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Research Article

Relationship of Somatotypes with Pain Intensity and Threshold Level of Patients with Non-Specific Low-Back Pain

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Abstract

Objective: This study assessed the relationship of pain intensity and threshold level with the somatotypes of patients with nonspecific Low-Back pain.

Method: Thirty-five (males: n = 13, females: n = 22) consented participants who were purposively recruited participated in this observational study. The participant were allocated into groups following stratification into somatotypes using Health- Cater somatotyping method. The Quadruple Visual Analogue Scale was used to assess each patient's pain intensity. Digital pressure was applied to the symptomatic vertebrae according to standard procedure at once and at first contact. Pain threshold level of each participant was assessed using the pain pressure threshold scale during the application of digital pressure. Data were collected and analyzed.

Result: The stratification into somatotypes showed that 43.6% of participants were endomorphs (n = 17), 30.8% were ectomorphs (n = 12) and 25.6% are mesomorphs (n = 10). The mean age of the participants was 44 ± 12.90 years, the mean weight was 67 ± 12.31 kg and the mean BMI was 26 ± 2.80. Within group comparison of the effect of digital pressure on the somatotypes showed that there was no significant differences of pain pressure threshold level (PPT) across the somatotypes ($F = 1.71$, $P = 0.2$), but there was significant differences in pain intensity across the somatotypes ($F = 3.17$, $P = 0.05$), and post hoc analysis showed ectomorph pain intensity to be higher than other body types. Moreover, there was no significant relationship of the variables to the somatotypes ($p > 0.05$).

Conclusion: This study showed that majority of the participants were endomorph. There is no significant difference in pressure pain threshold of the somatotypes, However, ectomorphic group had higher pain intensity level than other somatotype.

Keywords: *Somatotypes; Pain Intensity; Pain Threshold; Low-Back-Pain*

Introduction

Low Back Pain (LBP) has being identified as one of the four major musculoskeletal conditions that lead to disability [1,2]. LBP is defined as pain between the inferior margin of the 12th rib and inferior gluteal folds that is bad enough to limit usual activities or change the daily routine for more than 1 day, with or without leg pain (sciatica) [3,4].

A global prevalence of low back pain has been reported to be between 30 - 80% [5,6]. A review by Olotu and Okon [2020] found that the lifetime, annual and point prevalence of LBP among African nations was considerably higher than global LBP prevalence estimates by comparison. Although the prevalence of LBP in the Nigerian populace is not known with certainty, a study by Edomwonyi., *et al* [2], showed a prevalence rate of 3.24%, with a peak age incidence of LBP at 61 - 70 years. Another study by Omokhodion., *et al* [7], 2004 and Eyichukwu and Ogugua [8], reported a variant, 31 - 40 years. In a study linking 17 countries across 6 continents, the prevalence of chronic pain condition was higher among females than males, and females had a higher prevalence of depression co-morbid with chronic pain than males [9]. Other studies on the prevalence of low back pain reported that seventy-five to eighty-four percentage of the general population suffer from low back pain, and among them a fraction experienced LBP resulting in severe morbidity, increased health care costs, sick leaves and individual suffering [10]. The prevalence of low back pain has also been reported to be high amongst work related and occupational activities [9] and another study Lis., *et al*. [10] showed a rising incidence of LBP among many young adults and children.

The causes of LBP includes nonspecific or mechanical low back pain which comprises of musculoskeletal strains and sprains, herniated discs, compressed nerve roots, degenerated discs, or joint disease [11] and specific or non-mechanical pain which are those due to tumors, inflammatory conditions, infections, fractures [12]. The risk factors associated with the development of LBP has been linked to psychosocial, physical, psychological and behavioral factors [13,14]. Psychological risk factors such as stress, distress, mood and emotions, and cognitive functioning are associated with increased risk of chronic low back pain [16,14] and also predict long-term work absence in disabling low back pain [14].

The duration of low back pain symptom is classified as acute (6 weeks duration), sub-acute c (less than 6 - 12 weeks) and chronic (12 weeks or longer) [14]. Acute pain tends to resolve on its own within a few days with self-care and there is no residual loss of function while chronic pain can persist with symptoms at one year with or without underlying cause [14]. And Low Back Pain responsible for high socioeconomic cost [8]. About a third of people seek treatment for Low Back Pain for one year after an acute episode [15-17].

Recent guidelines for the treatment of low back pain involve the use of pharmacological and non- pharmacological (physiotherapy, surgery) approaches [15,18]. Physiotherapy management of LBP include exercises and manual therapy [19]. Other physiotherapy treatment options include electrotherapy and traction [20-22]. Different manual therapy techniques have become effective tools in the management of LBP [23-25] these include vertical oscillatory pressure, transverse oscillatory pressure etc. Vertical oscillatory pressure is divided into two phases: digital pressure phase and oscillatory pressure phase [26,52].

Digital pressure (DP) as a diagnostic tool and its depth can determines the level of tolerable of pain [26]. The perception of pain in different body types differ and can be determined by the depth of pressure that the physiotherapist applies on the tissue type [26]. Nwuga [26] attempted to use pressure released sequence as a determinant of the threshold level of pain before proceeding to oscillatory movement for the application of Vertical oscillatory Pressure [26]. However, one of the significant limitations of pressure release sequence is putting patient's feedback to consideration Hence pain pressure threshold application involves the application of force in consonance with the patients feedback to determine the threshold of pain the patients can undergo [27]. Moreover, Mancini., *et al.* [28] explained that pain perception depends on multisensory representations of the body. Studies on psychophysical [29] and clinical [30] variables have confirmed links between pain sensation and body representation. Body representation is also called body types or somatotypes, and the act of categorizing the body types is called somatotyping [28].

Somatotyping is the quantification of the present shape and composition of the human body. It is expressed in a three-number rating representing endomorphy, mesomorphy and ectomorphy components respectively [31]. The quantification of body composition can be done using two basic techniques; the Sheldon technique and the Heath-Carter technique. The Heath-Carter technique is however, the most utilized technique. Meanwhile, studies have revealed that somatotypes may affect a person's disability level [31]. Pain intensity level in non-specific LBP varies [32], and may be associated with lordotic changes seen in varying somatotypes [31,33] which can influence

the disability status in individuals with LBP [34]. Somatotypes have influence on pain perception [31] which has been reported to differ amongst individuals and changes with gender, race, and culture [32]. In addition, it has been suggested that its components can influences pain perception and be a risk factor for increased pain thresholds [31,33].

Pain pressure threshold scale (PPTS) is used to measure deep muscular tissue sensitivity [33]. Pain pressure threshold (PPT) is the minimum application force which induces pain and may be an easy and efficient method to screen and evaluate pain [34] and this can therefore be reported by the use of a pain pressure threshold scale [35]. The diagnostic efficacies of spinal dysfunction with Digital pressure technique have been shown by different studies [23,25,35]. Attempts have been made in difference studies to grade pressure applied on the spine [23,36,37]. A, research has also shown different reactions to pressure applied on body types and threshold tolerant level of the patient [26]. The pain intensity level of patient determine its tolerant and threshold level of pain [38,39].

Musculoskeletal and subcutaneous tissues have been found to react to pressure during digital pressure [40] and this has serve as guide to pressure application to preventing further tissue injuries. Attempts have been made to standardize pressure applied on the musculoskeletal tissues of the spine either to diagnose or to proceed to intervention [23,36,37]. For the purpose of standard application of digital pressure, different body types have been considered as a factor in variability in pain perception among patients [40]. There are scarcity of researches that investigated various effects of somatotypes on level of pain felt and its perception level. Therefore, this study assessed the influence of somatotype on pain intensity and threshold level of patients with nonspecific Low Back Pain.

Methods

Thirty-five consented participants were purposively selected for this cross sectional study after the ethical approval and permission to conduct research were secured from University of Medical Sciences Ethics and Research Committee. The recruited patients with Low Back Pain that met the inclusion criteria were stratified into somatotypes using Heath and cater [35]. manual. Quadruple Visual Analogue Scale was administered to each participant to confirm the presence of Low Back Pain. Digital Pressure technique was applied to the symptomatic vertebrae of participant to diagnose the presence of pain and before proceeding to oscillatory phase of Vertical Oscillatory Pressure. Pain threshold level of each participant was assessed during the application of digital pressure using Pressure Pain Threshold scale (PPTs) with a standing mirror placed at the one end of treatment plinth where head was located to get feedback of facial expression or body movement which will be graded according to PPTs of each participant. Data was taken for each participant, recorded and analyzed. Significant was set at $P > 0.05$.

Results

Physical characteristics of the participant

A total number of 35 patients were recruited for the study, (13 males and 22 females). The mean age of the participants was 44 ± 12.90, the mean height was 1.61 ± 0.12, the mean weight was 67 ± 12.31 and the mean BMI was 26 ± 2.80 (Table 1).

Variables	$\bar{x}$ ± S.D
Age	44.0 ± 12.90
Height	1.6 ± 0.12
Weight	67.0 ± 12.37
BMI	26.0 ± 2.80

Table 1: *Physical Characteristics of the participants.*

Stractification in to somatotype

The stratification of somatotypes showed that 43.6% of participants were endomorphs (n = 17), 30.8% were ectomorphs (n = 12) and 25.6% are mesomorphs (n = 10) (Table 2).

Somatotypes	Frequency	$\bar{X}$ ± S.D	%
Endomorph	17	2.0 ± 0.87	43.6%
Ectomorph	12	2.5 ± 0.62	30.8%
Mesomorph	10	2.4 ± 0.67	25.6%

Table 2: *Stratification into somatotypes.*

Key: F = Female

M = Male

BMI = Body Mass Index

$\bar{x}$ *= Mean*

S.D = Standard deviation

% = Percentage.

Across somatotype comparison of variables

The one-way ANOVA of comparison across the somatotypes showed that there was no significant difference in pain threshold level (P = 0.20, F = 1.71). However, there was significant difference in pain intensity across the somatotypes (P = 0.05, F = 3.17) (Table 3).

Variables		Somatotypes			
	Endomorph $\bar{X}$ ± S.D	Ectomorph $\bar{X}$ ± S.D	Mesomorph $\bar{X}$ ± S.D	F-Ratio	P-Value
PPTS	-0.50 ± 0.29	0.50 ± 0.29	0.40 ± 0.31	1.71	0.20
QVAS	-1.77 ± 3.67^{b}	1.77 ± 3.67^{a}	-8.07 ± 3.87^{c}	3.17	0.05*
ODI	1.54 ± 5.21	-1.54 ± 5.21	-3.01 ± 5.51	0.15	0.86

Table 3: *Comparison of clinical variables (pain perception, pain intensity, and disability level, across the somatotypes using one-way ANOVA.*

**Mean difference is significant at 0.05 level.*

Key: PPTS = Pain Pressure Threshold Scale

QVAS = Quadruple Visual Analog Scale

ODI = Oswestry Disability Index

Superscript abc: post hoc analysis.

Correlation of somatotypes with variables

The result showed that there is no significant relationship of pain intensity, pain pressure threshold level with the somatotypes (Table 4).

Variables	Somatotypes	
	Rho (R)	P-Value
PPTS	0.24	0.15
QVAS	-0.29	0.08
ODI	-0.09	0.58
FF	-0.00	0.96

Table 4: *Comparison of the Pain Pressure Threshold Scale, Oswestry Disability Index, Quadruple Visual Analog Scale and Spinal Range of Motion across the somatotypes using the Pearson's correlation.*

Key: PPTS = Pain Pressure Threshold Scale

QVAS = Quadruple Visual Analog Scale

ODI = Oswestry Disability Index

FF = Forward Flexion

SBR = Side Bending Right.

Discussion

This study focused on assessing the relationship of somatotypes with pain perception, pain intensity of patients with non- specific low back pain.

Physical characteristics of age, weight, height, and body mass indices and other anthropometric variables of the participants were used in stratifying the patients into the three somatotypic variables (endomorphy, ectomorphy, and mesomorphy). The result showed that 43.6% of participants were endomorphs, 30.8% were ectomorphs, and 25.6% are mesomorphs, which indicates that more ectomorphs were recruited for this study. The outcome of this study may be attributed to reduced fat deposit that is ectomorphic group had which made the musculoskeletal structure very close to the subcutaneous layer of the skin. Data collected from this study also showed that more women are predisposed to LBP than men, his is supported by a study by Omokhodion [7], however, contrary to study by Edomwonyi and Ogbue [2] which reported that prevalence of low back pain was high among female compared to male this changes were attributed to level physical activities and homonal changes in women [7].

Majority of the participants recruited for this study were endomorph and this may be due reduction in general physical activity of the community where this study was conducted. Studies have found that endomorph having accumulated subcutaneous fat are susceptible to occurrence of musculoskeletal disorder such as low back pain [40].

When comparing the effect of pain perception across the somatotypes, it was observed to have an effect on application of digital pressure on ectomorphs, endomorphs and mesomorphs. This implies that there is a relationship between the body type of an individual and their perception of pain using the pain pressure threshold scale [41]. Studies by Nwuga, [24], Castien., *et al.* [42] and Harm., *et al.* [43] supported that different force pressures are perceived across the body types. Nwuga, [24] noted that in the perception of pain, more force application is needed by the endomorphs. Also when comparing the effect of pain intensity across the somatotypes, there was a significant difference in somatotypes upon application of digital pressure which is a phase of vertical oscillatory pressure (VOP) signifying that body physique variables have an effect on pain intensity. This is recognised by a study by Sharma., *et al.* [44] which reported that manual therapy technique (VOP) had a significant effect on pain intensity although there was no link to somatotypic variables. It was also observed from this study that pain intensity and pain perception were greatest among ectomorphs. This implies that pain intensity fol-

lows the perception of pain and that low back patients who are of ectomorphic body type will experience more pain and have a greater perception of pain than those patients possessing other body types. This could be due to less accumulation of subcutaneous tissue, which provides more access to their spinal segment [45,46].

Findings from this study lead to the conclusion that there is a positive link between pain intensity and disability levels, especially among low back pain patients with endomorphic somatotypes, with their increasing disability levels being associated with higher anthropometric measures. This is supported by a study by Arnstein., *et al.* [47] where increasing pain intensity had direct effect on increasing disability level amongst the participants. Effective digital pressure is a precursor to efficacy of vertical oscillatory pressure, as explained by [48,50,51] and it has significant effect on pain intensity [49,51] but has no significant effect on disability [52].

This study showed that participant's pain threshold is not related to the physique and body, this is in agreement with Arnstein., *et al.* [40]. While in contrary, a study by Sharma., *et al.* [46] explained influence of body physique on pain intensity of the patient.

Conclusion

This study showed that majority of the participants were endomorph. Pain Pressure Threshold level was not related to somatotypes, However, ectomorphic group had higher pain level than other somatotypes when subjected to external stimuli.

Bibliography

1. Woolf A and Pfleger B. "Burden of major musculoskeletal conditions". *Bulletin of the World Health Organization* 81.9 (2003): 646-656.
2. Edomwonyi EO and Ogbue IA. "Epidemiology of low back pain in a suburban Nigerian tertiary centre". *Nigerian Journal of Surgical Sciences* 27 (2017): 20-25.
3. Manek NJ and MacGregor AJ. "Epidemiology of back disorders: prevalence, risk factors, and prognosis". *Current Opinion in Rheumatology* 17 (2005): 134-140.
4. Hoy D., *et al*. "The epidemiology of low back pain". *Best Practice and Research: Clinical Rheumatology* 24.6 (2010): 769-781.
5. Olotu JE and Okon M. "Prevalence of Low Back Pain in a Southern Nigerian". *Population* (2020): 2456-2165.
6. Froud R., *et al*. "A systematic review and meta-synthesis of the impact of low back pain on people's lives". *BMC Musculoskeletal Disorders* 15 (2014): 50.
7. Omokhodion FO. "Low back pain among rural and urban populations in Southwest Nigeria". *African Newsletter on Occupational Health and Safety* 12 (2002): 57-59.
8. Eyichukwu O and Ogugua PC. "Epidemiology of low back pain in Enugu, Nigeria". *New Jersey Institute of Technology* 11 (2012): 1.
9. Louw QA., *et al*. "The Prevalence of low back pain in Africa: a systematic review". *BMC Musculoskeletal Disorders* 8 (2007): 105.
10. Dagenais S., *et al*. "A systematic review of low back pain cost of illness studies in the United States and internationally". *Spine Journal* 8.1 (2008): 8-20.
11. Lis AM., *et al*. "Association between sitting and occupational LBP". *European Spine Journal* 16.2 (2007): 283-298.
12. Ramdas J and Jella V. "Prevalence and risk factors of low back pain". *International Journal of Advances in Medicine* 5.5 (2018).

13. Turk DC and Okifuji A. "Psychological factors in chronic pain: evolution and revolution". *Journal of Consulting and Clinical Psychology* 70.3 (2002): 678-690.

14. Balthazard P., *et al*. "Manual Therapy Followed By Specific Active Exercises Versus A Placebo Followed By Specific Active Exercises On The Improvement Of Functional Disability In Patients With Chronic Non Specific Low Back Pain: A Randomized Controlled Trial". *BMC Musculoskeletal Disorder* 13 (2012): 162.

15. Reiso H., *et al*. "Back to work: predictors of return to work among patients with back disorders certified as sick: a two-year follow-up study". *Spine* 28 (2003): 1468-1473.

16. Low Back Pain. National Institute of Neurological Disorders and Stroke National Institutes of Health Department of Health and Human Services Bethesda, Maryland (2020).

17. Aure OF., *et al*. "Manual Therapy and Exercise Therapy in Patients With Chronic Low Back Pain: A Randomized, Controlled Trial With 1-Year Follow-Up". *Spine* 28.6 (2003): 525-532.

18. Ferreira ML., *et al*. "Comparison of General Exercise, Motor Control Exercise and Spinal Manipulative Therapy for Chronic Low Back Pain: A Randomized Trial". *Pain* 131 (2007): 31-37.

19. Chou R and Huffman LH. "Non-pharmacologic therapies for acute and chronic low back pain: A review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline". *Annals of Internal Medicine* 147 (2007): 492-504.

20. Qaseem A., *et al*. "Noninvasive treatments for acute, subacute, and chronic low back pain: a clinical practice guideline from the American College of Physicians". *Annals of Internal Medicine* 166 (2017): 514-530.

21. Stochkendahl MJ., *et al*. "National Clinical Guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy". *European Spine Journal* 27 (2018): 60-75.

22. Ford J., *et al*. "The Evolving Case Supporting Individualised Physiotherapy for Low Back Pain". *Journal of Clinical Medicine* 8.9 (2019): 1334.

23. Almeida M., *et al*. "Primary care management of non-specific low back pain: key messages from recent clinical guidelines". *Medical Journal of Australia* 208.6 (2018): 272-275.

24. Nwuga VCB. "Case Histories in Manual Treatment of Back Pain". 2nd Edition, Wasiam Publishers (2007): 199-211.

25. Delitto A., *et al*. "Low Back Pain: Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association". *Journal of Orthopaedic and Sports Physical Therapy* 42.4 (2012).

26. Ojoawo AO., *et al*. "Effect of vertical oscillatory pressure on disability of patients with chronic mechanical low back pain using Roland Morris Disability questionnaire". *Tanzania Journal of Health Research* 15.1 (2013).

27. Nwuga VCB. "Case Histories in Manual Treatment of Back Pain". 2nd Edition, Wasiam Publishers (2007): 199-211.

28. Coulter ID., *et al*. "Manipulation and mobilization for treating chronic low back pain: a systematic review and meta-analysis". *Spine Journal* 18.5 (2018): 866-879.

29. Gomes B., *et al*. "Palpation and pressure pain threshold: reliability and validity in patients with temporomandibular disorders". *Cranio* 26.3 (2014): 202-210.

30. Mancini F., *et al*. "Visual Distortion of Body Size Modulates Pain Perception". *Psychological Science* 22.3 (2011): 325-330.

31. Kammers MP., *et al*. "Cooling the thermal grill illusion through self-touch". *Current Biology* 20 (2010): 1819-1822.

32. Ramachandran VS., *et al*. "Size reduction using Mirror Visual Feedback (MVF) reduces phantom pain". *Neurocase: The Neural Basis of Cognition* 15 (2009): 357-360.

33. Carter JEL and Heath BI. "Somatotyping. Development and Applications". Cambridge, UK: Cambridge University Press (1990).

34. Táboas-Pais MI and Rey-Cao A. "Disability in Physical Education Textbooks: An Analysis of Image Content". *Adapted Physical Activity Quarterly* 29 (2012): 310-328.

35. Carter JEL. "The heath-carter anthropometric somatotype-instruction manual". San Diego, USA (2002).

36. Nasution IK., *et al*. "The correlation of pain intensity and quality of life in chronic LBP patients in Adam Malik general hospital". *Earth and Environmental Science* 125.1 (2018).

37. Shariati M and Zilaei Bouri S. Relationship between Flexibility and Somatotype with Lumbar Lordosis in Young Girls (2019).

38. Evcik D and Yücel A. "Lumbar lordosis in acute and chronic low back pain patients". *Rheumatology International* 23.4 (2003): 163-165.

39. Torensma B., *et al*. "Pain Experience and Perception in the Obese Subject Systematic Review (Revised Version)". *Obesity Surgery* 26.3 (2016): 631-639.

40. Cheatham SW., *et al*. "Concurrent validation of a pressure pain threshold scale for individuals with myofascial pain syndrome and fibromyalgia". *Journal of Manual and Manipulative Therapy* 26.1 (2017): 25-35.

41. Kinser AM., *et al*. "Reliability and validity of a pressure algometer". *Journal of Strength and Conditioning Research* 23.1 (2009): 312-314.

42. Castien RF., *et al*. "Pressure pain thresholds over the cranio-cervical region in headache: a systematic review and meta-analysis". *The Journal of Headache and Pain* 19 (2018): 9.

43. Harms MC., *et al*. "Forces Measured During Spinal Manipulative Procedures in two age group". *Rheumatology* 38 (1999): 267-274.

44. Sharma A., *et al*. "Efficacy of Manual Therapy versus Conventional Physical Therapy in Chronic Low Back Pain Due to Lumbar Spondylosis. A Pilot Study". *Medical Sciences* 3.3 (2015): 55-63.

45. Drywien M., *et al*. "Influence of the somatotype on intake of energy and nutrients in women". *Anthropological Notebooks* 22.3 (2016): 147-157.

46. Krzykała M., *et al*. "Morphological asymmetry, sex and dominant somatotype among Polish youth". *PloS one* 15.9 (2020): e0238706.

47. Arnstein P., *et al*. "Self efficacy as a mediator of the relationship between pain intensity, disability and depression in chronic pain patients". *Pain* 80 (1999): 483-491.

48. Croft PR., *et al*. "Course and prognosis of back pain in primary care; the epidemiological perspective". *Pain* 122 (2006): 1-3.

49. Naguszewski WK., *et al*. "Dermatomal somatosensory evoked potential demonstration of nerve root decompression after VAX-D therapy". *Neurological Research* 23.7 (2001): 706-714.

50. Çinarli FS and Kafkas ME. "The effect of somatotype characters on selected physical performance parameters". *Physical Education of Students* 23.6 (2019): 279-287.

51. Egwu MO., *et al*. "Cortical Electrophysiological change during Vertical Oscillatory Pressure Therapy in patients with Low Back Pain". *International Journal of Medicine and Medical Sciences* 2.1 (2012): 1-7.

52. Afolabi TO., *et al*. "Comparative Effectiveness of Lumbar Stabilisation Exercises and Vertical Oscillatory Pressure in the Management of Patients with Chronic Low Back Pain". *International Journal of Physical Medicine and Rehabilitation* 06.06 (2018).

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