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The correlation between pain and proprioception in mechanical lowback pain

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Mechanical low back pain is one of the most common disorders in the young age category. The degree of correlation between the intensity of pain and proprioception deficit is not well known yet. The target of our work was to know the link between proprioception deficit in the back region and the degree of pain in young aged individuals and to investigate the degree of correlation. In case of proofing the link between them, a new standard of physiotherapy programs should be applied to patients who suffer from mechanical low back pain including pain management in addition to proprioceptive training especially in the young age category. In this study, 130 persons (65 patients with mechanical low back pain and 65 normal persons) were chosen for the study 23 were excluded and 107 were assigned into two groups. Group A: Fifty-three patients (17 females and 36 males) with mechanical low back pain were included in this group. The mean ± SD age, weight, height were 22.08 ± 1.920 years, 74.28± 13.410 kg, 172.92 ± 8.546 cm, respectively. Group B: Fifty-four normal subjects (11 females and 43 males) were included in this group. The mean ± SD age, weight, heights were 21.11 ± 1.755 years, 72. 93 ± 13.548 kg, 174.02 ± 7.735 cm, respectively. Active repositioning error was calculated three times after that the average was calculated then pain assessment was done via Numerical Rating scale, and then correlation study was done through statistical analysis. Results revealed that there was a direct strong correlation between the degree of mechanical low back pain and proprioception deficit of the back. It is concluded that there is a correlation between the degree of pain in the low back region in young age and proprioception deficit of the back, so it is recommended to perform pain management procedures in addition to proprioceptive training in young aged individuals who suffer from mechanical low back pain.

Keywords: Proprioception, Mechanical low back pain, Numerical rating scale.

INTRODUCTION

Low back pain (LBP) is one of the most common disorders all over the world and it causes medical, social, and economic burden.(Andersson,1997) and (Volinn,1997) affection of lumbar proprioception is a possible cause for the development of LBP and it is associated with recurrence of the LBP, especially if previous impairments are not resolved. Impairment in lumbar proprioception decreases the ability to maintain a neutral spinal posture and properly coordinate muscle activation. This would yield spinal control and increase trunk muscle activity and spinal stresses, which may cause increasing the incidence of the LBP and causing further decline of proprioception (Panjabi 1992& 2003; Reeves et al., 2011; O'Sullivan, 2002 and Dankaerts et al., 2006). The link between proprioception and other factors was not that clear in the previous literature. This is most probably

due to differences in the methods to assess proprioception and in the characteristics of participants between studies. Also, there are a lot of subgroups of people who suffer from LBP. Valid and reliable pain measurement tool is basically recommended for effective management of youths with acute and chronic pain (Castarlenas et al., 2017). The NRS-11 (Numerical rating scale) has been assessed in researches for adults who suffer from acute and chronic types of pain (Dworkin and Trunk, 2005). Research reveals the high validity of NRS-11 as a measurement tool of pain intensity compared to other pain measurement tools (Bijur et al., 2003) and (Bahreini et al., 2015) and accurate measurement for responsivity to treatments aimed at diminishing or eliminating pain (Ferreira-Valente et al., 2011 and Chien et al., 2013). In addition to that, NRSs is preferred more than other pain intensity measures as it suits patients who belong to different populations and cultures (Hjermstad et al., 2011). The signs of mechanical low back pain are more apparent during activity particularly when doing flexion and turning. The signs can be worse, while rest can improve signs and symptoms of the back pain. (Alemo and Sayadipour, 2008). Proprioception is a transmitted sensation from mechanoreceptors found in muscles, ligaments, skin, joint and tendons to the CNS. Carpenter et al., (1998) defined proprioception as the sense of position and sense of movement in addition to recognizing velocity of movement (Rienmann and lephart, 2002). The affection of proprioception can affect the neuromuscular system and increase the risk for re-injury or recurrence of the problem (Brumagne et al., 2000).

Designing of an effective physical therapy program was one of our goals based on our results that revealed pain management in addition to proprioceptive training must be considered in future especially in young aged individuals rather than the traditional types of rehabilitation training.

MATERIALS AND METHODS

Subjects:

The study was conducted on 53 patients with mechanical low back pain (Group A), and 54 normal subjects for a control group (Group B), their age ranges from 18-29 years. some Patients were excluded before selection of this sample due to having pathological conditions related to the back or lower limb, osteoarthritis of hip and knee, severe shortening of the muscles around the hip, or spinal deviation, patients with thyroid or gland problems, pregnant women or breastfeeding. A consent form was taken from all subjects who participated in this study after explaining its aim.

Instrumentations:

Biodex Isokinetic Dynamometer. The Biodex System was used for calculating the active The system measures the repositioning error as it is one of the most used instrumentation in the field of research, clinical testing and rehabilitation to assess muscle performance and proprioception (Drouin, 2004).

Weight and height measurement.

Study Procedure:

Patients were informed about the objectives of the study and consent form was taken after their approval. Each subject was sitting in a neutral position.This position as a starting position. Then patients were asked to memorize the "target position" which was thirty degrees of lumbar flexion while velocity was 30 degrees per second. then every participant was asked to recreate the same flexion angle three times with a closed eye, then the average of the three readings was calculated (Al Hamaky et al., 2018). In addition to previously collected data, we had done an assessment of pain via Numerical rating scale (the patient was asked to circle a number from zero to 10 which represents his pain as zero refers to no pain and 10 refers to the most severe pain).

Statistical Analysis

Then we did a correlation study between the two variables active repositioning error and pain intensity via numerical rating scale by calculating the correlation coefficient.

RESULTS

Comparison of active repositioning error between the 2 groups:

There was a significant difference between the two groups in the mean of active repositioning error as shown in (Table 1), Al Hamaky et al., (2018).

Table (1): Demonstrates the difference between active repositioning error in the 2 groups.

Group Statistics					
M Error	**Type of Pain**	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
	Normal	54	2.8889	1.90442	0.25916
	MLBP	53	6.9497	3.63999	0.49999

It revealed that there was a significant difference between the two groups.

Correlation between the active repositioning error and pain severity.

Table (2) :demonstrates the correlation between the error and intensity of pain.

Correlation			
		MError	**Pain**
MError	**Pearson Correlation**	1	0.770**
	Sig. (2-tailed)		0.006
	N	53	11
Pain	**Pearson Correlation**	0.770**	1
	Sig. (2-tailed)	0.006	
	N	11	11

** Correlation is significant at the 0.01 level (2-tailed).

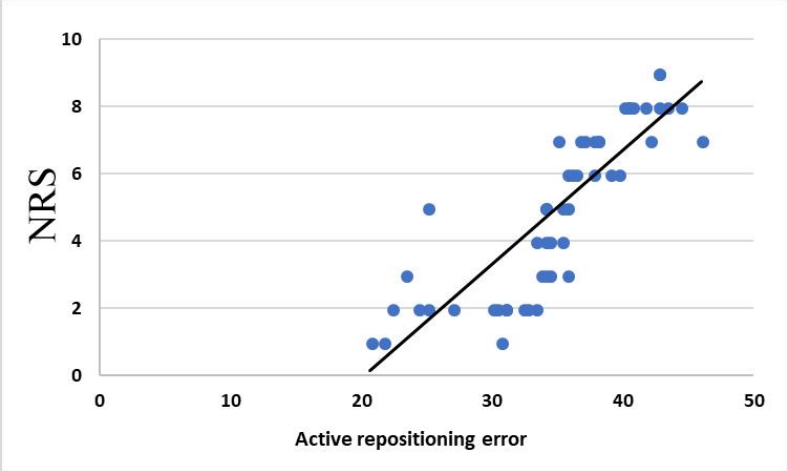

Figure (1): Correlation between active repositioning error and pain intensity of group A.

DISCUSSION

Many researches had reported that proprioception can be affected in both acute and chronic musculoskeletal disorders related to the spine at the cervical (Treleaven et al., 2003; Sjolanderet al., 2008; Kristjansson and Oddsdottir, 2010) and lumbar (Lee et al., 2010; Williamson and Marshall, 2014) spine, in addition to the upper (Juul-Kristensen et al., 2008; Anderson and Wee, 2011) and lower (Sharma et al., 2003; Salahzadeh et al., 2013) limb when pain is present in these cases. Pain can hinder the ability to recognize changes in body position which can affect proprioception of the human. Trunk muscle affects the normal afferent input from the affected muscles. On the other hand, proprioceptive affection may cause different muscle activation forms and produce new adaptive protective mechanisms. Whatever it is a cause or a result of NSLBP, it is a predicted result (Yilmaz et al., 2010). Proprioception can be affected due to changes in reflex activity and changed sensitivity of the gamma-muscle spindle (Johansson et al.,

2003) by increasing activity of chemo-sensitive type III and IV afferents (nociceptors). Animal models did show high effects on the muscle spindle afferents from intramuscular and intracapsular injections of inflammatory substances (Djupsjobacka et al., 1995;Thunberg et al., 2001). Affected proprioception can be seen in human research pain models (Weerakkody et al., 2008). Pain can affect body perception at the central level (Rossi et al., 2003 and Haggard et al., 2013), by reorganization of the somatosensory cortex (Moseley and Flor, 2012). It is concluded that pain can affect proprioception regarding peripheral and central levels of the nervous system. One study hypothesized that if proprioceptive impairments exist in the LBP group, they will more likely be exhibited on the more sensitive motion perception threshold test than on the repositioning tests (which rely on memory recall), lee et al., (2010), which noted that people with LBP have lesser ability to identify trunk position changes in motion perception threshold testing. Repositioning tests showed no difference between LBP and control groups. They assume that motion perception threshold is more accurate than the repositioning tests to detect any proprioceptive deficits (passive repositioning and active repositioning).

CONCLUSION

Designing of an effective physical therapy program was one of our goals based on our results that revealed pain management in addition to proprioceptive training must be considered in future especially in young aged individuals rather than the traditional types of rehabilitation training.

CONFLICT OF INTEREST

The present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

All authors contributed equally in all parts of this study.

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