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Fear of movement (Kinesiophobia), body mass index and pain intensity in university male students with chronic non-specific lower back pain: comparison of three levels of kinesiophobia

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Abstract:

The current study aimed to investigate the weight status and the level of kinesiophobia of university male students with non-specific lower back pain.

106 male students were enrolled voluntarily in the study. Kinesiophobia had assessed using the Tampa Scale (TSK), pain with 0-to-10 Pain Numerical Rating Scale (NRS). Subgroups was classified according to BMI and to kinesiophobia level. Beyond descriptive statistics, Pearson's rank correlation test (rho) was adopted for identifying the correlation between parameters. Percentage of overweight and obese students was above 61%, and near to half of the university students had high TSK score. All studied variables (weight, BMI, TSK, pain) showed significant ($p<005$) increment due to BMI classification and to kinesiophobia classification alike. No association was found between TSK score with BMI in the three subgroups, but the association was slightly significant with pain in low ($r=0.408$) and in high ($r= 0.462$) subgroups of kinesiophobia only.

Key Words: Kinesiophobia, Male Students, BMI, Pain Intensity, LBP.

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الرهاب الحركي، مؤشر كتلة الجسم وشدة الألم لدى طلاب الجامعة الذكور الذين يعانون من آلام أسفل الظهر غير النوعية: مقارنة ثلاثة مستويات من الرهاب الحركي

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الملخص:

هدف البحث الحالي إلى دراسة حالة الوزن ومستوى رهاب الحركة لدى طلاب الجامعة الذين يعانون من آلام أسفل الظهر غير النوعية. شارك في الدراسة 106 طالب بشكل تطوعي، وتم تقدير الرهاب الحركي باستخدام مقياس تامبا (TSK)، وشدة الألم باستخدام المقياس الرقمي لشدة الألم من 0 إلى 10 (NRS). تم تصنيف المجموعات الفرعية وفقاً لمؤشر كتلة الجسم ولمستوى الرهاب الحركي. إلى جانب الإحصاء الوصفي، تم اعتماد اختبار ارتباط رتبة بيرس (rho) لتحديد الارتباط بين المتغيرات المدروسة. كانت نسبة الطلاب الذين يعانون من زيادة الوزن والسمنة أعلى من 61٪، وحصل ما يقرب من نصف طلاب الجامعة على درجة عالية على مقياس الرهاب الحركي. أظهرت جميع المتغيرات المدروسة (الوزن، مؤشر كتلة الجسم، الرهاب الحركي، الألم) زيادة معنوية ($p < 005$) تعزى إلى تصنيف مؤشر كتلة الجسم وتصنيف رهاب الحركة على حد سواء. لم يتم العثور على ارتباط بين مستوى الرهاب الحركي ومؤشر كتلة الجسم في المجموعات الفرعية الثلاث، ولكن كان الارتباط ذات دلالة بشكل طفيف مع الألم في المجموعات الفرعية المنخفضة ($r = 0.408$) وفي المجموعات الفرعية العالية ($r = 0.462$) من رهاب الحركة فقط .

الكلمات المفتاحية: رهاب الحركة، الطلاب الذكور، مؤشر كتلة الجسم، شدة الألم، ألم أسفل الظهر.

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Introduction:

The term kinesiophobia used for ascertaining an excessive, unreasonable and devastating fear of movements, exercises and physical activity, which magnitudes presence in feeling of susceptibility to pain or fear of injury recurrence (Luque-suarez et al. 2018). The predisposition to pain or inability lead undoubtedly to fear of movement, which in turn enhances avoiding behavior toward exercises, physical activity, or any physical movements, thus resulting in negligence and may lead to functional disability with time (Varallo et al. 2021). In addition, the disposition to physical exercising, which is consequently main factor of physical inactivity is strongly associated with obesity, overweight and other health complications (Vincent et al. 2013). Consequently, the interrelationship between kinesiophobia, physical inactivity and body composition is apparently correlative with the theoretical model "cause-effect-result", where kinesiophobia cause inactivity and inactivity results unfavorable (unhealthy) body composition content, and vise versa. Additionally, many investigations have identified that high levels of pain in the form of musculoskeletal pain, chronic low back pain, definitely lead to restrictions in functional activity (Goossens et al. 2007). Furthermore, individuals with high levels of pain and disability may develop avoidance behaviors (Vlaeyen and Linton 2000, Goossens et al. 2007).

On the other hand, obesity and excess body weight, which cause undesirable body composition is a foremost concern for individuals with lower back pain (LBP). This because it could have numerous deleterious consequences, including an increased risk of musculoskeletal pain, osteoarthritis, cardiovascular disease, falls and other injuries, impaired functional capacity and a diminished quality of life (Egger and Dixon 2011, Janke et al. 2007). These consequences could in turn cause reduced activity levels and a cascade of events such as increased modern technology usage. Moreover, it causes higher level of sedentary lifestyle, greater healthcare utilization and costs, reduced ability to live independently, and increased burden on formal and informal caregivers (Vincent et al. 2013, Ma et al. 2014). Countless researches findings are providing supports for the transformation of the inclusive hypothesis to a systematic fact that LBP leads to physical inactivity and fear of movements, which are main reasons of excess weight gain, obesity and undesirable body composition (Burgess and Hassmenad 2017, Li et al. 2018). To enhancing health-giving understanding of how LBP may affect body composition, longitudinal and observational studies are required to describe typical body composition trajectories, these are needed for better circumscribing of the scope of the problem and ultimately to develop interventions to prevent unhealthy body composition and improve wellbeing outcomes.

Objectives:

The aim of the current study was to (1) explore the weight status of university students with non-specific LBP (NS-LBP), and (2) to determine the level of kinesiophobia (fear of movement), and (3) to evaluate the possible relationship between the level of fear of movement and pain and body mass index (BMI) of them. Researcher hypothesize the null hypothesis, that there is no relationship between kinesiophobia and pain and BMI. Therefore the study attempt to answer the next question: Is kinesiophobia interrelate with pain and BMI?

Participants:

A total of 123 university male students had been surveyed but 109 students were met the criteria of the study, aged between 19 and 28 years. According to their medical records, all of them were severe from different levels of NS-LBP (there is no anatomical and/or physio-pathological reason). After brief enlightenment of the purposes of the study, all participants were volunteered, however three of them have refused to participate in the investigation, yet the final sample consisted of 106 males. Of those 28 (26.42%) from college of Education, 24 (22.64%) college of Law, 16 (15.09%) from college of Economy, 26 (24.53%) from college of Literature and 12 (11.32%) from college of Science. All of them were from Damascus University

branch of Daraa (south Syria). According to the principles of the Declaration of Helsinki, written consents were collected.

Methods:

For the purpose of the study, the sample of current investigation were classified into three subgroups based on distribution of TSK in the study population. Even though, many classifications of kinesiophobia subgroups had published in the related literature, in the present investigation Neblett et al. (2016) taxonomy have adopted. The first TSK subgroup had low kinesiophobia score (ranged between 17–32) and consisted of 38 students (35.85%), the second subgroup recorded medium kinesiophobia score (ranged between 33–40) and involved 18 students (16.98%) and the third subgroup had high kinesiophobia score (ranged between 41–68) and restricted to 50 students (47.17%).

Measures:

Body weight (BW) have measured using calibrated electronic scale with barefoot and in orthostatic position, and the results were recorded to the nearest 100 g. Body height (BH) was measured by standardized stadiometer to the nearest 0.1 m. The stadiometer was placed to the wall with no skirting board and the student remained in orthostatic position, inspiration apnea, barefoot and the ankle's posterior surface, pelvic waistline, scapular waistline and occipital region in contact with the wall to which the device was fixed. The head was positioned with the eyes' external angle parallel to the ground – Frankfurt Plane. Body Mass Index (BMI) was estimated as body weight in kilograms divided by squared body height in meters for indicating the status of body composition and was obtained using the cut-off points according to world health organization (1998).

Tampa Scale of Kinesiophobia (TSK):

The Tampa Scale of Kinesiophobia (TSK) questionnaire was originally developed for use in clinical setting to quantitatively discriminate kinesiophobia from less extensive fear of activity among patients with longstanding musculoskeletal pain. The original English version (Kori et al. 1990) of TSK had translated into Arabic language and then translated back into English by certified translators. The English versions were then compared, and both the translators and the researcher resolved differences by the compromised procedure. TSK-AV is a 17-item questionnaire, in which each item has a 4-point Likert scale with the following choices: strongly disagree, disagree, agree, strongly agree. Total possible scores range from 17–68, and the total score is calculated after inverting the individual scores of items 4, 8, 12 and 16, however, the higher score of TSK correspond to a high level of fear of movement. The original English questionnaire has demonstrated good internal consistency, test-retest stability, and validity (Woby et al. 2005, Kori et al. 1990, Clark et al. 1996). TSK-AV in the current study have also shown acceptable reliability and validity, and the internal consistency was high, where the Alpha Cronbach value was 0.86.

The 0-to-10 Pain Numerical Rating Scale (NRS):

The 0-to-10 NRS is tool for assessing pain intensity (PI), however many researchers have summarized the evidence supporting the reliability and validity of it (Jensen 2010). In this scale, researchers asked students to select the number that best represents their pain. 1- current pain intensity, 2- the least intensity of pain in the past 24 hours, seven days, 3- the worst pain intensity in the past 24 hours, seven days, 4- the average intensity of your pain in the past 24 hours, past seven days, on a 0-to-10 scale, where 0 = No pain and 10 = Pain as intense as it imaginable. The final score was computed by extracting the average of the four answers provided by the students. The interpretation of the scores in the current research was depended on most often-used pain ratings procedures. Thus, between 1 and 4 indicate mild pain, scores of 5 or 6 indicate moderate pain, and ratings of 7 to 10 indicate severe pain. In consistence with previous studies (Jensen 2010, Hoftun et al. 2012) where, NRS had good internal consistency, test-retest stability, and validity in the present

study also have demonstrated acceptable reliability and validity, and the internal consistency was high, where the Alpha Cronbach value was 0.88.

Statistical analysis:

The Statsoft Statistica version 10 software was used to conduct descriptive statistics, correlation, and variance analyses. The percentages (as required) and the mean and standard deviation of all the variables were calculated and the significance level was set as $p < 0.05$ for each of the statistical analyses. The group comparisons that do not meet the normal distribution, Pearson's rank correlation test (rho) was adopted for establishing the correlation between parameters. The Spearman's rank correlation coefficients were accepted as follows: 0.81-1.0 as excellent, 0.61-0.80 very good, 0.41-0.60 good, 0.21-0.40 fair, and 0-0.20 poor. Analysis of variance (ANOVA) was performed for testing the differences between the three subgroups.

Results:

Table 1 contains a total of 106 university male students participated in the recent research with their classification due to BMI. Percentage of overweight and obese students with LBP have exceeded 61%. Precisely, 36.79% overweight (BMI≥25 and <30) and 24.53% obese (BMI≥30) as opposed to 38.68% normal weight (BMI <25) students. Apart from body height, all studied variables (BW, BMI, TSK, PI) showed significantly (p<005) increasing propensity due to BMI classification, where greater values were distinguished in obese students.

Table 1: Distribution of the sample, descriptive and comparative statistics of studied variables according to BMI classification.

	Together	**Normal weight**	**Over-weight**	**Obese**	**Analysis of variance**	
	(N=106, 100%)	(N=41, 38.68%)	(N=39, 36.79%)	(N=26, 24.53%)	F - ratio	p
BW (M±SD)	73.93 ±11.73	63.41 ±6.79	76.25 ±7.54	87.03 ±7.04	90.450	0.001*
BH (M±SD)	165.38 ±6.92	165.59 ±7.58	164.69 ±6.38	166.09 ±6.79	0.346	0.708
BMI (M±SD)	26.98 ±3.65	23.08 ±1.17	28.04 ±1.37	31.53 ±1.59	329.448	0.001*
TSK (M±SD)	41.76 ±16.27	26.15 ±7.57	48.59 ±11.99	56.15 ±10.69	83.493	0.001*
PI (M±SD)	4.16 ±1.28	2.84 ±0.54	4.65 ±0.83	5.52 ±0.45	154.71	0.000*

Same tendency observed when the classification was based on TSK. Table 2 demonstrate the three subgroups, Low TSK ((17-33), Medium TSK (34–40) and High TSK (41-68) groups. Statistical analysis revealed that near to half of the university students with LBP had high TSK score. By numbers, 47.17% had high scores, 16.98% had medium scores, and 35.85% of students had low TSK scores. Similarly, to BMI classification, in the TSK classification, the values of the investigated variables –excluding BH- displayed significant (p<0.05) increasing trend as the classification of the score of TSK increase.

Table 2. Descriptive and comparative statistics of studied variables according to TSK classification.

	Low TSK (N=38, 35.85%)	Medium TSK (N=18, 16.98%)	High TSK (N=50, 47.17%)	Analysis of variance	
				F - Ratio	p
BW (M±SD)	62.88 ±6.72	75.81 ±11.43	81.64 ±7.67	58.328	0.001*
BH (M±SD)	164.49 ±7.21	165.33 ±8.02	166.08 ±6.32	0.562	0.572
BMI (M±SD)	23.21 ±1.47	27.65 ±2.95	29.60 ±2.37	91.538	0.001*
TSK (M±SD)	24.29 ±4.22	37.22 ±2.05	56.68 ±9.02	252.475	0.001*
PI (M±SD)	2.80 ±0.57	4.18 ±0.78	5.20 ±0.71	136.09	0.000*

Low TSK (17-33) group, Medium TSK (34–40) group, High TSK (41-68) group.

Regarding the possible relationship between TSK with pain, and with BMI, our statistical analysis disclosed that there were no significant ($p>0.05$) associations found in the three TSK subgroups (table 3). The only exception was the relationship between TSK and pain intensity in low TSK subgroup and in high TSK subgroup, where the correlation was slightly positively significant (rho=0.408; p=0.011 for low TSK) and (rho=0.283; p=0.462 for high TSK).

Table 3. Spearman's coefficient rank correlation (rho) matrix of TSK scores with pain intensity and with body mass index due to TSK classification

	rho	CI (95%) for rho	t(N-2)	p
Low TSK (17-33) group (N= 38)				
TSK & PI	0.408	0.101 to 0.644	2.6795	0.011*
TSK & BMI	0.078	-0.248 to 0.388	0.4707	0.640
Medium TSK (34–40) group (N= 18)				
TSK & PI	-0.047	0.503 to 0.429	-0.1885	0.853
TSK & BMI	0.052	-0.425 to 0.507	0.2111	0.835
High TSK (41-68) group (N= 50)				
TSK & PI	0.283	0.00542 to 0.521	2.0470	0.046*
TSK & BMI	0.234	-0.0475 to 0.481	1.6669	0.102

Discussion:

This is the first study investigate the kinesiophobia and its association to BMI and PI in Damascus university students with NS-LBP. The main objectives of this investigation were to describe the weight status of university male students with chronic low back pain, and to determine if there were associations of kinesiophobia with the other measured variables (BMI, pain intensity).

The results of current investigation make evident that the weight status of university male students with NS-LBP is considerably worrying provocateur topic, despite the fact that overweight and/or obesity is worldwide health problem. Astonishingly, the percentage of overweight and/or obese (BMI≥ 25) students with NS-LBP was 61.32% and from those 24.53% were obese (BMI≥30). In investigation on university student's general population carried out by Mahmoud (2019), pronounced the percentage of overweight and obesity in Damascus University students as alarmingly high in both sexes, where percentage was 30.36% for males and 36.26% for females and for both sexes 33.37%. The far-outsized differences between general student's population and specific students sample with NS-LBP from the same population may be elucidated by the inactive life style caused by pain which consequently cause fear of moving (Varallo et al. 2021, Vlaeyen and Linton 2000, Li et al. 2018) and reduced functional ability (Hoftun et al. 2012, Forhan and Gill 2014).

At any case, the theoretical model "cause-effect-result" mentioned in the introduction may clarify the high percentage of overweight students, where overweight and/or obesity cause LBP, and -in turn- pain may reduce physical activity level, which lead to overweight.

On the other hand, the recent research did not study the factors lead to overweight and obesity, however, the unacceptably and unhealthy high percentage cannot be taken to mean by "cause-effect-result" model merely. Other necessary and effective factors must be taking into consideration such as nutrition habits, percentages of overweight and obesity in the general population, and the social traditions and predisposition toward physical exercise and weight reduction procedures (Burgess and Hassmenad 2017, Mahmoud 2019).

Irrespective of purposely-selected population, our findings related to rate of obesity are disturbingly high, even though, they are in consistence or close to percentages published by other researches regarding samples without LBP. For instance, the percentage of obesity have exceeded the 47% in Syrian students in private university in study conducted by Labban (2014), and 53%- 59% in Jordan university students (Alarjan 2011, Ajlouni et al. 1998). These comparative results may support the pervasive axiom, that overweight and obesity are distinctive feature of Arab individuals disrespecting of their socio-economical- or health status.

Regarding body weight, BMI, kinesiophobia level and pain intensity, the ANAVOA comparative analysis revealed that the four variables (weight, BMI, TSK and pain) demonstrate significantly increasing tendency between the three groups classified according to BMI. Those, the four variables became more prevalent as BMI status rose ($p=0.001$ for pain and 0.000 for TSK, weight and BMI). These results are in equivalent with previous related studies. In a cohort study of 6,796 adults completed by Smuck et al. (2014), researchers evidenced that the prevalence of LBP increases as BMI rises, less than 3% of people in the normal BMI range reported LBP in the past 3 months, whereas 7.7% of obese and 11.6% of morbidly obese individuals reported LBP.

In another large-scale survey (Vincent et al. 2010) with over one million people in the USA, confirmed a linear increment of chronic pain cases as BMI increases. Relative to normal weight people, overweight people reported 20% greater rates of recurring pain, and the rates go up to 68% for people with class I obesity, 136% for people with class II obesity, and 254% for people with morbid obesity. Additionally, many researchers (Varallo et al. 2021, Goossens et al. 2007, Neblett et al. 2016,) had also shown an association between Kinesiophobia and BMI, their findings point out that overweight and obese individuals had higher Kinesiophobia scores when compared to normal weight or non-obese individuals.

Same results detected when the subgroups were classified according to the level of kinesiophobia (table 2). In the present sample, 47.17% had high TSK scores. Related literature has published similar findings regarding high kinesiophobia levels. The furthermost investigations on kinesiophobia and accompanying factors, that were implemented on individuals with chronic LBP and other chronic musculoskeletal diseases including spinal related musculoskeletal diseases and pain, publicized a prevalence as high as 50% (Neblett et al. 2016, Branstrom and Fahlstrom 2008, Roelofs et al. 2011).

According to the results of ANAOVA analysis, the studied variables (weight, BMI, pain intensity) increase as TSK scores became higher. Body weight increased from 62.88 kg in low kinesiophobia subgroup to 75.82 kg in medium TSK subgroup to 81.64 kg in high TSK one (p=0.001). Consequently, BMI demonstrated significant increment, from 23.21 to 27.65 to 29.60 kg/m^2 respectively (p=0.001). Similarly, pain intensity has rose from 2.80 to 4.18 to 5.20 in low, medium and high TSK subgroups congruently (p=0.000).

The resemblance in results extracted from BMI and TSK classifications may support the growing body of evidences, which present the interactive mechanism between body weight, BMI and pain with kinesiophobia level, where, one variable influence and inter-influenced by other variables. Since overweight and obesity aggravates chronic pain or presents a greater risk of having pain, which in turn rise the level of kinesiophobia, one may speculate that weight loss should reduce pain and lowering TSK level. In addition, extensively accumulated evidences give the impression to point in that direction (Stone and Broderick 2012).

Most advanced researches related to kinesiophobia and associated aspects have classified the level of fear of movement into two categories, low and high (Oskay et al. 2017). Those where TSK scores divided into three categories, low, medium and high subgroups are so rare and not well documented. The main indication of the two subgroups division may trace back to the well-known neurological fact and law, "all or none response", which mean that fear of movement has two facet, or exist or has no existence. Supporters of this categorization contended with TSK scale as physiological one, whereas it has mainly psychological aspects. However, in the present study, the rational explanation of the three subgroups classifications of TSK was the preferred answers selected by the students themselves, where, 16.98% of 106 male students classified themselves into the medium TSK scores.

In the low TSK High TSK subgroups, the Spearman's rank correlation (rho) coefficients indicate that there were no association between TSK and BMI (p=0.065 for low, and p=0.102 for high subgroup). Uncooperatively, there was a positive association between TSK and pain in the two subgroups (low, high), where p=0.011 for low subgroup and p=0.102 for high TSK subgroup. In the medium TSK group, there were no associations between TSK and BMI or pain (p=0.835 for BMI and p=0.853 for pain). The absent of the association in the medium subgroup, may contribute to the small quantity of students in the subgroup of medium TSK (18 out of 106). Furthermore, the relationship between kinesiophobia and BMI and/or pain is still conflictive and not clear enough (Leboeuf et al. 1999, Andersen et al. 2003).

Several cross-sectional investigations conducted in general populations have perceived no association between LBP and increasing BMI (Han et al. 1997, Heliovaara et al. 1991) and/or kinesiophobia levels, while others have detected a positive association between them (Andersen et al. 2003, Michel et al. 1997). On the other side, numerous studies have identified LBP to be independently associated with increased BMI and –consequently- with kinesiophobia level, but only in large (N > 5,000) samples of adults from the general population (Deyo and Bass 1989, Webb et al. 2003). However, longitudinal and large sampled investigation have also published contradictory results. Additionally, the most advanced body of these studies have suggested no direct causal explanation exists (Lake et al. 2000).

Regrettably, none of above-mentioned studies had classified kinesiophobia into three subgroups such like in the recent investigation. Even though, our findings indicate similar inconsistent results when TSK classification had taken into account. Nonetheless, when the whole sample – as it recommended by Clarck et al. (1996)- was treated as a unit, the association between TSK scores and BMI (figure1; r = 0.748; p = 0.000) and pain (figure2; r = 0.828; p = 0.000) was strongly positive.

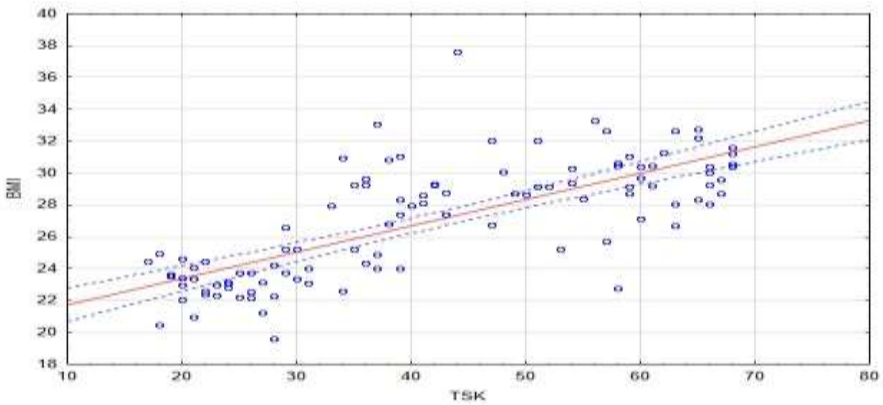

Figure 1: Correlation of TSK with BMI in the whole sample (N=106)

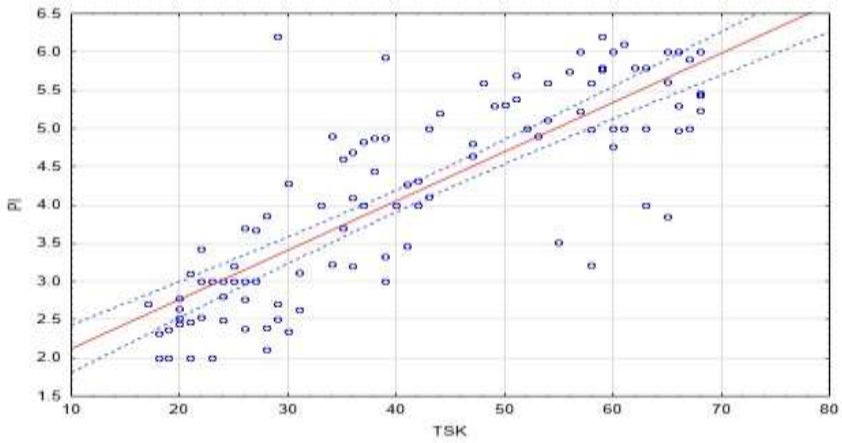

Figure 2.: Correlation of TSK with pain intensity in the whole sample (N=106)

Conclusion:

In conclusion, we can state that the associations and/or inter-influence between kinesiophobia, BMI and pain still not understood clearly because of the contradictory results published by different researches. This may be traced back to the fact that it varies according to definitions used, methodology applied, sample size and demo-geographical characteristics of studied populations. In addition, level of kinesiophobia and BMI may deviate over time, and symptoms of chronic LBP are varied (indeed, LBP is often a symptom rather than a discrete diagnosis in and of itself) and pain may be experienced in one position or many positions independently of BMI and kinesiophobia levels and may vary in intensity and interference over time.

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