The Effect of Dynamic Neuromuscular Stabilisation on Core Strength: A Literature Review

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ABSTRACT
Training to improve the stability of the core is a routine component of the injury prevention regimen in musculoskeletal conditions [1]. Core strength is essential for improving body balance and postural control during actions like landing and contact [2]. The pelvis, spine, and kinetic chain all require stability of the core for optimal load balance. The collection of muscles of the trunk that surround the abdominal viscera and spine is referred to as the core. Core strengthening is a word used to describe control over the muscles necessary to preserve functional stability around the lumbar spine. To produce spinal stability, the abdominal, paraspinal, hip girdle, gluteal and other muscles work together. Core strengthening has become a popular rehabilitation technique. Motor control training, lumbar stabilisation and other regimens have all been referred to as lumbar stabilisation. Stability of the core is required for adequate load balancing within the spine, pelvis and kinetic chain [3]. The strength of the core muscles is significantly impacted by obesity. Obesity is linked to several physiological changes that reduce flexibility and cardiovascular fitness and slow down a person’s activities [4]. Obesity leads to functional impairment in strength, mobility, and static, as well as dynamic balance. Muscle performance is reduced in such individuals [5]. Obesity causes issues with the motor and cardiorespiratory systems that result in disability [6]. Since the early 1960s, researchers have been studying core stability and strength. According to Wickstrom RL, some motor actions such as gripping, turning, crawling, and finally, the ability to walk are produced automatically in healthy babies without any special instruction. Activating peripheral regions or zones can trigger the neural circuitry that drives these complicated developmental processes. During an infant’s development, these zones are usually generated from balancing and stabilising points. Professor Pavel Kolar used the terminology Dynamic Neuromuscular Stabilisation (DNS) to describe how he applied Vojta’s approach to the treatment and rehabilitation of athletes [7]. The DNS therapy method is based on a thorough analysis of the quality of stability and/or movement, restoring the integrated spinal stabilisation system through specialised functional exercises focused on developmental kinesiological postures displayed by a normal baby. All such activities should focus on both the closed kinetic chain’s ideal patterns for stabilisation (support) and the open kinetic chain’s dynamic movements, such as reaching, throwing, stepping forward, or kicking. The central control eventually develops an automatic model that is a vital element of everyday movement and abilities as a result of the repetition of the exercises. Incorporating an optimum pattern of stabilisation into sports activities would not only minimise the likelihood of injuries and subsequent pain syndromes caused by overloading, but it might also help athletes perform better [8].

INTRODUCTION
Training to improve the stability of the core is a routine component of the injury prevention regimen in musculoskeletal conditions [1]. Core strength is essential for improving body balance and postural control during actions like landing and contact [2]. The pelvis, spine, and kinetic chain all require stability of the core for optimal load balance. The collection of muscles of the trunk that surround the abdominal viscera and spine is referred to as the core. Core strengthening is a word used to describe control over the muscles necessary to preserve functional stability around the lumbar spine. To produce spinal stability, the abdominal, paraspinal, hip girdle, gluteal and other muscles work together. Core strengthening has become a popular rehabilitation technique. Motor control training, lumbar stabilisation and other regimens have all been referred to as lumbar stabilisation. Stability of the core is required for adequate load balancing within the spine, pelvis and kinetic chain [3]. The strength of the core muscles is significantly impacted by obesity. Obesity is linked to several physiological changes that reduce flexibility and cardiovascular fitness and slow down a person’s activities [4]. Obesity leads to functional impairment in strength, mobility, and static, as well as dynamic balance. Muscle performance is reduced in such individuals [5]. Obesity causes issues with the motor and cardiorespiratory systems that result in disability [6]. Since the early 1960s, researchers have been studying core stability and strength. According to Wickstrom RL, some motor actions such as gripping, turning, crawling, and finally, the ability to walk are produced automatically in healthy babies without any special instruction. Activating peripheral regions or zones can trigger the neural circuitry that drives these complicated developmental processes. During an infant’s development, these zones are usually generated from balancing and stabilising points. Professor Pavel Kolar used the terminology Dynamic Neuromuscular Stabilisation (DNS) to describe how he applied Vojta’s approach to the treatment and rehabilitation of athletes [7]. The DNS therapy method is based on a thorough analysis of the quality of stability and/or movement, restoring the integrated spinal stabilisation system through specialised functional exercises focused on developmental kinesiological postures displayed by a normal baby. All such activities should focus on both the closed kinetic chain’s ideal patterns for stabilisation (support) and the open kinetic chain’s dynamic movements, such as reaching, throwing, stepping forward, or kicking. The central control eventually develops an automatic model that is a vital element of everyday movement and abilities as a result of the repetition of the exercises. Incorporating an optimum pattern of stabilisation into sports activities would not only minimise the likelihood of injuries and subsequent pain syndromes caused by overloading, but it might also help athletes perform better [8].

Science behind DNS
A rehabilitative technique founded on the original concept of developmental kinesiology is DNS, which is given manually for optimising the movement system [8]. The theory of reflex locomotion describes how firm pressure stimulation over specific muscle zones causes distinct reflexive motor response patterns. These generic movement patterns have been coined as global patterns. The global pattern elicited from the prone lying is known as reflex creeping, whereas the other one elicited from the side-lying or supine posture is known as reflex rolling. The coordination of this complex system for dynamic stability relies heavily on neuromuscular control. According to Frank C et al., and, Kobesova A and Kolar P, there are three levels of sensorimotor control: a) brainstem and spinal level; b) subcortical level; and c) cortical level [7,9]. Central Nervous System (CNS) motor control at the subcortical level begins and grows mostly over the first year of life after the newborn period. This facilitates fundamental trunk stability, which is required for any rhythmic movement and extremity locomotor functioning. Muscles of the orofacial region and afferent signals are naturally incorporated into postural locomotor patterns at the subcortical level. Finally, the cortical which is the highest motor control level becomes highly active. Control from the cortex is essential for movement characteristics and qualities [10].

The development of body posture is defined as postural ontogenesis, with the primary purpose of establishing efficient physical movements. The maturity of the CNS is required for the activation of postural
Dynamic neuromuscular stabilisation is a technique for providing dynamic muscle stability [13]. Every joint position relies on stabilising muscle contraction as well as synchronisation from both distant and local muscles to provide a central or neutral joint position within the kinetic chain, according to the DNS approach [8]. Intra-abdominal Pressure (IAP) is one factor that influences spinal mechanics and stiffness. Although there is a strong consensus that increasing IAP stabilises the spine, the role of IAP in spine unloading is still questioned. According to Kolar, the integrated spinal stabilising system is constituted of balanced co-activation of the extensors of the spine and deep flexors in the cervical and upper thoracic regions, and the diaphragm, as well as the pelvic floor, all segments of the abdominals, and extensors of the spine in the lower thoracolumbar regions. The intrinsic spinal stabilising muscles produce stiffness in the spine in conjunction with the IAP, resulting in dynamic spine stability. The DNS method aims to activate the integrated spinal stabilising system and re-establish optimum IAP control to improve movement efficiency and avoid joint overloading [8]. IAP is a crucial mechanism for spine and trunk stabilisation. The coordination of the abdominal, diaphragm and pelvic floor muscles is required for IAP modulation [14]. The objective is to achieve the maximum motor coordination achievable by positioning the patient in different developmental postures while allowing the supporting segments and joints into a functionally centered position. The individual is initially coached verbally and manually to detect the differentiation between the optimal and poor stabilising stereotypes. The individual is then advised to maintain the ideal pattern in various positions, as well as during mobility. Because the stability stereotype is closely linked to the pattern of breathing, the DNS evaluation always involves a breathing pattern examination. Simultaneous stabilising and breathing functions are also addressed in the training. The ultimate objective of DNS is to educate the patient on how to integrate an appropriate pattern of breathing and stabilisation into daily activities and athletic performance [10]. Mechanism of DNS is described in [Table/Fig-1] [8].
regulation of IAP. Performance training and muscle rehabilitation should not only emphasize training muscles in their dynamic anatomical function but also in their stabilising role. The DNS technique is a valuable tool for assessing and training muscles in all aspects of their physiological function [7]. Flatwater kayaking has grown in popularity as a recreational and competitive sport all around the world. Painful shoulder girdle syndromes and repetitive strain injuries have grown increasingly common as competitive engagement has increased. While DNS combined with regular training may enhance maximal Paddling Force (PF), it may not have the same effect on pain perception as was given by Davidek et al., [20]. Rahimi NM et al., concluded that DNS training may enhance maximal Paddling Force (PF), it may not have the same effect on pain perception as was given by Davidek et al., [20]. Rahimi NM et al., concluded that DNS training 

Improves balance function anticipatory postural adjustment control, balance, and fear of falls. 

DNS is more useful in improving trunk function. 

DNS is a promising, effective approach for facilitating deep core muscle activation of the underactive muscle chain.
The review explained how developmental influences play a role in maturation. DNS is a key link in finding the dysfunction and assess integrated spinal stabilising system. DNS is a valuable tool for assessing and training muscles in all aspects of their physiological function.

DNS may enhance maximal PF, but may not affect pain perception.

DNS helps in improving respiratory function.

DNS aids in enhancing lung capacity. It focuses on the integrated spinal stabilising system and techniques for breathing.

DNS was found to be more effective than general exercise.

CONCLUSION(S)
The approach of DNS has recently gained popularity. This method is mostly used to strengthen the core muscles. It has proven to be more effective than many other core stabilisation methods. It can help with a wide range of neurological and musculoskeletal issues. Sports rehabilitation is one of its principal applications. More studies are needed to determine its efficacy in other conditions including obesity.

REFERENCES
[14] Marand L, Dehkordi S, Roohi-Azizi M, Dadgoo M. Effect of dynamic neuromuscular stabilisation on diaphragm movement, postural control, balance and expiration breath hold time, and the respiratory rate outcomes all showed significant group-by-time interactions overall. There were significant differences between the groups in the global change (p<0.05). In each of the six tests, the DNS group showed a faster rate of progress than the general exercise group.

Table/Fig-3: DNS studies in musculoskeletal conditions [7,21-24].

