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Effect of Mulligan Concept Lumbar (SNAG) on Neuro Radiculopathy In the Patients With Lumbar Disc Herniation (LDH)

(Original Research Article)

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Abstract: This study is to shed light on lumbar disc herniation (LDH) with radiculopathy that is considered one of the most common diagnoses encountered in orthopedic clinical practice and it is believed to be a major contributor to the estimated 60-80% lifetime incidence of low back pain. The effectiveness of Sustained Natural Apophyseal Glides (SNAG) technique of Mulligan on Neuroradiculopathy in the patients with lumbar disc herniation (LDH). The researchers were used the experimental method due to its suitability to the nature of the research with the one experimental group system. Tribal, interlayer, and dimensional measurements were made for the variables. The measurement of the variables under study was applied from the tribal, interlayer, and dimensional measurements of the anthropometric and physiological variables. the muscle strength, the range of motion, the degree of pain perception. The study sample was subjected to the (SNAG) technique for Mulligan for a period of (2) months, at a rate of (24) sessions in order to achieve the objectives of the study. Ten patients were participated in this study with lumbar disc herniation (LDH)L4-L5-S1. The research sample included (n=10men,) patients with slipped lumbar cartilage men are between (25-45) years old. Lumbar Disc Herniation (LDH) were randomly one experimental group system. The study group (aged 25- 45, 10 men) received a conventional physical therapy program consisted of stretching and strengthening exercises plus (SNAG) (based on the Mulligan concept) on the affected lumbar levels, (SNAG) (3) times per week for (2) month . Outcome measures were repositioning error (the primary

outcome), pain, and function measured by an kinetic dynamometer, visual analog scale(VAS), and the Oswestry Disability Index(ODI). Measurements were recorded before and after the end of the treatment period. The result showed that the qualification program and the use of (SNAG) technology for Mulligan had a clear effect. Which led to improvement in all research variables in the measurements (VAS) and (ODI) of people with a lumber herniated disc, through the application of the motor rehabilitation program and the use of (SNAG) technique of Mulligan in the sample to which the program was applied. The study concluded that preliminary study indicated improvement in group Adding (SNAG) to conventional programs in the treatment of chronic nonspecific (LDH) may result in greater improvement of repositioning error, pain reduction, and improved function.

Keywords: Pain; Lumbar disc herniation; Neural tissue mobilization; Facet joint immobilization; Disability**.**

Abbreviations:

SNAG: Sustained Natural Apophyseal Glides.
LDH: lumbar disc herniation.
ODI: Oswestry Disability Index.
VAS: visual analog scale.
ROM: range of motion.

Introduction

The Lumbar disc herniation (LDH) is a common condition which frequently affects the spine in young and middle-aged patients (1-3). It is one of the most common diagnoses encountered in orthopedic clinical practice [4) with peak incidence usually occurring between 25 and 55 years of age (5). Lumbar disc herniation can be defined as localized displacement of disc material beyond the normal margins of the intervertebral disc space leading to pain, weakness, or numbness in a myotomal or dermatomal distribution (6). The Cost of treatment of low back pain due to lumbar disc herniation in United States is estimated to be approximately 31 billion dollars per year (7). Most herniated discs occur in a posterolateral direction, compressing the ipsilateral nerve root as it exits from the dural sac chiefly affecting the L4-L5, L5-S1 nerve roots. It usually presents with low back ache with or without radicular pain (8). Many studies have demonstrated that lumbar disc herniation, protrusions, and annular tears are present even in asymptomatic individuals and only 50% of patients feel the radicular symptoms (9).

Herniation of the intervertebral disc usually causes impingement of neural structures and various spinal structures like the paravertebral muscles, ligaments, facet joints, annulus fibrosus and spinal nerve roots have been suggested as the cause of pain (10). Some researchers believe that neural compression due to herniation of intervertebral disc is the main generator of pain and it has been suggested that if nociceptive input continues over time

it may lead to functional, chemical and structural alterations in peripheral system and at various levels within the central nervous system (11), so the pain associated with lumbar radiculopathy occurs due to a combination of nerve root ischemia and inflammation resulting from local pressure and also the neurochemical inflammatory factors present within the disc material (2,3,12,13). It is also worthy to mention that the size of the disc herniation has not been found to be related to the severity of the patient's pain (11).

Socioeconomic impact is a major cause for seeking medical help, deterioration of functional ability, limitations in occupational activities, and work absence (14). Manual therapy is a common therapeutic approach used in the treatment of back problems. A recent systematic review reported medium to high evidence regarding the efficacy of manual therapies in the treatment of chronic LBP (15) . Different manual therapies, such as passive Maitland mobilization and Mulligan mobilization with movement, are used routinely in physical therapy practice (16). There is a gap in research concerning the efficacy of different manual techniques and their different physiological effects (17). This is true regarding lumbar (SNAG), which is commonly used in the treatment of (LBP) .(18)(SNAG) is one of the Mulligan concept techniques performed from a weight-bearing position, with the mobilizing force applied over the affected spinous process while the patient is enacting the painful or limited movement. (SNAG) when indicated, can provide immediate pain relief and improvement in range of motion (ROM) as it corrects the positional fault in facet joint (16).

Most of the research is concerned with (SNAG) techniques has concentrated on the study of peripheral joints (19-20) and the cervical region (21-22). Few studies have been concerned with the effects of (SNAG) on the lumbar spine. (17,23,24) The rest of the available research was in the form of case reports or case series (25,26) .Only 5 trials have investigated different effects of the (SNAG) technique when applied to the lumbar region. None of them concerned with its effects on proprioception. Range of motion was investigated in 4 out of the 5 studies. It was improved in 3 of them (17,27); no change was reported in the fourth trial by Moutzouri et al (22). The increase in ROM was reported only in the studies performed on (LBP) patients, and no improvement was reported when applied on healthy participants. Pain was investigated in 3 studies (17,27). It improved in 2 of them (27). although in the third study, Konstantinou et al failed to report any significant change (17) . Pain was measured with a visual analog scale (VAS) in all studies and in the present study. The controversy in the available literature regarding effects of lumbar (SNAG) on pain measure necessitates further investigation, as we did in the present study.

Functional disability level was recorded in 2 studies using 2 different tools (27). The Oswestry Disability Index (ODI) was used by Hidalgo et al, (24) whereas the back performance scale was used by Heggannavar et al (25). On both occasions patients reported better improvement in the level of function in response to (SNAG). New explanations for the effects of the lumbar (SNAG) were investigated in one study. Moutzouri et al have investigated the changes in the sympathetic activity of the lower limbs in healthy participants after the application of (SNAG) on the lumbar spine. Their results did not indicate any

significant effect (24). The present work is to shed light on lumbar disc herniation (LDH) with radiculopathy as a one of the most common diagnoses encountered in orthopedic clinical practice and it is to estimate 60-80% lifetime incidence of low back pain.

Materials and Methods

The researcher used the experimental method using one of the experimental approaches known as the pre, intermediate and post measurement on one experimental group and due to its suitability to the nature of the research problem, which characterized this study by developing a rehabilitation program and technique of continuous natural sliding of the vertebral joints in the lumbar region (SNAG) Sustained Natural Apophyseal Glides for Mulligan and conducting the measurement (pre-intermediate-first-intermediate-second-post) of the variables under study and to know the extent of its effect on people with a lumbar herniated disc in the vertebrae (L4 - L5 - S1) and its effect on the function of the back muscles, the intensity of pain, and the range of motion of the lumbar region for the study group.

Research fields

Spatial Domain

It is performed in the following centers and clinics of Physical medicine and rheumatology and rehabilitation. Conducting the first, second and third exploratory experiments:

- Some of the pre-, inter- and dimensional measurements of the anthropometric and physical variables of the experimental group under investigation. - The qualifying program was applied to the experimental group.

- Physiological measurements were performed for the experimental group under investigation.

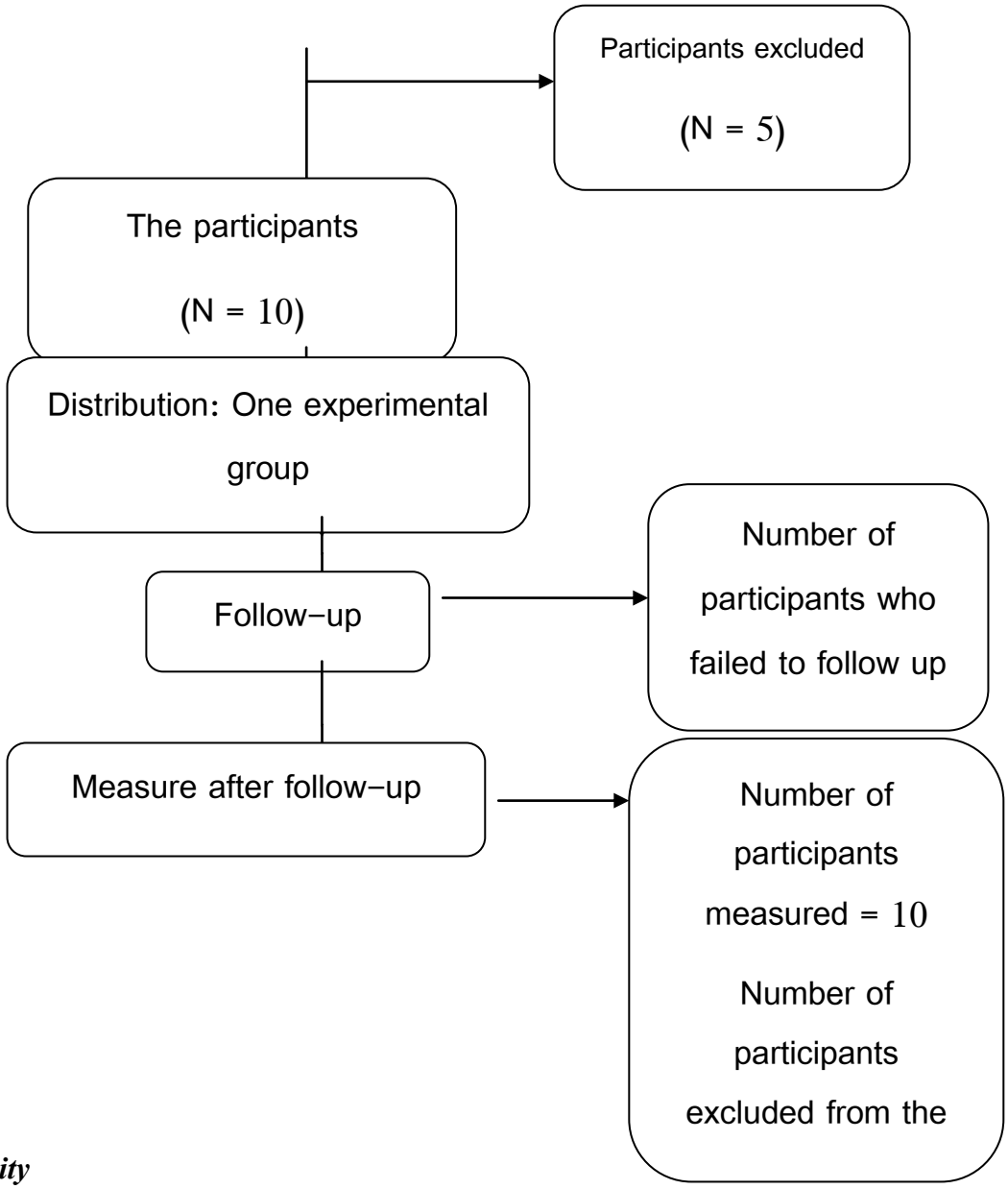
The Human Domain

Conducting the study on individuals with a lumbar herniated disc (L4, L5, S1) among men attending the Physical medicine and rheumatology and rehabilitation Clinics and the Physical Therapy Department.

Total Sample Size

The final number of the sample to which the qualification program and (SNAG) technique were applied and the measurements made (pre-intermediate-first-intermediate-second-post) ten infected persons in one experimental group, after excluding non-conforming with the conditions of the sample and non-observers.

Work outline



Sample Homogeneity

Homogeneity was performed between the experimental group in all measurements before the program.The study sample consisted of (10) herniated disc patients who were deliberately selected from among those attending the Physical medicine and rheumatology and rehabilitation and Physical therapy department .

Measurements

By referring to the reference studies conducted in the field of injuries and rehabilitation programs for the spine, such as the study of SebhanYounis Sultan (2017), Hisham Muhammad Hussein (2017), Nabila Ibrahim (2015), Ayman Abdel Razek (2013), the researchers were able to determine the appropriate measurements for the nature of the study This is to determine the extent to which the qualifying program has achieved the goal set for it.

Study Methodology

The use of the experimental method due to its suitability to the nature of the research, using an experimental design from one group on which the technique of (SNAG) is applied to Mulligan, and conducting a test (pre-intermediate - first-intermediate - second-post) of the variables under study.

Conditions for Selecting the Sample

1. He should be one of the individuals suffering from a lumbar disc herniated (L4-L5 and L5-S1) according to the medical diagnosis by the attending physician.

2. A lumbar herniated disc is associated with radiculopathy.

3. Cases are determined according to magnetic resonance imaging (MRI) and the diagnosis of the treating physician.

4. That one of the symptoms is the presence of pain in the lumbar region accompanied by the leg pain (right - left).

5. The age should be chosen between (25-45) years for men.

Total sample Size

The total size of the sample to be applied to the motor rehabilitation program,(SNAG) technique, and the measurement procedure (pre-intermediate, first intermediate, second and post intermediate) (10).

Measurements

The researchers made the following measurements on the study sample:

Anthropometric Measurements

- Height measurement: The measuring tape was used to measure the total height of the body to the nearest centimeter.

Weight: The medical scale is used to measure the body weight to the nearest kilogram.

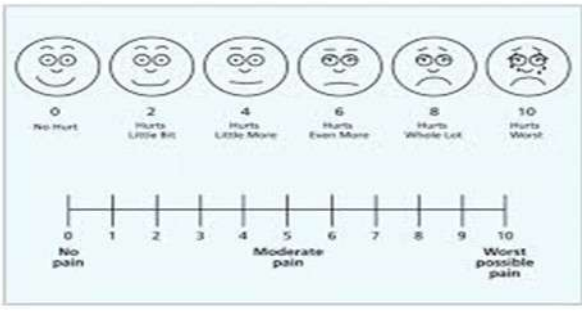
Chronological age: The chronological age of the nearest month was calculated upon pre-measurement for the research.

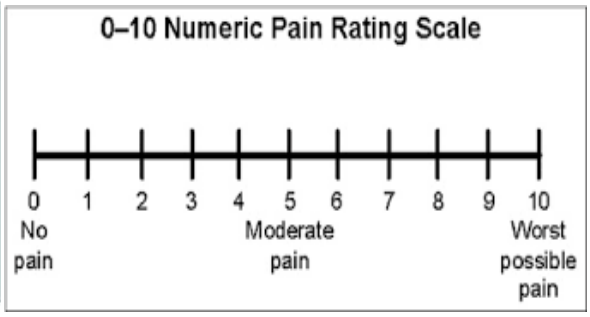
Body Mass Index: (BMI) is measured by dividing the weight in kilograms by the square of height in meters.

(Body mass index = weight (kg) ÷ height (m) 2(m) (BMI) = W (kg) / H^2

Measuring the Degree of Pain

The degree of pain (NUMERICAL PAIN SCALE) on the sufferers of a lumbar herniated disc is determined by the Visual Analogies Scales (VAS) by determining the degree of pain from (0-10) The patient is asked to choose a score of (10) By using (NUMERICAL PAIN SCALE).





Measuring the Percentage of Function Disability

The Disability Index Questionnaire, also known as the Oswestry Disability Index (ODI) questionnaire for lower back pain, is a very important tool used by researchers and disability assessors to measure the permanent functional disability of a patient. The test is considered the "gold standard" for determining functional outcomes for the lower back.

Numerical Pain Scale is determined by determining the degree of pain (0-10), asking the patient, looking at the expression of the patient's face, giving him a degree of (10 cm) and measuring the degree of pain (VAS).

The degree of pain (NUMERICAL PAIN SCALE) was determined on the sufferers of a lumbar herniated disc through the Visual Analogues Scales (VAS) by determining the degree of pain from (0-10) and then asking the patient and asking him to choose a degree from (10) using (NUMERICAL PAIN SCALE).

Results and Discussion

Table (1). Degrees of Measuring the Severity of Pain

	Sensation of Pain	**Degrees of Measurement**
1	There is no pain	0
2	Minor pain	1,2,3
3	Moderate pain	4,5,6
4	Severe pain	7,8,9,10

Functional Disability Index

Table (2). Interpretation of Degrees of Functional Disability

The patient can handle most live activities. Usually there is no cure; it is indicated apart from advice on sitting elevation and exercise.	0% to 20%: minimal disability
The patient has more pain and difficulty sitting, lifting, and standing. Travel and social life are more difficult, and they may also be disabled from work. Personal care, sexual activity and sleep are not severely affected and can usually be managed by the patient by conservative means.	21%-40%: moderate disability

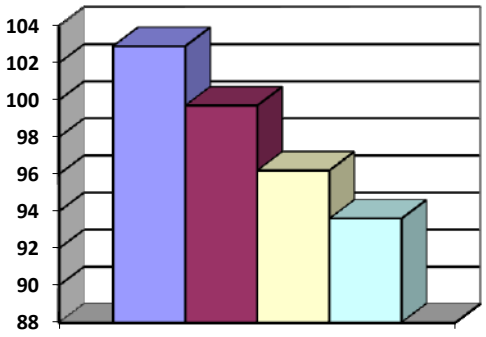
Pain remains the main problem in this group, but daily activities are affected by living. These patients require detailed investigation.	41%-60%: severe disability
Back pain affects all aspects of a patient's life. Positive intervention is required.	61%-80%: crippled
These patients are either bed-bound or exaggerate their symptoms.	81%-100%

Fairbank JCT &Pynsent, PB (2000 p 2940-2953) Davidson M & Keating J (2001) p8-24)

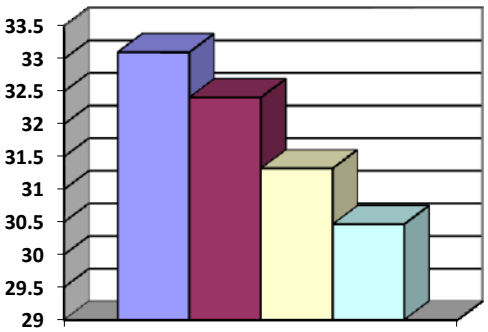
First hypothesis Related to Anthropometric Variables (Weight and Body Mass Index)

Table (3) . Analysis of Variance (ANOVA) between the Four Measurements: (pre-intermediate-intermediate-secondary-post) in weight and body mass index of patients with lumbar herniated disc.

Variables	Source Variance	degrees Freedom	Sum squares	Average squares	Fvalue	level	intangible connotation
Weight (kg)	between measurements	**3**	**494.60**	**164.87**	***9.26**		
	inside measurements	**36**	**641.00**	**17.81**			
	Total	**39**	**1135.60**				
body mass index (BMI)	between measurements	**36**	**185.20**	**5.14**	***9.26**		
	inside measurements	**39**	**49.72**	**164.87**			
	Total	**3**	**494.60**				



KG



BMI

Chart (1)

It is clear from the table (3) and the graph (1) of the analysis of variance (ANOVA) between the four measurements (pre-intermediate-intermediate-secondary-post) in weight and body mass index for patients with lumbar disc herniation, and there are significant differences between the measurements.

The four were in (weight - body mass index), where the value of P ranged between (3.22 to 9.26), and this value is greater than the value of the tabular (F) at the level (0.05,) and to determine the significance of the differences between the four measurements (tribal - inter-first - inter-second - dimensional) in weight and body mass index, the least significant difference test (LSD) was used in Table (4)

Table (4). Significant differences between the four measurements (pre-intermediate-intermediate-secondary-postural) of patients with lumbar disc herniation in weight and body mass index using the least significant difference test LSD.

Variables	Measurements	mean	Standard Deviation	Indication of the differences between the averages				LSD
				Tribal	first	second	After	
Weight (kg)	Tribal	102.90	5.95		3.20-	*6.70-	*9.30-	3.83
	Benny Ol	99.70	5.74			3.50-	*6.10-	
	Benny Thani	96.20	0.92				2.60-	
	after me	93.60	1.43					
body mass index (BMI)	Tribal	33.10	2.83		0.69-	1.78-	*2.64-	2.06
	Benny Ol	32.41	2.07			1.09-	1.95-	
	Benny Thani	31.32	2.13				0.86-	
	after me	30.46	1.95				*9.30-	

It is clear from Table (4) and Chart No. (1) regarding the significance of the differences between the four measurements (pre-intermediate-intermediate-secondary-postural) of patients with lumbar disc herniation in weight and body mass index using the least significant difference test LSD.

Weight (kg): The second and dimensional measurements were significantly superior to the tribal measurements, and the dimensional measurements were superior to the first intermediary measurements, and no significant differences appeared between the rests of the measurements.

Body mass index (BMI): the post measurement was significantly superior to the premeasurement, and no significant differences were found between the rests of the measurements.

Table (5). Significant differences between the Three Measurements

Variables	Measurements	Mean	% difference between the three measurements			
			Tribal	first	Second	After
Weight (kg)	Tribal	102.90		%3.11-	%6.51-	%9.04-
	Benny Ol	99.70			%3.51-	%6.12-
	Benny Thani	96.20				%2.70-
	after me	93.60				
body mass index (BMI)	Tribal	33.10		%2.08-	%5.38-	%7.98-
	Benny Ol	32.41			%3.36-	%6.02-
	Benny Thani	31.32				%2.75-
	after me	30.46				

It is clear from Table (5) and Figure (1) regarding the percentage of differences between the four measurements (pre-intermediate-first-intermediate-secondary-postural) of patients with lumbar disc herniation in weight and body mass index .

- The highest percentage of improvement was between the first inter-measurement and the post-measurement, ranging from 3.11% to 9.04% for the body weight variable .

- The highest percentage of improvement was between the first inter-measurement and the post-measurement, between 2.08% and 7.98% for the BMI variable.

The First Hypothesis of Anthropometric Variables

The result of the current study agrees with the results of the study of "SabhanYunis Sultan (2017) Naseem Hassan" Bushra Abdel Rahman (2009) "IzzatQassemLutfi (2005) "Amal Hussein Al Sayed (2003)" Rasha Mustafa Muhammad Farid (2002) "Hassan Ezzedine (2001) "ManalTalaat Muhammad (2000)" Pedersen Hoffmann (2000) "Rhind et al (2000), where the results of these studies confirmed that physical exercise works to reduce weight and thus reduce body mass index, and that this remarkable progress is due to the effectiveness of the proposed rehabilitation exercises. The researcher attributes the improvement in reducing the body mass index to the effectiveness of the proposed motor rehabilitation program, which included a group of static (isometric) and mobile (isotonic) exercises and PNF elongation exercises.

In addition, Mulligan's kinetic rehabilitation program (SNAG) is a way to reduce pressure on the nerve roots and thus increase motor activity, which led to a reduction in body mass index. It is known that the increase in BMI represents an excess burden on the vital organs of the body and that there is an inverse relationship between the increase in BMI and the speed of movement of the individual. The spine, especially the lumbar region, in addition to affecting the efficiency of some muscles, and obese people are more susceptible to stress.Through the previous presentation and discussion of the results, it becomes clear that the first hypothesis is correct, which states: There are statistically significant differences between the four

measurements (pre-, inter- and inter-secondary- dimensional) for lumbar herniated discs in the anthropometric variables (weight - body mass index).

Table (6). (ANOVA) between the Four Measurements in the Degree of Pain (VAS)

Variables	Source variance	degrees Freedom	Sum squares	Average squares	F value	level
VAS	between measurements	3	255.28	85.09	*315.80	0.00
	inside measurements	36	9.70	0.27		
	Total	39	264.98			

Table (7). The Differences between the Averages

Variables	**Measurements**	**mean**	**Stander Deviation**	**Indication of the differences between the averages**				Variables
				Tribal	**first**	**second**	**After**	
VAS	Tribal	7.80	0.42		*3.20-	*5.50-	*6.60-	0.47
	First	4.60	0.70			*2.30-	*3.40-	
	Second	2.30	0.48				*1.10-	
	after	1.20	0.42					

Table (8). Difference between the Three Measurements

Variables	Measurements	Mean	% **Difference between the three measurements**			
			Tribal	**first**	**second**	**After**
VAS	Tribal	7.80		%41.03-	%70.51-	%84.62-
	First	4.60			%50.00-	%73.91-
	Second	2.30				%47.83-
	After	1.20				

Chart (2)

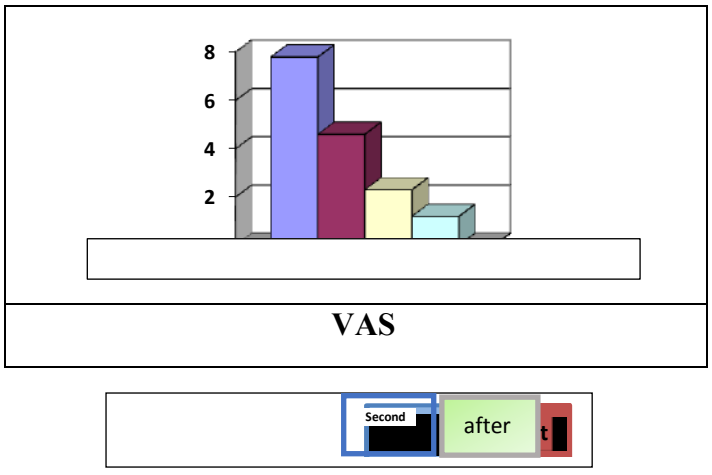


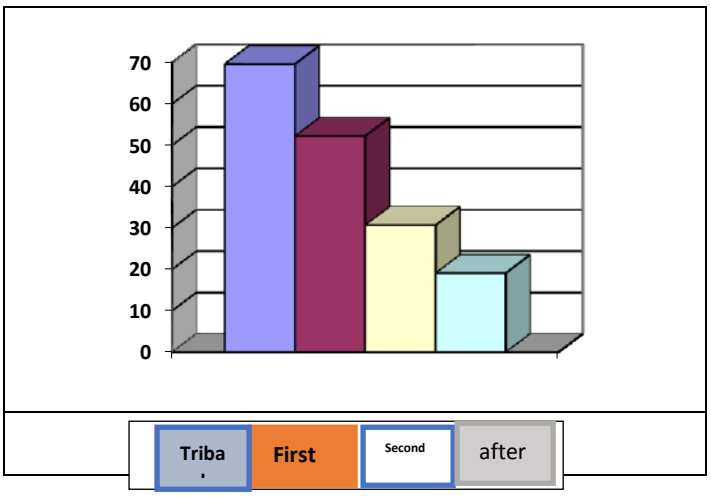
Table (9). (ANOVA) between the Four Measurements in the Degree (ODI)

Variables	Source variance	degrees Freedom	Sum squares	Average squares	F value	level	intangible connotation
ODI	between measurements	3	15146.60	5048.87	*492.57	0.00	
	inside measurements	36	369.00	10.25			
	Total	39	15515.60				

Variables	Measurements	mean	Stander Deviation	Indication of the differences between the averages				Variables
				Tribal	**first**	**Second**	**After**	
ODI	Tribal	69.60	5.62		*17.40	*38.90-	*50.50-	2.91
	First	52.20	1.62			*21.50-	*33.10-	
	Second	30.70	2.36				*11.60-	
	After	19.10	1.10					

Variables	Measurements	Mean	% difference between the three measurements			
			Tribal	**First**	**Second**	**After**
ODI	Tribal	69.60		%25.00-	%55.89-	%72.56-
	First	52.20			%41.19-	%63.41-
	Second	30.70				%37.79-
	after	19.10				

Chart (3)



It is clear from the table (1), (2), (3) and the graph (1) of the analysis of variance, the percentage of percentage and the percentage of differences between the four measurements (pre-intermediate, first intermediary, second intermediary, dimensional) in the variables

(intensity of pain). .The percentage of improvement was in favour of the dimensional measurement, as the percentage of improvement over the first inter-measurement ranged between (41.03%) to (84.62%).

The results of the current study are in agreement with what was indicated by the studies of Vinayak Nagral et al (2012), WTrupti (2014), Moutzouri M et al (2008) and Lephart SM Riman BL (2002). Efficacy of Mulligan's (SNAG) Technique for Pain Relief Studies have shown an improvement in (VAS) measurements, and this improvement may be due to multiple factors, including relieving the mechanical imbalance of the lumbar joints, which may allow for easier and pain-free movement. Hidalgo B et al (2015) mentions Heggannavar A, Kale A (2015) This improvement may be due to the efficacy of Mulligan's (SNAG) technique. On the other hand, Constantino et al. (2007) reported a slight improvement in the degree of pain that did not reach statistical significance. However, they attributed these results to the heterogeneity of the participating sample and the use of a range of kinematics scale instead of measuring the degree of pain as a basis for calculating the sample size to participate in their study. The researchers suggested this improvement to the clear positive impact of Mulligan's (SNAG) technique and the regularity of the sample members by applying the rehabilitation program.

It is clear from the table (4), (5), (6)(7), (8), (9) and the graph (2-3) related to the analysis of variance, the percentage of percentage and the percentage of differences between the four measurements (pre-test, inter-measurement first, inter-second and dimensional) in the variables (ODI).The percentage in favour of improvement was in favour of the dimensional measurement, as the percentage of improvement from the first inter-measurement ranged from (41.03%) to (84.62%).The training program that appears in which is a dry program in the physical activity program.This is confirmed by Hidalgo B et al (2015) that the level of functional disability was recorded in 2 studies using two different tools. Hidalgo B et al (2015) used the Oswestry Disability Index (ODI), while Hijanavar et al. Heggannavar A, Kale A (2015) using the lumbar performance scale. In the two studies, there was an improvement in the level of functionality as a result of the application of Mulligan's (SNAG) technique.It is clear from the study of Aslan Telci E et al (2013) that increasing the patient's ability to move without pain increases self-confidence and reduces psychological fear factors and signs of depression that coincide with lower back pain, so that the lower back pain patient is able after the lower back pain is relieved Pain is the ability to perform more body positions and thus improve the ability to perform the required daily activities and functions.
This is confirmed by the study of Vinayak Nagral (2012) that there is an improvement in the percentage of functional disability using Mulligan's (SNAG) technique.

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