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The relationship between the degree of low back pain and concentration levels among RICCI Catholic High School Jakarta students during the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic has shifted most learning activities to an online format, leading to increased sitting time and a higher risk of low back pain (LBP). Low back pain can be a factor that causes changes in concentration during learning. This study aimed to evaluate the relationship between the degree of LBP and the level of learning concentration in high school students. It was a cross-sectional study conducted at RICCI Catholic High School Jakarta, involving students from grades 10, 11, and 12. Data were collected using a questionnaire that was distributed online with Google forms. The Chi-square method for data analysis was used with a significance level of 0.05. A total of 121 students participated in this study, with 66.9% did not experience LBP, 30.6% had LBP with a slight degree of pain, and 2.5% had LBP with a moderate degree of pain. There were no students with severe LBP. The results for low, moderate and high concentration levels were 8.3%, 70.2%, and 21.5%, respectively. The bivariate analysis between LBP and learning concentration level using was 0.062 (p>0.05). In conclusion, there is no significant relationship between the degree of LBP and the level of concentration in high school students.

ABSTRAK

Pandemi COVID-19 menyebabkan sebagian besar proses pembelajaran berlangsung secara daring sehingga meningkatkan waktu duduk dan risiko terjadinya nyeri punggung bawah (NPB). Nyeri punggung bawah dapat menjadi salah satu faktor yang mengakibatkan perubahan konsentrasi selama pembelajaran. Penelitian ini bertujuan untuk mengetahui hubungan derajat NPB dengan tingkat kosentrasi belajar pada siswa SMA. Penelitian ini menggunakan rancangan potong lintang di SMA Katolik RICCI Jakarta. Responden yang diteliti adalah seluruh siswa kelas 10, 11, dan 12. Pengambilan data menggunakan kuesioner yang dibagikan secara daring dengan Google form. Analisis data menggunakan metode Chi-square dengan tingkat signifikansi 0,05. Responden yang mengikuti penelitian berjumlah 121 siswa. Sebanyak 66,9% tidak mengalami NPB, 30,6% mengalami NPB dengan nyeri ringan, dan 2,5% dengan NPB dengat nyeri sedang. Tidak terdapat siswa NPB dengan nyeri berat. Tingkat konsentrasi rendah, sedang, dan tinggi didapatkan berturut-turut adalah 8,3; 70,2; dan 21,5%. Hasil analisis bivariat antara NPB dan tingkat konsentrasi belajar adalah 0,062 (p>0,05). Simpulan, tidak terdapat hubungan antara derajat NPB dan tingkat konsentrasi belajar pada siswa SMA.

Keywords:
concentration;
COVID-19 pandemic;
high school students;
low back pain;
work from home

INTRODUCTION

The COVID-19 pandemic caused by the SARS-CoV-2 virus impacted various sectors. Office work has been replaced with working from home (WFH). In the

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education setting, teaching and learning activities that initially took place at school had been suddenly changed into online learning. This new situation caused considerable physical and psychological impacts on humans, such as lack of physical activity, weight gain, addictive behavior, and social isolation.[1,2] Changes in musculoskeletal conditions due to online learning or working from home may also increase as the effects of reduced physical activity.[3,4]

Low back pain (LBP) is a common health problem and affects all population ranges.[5] The World Health Organization (WHO) Global Burden of Disease study in 2019 showed low back pain dominates the overall musculoskeletal pain with a prevalence of 568 million people worldwide.[6] About 1 in 5 school-aged children experience back pain, and its occurrence will increase with age in children and adolescents.[7] Under these pandemic conditions, time spent on technology-based activities in education, communication, and entertainment related to online schooling from home may increase sitting time, further increasing the risk of low back pain. A research by Shan *et al.*[8] and Bento *et al.*[9] showed that the incidence of LBP is influenced by the use of personal computer (PC), mobile phone and sitting duration.[8,9]

Discomfort or pain can adversely affect several aspects of an individual's performance, such as concentration, cognitive capacity, rationality/mood, mobility, stamina, agility, and physical factors.[10] The same thing was mentioned by Grimby *et al.*[11] where chronic pain affects the quality of life and cognitive functions such as attention and memory in adults. In children who experience chronic pain, everyday school routines will be disrupted, and it is not uncommon to have concentration and memory difficulties.[12] No research has shown the relationship between LBP to concentration ability and attention levels with adolescent targets, especially within high school students. Therefore, this study aimed to evaluate whether the degree of LBP has any correlations with the level of learning concentration in high school students during online learning in the COVID-19 pandemic. This study targeted high school students because adolescence is a period of development and transition from dependent to independent life, where individuals have social, physical, and cognitive needs that need to be met.

MATERIAL AND METHODS

Design and subject

This was an analytical observational study with a cross-sectional design. The study was conducted online by distributing questionnaires via Google Forms to students at RICCI Catholic High School, Jakarta. This research used total sampling, including all 10th, 11th, and 12th-grade students.

Procedure

The students who meet the inclusion and exclusion criteria were recruited in this study. Low back pain was measured using part of the Nordic musculoskeletal questionnaire (NMQ), which has been validated and translated into Bahasa. A numbered picture showing the lower back i.e. below the rear costal margin and above the inferior gluteal folds, was derived from the NMQ along with question related to the incidence of LBP

experienced to measure the degree of pain. The level of study concentration was measured using a questionnaire made by the researcher and had been tested for validity and reliability.[13] The author has designed and validated the questionnaire by taking references from Aprilia *et al*.[14] which also measures the level or ability of learning concentration based on learning concentration indicators. This questionnaire refers to a Likert scale which shows the tendency of the quality of the variables being measured. Thus, the level of learning concentration can be classified into three, namely low, medium and high.[14]

Statistical analysis

Data were presented as frequency and percentage and then analyzed using univariate and bivariate analysis, with the Chi-square test.

RESULTS

The majority of the respondents were 17 y.o. (TABLE 1). There were 60 male respondents (48.58%) and 61 female respondents (50.42%). The findings showed that 40 respondents (33,1%) reported having LBP (mild, moderate, or severe), while 81 respondents (66.9%) reported not having LBP. A low degree of learning concentration (8.3%), a high level (21.5%), and a moderate level (70.2%) of learning concentration were the most common responses.

For students who have low back pain, the categories of mild pain, pain, and severe pain would be taken into consideration. As presented in TABLE 2, 26 females (42.6%) and 14 males (23.3%) had LBP. As a result, women experienced LBP with mild pain more frequently than males.

There is no significant relationship (p=0.062) between the degree of low back pain and the level of learning concentration (TABLE 3).

TABLE 1. Respondent characteristics

Characteristics	n (%)
Gender	
• Male	60 (49.58)
• Female	61 (50.42)
Age (yr)	
• 15	12 (9.92)
• 16	45 (37.19)
• 17	51 (42.15)
• 18	12 (9.92)
• 19	1 (0.83)
Degree of LBP	
• No pain	81 (66.90)
• Mild pain	37 (30.60)
• Pain	3 (2.50)
• Severe pain	0 (0.00)
Level of learning concentration	
• Low	10 (8.30)
• Moderate	85 (70.20)
• High	26 (21.50)

LBP: low back pain

TABLE 2. Frequency of gender and degree of LBP

Gender	Degree of LBP			
	No pain	Mild pain	Pain	Severe pain
	n (%)	n (%)	n (%)	n (%)
Male	46 (76.7)	14 (23.3)	0 (0.0)	0 (0.0)
Female	35 (57.4)	23 (37.7)	3 (4.9)	0 (0.0)

TABLE 3. The relationship between the degree of LBP and the level of study concentration

Degree of LBP	Level of study concentration [n (%)]			Total	p
	Low	Moderate	High		
No pain	4 (3.3)	56 (46.3)	21 (17.4)	81 (66.9)	0.062
Pain	6 (5)	29 (24)	5 (4.1)	40 (33.1)	
Total	10	85	26	121	

DISCUSSION

The number of women who experience LBP is more than men in this study (TABLE 2). In the previous studies conducted by Paranjape and Ingole[15] and O'Sullivan *et al.*[16] have proved that the prevalence of LBP in women is more significant than in men. It is associated with hormonal changes experienced during puberty that affects attitudes or perceptions of pain in women, so it is a considerable risk factor for LBP.[12] The prevalence of LBP increased significantly following the COVID-19 lockdown, according to a study by Šagát *et al.*[17] going from 38.8% prior to quarantine to 48.3% after. However, this study offered a broader research target, adults. Until now, no studies have examined the prevalence of LBP in school students, especially during the transition from offline to online learning. This study found that 33.1% of students experienced LBP during the COVID-19 pandemic. Nevertheless, this current study still does not know whether the incidence of LBP has increased from the time before the COVID-19 pandemic as it is a cross-sectional study, therefore there are no data regarding previous LBP events.

In a study conducted by Winata[18] at the Senior High School 2, Mendoyo, Bali found that the average level of student concentration on online learning during the COVID-19 pandemic is in a low category. However, the current study found that as many as 85 respondents (70.2%) had medium learning concentration levels. They are then followed by high and low learning concentration levels of 21.5% and 8.3%, respectively. The difference in these results could be influenced by the factor of the learning concentration level measurement tool, where the contents of the questionnaire are thought to be different for each researcher. From the results of the analysis of the respondent's data, the significance value of the relationship between the degree of low back pain and the level of learning concentration was 0.062 ($p > 0.05$), which indicates that there is no significant relationship between the degree of low back pain and the level of learning concentration. This is indirectly in line with the research of Schiltenwolf *et al.*[19] which states that patients with chronic LBP experience a decrease in information processing and working memory, but no change in attention, following the definition where concentration is a form of sustained attention or attention that is maintained.

However, this study indirectly contradicts the results of Mahaputra *et al.*[20] which state that respondents who received treatment in learning positions (standing and stretching for 5 min) experienced a lower concentration decrease than respondents who were

not given treatment. Mahaputra's study indirectly discusses the correlation between physical activity and learning concentration levels. Students who were not intervented in this study could be considered as students who were more prone to getting low back pain because they did not get time to stretch and reposition their bodies. In the results of this study, there was no direct correlation between low back pain with learning concentration. Researchers suspect this is due to other factors besides low back pain, which can be a distractor and affect the level of concentration in learning.

One of the factors that have a significant impact on the level of concentration or sustained attention is emotion. A study by Tyng *et al*,.[21] states that emotions significantly influence cognitive processes in humans, including perception, attention, learning, memory, reasoning, and problem-solving. Emotions have a powerful influence on attention, especially on modulating the selectivity of attention and motivating action and behavior. Attention and executive control are closely related to the learning process because the capacity for intrinsic attention is limited to relevant information.[21] Other factors affecting concentration at home include learning styles, psychological factors, breakfast habits, and learning facilities.[22,23]

The students who were respondents in this study mostly had degrees of low back pain with a slight degree of pain, so it might not affect the level of concentration of the respondents' learning. The study of Sörqvist *et al*.,[24] proves that a higher cognitive load can reduce the possibility of being distracted and one's ability to process information that is irrelevant to work (task-irrelevant information) as a consequence of increased activity in a focused attention network.

Cognitive load, such as the heavier learning demands on final year students in preparing for lectures, can make other factors seem less notable to be a distractor in concentration. The researcher did not further investigate towards any confounding factors, such as emotion and cognitive load, so it is possible that these factors have influenced the results of the study. This study only focused on the degree of low back pain as a factor that can affect students' concentration levels. Other factors that may cause low back pain, such as chronic disease, history of serious injury, spinal disorders, etc., were included in the exclusion criteria of this study, therefore the researchers were able to know that low back pain arose due to poor posture during online learning.

The duration of chronic pain is a variable investigated in most studies of pain and concentration levels. Chronic back pain is defined as pain that persists for 12 weeks or more, even after the initial injury or the underlying cause of acute low back pain has been treated.[25] Chronic ongoing back pain, such as fibromyalgia, rheumatoid arthritis, osteoarthritis, and other chronic pains, is the focus of most clinical studies.[26] This study only examined the incidence of low back pain experienced during online learning during the COVID-19 pandemic without exploring whether the pain was persistent and ongoing or only temporary. In the events that this study was conducted longitudinally and the duration of the chronic pain was taken into account, the relationship between chronic pain and impaired concentration levels might have become more evident.

Due to the limitations of measuring instruments in the form of questionnaires, it is hoped that future research will pay more attention to existing confounding variables, such as emotions, cognitive load, etc. This is because there are many factors that can influence concentration levels, and there tends to be bias so further research is needed. And the pandemic conditions when the research was being carried out made it impossible to carry out direct examinations on each subject.

CONCLUSION

In conclusion, there is no significant relationship between the degree of low back pain and the level of concentration in high school students during the COVID-19 pandemic. In addition, the proportion of high school students who have lower back pain during the pandemic is less than those who do not. Moreover, most of the students have a moderate level of concentration during the COVID-19 pandemic.

The authors strongly recommend that additional research be conducted after the COVID-19 pandemic has ended to determine whether the results obtained differ between the two time periods (during and after the pandemic), so that comparisons with research conducted prior to the COVID-19 pandemic can be made. Based on the study's findings, the authors hope that certain parties will be able to improve aspects of the quality of online learning environments for students in the future, given their efficacy and benefits.

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