Analysis physical workload, mental workload, and work stress on teachers at Public Special School of Surakarta

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Abstract

Purpose: This study aimed to analyze the relationship between physical workload and mental workload towards work stress on special school teachers. In addition, it discovers the portrayal of the level of physical and mental workload and work stress. **Methods:** This study is a quantitative research through a cross-sectional approach. A total of 50 teachers was the sample. Variables in this study were physical workload, mental workload, and work stress. Data was collected with a pulse oximeter and questionnaires of NASA-TLX and PSS-10, and collected data was analyzed with the Spearman rank test. **Results:** The results of this study showed there is no relationship between physical workload and work stress. On the other hand, there is a relationship between mental workload and work stress (p-value=0.720; PR=0.762). Furthermore, 18% of teachers had a required improvement in physical workload, 12% had a very high mental workload, and 50% had moderate work stress (p-value=0.000; PR=0.552). **Conclusions:** This study indicated that there is no relationship between physical workload and work stress, in the other hand, there is a relationship between mental workload and work stress.

Keywords: mental workload; physical workload; special school teachers; work stress

INTRODUCTION

Modern education systems evolve in the context of augmenting teacher shortages. The TALIS (Teaching and Learning International Survey) 2018 report confirmed the prevalence of teacher shortages in developing countries, 21% of principals of participant countries stated that there was a shortage of qualified and well-performing teachers [1]. The Ministry of Education, Culture, Research, and Technology stated that teacher shortages will increase to 1,3 million in 2024 [2]. Nevertheless, the issue of teacher shortages is also emerging in special schools. According to Dapodik, the number of special school teachers in Central Java decreased to 2,623 in 2022 [3].

Teacher shortages frequently coexist with the additional workload for teachers. According to Permendikbud No 15/2018, a teacher has 37,5 working hours per week to perform and accomplish additional teacher duties [4]. Nevertheless, each teacher has distinct abilities and work capacity, known as workload [5]. Workload could be divided into physical workload and mental workload. The physical workload requires physical energy as a resource to perform the work activities and results of the individual's body reaction [6]. The body's physical workload responses were temporary during the work and several hours afterward; some responses were changes in heart rate, blood pressure, respiratory frequencies, and hormonal changes [7]. Mental workload can be defined as the difference in mental capacity required to perform specific tasks [8]. To make decisions, individuals utilize perception, interpretation, and mental processing of information, which are some of the mental activities

daily [9]. Considering the notable limitations, being a special school teacher requires additional effort in administering learning methods for the students. Moreover, it might affect the teachers' physical, psychological, and social aspects [10–12]. Based on the research of the special school teachers in Purwokerto, it was found that 40% of SLB-B teachers had a moderate physical workload, and 29% of SLB-C teachers had a light physical workload [13]. Research found that the majority of special school teachers in Jombang had a moderate mental workload [14].

Teachers' excessive workload could impact the organization or workplace, considering that it is one of the uppermost causes of work stress [15]. Research studies indicated that teaching is a stressful profession [16–19]. Based on research, workload is associated with the level of work stress on teachers, the higher the workload borne, the higher the level of work stress [20,21]. Work stress is an individual response of adjustment due to individual differences and psychological approaches as a consequence of conception from environments, actions, and events that had psychological and physical constraints [22]. Therefore, teachers could experience work stress due to the work environment pressure and its responses to dealing with it.

Surakarta comes first in the number of special schools in Central Java, and the Public Special School of Surakarta had the most significant number of teachers. A preliminary study showed that 4 out of 5 teachers at the Public Special School of Surakarta had experienced work stress. The diverse challenges and job demands experienced by special school teachers enchant the author's attention to analyze the relationship between physical and mental workload towards work stress on special school teachers. In addition, it discovers the portrayal of the physical and mental workload and work stress on teachers. The physical workload and mental workload are the novelty aspects of this research because those have never been conducted in the Public Special School of Surakarta

METHODS

This study was a quantitative research with a cross-sectional approach conducted at the Public Special School of Surakarta. The sample of this study was all the teachers who worked at the Public Special School of Surakarta, with a total of 50 teachers. The sampling procedure was done with total sampling. The study was conducted in November 2023.

The variables of this study were physical workload, mental workload, and work stress. The data collection technique was carried out through pulse oximeter

devices and questionnaires of NASA-TLX and PSS-10. The physical workload measurement was carried out with a pulse oximeter to determine the cardiovascular load (%CVL). The measurement of CVL is based on an increase in the work pulse rate, which is then compared to the maximum pulse rate. The mental workload measured with the NASA-TLX questionnaire. NASA-TLX, developed by Sandra G. Hart and Lowell E. Staveland has been used to measure mental workload worldwide in various industries [23–25]. The validity and reliability test of the Indonesian version of NASA-TLX was done [25]. Work stress was measured with the Perceived Stress Scale (PSS)-10 questionnaire. The PSS-10, developed by Cohen and Williamson, consists of items to measure situations or events that occur in an individual's life that are considered stressful [26]. The validity and reliability test of the Indonesian version of PSS-10 was conducted and concluded that it was a valid and reliable instrument [27].

The data collected were analyzed by using data processing software and then narrated. The data were analyzed through univariate and bivariate analysis. The univariate analysis was used to show the distribution of the Public Special School of Surakarta teachers in each variable, including gender, age, working period, physical workload, mental workload, and work stress. The bivariate analysis determined the relationship between physical workload, mental workload, and work stress.

This research has been declared ethical by the Health Research Ethic Committee Universitas Negeri Semarang. This decision was based on the statement of ethics No: 390/KEPK/EC/2023.

RESULTS

General overview of the Public Special School of Surakarta

The Public Special School of Surakarta is located on Cucok X Sidorejo St., Mankubumen, Banjarsari, Surakarta. The Public Special School of Surakarta is located in an area of 5,090 m^2 with various facilities such as learning rooms, vocational skills facilities, therapy clinic, PKPBI / Bina Wicara room, playroom, music room, hall, library facilities, health unit room, computer laboratory, and science laboratory.

The Public Special School of Surakarta consisted of education levels, specifically TKLB (kindergartens), SDLB (primary school), SMPLB (secondary school), SMALB (high school), and Skills Training Classes/Workshops. The Public Special School of Surakarta has a variety of classes according to the unique needs of students, including class A for the

visually impaired, class B for the hearing impaired, class C for the mentally impaired, class D for the physically disabled without any impairments, class D1 for the physically disabled accompanied by intelligence disorders, class H for students with autism.

The Public Special School of Surakarta has the vision to actualize human resources with special needs children who transcend and can compete in a global that has independent, honest, and creative characters. To actualize this vision, the Public Special School of Surakarta has a mission, precisely, to provide opportunities for all children with special needs to obtain special education by their potential and underlying abilities, to form graduates who have the personality and ability to develop themselves so that they have adequate faith, knowledge, and skills in entering community life, and to expand the network to socialize special education.

The Public Special School of Surakarta has 50 teachers and 14 educators. The number of students at The Public Special School of Surakarta is 230 pupils from various levels of education.

The distribution of respondents based on gender

The distribution of respondents based on individual characteristics is shown in **Table 1**, in addition, it showed the majority of respondents of this research are female about 35 people (70%) while the male respondents are 15 people (30%).

The distribution of respondents based on age

The distribution of respondents based on age is shown in **Table 1**. The categorization of respondents based on non-normally distributed data used a quartile (*Q1, Q2, Q3*) approach [28]. The majority of respondents are in the age category ≤42 years, particularly 16 people (32%). 13 respondents (26%) were in the 43 – 49 years age category, 12 respondents (24%) were in the 50 – 54 years age category, and 9 respondents (18%) of Public Special School of Surakarta's teachers in the >54 years age category. Based on the distribution of data on age, the average age of respondents was 46,3 years.

The distribution of respondents based on the working period

The distribution of respondents based on the working period is shown in **Table 1**. The categorization of respondents is based on the normal data distribution, using the mean and standard deviation (SD) approach [28]. Table 1 shows that 38 people (76%) have worked for 9 – 23 years, 6 people (12%) have worked for more than 23 years, and 6 people (12%) have worked for less than 9 years. Based on the distribution of data on the working period, it is known

that the average working period of respondents was 16 years.

Table 1. Frequency distribution of respondents based on gender, age, and working period (n=50)

Individual Characteristics	Frequency	Percentage
Gender		
Male	15	30
Female	35	70
Age		
≤ 42 Years	16	32
43 – 49 Years	13	26
50 – 54 Years	12	24
> 54 Years	9	18
Working Period		
< 9 Years	6	12
9 – 23 Years	38	76
> 23 Years	6	12

Table 2. Frequency distribution of respondents based on the variables

Variable	Frequency	Percentage
Physical Workload		
Improvement required	9	18
No fatigue	41	82
Mental Workload		
Very high	6	12
High	18	36
Moderate	14	38
Low	9	18
Very low	3	6
Work Stress		
Moderate	25	50
Mild	25	50

The distribution of respondents based on the level of physical workload

The level of physical workload of the respondents could be seen in **Table 2**. It is known that most respondents are at the level of physical workload where no fatigue occurs, where about 41 people (82%), and 9 respondents (18%) are at the level of physical workload that required improvement.

The distribution of respondents based on the level of mental workload

Based on **Table 2** it is known that most respondents have a high mental workload, as many as 18 people (36%). As many as 6 people (12%) have very high mental workload, 14 people (28%) have moderate mental workload, 9 people (18%) have low mental workload, and 3 people (6%) have very low mental workload.

The distribution of respondents based on the level of work stress

Based on **Table 2** were known that 25 respondents (50%) experienced moderate work stress, and 25 respondents (50%) experienced mild work stress.

The relationship between physical workload and work stress

The analysis of the relationship between physical workload and work stress was done by the Spearman rank test shown in **Table 3**.

The majority of respondents had a physical workload that was at the level of no fatigue for about 41 people (82%), of which 21 people (42%) experienced mild work stress, for about 20 people (40%) experienced moderate work stress. A total of 9 respondents (18%) had a physical workload at the required level of improvement experiencing mild work stress as many as 4 people (8%), and 5 people (10%) experienced moderate work stress.

Based on the Spearman rank test result, the p value=0,720 (p>0.05) therefore, concluded that there is no significant relationship between physical workload and work stress experienced by teachers of the Public Special School of Surakarta. The PR (Prevalence Ratio) value showed 0,762 so it was known that Public Special School of Surakarta's teachers who had a physical workload at the level improvement was required had a 0,762 times lower risk of experiencing moderate work stress compared to teachers who had a physical workload at the level where no fatigue occurred.

The relationship between mental workload and work stress

The analysis of the relationship between mental workload and work stress was done by the Spearman rank test shown in **Table 4**.

The majority of respondents had a high mental workload, namely 18 people (36%), where respondents experienced mild work stress as many as 5 people (10%) and moderate work stress as many as 13 people (26%). A total of 6 respondents (12%) had a very high level of mental workload and experienced moderate work stress. A total of 14 people (28%) had a moderate mental workload, of which 11 respondents (22%) experienced mild work stress, and 3 respondents (6%) experienced moderate work stress. A total of 9 respondents (18%) had a low mental workload, of which 6 respondents (12%) experienced mild work stress, and 3 respondents (6%) experienced moderate work stress. A total of 3 respondents (6%) had a very low mental workload and experienced mild work stress.

Table 3. Result analysis of the relationship between physical workload and work stress

| Physical Workload | Work Stress | | | | Total | | p-value | PR |
| | Moderate | | Mild | | | | | |
	n	%	n	%	n	%		
Improvement required	5	10	4	8	9	18	0,720	0,762
No fatigue	20	40	21	42	41	82		

Table 4. Result analysis of the relationship between mental workload and work stress

| Mental Workload | Work Stress | | | | Total | | p-value | Cor. coef. |
| | Moderate | | Mild | | | | | |
	n	%	n	%	n	%		
Very high	6	12	0	0	6	12	0,000	0,552
High	13	26	5	10	18	36		
Moderate	3	6	11	22	14	28		
Low	3	6	6	12	9	18		
Very low	0	0	3	6	3	6		

Based upon the test results of the Spearman rank, the p value=0,000 (p<0,05) and the correlation coefficient of 0,552 therefore, concluded that there was a significant relationship between the level of mental workload and the level of work stress experienced by teachers of the Public Special School of Surakarta and the strength of the correlation between mental workload and job stress in teachers at the Public Special School of Surakarta was at a strong level.

DISCUSSION

The relationship between physical workload and work stress

The study results indicate there is no significant relationship between the physical workload and the work stress on teachers at the Public Special School of Surakarta. The absence of a significant relationship between those variables could be due to implementing work activities generally done in a sitting position. Few physical activities such as lifting, pushing, or pulling goods require tremendous energy and muscle performance. Work activities done in a sitting position could reduce the static loads on the legs, reducing energy consumption [29].

At the Public Special School of Surakarta, teachers had regular breaks. In addition, between working hours, they had some space-time. This time gives a way to rejuvenate and rest the body. Thus, teachers did not feel significant fatigue. This study aligned with research on 26 emergency nurses, which found that 96,2% of workers had a light physical workload and as many as 70,1% did not experience work stress. The Spearman rank test showed p=0,332, showing that the physical workload variable did not significantly influence work stress [30].

Research conducted on workers at PT. Maruki Internasional Indonesia Makassar found no relationship between physical workload and work stress. The results showed the p-value is 0,13, indicating there are no relationships between variables. Moreover, the time for breaks was enough to convert the worker's energy before continuing to work [31].

Research conducted on 217 high school teachers in South Tangerang about the relationship between physical workload and work stress found no significant relationship between the physical workload and work stress felt by teachers. The Spearman rank test showed a p-value of 0,840, indicating that the physical workload variable did not have a significant relationship with work stress in high school teachers in South Tangerang [32].

The relationship between mental workload and work stress

The study results indicate a significant relationship between mental workload and work stress in teachers at the Public Special School of Surakarta, with a strong correlation. In other words, increased mental workload could be followed by increased work stress. The mental workload experienced by teachers at the Public Special School of Surakarta is not limited to teaching children with special needs who require individualized attention but also includes demands from parents and other administrative tasks that must be completed within a limited time.

Relevant to delivered learning materials, a special school teacher often requires bizarre ideas to make suitable learning material for each pupil. At another time, recitation for learning materials to students over school hours is required for students who are unable to understand the material in class. Those activities could be a burden for the teachers, and the responsibility of a special school teacher could trigger work stress [33,34]. This study's results align with research about mental workload and work stress in special school teachers, which states that there is a relationship between mental workload and work stress in special education teachers. The test results showed that the p-value=0,049 and r=0,360, indicating a significant influence between mental workload and work stress. In addition, the special school teachers in Jombang who had a moderate mental workload experienced mild work stress [14].

Completing numerous administration tasks in a brief time could affect the mental workload of teachers. For instance, teachers should make study plans suitable to the student's limitations. Moreover, this particular task is conducted before the beginning of the academic year, yet the books were received after the academic year began. These conditions made teachers face difficulties in accomplishing the task. The combination of the task and time pressure might result in a mental workload and prompt work stress for the teachers. The research concluded that there is a relationship between mental workload and work stress in junior high school teachers in Samarinda. The test results showed a p-value of 0,000 (p<0,05) with a correlation value of 0,444, which is considered a moderate relationship [21]. Managing multiple classes and adjusting the learning material based on students' limitations might give a pile to prepare learning materials. Nonetheless, teachers could have a higher mental workload. Research showed that mental workload had a strong relationship with work stress. The results showed that 90,9 % of special school teachers in Semarang had heavy mental workloads and experienced severe work stress [35].

Due to work stress, emotional symptoms could arise. Refreshing activities can be done to minimize the impact of work stress, for instance, trips or outings once every 6 months or by the end of the academic semester. Those activities intend to rejuvenate the mind and body moreover, improve the relationships between fellow teachers and principals. Teachers could look for new activities or hobbies to refresh the mind from the work routine. Those activities or hobbies are expected to help relax the mind from work matters and provide time for themselves. School management or principals could implement stress management training, such as meditation and relaxation training, to help teachers develop skills and abilities to cope with job pressures.

CONCLUSION

The conclusion of this study indicated that there is no relationship between physical workload and work stress, on the other hand, there is a relationship between mental workload and work stress. Furthermore, at the Public Special School of Surakarta, 9 teachers (18%) had a physical workload where improvement is required, 6 teachers (12%) had a very high mental workload, and (50%) had moderate work stress.

A few programs could be done to minimize and reduce work stress at the school, such as conducting stress management training for the teachers and providing counseling facilities from a psychologist who can help teachers who experience work stress. Forthcoming researchers could explore other risk factors for work stress in teachers of the Public Special School of Surakarta. Risk factors such as physical conditions of the work environment in terms of light

intensity and noise have not been discussed in this study.

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