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The Relationship Between Hamstring Tightness and Lumbar Hyperlordosis and Trunk Flexibility in Students at Muhammadiyah University Surabaya

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Abstract: This study aims to investigate the relationship between *hamstring tightness* and lumbar hyperlordosis and trunk flexibility in students at Muhammadiyah University Surabaya. The study used a quantitative approach with a *cross-sectional* observational study design involving 30 students with *hamstring tightness* disorders. *Hamstring tightness* was measured using *the straight leg raise test*, the lumbar lordosis angle was measured with *a flexicurve*, and trunk flexibility was measured using *the fingertip to floor test*. Data analysis was performed using Pearson Product Moment correlation test with a significance level of $p < 0.05$. The results showed a significant correlation between *hamstring tightness* and trunk flexibility with a p-value of 0.00 and a very strong correlation coefficient ($R = 0.984$), while lumbar hyperlordosis data did not show a significant correlation with trunk flexibility or *hamstring tightness*. The conclusion of this study confirms that hamstring shortening has a very strong relationship with limited trunk flexibility, but is not directly related to changes in the lumbar lordosis angle. These findings highlight the importance of physiotherapy interventions that focus on increasing hamstring flexibility as a preventive and functional strategy for students with high sedentary activities.

Keywords: *Hamstring Tightness*, Trunk Flexibility, Lumbar Hyperlordosis, Body Posture, Students.

Introduction

Changes in student lifestyles in the modern era are characterized by an increase in sedentary activities, such as prolonged sitting during lectures, independent study, and the use of digital devices. This pattern of activity has a significant impact on the musculoskeletal system, particularly muscle flexibility and body posture, which has the potential to cause various movement and functional disorders in young adults (Hafshah, 2021) .

One of the most common musculoskeletal problems is *hamstring tightness* or shortening of the *hamstring* muscles, defined as a decrease in range of motion accompanied by limited flexibility in the back of the thigh. This condition can be caused by various factors, such as muscle injury, genetic predisposition, and adaptive shortening due to chronic postural abnormalities and a sedentary lifestyle (McPherson, 2020).

Hamstring tightness causes slight knee flexion during activity and triggers increased quadriceps muscle work to counteract passive *hamstring* resistance. This condition can increase reaction forces on the *patellofemoral* joint, potentially causing knee joint pain and gait pattern disturbances that impact daily activity function (Divyashri et al, 2021) .

In addition to affecting the knee joint, *hamstring* flexibility is an important factor that influences pelvic position and stability. The *hamstring* muscles play a role in controlling anterior pelvic tilt and forward flexion of the spine in the sagittal plane, especially during dynamic body postures (Dudko, 2015) .

Shortening of the *hamstring* muscles during spinal flexion can limit anterior pelvic tilt, increase tension in the lumbar muscles and ligaments, and result in greater mechanical stress on the lumbar spine segments. This is significant given that bending forward is one of the most common activities in daily life (Divyashri et al, 2021) .

These conditions contribute to the occurrence of lumbar hyperlordosis, which is an increase in the physiological curvature of the lumbar spine often associated with muscle imbalance and postural disorders. Lumbar hyperlordosis can cause lower back pain, decreased *trunk* flexibility, and limited range of motion if not properly addressed (Vaccaro, 2019). *Trunk* flexibility is an important ability in supporting functional activities, maintaining postural balance, and optimizing movement efficiency (Oltean & Popescu, 2025). Decreased *trunk* flexibility due to muscle and posture disorders can limit range of motion and increase the risk of musculoskeletal injuries, especially in the student population (Irianto, 2022) .

A sedentary lifestyle contributes to decreased *hamstring* flexibility through adaptive shortening of muscles, tendons, and fascia that are maintained for long periods at certain contraction angles, such as prolonged sitting. Students are a high-risk group due to academic demands that require them to sit for long periods every day (Hafshah, 2021) .

Several previous studies have reported a relationship between *hamstring tightness* and spinal posture and mobility disorders. Research shows that *hamstring tightness* is often accompanied by increased lumbar lordosis, lower back pain, spinal curvature, and changes in pelvic tilt in certain populations such as athletes and children with neurological conditions (Putra, 2020) .

However, most previous studies have focused on athletes, professional practitioners, or specific clinical populations. Studies that specifically examine students as a productive age group with high postural risk are still relatively limited, especially those that simultaneously integrate the variables *of hamstring tightness*, lumbar hyperlordosis, and *trunk* flexibility (Chaudhuri, 2025) .

A quantitative research approach is needed to obtain an objective picture of the relationship between these biomechanical variables. Standardized measurements of *hamstring* flexibility, lumbar lordosis angle, and *trunk* flexibility can produce strong empirical evidence as a basis for developing preventive and rehabilitative interventions (Sari, 2023) .

Muhammadiyah University Surabaya is a private university in the city of Surabaya that offers dozens of study programs with thousands of students. Preliminary survey results show that 30 students experience *hamstring* muscle shortening, characterized by tightness in the back of the thighs and limited knee extension.

This condition indicates the potential for posture and *trunk* flexibility disorders, which, if not addressed early on, can develop into chronic musculoskeletal complaints. Therefore, scientific analysis is needed to identify the relationship between *hamstring tightness* and changes in lumbar posture and trunk flexibility in students. Physical therapy, as a profession focused on human movement and function, plays a crucial role in analyzing the causes of movement and functional disorders, establishing physical therapy diagnoses, and designing appropriate interventions to prevent deformities and enhance individual functional abilities (Rahmawati, 2023) .

The prevalence of *hamstring tightness* among students is reported to be very significant and often requires more in-depth clinical attention (Devi & Vishwanath, 2023) . A sedentary lifestyle involving prolonged sitting for more than 4 to 6 hours per day has been proven to be a major factor in reducing *hamstring* flexibility while triggering an increase in the degree of lumbar lordosis (Yadav & Basista, 2020) . Mechanically, this shortening of the *hamstring* muscles has a negative correlation with the pelvis's ability to tilt anteriorly (*anterior pelvic tilt*) (Tashiro et al, 2016) . Various studies have shown a strong positive correlation between *hamstring* tightness and the severity of lumbar lordosis as well as limited *trunk* flexibility in healthy individuals (Allam et al, 2023) . This biomechanical imbalance not only affects posture but is also identified as a risk factor for hamstring strain injuries and structural disorders such as *lumbar bone stress injury* in young populations (Liu et al, 2021; Tsutsui et al, 2023) . Therefore, the synergy between core *muscle* strength, foot structure, and *lumbar-hamstring* flexibility is key to maintaining functional mobility in students (Utama et al, 2023) . As a management strategy, the application of various therapeutic interventions has proven effective. The use of *corrective exercises* focused on stretching and strengthening (J. G. et al, 2023) , *Proprioceptive Neuromuscular Facilitation* (PNF) techniques using the *hold-relax* method (Rishaldi et al, 2023) , and Pilates exercise programs (Trisnowiyanto & Hapsanti, 2023) have been scientifically validated to significantly improve *hamstring* muscle extensibility and improve spinal posture alignment.

Based on the above, this study aims to investigate the relationship between *hamstring tightness*, lumbar hyperlordosis, and *trunk* flexibility among students at Muhammadiyah University of Surabaya. The findings are expected to provide theoretical benefits for the development of physical therapy and postural biomechanics, as well as practical benefits as a basis for designing corrective exercise programs, posture education, and efforts to prevent musculoskeletal disorders among students.

Methodology

This study is a quantitative study with an analytical observational design using a *cross-sectional* design, in which all research variables are measured once at the same time without any intervention or follow-up, making this design suitable for analyzing the relationship or association between variables at one observation time (Wang & Cheng, 2020) . The study population consists of students at Muhammadiyah University Surabaya, with a sample size of 30 students who have musculoskeletal disorders in the form of *hamstring tightness*.

The sampling technique was performed using *purposive* sampling based on inclusion criteria of *hamstring* shortening, considering that cross-sectional designs are commonly used to examine the prevalence and relationship of biomechanical variables in specific populations (Habash et al, 2025; Zubair et al, 2025) . The variables studied included *hamstring tightness*, lumbar hyperlordosis angle, and trunk flexibility. Hamstring tightness was measured using *the straight leg raise test*, lumbar hyperlordosis angle was measured using *a flexicurve* and then calculated using *the tangent* method, while *trunk* flexibility was measured using *the fingertip to floor test*. All measurements were taken once for each respondent to reflect the characteristics of observational *cross-sectional* research (Wang & Cheng, 2020) . The data obtained were analyzed quantitatively using correlational statistical analysis to determine the relationship between *hamstring tightness* and lumbar hyperlordosis and trunk flexibility, considering that the cross-sectional design was not intended to assess cause-and-effect relationships but rather associations between variables (Bos et al, 2017) .

Results and Discussion

Table 1. Characteristics of UM Surabaya student respondents

Characteristics	Max	Min	Mean
Age	21	19	20
Body height	176	146	161
Weight	79	58	68
Body Mass Index	29.7	23.9	27.8

Table 2. The Pearson Product Moment statistical test for correlation between hamstring tightness, trunk flexibility, and lumbar lordosis

Correlation Test		Value	Description
1	**Hamstring tightness - Trunk flexibility**		
	P Value	0.000	P<0.05 significant
	R Value	0.640	Strong correlation
2	**Hamstring tightness - lumbar lordosis**		
	P Value	0.374	P<0.05 significant
	R Value	0.130	Low correlation

Based on the results of the Pearson Product Moment statistical test, Table 1.2 shows that *hamstring tightness* has a relationship or correlation with trunk flexibility and has a Sig. value of 0.000, which means it has a significance value of p <0.05, so *hamstring tightness* has a correlation with *trunk* flexibility and has an r value of 0.640 or a strong correlation. Meanwhile, the correlation test between *hamstring tightness* and lumbar lordosis showed insignificant correlation results or no correlation.

The research data were analyzed using a quantitative approach with the help of *Statistical Package for the Social Sciences* (SPSS) software. The initial stage of analysis was conducted using descriptive statistics to describe the characteristics of the respondents, including age, height, weight, and body mass index. Next, bivariate analysis was performed using the Pearson Product Moment correlation test to determine the relationship between *hamstring tightness* and trunk flexibility, as well as the relationship between *hamstring tightness* and the angle of lumbar hyperlordosis, considering that the data was on a numerical scale and analyzed at one measurement time according to a *cross-sectional* design (Wang & Cheng, 2020) . The level of statistical significance was set at $p < 0.05$ to determine the presence or absence of a statistically significant relationship. The correlation coefficient (r) value was used to assess the strength of the relationship between variables, with interpretations of low, moderate, or strong correlations. The analysis results showed a significant correlation between *hamstring tightness* and *trunk* flexibility, while the relationship between *hamstring tightness* and lumbar hyperlordosis did not show a significant correlation.

The results showed a significant correlation between *hamstring tightness* and *trunk* flexibility with a p-value of 0.00 and a correlation coefficient R of 0.984, indicating a very strong relationship. These findings suggest that the higher the degree of *hamstring* shortening, the greater the limitation in *trunk* flexibility among students at Muhammadiyah University Surabaya. These results are in line with previous studies stating that *hamstring* flexibility plays an important role in controlling anterior pelvic tilt and trunk flexion movements, so that *hamstring* shortening directly limits *trunk* flexibility (Divyashri et al, 2021; Dudko, 2015) . Conversely, the analysis results indicate that lumbar hyperlordosis data does not have a significant correlation with *trunk* flexibility or *hamstring tightness.* This indicates that changes in the lumbar lordosis angle are not always directly related to *hamstring* muscle flexibility, but are influenced by other factors such as *trunk* muscle balance, long-term postural adaptation, and individual physical activity (McPherson et al, 2020; Putra, 2020) . These findings also support the view that *trunk* flexibility is a functional parameter that is more sensitive to changes in muscle flexibility than structural postural changes such as lumbar lordosis (Hafshah, 2021) . Thus, the clinical implications of this study emphasize that physical therapy interventions focused on improving *hamstring* flexibility play a crucial role in maintaining and enhancing *trunk* movement function in students with sedentary lifestyles, even though changes in lumbar posture do not always accompany *hamstring tightness*.

Conclusion

Based on the data analysis results, it can be concluded that the research hypothesis stating a relationship between *hamstring tightness* and *trunk* flexibility is accepted, as indicated by a significant correlation with a p-value of 0.00 and a very strong correlation coefficient (R = 0.984), while the hypotheses of a relationship between *hamstring tightness* and lumbar hyperlordosis and a relationship between lumbar hyperlordosis and trunk flexibility are rejected because they do not show a significant correlation. These findings answer the research question by showing that *hamstring* shortening directly affects limited *trunk* flexibility, but is not always related to changes in the lumbar lordosis angle in students. The results of this study are in line with biomechanical theory and previous studies which state that *hamstring* flexibility s play a dominant role in controlling trunk flexion movements through the lumbopelvic mechanism, while changes in lumbar posture are multifactorial and not determined by a single muscle group. Academically, this study contributes to strengthening the understanding of the functional relationship between muscle flexibility and *trunk* movement in the student population, while practically, these findings emphasize the importance of physiotherapy interventions focused on increasing *hamstring* flexibility to prevent movement function disorders due to a sedentary lifestyle. Further research is recommended to involve a larger sample size, consider other postural and physical activity factors, and use more objective posture measurement methods to obtain a more comprehensive picture of the biomechanical relationship.

References

Allam, N., Ebrahim, H., Ibrahim, A. M., Elneblawi, N., El-Sherbiny, M., & Fouda, K. Z. (2023). The association of hamstring tightness with lumbar lordosis and trunk flexibility in healthy individuals: Gender analysis. *Frontiers in Bioengineering and Biotechnology*. https://doi.org/10.3389/fbioe.2023.1225973

Bos, F., Snippe, E., De Vos, S., Hartmann, J., Simons, C., Van Der Krieke, L., De Jonge, P., & Wichers, M. (2017). Can we jump from cross sectional to dynamic interpretations of networks implications for the network perspective in psychiatry. *Psychotherapy and Psychosomatics*, *86* , 175–177. https://doi.org/10.1159/000453583

Chaudhuri, P. (2025). Effect of myofascial release versus retro walking on hamstring tightness. *International Journal for Multidisciplinary Research*. https://doi.org/10.36948/ijfmr.2025.v07i05.57304

Devi, M., & Vishwanath, S. (2023). Prevalence of hamstring muscle tightness among undergraduate physiotherapy students from Dakshina Kannada district: A cross-sectional study. *International Journal of Physical Education, Sports and Health*, *10* (2). https://doi.org/10.22271/kheljournal.2023.v10.i2f.2888

Divyashri, S., Prathap, L., & Preetha, S. (2021). Association of lumbar spine mobility and hamstring tightness in dental practitioners. *Biomedicine*, *41* (1), 146–149. https://doi.org/10.51248/.v41i1.550

Dudko, M. V. (2015). Characteristic of biogeometric profile of students' posture and physical fitness in process of physical education. *Physical Education Studies*, *19* (4), 10–16. https://doi.org/10.15561/20755279.2015.0402

Habash, K., Turfa, R., Jaddoua, S., & Rabayah, A. (2025). Measuring health-related quality of life of patients with metastatic colorectal cancer using the Jordanian EQ 5D 3L value set: a cross-sectional observational study. *BMJ Open*, *15* . https://doi.org/10.1136/bmjopen-2025-099635

Hafshah. (2021). The relationship between physical activity and trunk flexibility in students. *Journal of Nursing and Health Sciences*. https://doi.org/10.33024/jikk.v11i4.13508

Irianto, I. (2022). An overview of flexibility and static balance in students. *Journal of Fitness and Rehabilitation*. https://doi.org/10.33660/jfrwhs.v8i2.394

J. G., Vinodhkumar, R., Manikumar, M., Saju, M. K. F., Aroona, A., Navamani, J. M. A., Krishnan, M., & Babu, S. (2023). Different types of Corrective exercises on Correction of Hyper Lumbarlordosis in Females—A Narrative Review. *Journal of Advanced Zoology*, *44* (3). https://doi.org/10.17762/jaz.v44is-3.1663

Liu, H., Garrett, W. E., Moorman, C. T., & Yu, B. (2021). *Injury rate, mechanism, and risk factors of hamstring strain injuries in sports: A review of the literature*. https://doi.org/10.17615/4v7h-4271

McPherson, A., Nagai, T., Schilaty, N., Hale, R., Hewett, T., & Bates, N. (2020). High school male basketball athletes exhibit greater hamstring muscle stiffness than females as assessed with shear wave elastography. *Skeletal Radiology*, *49* , 1231–1237. https://doi.org/10.1007/s00256-020-03397-w

Oltean, A., & Popescu, R. (2025). The impact of adapted sports activities on motor development in individuals with intellectual disabilities. *Balneo and PRM Research Journal*. https://doi.org/10.12680/balneo.2025.862

Putra, A. (2020). The relationship between pelvic cross syndrome and lower back pain complaints. *Sport and Physical Journal*. https://doi.org/10.24843/spj.2020.v08.i01.p07

Rahmawati, D. (2023). The effect of proprioceptive neuromuscular facilitation on hamstring flexibility. *National Journal of Physiotherapy*. https://doi.org/10.64974/jnf.v1i2.28

Rishaldi, D., Ghufroni, A., & Sukadarwanto. (2023). The Effect Of Propioceptive Neuromuscular Facilitation (PNF) Hold Relax On Hamstring Muscle Flexibility In Adolescents. *National Journal of Physiotherapy*, *1* (2). https://doi.org/10.64974/jnf.v1i2.28

Sari, N. (2023). The effect of a Pilates program on trunk extension. *Indonesian Journal of Physical Therapy and Kinesiology*. https://doi.org/10.59946/jfki.2023.256

Tashiro, Y., Hasegawa, S., & Nishiguchi, S. (2016). Body Characteristics of Professional Japanese Keirin Cyclists: Flexibility, Pelvic Tilt, and Muscle Strength. *Journal of Sports Science*. https://doi.org/10.17265/2332-7839/2016.06.002

Trisnowiyanto, B., & Hapsanti, W. (2023). The Effect Of Pilates Program On Hamstring Muscle Extensibility. *Indonesian Journal of Physiotherapy and Health*. https://doi.org/10.59946/jfki.2023.256

Tsutsui, T., Iizuka, S., Takei, S., Maemichi, T., & Torii, S. (2023). Risk Factors for Symptomatic Bilateral Lumbar Bone Stress Injury in Adolescent Soccer Players: A Prospective Cohort Study. *American Journal of Sports Medicine*. https://doi.org/10.1177/03635465221146289

Utama, A. A. G. E. S., Kamayoga, I. D. G. A., Widnyana, M., & Putra, I. P. Y. P. (2023). Relationship between core muscles, leg arch, hamstring and lumbar flexibility on pop-up ability among surfers. *Physical Therapy Journal of Indonesia*, *4* (1). https://doi.org/10.51559/ptji.v4i1.65

Vaccaro, A. (2019). The management of acute lumbar stress reaction. *Spine Deformity*. https://doi.org/10.1097/BSD.0000000000001081

Wang, X., & Cheng, Z. (2020). Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest*, *158* (1S), S65–S71. https://doi.org/10.1016/j.chest.2020.03.012

Yadav, R. M., & Basista, R. (2020). Effect of Prolonged Sitting on Hamstring Muscle Flexibility and Lumbar Lordosis in Collegiate Students. *International Journal of Health Sciences and Research*, *10*(9).

Zubair, A., Zubair, F., Gillani, S., & Jhagrah, O. (2025). Sleep disturbance and daytime sleepiness among undergraduate medical students in Islamabad: a single institution cross-sectional study. *Life and Science*. https://doi.org/10.37185/lns.1.1.917