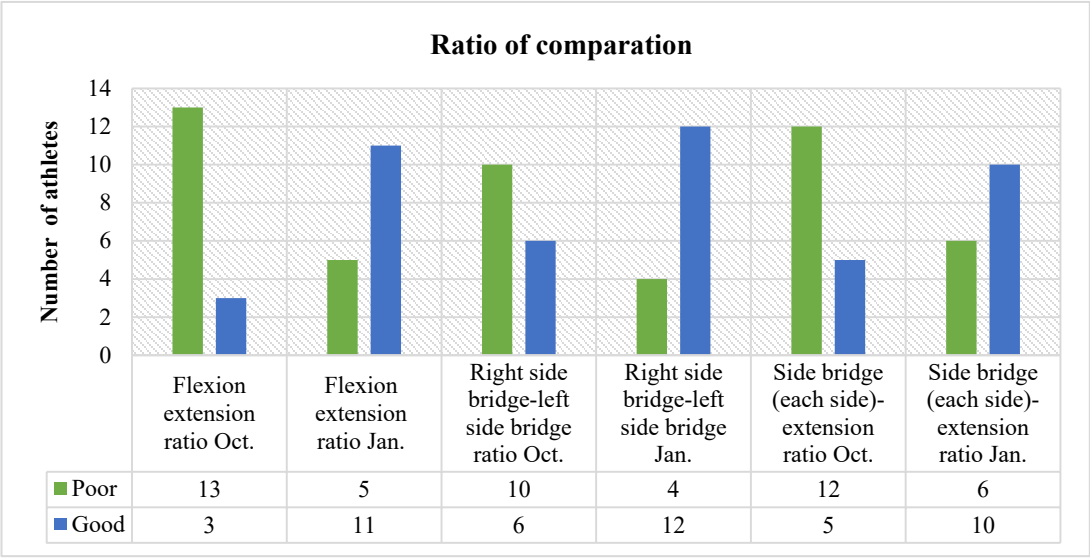

Figure 1. Summary of core training response for McGill torso muscular endurance test battery

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4. Purpose of the Study

The purpose of this paper is to analyse the effect of four-month isometric core muscular training on core stiffness and endurance in youth handball players.

5. Research Methods

The research methods was carried out as follows: method of study of specialized literature, method of analysis, method of tests, graphical and table method, statistical-mathematical method.

6. Findings

A significant improve on trunk muscular endurance was observed after four-month isometric training. After data collected the flexion-extension ratio increased for 8 players, ride side bridge-left side bridge ratio increased for 6 players and side bridge (each side)-extension ratio increased for 5 youth handball players. The results suggest that the isometric training approach enhance core stiffness and muscular endurance and this may allow the spine to bear greater loads. The next step is to examine the incidence of spinal injury in handball players who perform a core muscular training in their traditional training program.

7. Conclusions

The spinal injury in handball players are mainly influences by dynamic and repetitive nature of sport and the approach to prevent spinal injury in a handball athlete can be a challenge. The isometric core training may have a large impact on the approach to torso muscle training for both prevention spinal injury and performance enhancement.

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