ORIGINAL ARTICLE

The Correlation between Unilateral Hip Bridge Endurance and Lumbar Multifidi Sonologic Characteristics in Physically Active Allied Healthcare Professionals at St. Luke's Medical Center – Quezon City: A Cross-sectional Study

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ABSTRACT

Background and Objective. Low back pain is one of the most common work-related musculoskeletal disorders. Healthcare workers are prone to low back pain because of the nature of their profession. Low back pain may be related to lumbar multifidi atrophy or instability and poor core stability. Core stability can be assessed using the unilateral hip bridge endurance test. This cross-sectional study aims to determine the correlation between unilateral hip bridge endurance (UHBE) and sonologic characteristics of the bilateral L4-L5 lumbar multifidus muscles of physically active allied healthcare professionals.

Methods. Forty (40) physically active healthcare professionals (mean age = 31.3 ± 6.39 years, mean height = 161.17 ± 8.45 cm, mean weight = 61.88 ± 13.58 kg, mean BMI = 23.61 ± 3.68 kg/m^2) were recruited via purposive sampling. The participants answered online versions of the Global Physical Activity Questionnaire (GPAQ) and Oswestry Disability Index. They subsequently underwent the UHBE test and ultrasound assessment of the L4-L5 multifidi. Multiplied anteroposterior (AP) and lateral linear (L) measurements were used to estimate L4-L5 multifidi size. The Pearson test was used to test for correlation between the primary outcomes of the study.

Results. There was no statistically significant correlation between Lumbar Multifidi CSA and UHBE Scores (r = -0.172, $p > 0.05$), and between Lumbar Multifidi CSA% Difference and UHBE Scores (r = -0.140, $p > 0.05$). However, results showed a very weak negative correlation between the Lumbar Multifidi CSA% Difference and UHBE Scores.

Conclusion. There is no definite evidence showing a correlation between core stability tests such as the unilateral hip bridge test scores and sonologic characteristics of the lumbar multifidi. However, lumbar multifidi symmetry may have a role with core stability. The correlation between core stability tests and lumbar multifidus morphology should be further investigated.

Keywords: core stability, low back pain, multifidus, ultrasound

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INTRODUCTION

Low back pain is one of the most common work-related musculoskeletal disorders.[1] Low back pain is defined as discomfort, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds, with or without sciatica.[2] Healthcare workers are prone to low back pain because of the physical and emotional factors associated with their profession.[3] Low physical activity levels are prevalent in individuals with low back pain.[4] Exercise alone may reduce the risk of low back pain.[5] Physical activity, as defined by the World Health Organization (WHO), refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work.[6] The American College of Sports Medicine recommends 150-300 minutes per week of moderate-intense physical activity or 75-150 minutes per week of vigorous-intensity physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Moderate-intensity physical activity are activities requiring 3.0 to less than 6.0 METs; examples include walking briskly (2.5 to 4 mph), playing doubles tennis, or raking the yard. Vigorous-intensity physical activity are activities requiring 6.0 or more METs; examples include jogging, running, carrying heavy groceries or other loads upstairs, or participating in a strenuous fitness class. In addition, adults are recommended to engage in muscle-strengthening activities involving all major muscle groups on two or more days a week.[7] A study on the levels of physical activity of US healthcare workers revealed that in 1,502 participants, 56.2% met the recommended guideline for aerobic activity, 30.1% met the recommended guideline for muscle-strengthening activity, and 25.3% met both recommended guidelines.[8]

Low back pain may be related to lumbar multifidi atrophy or instability in elderly individuals.[9,10] The lumbar multifidi are deep paraspinal muscles attached posteriorly to the spine.[11] These muscles are stout with short fibers and high cross-sectional area. These characteristics allow the lumbar multifidi to produce large forces over a small operating range. The deep fibers of the multifidi cross 2 spinal levels and does not lengthen during spinal motion, hence these fibers are attributed to spinal stability.[10,12,13] Hence, the lumbar multifidi account for more than two thirds of the stiffness of the spine.[14] In addition, the multifidi functions as a sensory organ to provide proprioception for the spine, given the predominance of muscle spindles in these muscles.[11] The morphology of the lumbar multifidi can be assessed using magnetic resonance imaging (MRI), computed tomography (CT), and ultrasound (US).[10] MRI produces excellent soft tissue contrast and demonstrates a clear image of the soft tissue anatomy.[15] CT assessment and ultrasound have relatively low-cost compared to MRI.[10] Ultrasound assessment offers the advantage of dynamic imaging. The utility and reliability of US relative to MRI scanning has been studied and showed that lumbar multifidi cross-sectional area (CSA) could be measured as accurately with US as with MRI.[15] Further studies reported that ultrasound assessment of the lumbar multifidus produced accurate measurement of cross sectional area and procedural reliability.[16] Ultrasound imaging has been shown to be reliable for assessing multifidus size, thickness and cross-sectional area, and multifidus activity, change in thickness from a resting to a contracted state.[16] In patients with chronic low back pain, paraspinal muscles are smaller compared to healthy patients.[9,17] Compared to younger adults, lumbar multifidi cross-sectional area is smaller among older individuals.[16] Additionally, individuals with lesser weight have higher density of paraspinal muscles than those who are overweight.[2]

In addition, low back pain has been associated with poor core stability.[18] Core muscles are group of trunk muscles that surround the spine and abdominal viscera.[19] Clinical assessment of muscle endurance of core muscles has been used to evaluate core stability. Prone planks, side planks, abdominal curls, and trunk extension have been used to assess core stability in healthy adults.[20–22] Decreased trunk and hip extensor muscle endurance has been shown to be predictive of future low back pain.[23] A study validated the use of a novel clinical core stability assessment in the form of the unilateral hip bridge endurance test (UHBE).[24] In this previous study, 20 active individuals completed the trunk stability test, unilateral hip bridge endurance test, trunk extensor endurance test, Y-balance test, and laboratory-based biomechanical test of core stability. The laboratory-based biomechanical test was used to isolate neuromuscular control to the core. Results showed a significant correlation between the UHBE and biomechanical test of core stability (r = -0.49 to -0.56, $p < 0.05$) and the execution of the unilateral hip bridge required significant activation of the lumbar multifidus and erector spinae muscles.[24] Additionally, the UHBE was included in the development of a comprehensive movement screening tool for athletes wherein 80 athletes completed 21 clinical tests including the UHBE. The study concluded that the screening tests including the UHBE are acceptable for clinical use in injury risk and measurement.[25]

To our knowledge, no prior study has determined the correlation of clinical core assessment with sonologic characteristics of lumbar multifidi. In addition, ultrasound assessment of the lumbar multifidi of healthcare workers has not been done, particularly in our local setting. With the enduring Coronavirus disease 2019 pandemic, the hospital workforce at the frontline continues to be at risk for health problems, both communicable and non-communicable, including musculoskeletal disorders from manual work and stress. Awareness of back care and prevention programs may help decrease the fallout of front liners due to debilitating low back pain.

The results of this study may be used to assess the correlation of low back pain symptoms in patients with low scores in the unilateral hip bridge endurance (UHBE) test and asymmetrical lumbar multifidi. The UHBE test is a clinical assessment tool to measure core stability. The ultrasound assessment of the lumbar multifidi may provide supporting data for the results of the clinical assessment of core stability. The results of the study may contribute to the establishment of a low back pain rehabilitation program which will emphasize strengthening of the lumbar multifidi. Hence, this study aims to determine the correlation between the unilateral hip bridge endurance and sonologic characteristics of the bilateral L4-L5 lumbar multifidus muscles of physically active allied healthcare professionals in St. Luke's Medical Center – Quezon City. The specific objectives of this study include: 1) to determine the core stability of allied healthcare professionals who engage in regular physical activity through the unilateral hip bridge endurance test; 2) to determine the cross-sectional area and presence of lumbar multifidi asymmetry defined as a side-to-side cross-sectional difference of ≥ 10%; 3) to determine the correlation of sonologic lumbar multifidi cross-sectional area and asymmetry with low back pain disability using the Oswestry Disability Index score; 4) to determine the correlation of unilateral hip bridge endurance with low back pain disability; and 5) to determine the correlation of levels of physical activity based on the Global Physical Activity Questionnaire (GPAQ) with lumbar multifidi asymmetry, multifidi cross-sectional area, and UHBE scores.

MATERIALS AND METHODS

This is a cross-sectional study which utilized a purposive sampling method. Specifically, physically active allied healthcare professionals employed at St. Luke's Medical Center-Quezon City (SLMC-QC) were invited through flyers and referrals. The study was conducted from January 2022 to December 2022. The following were the study's inclusion criteria: ages 18 – 59 years old[26,27], with written signed voluntary informed consent, with or without history of low back pain, physically active allied healthcare professionals including nurses, medical technologists, radiologic technologists, physical therapists, and occupational therapists employed at SLMC-QC. Participants were excluded based on the following criteria: neuromuscular or neurological disease and/or syndromes causing weakness (stroke, myopathies, central nervous system degenerative disorders), low back pain graded ≥ 8/10 limiting functional activity, inactive individuals, pregnancy, history of previous back surgery, allergy to ultrasound gel, open wounds/ulcers in the lumbar area, intolerance to prone position, and female participants who refused to be scanned by a male sonologist.

The study was subjected to scientific and ethical review by the St. Luke's Medical Center Research and Biotechnology Department. The study abided by the Principles of the Declaration of Helsinki (2013) and was conducted according to the Guidelines of the International Conference on Harmonization-Good Clinical Practice (ICH-GCP). Written informed consent was secured by the researcher from the participants. Figure 1 describes the procedural flow of the study.

In this study, low back pain symptom was defined as pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds, with or without radiation.[2] Severity of low back pain was assessed using the Oswestry Low Back Pain Disability Questionnaire.[28] Based on the WHO, physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work.[6] A physically active healthcare professional is an individual who engage in any form of physical activity incorporated in their daily routines are considered physically active. Levels of physical activity was

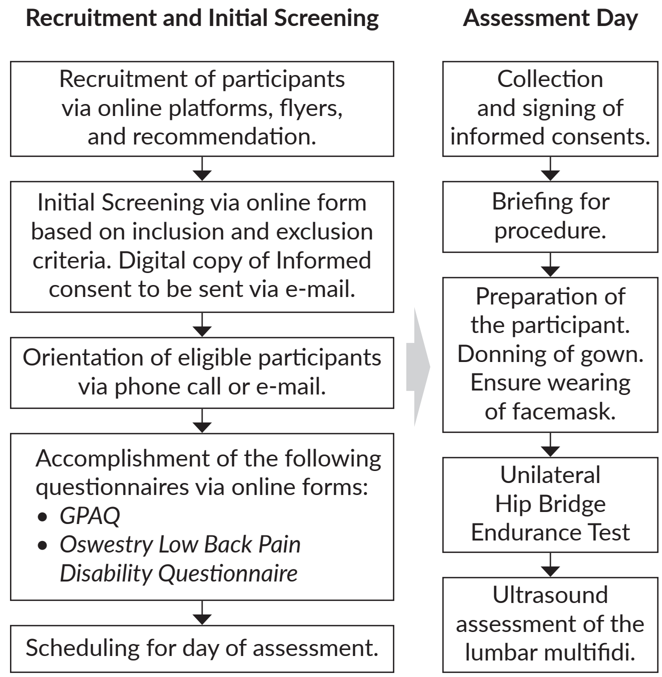

Figure 1. Procedural flow of the study.

assessed using the Global Physical Activity Questionnaire (GPAQ). The GPAQ consists of 16 questions designed to estimate an individual's level of physical activity in 3 domains – work, travel, and recreational activity. The total time and intensity of physical activity in these domains was calculated and expressed as METs (Metabolic Equivalents) per week. 4 METs was assigned to the time spent in moderate activities, and 8 METs to the time spent in vigorous activities.[29] Sufficiently active individuals are persons doing the equivalent of 150 minutes to 300 minutes of moderate-intensity physical activity a week.[7] For this study, these include individuals with activity levels equating to >600 METs/week. Insufficiently active individuals are persons doing some moderate- or vigorous-intensity physical activity but less than 150 minutes of moderate-intensity physical activity a week or 75 minutes of vigorous-intensity physical activity or the equivalent combination.[7] In this study, these include individuals with activity levels equating to <600 METs/week.

Core stability was assessed using the Unilateral Hip Bridge Endurance (UHBE) test. The UHBE test was performed with the participant lying supine with their arms across their chest, knees in flexion, and feet flat on the table (Figure 2). The participant initially performed a double-leg hip bridge. Once a neutral spine and pelvis position was achieved, the participant was instructed to extend the left knee first. Participants were instructed to hold this position as tolerated. The test was terminated when they were no longer able to maintain a neutral pelvic position in the sagittal and transverse planes. Visual assessment of the pelvic position was done. The scores were recorded in seconds by one tester. The procedure was done for the other side wherein the right knee is extended. Two trials were performed on each side. The average score for each side was used for analyses.[24] If pain was elicited during the test, the test was terminated and the patient's score was recorded based on the time of termination. However, no pain was elicited during time of examination throughout the duration of the study.

Ultrasound assessment of the lumbar multifidi commenced with the participant placed in a prone position. Pillows were placed under the hips to eliminate lumbar lordosis. The spinous processes were located through palpation. Upon palpating caudally from the sacrum, the spinous process of L5 was located. The spinous process of L4 was identified by palpating caudally from L5. The ultrasound transducer was first positioned longitudinally at the midline of the lower lumbar spine (Figure 3). This was done to appropriately orient and confirm the skin landmarks. The transducer was then rotated 90 degrees and was positioned transversely on the midline. Identification of the spinous processes and laminae was done on a cross-sectional scan. The transducer was then moved laterally to each side to scan the left and right multifidus muscles. For some participants, the bilateral lumbar multifidi were seen and captured without moving the probe laterally. The echogenic vertebral laminae served as a landmark to identify the deep border of the muscle. Images were captured, stored, and measured accordingly using the built-in software of the ultrasound machine.[30] The Samsung HS30 Ultrasound system was used in this study. It is equipped with a 21.5-inch LED Monitor with a built-in keyboard. The Samsung C2-5 2-5MHz curvilinear transducer was used for scanning of the L4-L5 multifidi (Figure 4). Captured images were saved in a built-in storage and transferred to a USB drive, password-locked, and accessible only to the study team. The ultrasound device was operated by a single sonologist with >3 years of experience in conducting Musculoskeletal Ultrasound. The participants were tested and scanned during their available time.

The lumbar multifidus was characterized via cross-section area and asymmetry. Cross-section area (CSA) of the multifidus is the quantified measurement of the size of the multifidi muscle expressed as cm^2. In this study, multiplied linear dimensions were used to quantify CSA. Two linear measurements were done: the greatest depth (anteroposterior) and the greatest width (lateral dimension). CSA was estimated by multiplying the linear measurements, with the AP multiplied with lateral dimension (AP x Lat).[31] Standard reference values for cross sectional area of the lumbar multifidi are still being established. A study established that in healthy young males, the resting thickness of the L4-L5 lumbar multifidus is 3.11 ± 0.45 cm.[32] In young females, the resting thickness of the L4-L5 lumbar multifidus is 2.67 ± 0.36 cm.[32] However, reference values for multiplied linear dimensions are yet to be established. Asymmetry of the multifidi was measured by quantifying the differences between the estimated CSA of the left and right multifidi muscles. The difference between sides was

Figure 2. Unilateral Hip Bridge Endurance (UHBE) test.

Figure 3. Participant position and initial transducer placement.

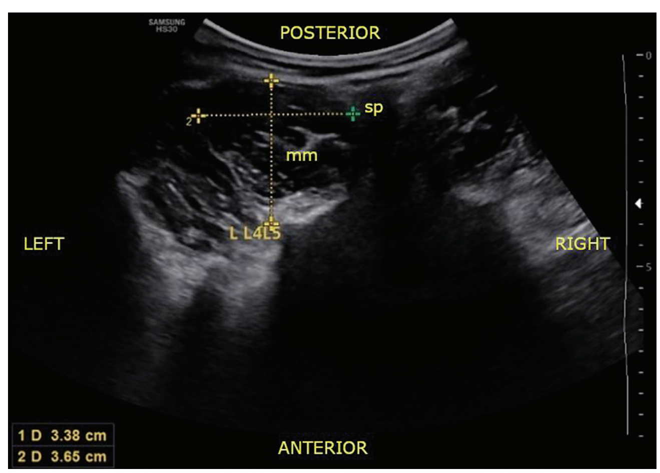

Figure 4. Cross-sectional ultrasound images of the L4-L5 lumbar multifidi with AP-L measurements.

mm – multifidus muscle; sp – spinous process calculated by dividing the value from the larger side by the smaller value and expressed as a percentage (% difference = [(largest/smallest value) x 100]–100).[30] A difference of ≥10% is considered asymmetrical.[33]

For this study, the level of significance was set at 0.05. With this level of significance, a power of 80% and a coefficient of determination of 0.10, the adequate sample size required to run a Pearson correlation analysis was 76. The calculation was based on previous studies on the relationship of multifidi characteristics, core stability, and low back pain.[2,9,10,12,17,18,23,26,34,35] Descriptive characteristics of the participants, activity level (total METs per week), Oswestry Low Back Pain Disability Index Scores, UHBE Scores, lumbar multifidi CSA, and asymmetry (CSA % difference) were expressed as means and standard deviations (SD). The Pearson test was used to test for correlation between the unilateral hip bridge endurance and sonologic characteristics of the bilateral L4-L5 lumbar multifidus muscles (CSA and asymmetry). Furthermore, the Pearson test was used to test for correlation between: sonologic lumbar multifidi characteristics with low back pain disability; unilateral hip bridge endurance with low back pain disability; and GPAQ-based levels of physical activity expressed as METs/week with lumbar multifidi asymmetry, multifidi cross-sectional area, and UHBE scores.

Table 1. Activity Levels (METs/week), Oswestry Low Back Pain Disability Index Scores, Unilateral Hib Bridge Endurance Test Sores, and L4-L5 Multifidi CSA and CSA % Difference of the Participants

	Mean	SD	Interpretation
METs/week	10197.50	10329.42	Sufficiently Active (Highly Active)
Oswestry Disability Index score	7.70	8.62	Minimal Disability
UHBE Test Score	12.49 s	3.55	No established reference range
L4-L5 multifidi CSA	8.81 cm^2	3.39	No established reference range*
L4-L5 multifidi CSA % Difference	20.57	16.24	Asymmetric

METs – metabolic equivalent, UHBE – unilateral hip bridge endurance, CSA – cross-sectional area.
**No established reference range for estimated CSA values using multiplied linear measurements*

RESULTS

Data were gathered from a total of 47 participants. However, only 40 participants were included for data analysis as one participant was unavailable during the scheduled day of assessment and six participants were excluded due to lacking responses in the GPAQ online questionnaire and the Oswestry Disability Index online questionnaire.

The participants had a mean age of 31.3 ± 6.39 years. Their mean height was 161.17 ± 8.45 cm, body weight was 61.88 ± 13.58 kg, and body mass index (BMI) was 23.61 ± 3.68 kg/m^2. The majority of the participants were females (62.5%). Among the participants, 55% (n=22) were physical therapists, 35% (n=14) were nurses, and 10% (n=4) were occupational therapists.

Table 1 shows the mean scores of the outcomes of interest. The median activity level of the participants was 5280 METs/week. Out of the 40 participants, 7.5% (n=3) were insufficiently active and 92.5% (n=37) were sufficiently active. The large majority (90%) had minimal low back pain disability symptoms, while 10% had moderate disability. Thirty percent of the participants had symmetrical bilateral L4-L5 lumbar multifidi and 70% had some asymmetry.

There was no statistically significant correlation between Lumbar Multifidi CSA and UHBE Scores (r = -0.172, p > 0.05). Likewise, there was no statistically significant correlation between Lumbar Multifidi CSA% Difference and UHBE Scores (r = -0.140, p > 0.05). However, a Pearson correlation value of -0.140 suggests a very weak negative correlation between the Lumbar Multifidi CSA% Difference and UHBE Scores (Table 2).

There was no statistically significant correlation between Lumbar Multifidi CSA and Oswestry Disability Index scores, Lumbar Multifidi CSA Difference and Oswestry Disability Index scores, and UHBE scores and Oswestry Disability

Table 2. Correlation between UHBE Score and L4-L5 Multifidi Morphology, L4-L5 Multifidi Morphology and Oswestry Disability Index Score, UHBE Score and Oswestry Disability Index Score, Activity Levels (METs/week) and L4-L5 Multifidi Morphology, Activity Levels (METs/week) and UHBE Scores

		UHBE	Oswestry Disability Index Score	L4-L5 multifidi CSA	CSA % Difference
L4-L5 multifidi CSA	*r*	-0.172	-0.044	1	
	p	0.287	0.785		
CSA % Difference	*r*	-0.140	0.016		1
	p	0.390	0.922		
UHBE Score	*r*	1	-0.146	-0.172	-0.140
	p		0.369	0.287	0.390
METS/week	*r*	0.191	0.425	0.062	0.025
	p	0.237	0.006	0.705	0.880

METs – metabolic equivalent, UHBE – unilateral hip bridge endurance, CSA – cross-sectional area, r – Pearson correlation, p – significance (2-tailed)

Index scores (all, $p > 0.05$). Furthermore, there was no statistically significant correlation between METS score and Lumbar Multifidi CSA, METS score and Lumbar Multifidi CSA Difference, and METS score and UHBE scores (all, $p > 0.05$).

In addition, there was a statistically significant correlation with a moderate positive correlation between the GPAQ-based activity level based on METS per week and Oswestry Disability Index scores ($r = 0.425$, $p < 0.01$). Based on the Pearson correlation value, lumbar multifidi CSA may be negatively correlated with low back pain disability ($r = -0.044$) while lumbar multifidi CSA difference may be positively correlated with low back pain disability ($r = 0.016$). Likewise, UHBE performance may have a weak negative correlation with low back pain disability ($r = -0.146$). Activity levels possibly showed a weak positive correlation to lumbar multifidi CSA and CSA asymmetry ($r = 0.062$ and $r = 0.025$). Lastly, activity levels may be directly related to UHBE performance ($r = 0.191$).

DISCUSSION

Core stability and L4-L5 multifidi asymmetry

The results of this study showed that core stability tests such as the unilateral hip bridge endurance (UHBE) test does not have a statistically significant correlation with characteristics of the lumbar multifidus seen on musculoskeletal ultrasound. However, a trend of improved UHBE performance was noted in participants with less asymmetry of the lumbar multifidus ($r = -0.140$,). The unilateral hip bridge requires significant activation of the lumbar multifidus and erector spinae muscles. Hence, the UHBE test can assess muscle capacity and neuromuscular control aspects of core stability.[24] Poor core stability is a risk factor for low back pain.[24] Optimal core stability is dependent on muscle endurance, strength, and neuromuscular control. Neuromuscular control relies on synchronized muscular responses to internal and external perturbations based on sensory information to control the position and movement of the body.[24] Concurrently, the multifidi functions as a sensory organ to provide proprioception for the spine, given the predominance of muscle spindles in these muscles.[11] The lumbar multifidus muscles are important core stabilizers, and dysfunction in these muscles is strongly associated with low back pain.[10] Symmetry of the lumbar multifidi may be related to improved core stability. The results of the study also exhibited a decreasing trend of low back pain symptoms in individuals with an increased multifidi cross-sectional size ($r = -0.044$) and higher UHBE scores ($r = -0.146$). This may imply that the increased unilateral cross-sectional size of the lumbar multifidus may reflect core stability and predict the incidence of low back pain. Previous studies have suggested that a decrease in the size of the multifidus muscle is related to low back pain and injury.[9,36] The risk of low back pain was also lower in individuals with medium or good performance in static back endurance test, which is a reflection of core stability.[23] Insufficient muscle strength and endurance results to physical fatigue which further leads to decreased concentration during tasks and increased risk of cumulative injuries.[23] Moreover, an increase in side-to-side CSA difference may be correlated with increasing severity of low back pain symptoms ($r = 0.016$). Previous research documented multifidi asymmetry in patients with acute and chronic low back pain.[34,35] Hence, instability of the lumbar multifidi may contribute to low back pain.[9,10] Spinal stabilization therapy was observed to be more effective over time in treating low back pain compared to exercise alone.[37,38] Thus, treatment of low back pain involves reactivation and strengthening of the smaller muscles of the spine to improve long-term stabilization of the vertebral column.[10] Exercises for segmental motor control of the deep trunk muscles involve proper breathing patterns synchronous with attempts to activate the deep muscles of the back. In conjunction with this, verbal and tactile cues are used in facilitating isometric contraction of the multifidi.[39,40] Stabilization training using real-time feedback from ultrasound imaging have been used to voluntary isometrically contract the lumbar multifidi among athletes. Feedback training of the lumbar multifidi have shown to decrease asymmetry among athletes with low back pain.[38] Moreover, an 8-week lumbar multifidus stabilization program may reduce low back pain disability in patients with reduced multifidi thickness.[40]

Core stability and L4-L5 multifidi size

Results also showed a possible trend of increasing UHBE scores in participants with decreased L4-L5 multifidi CSA. This possibly implies that the multifidi size in isolation may not fully reflect core stability. Abdominal, gluteal, hip girdle, paraspinal, and other muscles work in concert to provide spinal stability.[19] Hence, the high UHBE scores may be attributed to development of these other muscles.

Activity levels, core stability and L4-L5 multifidi characteristics

Activity levels may probably positively affect lumbar multifidi characteristics and UHBE performance ($r = 0.062$, $r = 0.025$, and 0.191). However, this study only accounted for the minimum activity levels to be considered active hence the participants had varied levels and types of physical activity in a week (mean 10197.50 ± 10329.42 METs/week, median 5280 METs/week). The type of physical activity also affects lumbar multifidi CSA. One of the benefits of an increased physical activity is general strengthening of the muscles. Specifically, individuals who train in weightlifting had hypertrophy of the lumbar multifidus.[41] A previous study supports the use of free weights in activating the lumbar multifidus.[42] The lumbar multifidus muscles are important core stabilizers, and dysfunction in these muscles is strongly associated with low back pain.[10]

Multiplied linear measurements to estimate L4-L5 multifidi size

One of the limitations of this study is the use of multiplied linear measurements to estimate that the values for multifidi CSA. Multiplying linear measurements of the lumbar multifidi is a simple and rapid way to evaluate muscle size and accurately reflects CSA.[31] Hence, lumbar multifidi CSA values of the participants in this study cannot be directly compared with measurements from active individuals or athletes described in other studies utilizing the standard method for measuring lumbar multifidi CSA.

Activity levels and low back pain symptoms

A sedentary lifestyle or the lack of physical activity increases the incidence of recurring low back pain.[4] However, the results showed a direct correlation between increasing activity levels and low back pain symptoms (r = 0.425, $p < 0.01$). However, 90% of the participants in the study only had mild impairments secondary to low back pain with majority of the participants having a score of 0 from the Oswestry Low Back pain disability index. Concurrently, low back pain symptoms are also apparent in various athletes with high levels of physical activity.[20,36,38,41] Previous assessment of multifidi muscles among gymnasts shows reduced thickness of their lumbar multifidi resulting into faulty postures.[43] A study on football players shows that the decreased size of the multifidus muscle at L5 is a consistent predictor of injury in the preseason and playing season. Asymmetry of the multifidus muscle and low back pain are significantly related to lower limb injuries.[36] In addition, ultrasound assessment of the lumbar multifidus of elite weightlifters showed no difference between resting cross-sectional area of the lumbar multifidus of participants with low back pain and without low back pain.[41]

Strengths and Limitations

This study only included physically active allied healthcare professionals. Allied healthcare professionals are prioritized in this study due to a consistent and comparable shift-work schedule, hence allowing them to have more leisure time for exercise. Resident physicians are not included in this study due to varying prolonged work hours among specialties; hence predisposing them to a decreased physical activity. In relation, a study of resident physicians in a hospital in Riyadh showed that 68.4% of the trainees had low levels of physical activity.[44] This study was also limited to the employees at St. Luke's Medical Center – Quezon City and unable to generalize the results to the whole population of healthcare workers. Another limitation of this study is the small sample size which may restrict generalizability of the findings. This study utilized a small sample which may be underpowered to find a definite correlation. The calculated sample size was not attained due to the restricted study duration and varying work schedules of the target population during the COVID-19 pandemic. In addition, no test for homogeneity was done; hence the distribution of the data was not analyzed. Due to the differences in activity levels of the participants, further studies on levels of physical activity of healthcare workers should be investigated. Moreover, the GPAQ was administered via online forms hence participants had varying responses in terms of their perceived level of activity. Studies on knowledge and perceptions on physical activity of healthcare works may be done in the future.

Despite the limitations, this study provided an initial report of the activity levels of the healthcare professionals at SLMC-QC. This study can be instrumental in conducting future large-scale research on the incidence of low back pain in healthcare workers at SLMC-QC. A caveat, however, in doing musculoskeletal ultrasound in a larger population is that inter- and intra-rater reliability have to be established as it is highly dependent on the skills and expertise of the operators. Nonetheless, the results of this study support previous research on the reliability of musculoskeletal ultrasound in assessing the lumbar multifidi. This study also demonstrated the practicality and ease-of-use of utilizing multiplied linear anteroposterior and lateral measurements to assess lumbar multifidi size.

CONCLUSION

The results of this study showed no definite evidence showing a correlation between core stability tests such as the unilateral hip bridge test scores and sonologic characteristics of the lumbar multifidi. However, a trend of improved core stability may be seen in participants with decreased lumbar multifidi asymmetry. Moreover, a trend of decreasing low back pain symptoms was also noted in individuals with larger lumbar multifidus cross-sectional area and higher unilateral hip bridge endurance test scores.

The correlation between core stability tests and lumbar multifidus morphology should be further investigated. Further studies on core stability and sonologic multifidi morphology should be done with a more homogenous sample with comparable activity levels and a larger sample size.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors had no conflict of interest to disclose.

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