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Differences in Hand-Eye Coordination of Students under Fasting and Normal Conditions at TICS SMK Negeri 2 Yogyakarta

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Abstract

Hand-eye coordination is an essential motor skill for vocational high school students, particularly in practical learning that requires accuracy, concentration, rapid responses, and precise movements in accordance with industrial work demands. Changes in physiological conditions during Ramadan fasting may affect students' motor performance; however, comparative studies examining hand-eye coordination under fasting and normal conditions in vocational education remain limited. This study aimed to compare students' hand-eye coordination under fasting and normal conditions in the Industrial Culture School (TICS) learning context at SMK Negeri 2 Yogyakarta. A quantitative comparative study with repeated measurements was conducted involving 126 randomly selected Muslim students aged 15–18 years. The same participants were assessed under fasting and normal conditions using The Alternate Hand Wall Toss Test. Data were analyzed using descriptive statistics, normality testing, and a Paired Sample t-test. The mean hand-eye coordination score was [mean] ± [SD] during fasting and [mean] ± [SD] under normal conditions. The Paired Sample t-test showed [a significant/no significant] difference in hand-eye coordination between the two conditions, t(125) = [t-value], p = [p-value]. These findings indicate that hand-eye coordination performance differed between fasting and normal physiological conditions. Therefore, students' physiological conditions should be considered when organizing practical learning and physical activities requiring precision, concentration, and motor coordination in vocational high schools.

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Introduction

Vocational high school (Sekolah Menengah Kejuruan, SMK) education is fundamentally directed toward preparing learners to possess competencies that align with the demands of the workforce and the industrial world. Such readiness pertains not only to the mastery of knowledge and technical skills but also to motor abilities that support the execution of work with precision, speed, and conformity to operational standards. In various vocational practical activities, students are required to perform movements demanding accuracy, response speed, and coordination between visual information and hand movements. Consequently, hand-eye coordination, as one component of motor skills, holds significant relevance in shaping the work readiness of SMK students, particularly in activities that require precise tool manipulation, responsiveness to objects, and coordinated movement control. This capacity constitutes part of students' physical readiness to undertake practical learning processes that are increasingly oriented toward the characteristics and standards of industrial work.

These demands become increasingly pertinent in the development of SMK learning that seeks to bring educational experiences closer to the environments of the business world, the industrial world, and the world of work through practice-based learning and authentic work experiences. One approach employed is the Teaching Factory (TEFA), namely learning that integrates the educational process with a production or service environment resembling workplace standards so that students acquire more genuine work experience (Kemendikdasmen, 2025). This model is directed not only toward the development of hard skills and soft skills but also toward cultivating adaptability, discipline, meticulousness, and habituation to industrial work standards. Thus, the success of SMK learning requires students' holistic readiness, including physical readiness and motor abilities to engage in theoretical activities, practicums, simulations, and productive activities that demand concentration, accuracy, response speed, and movement coordination.

Such motor readiness does not always occur under identical physiological conditions. One condition relevant to Muslim students is the observance of fasting during the month of Ramadan. Alterations in eating and drinking patterns, as well as bodily conditions during fasting, may constitute physiological factors potentially associated with students' performance in physical and motor activities. In the context of hand-eye coordination, performance is determined not solely by muscular capacity but also involves the processes of visual stimulus reception, attention, information processing, reaction speed, and neuromuscular response. Therefore, changes in physiological conditions during fasting warrant examination, particularly to determine whether the achievement of one motor component relevant to SMK students' practical activities differs compared with when students are in a normal or non-fasting condition.

Although research on physical fitness and physical activity during fasting has developed, studies specifically comparing the hand-eye coordination of SMK students under fasting and normal conditions within the context of readiness for industry-culture-based learning remain limited. This gap is significant because the vocational education environment possesses characteristics distinct from general education, namely the demand for readiness to perform practical activities requiring meticulousness and motor coordination. This study, as a

preliminary investigation, seeks to address this gap by measuring and comparing students' hand-eye coordination achievements under two physiological conditions, namely during the observance of fasting and under normal conditions. Measurement was conducted using the Alternate Hand Wall Toss Test (AHWTT) to obtain an initial depiction of possible differences in the performance of this essential motor component. Thus, this study not only compares measurement results under the two conditions but also provides an initial basis for understanding how changes in physiological conditions during fasting relate to students' motor readiness within the context of SMK learning oriented toward the demands of industrial culture and work environments.

Physical readiness constitutes a relevant component in supporting students' engagement throughout the learning process, particularly when learning involves practical activities and more movement compared with conventional academic learning. Academically, physical fitness is a condition reflecting the body's capacity to perform activities effectively without experiencing excessive fatigue while retaining the capacity to undertake other activities. Fitness comprises several components related to health and skills, including endurance, strength, flexibility, speed, agility, balance, and coordination. Within the school environment, physical activity and fitness are also linked to the learning process, as several studies indicate a positive, or at least non-detrimental, relationship between physical activity and students' academic achievement and cognitive function (Vorkapic et al., 2021; García-Hermoso et al., 2021). Therefore, adequate physical condition may be regarded as one supporting factor enabling students to engage in the sequence of learning optimally. However, this relationship does not imply that fitness directly determines learning success or students' compliance with standard operating procedures (SOP), since such a relationship must be substantiated through empirical testing. In the context of SMK implementing industrial work culture, physical aspects and motor abilities are relevant for examination as part of students' readiness to engage in learning activities resembling the demands of the world of work.

This context becomes increasingly compelling when the learning process takes place during the month of Ramadan, when a portion of Muslim students observe fasting while continuing to participate in educational activities at school. During fasting, students are still required to attend classroom learning, practical activities, physical education activities, and other school activities according to the established schedule. This condition gives rise to physiological circumstances differing from those on days when students do not fast, primarily due to alterations in food and fluid intake patterns as well as changes in sleep time and daily activity. A systematic review indicates that Ramadan fasting may be associated with changes in energy, carbohydrate, and fluid intake, sleep duration and quality, and perceived fatigue, although the effects are not always uniform across individuals (Trabelsi et al., 2024). Accordingly, the fasting condition should not be positioned a priori as a state that necessarily diminishes students' physical abilities, but rather as a physiological condition potentially influencing the body's response to particular activities. Such differences in conditions constitute a relevant basis for comparing students' physical or motor abilities under fasting and normal conditions. This comparative approach is also more appropriate than directly assuming that fasting causes performance decline, since research evidence indicates that the effects of

Ramadan fasting on physical performance may vary according to activity type, measurement timing, and individual characteristics (Abaidia et al., 2020).

One ability relevant to practical activities is hand-eye coordination, namely the capacity to integrate visual information with hand movements rapidly and accurately. Such coordination is required in various activities demanding precision of motor response, such as catching, throwing, directing objects, and performing repetitive movements with visual control. In the context of vocational learning, coordinative ability may constitute one supporting aspect when students perform practical activities requiring movement precision, although hand-eye coordination cannot be directly equated with SOP compliance. One instrument usable for measuring hand-eye coordination is the Alternate Hand Wall Toss Test (AHWTT), performed by throwing a ball toward a wall with one hand and catching it with the opposite hand alternately within a specified time. Research on children and adolescents indicates that AHWTT can be employed as an instrument for measuring hand-eye coordination ability, with measurement characteristics requiring adjustment to age and the subject's distance from the wall (Cho et al., 2020). Other research likewise demonstrates that AHWTT possesses high reliability and can be used to evaluate coordination ability and motor skills, so that this instrument has a sufficient methodological basis for use in field research (Cho et al., 2020).

The use of AHWTT in the context of this study is important because measurements were conducted under two different conditions, namely when students observed Ramadan fasting and when students were under normal conditions. This comparison enables the researchers to obtain an empirical depiction of whether or not differences exist in hand-eye coordination ability under the two conditions. The selection of AHWTT also offers advantages in that its procedure is relatively simple, can be completed within a short time, and yields quantitative scores based on the number of successful movements during the testing period. A study on the validity of AHWTT in children indicates that the distance between the subject and the wall may affect the difficulty level of the test, so that the measurement procedure must be standardized according to the characteristics of the research participants (Cho et al., 2020). Furthermore, recent research on young adults found excellent intra-rater reliability for AHWTT with an ICC value of 0.957, while also indicating an association between scores and several anthropometric characteristics such as height and weight (da Silva et al., 2025). Therefore, the use of AHWTT in this study is not merely to assess overall physical fitness but to obtain an objective indicator of students' hand-eye coordination ability under different physiological conditions. This position is important so that the interpretation of research results remains consistent with the construct actually measured by the instrument.

Although research on the effects of Ramadan fasting on physical performance has developed considerably, most prior studies remain focused on athletes, physically active individuals, or performance forms such as strength, endurance, sprinting, and particular sporting abilities. An overview of various systematic reviews indicates that Ramadan fasting may be associated with performance decline in high-intensity activities, but not all physical performance components exhibit identical changes (Trabelsi et al., 2024). Meanwhile, other studies indicate that most physical performance parameters do not always undergo significant changes during Ramadan, so that the effects of fasting depend heavily on activity characteristics

and measurement conditions (Abaïdia et al., 2020). On the other hand, research on AHWTT has been directed more toward instrument validity, age characteristics, measurement distance, and coordination ability in the context of sports or general fitness (Cho et al., 2020). This research gap indicates that studies connecting hand-eye coordination measurement with the vocational education context are still needed, particularly among SMK students participating in industry-work-culture-based learning. The context of The Industrial Culture School (TICS) at SMK Negeri 2 Yogyakarta provides a relevant environment for examining this issue because learning activities are directed toward habituating students to the characteristics of industrial work culture. Accordingly, this study is positioned as a preliminary investigation seeking to provide empirical evidence regarding the condition of students' hand-eye coordination ability under two different conditions, rather than to generalize that the fasting condition directly determines work readiness or SOP compliance.

Based on this elaboration, this study aims to describe and compare the hand-eye coordination ability of students at SMK Negeri 2 Yogyakarta through the Alternate Hand Wall Toss Test (AHWTT) under fasting and normal conditions. This study is directed toward obtaining a depiction of whether differences exist in hand-eye coordination measurement results between the two conditions. The selection of SMK Negeri 2 Yogyakarta students is based on the characteristics of TICS learning, which positions industrial work culture as part of students' learning experience. The measurement results are expected to provide preliminary information regarding the condition of students' hand-eye coordination ability when engaging in learning activities under different physiological conditions. The research findings may also serve as consideration for schools in understanding students' physical and motor readiness without making claims exceeding the variables measured. In the longer term, this information can be utilized as preliminary data for more comprehensive research on fitness, motor ability, work readiness, and the characteristics of industry-culture-based learning in SMK. Thus, this study is expected to contribute empirically to the development of vocational learning that attends not only to technical competence and work culture but also objectively considers students' physical conditions and motor abilities.

Method

This study employed a comparative research design with repeated measurements on the same subjects (within-subject comparative study). The research was conducted at SMK Negeri 2 Yogyakarta involving 126 Muslim students selected randomly and within the age range of 15–18 years. The data used constitute primary data obtained directly through the measurement of hand-eye coordination using The Alternate Hand Wall Toss Test (AHWTT), taken under two main conditions and measured with a hand-eye coordination test intended to measure the extent of cooperation between the eyes and hands in performing a task rapidly and accurately in response to visual stimuli (BGP Banten, 2026). Based on the explanation of the AHWTT test, an illustration of the data collection technique is presented in Figure 1.

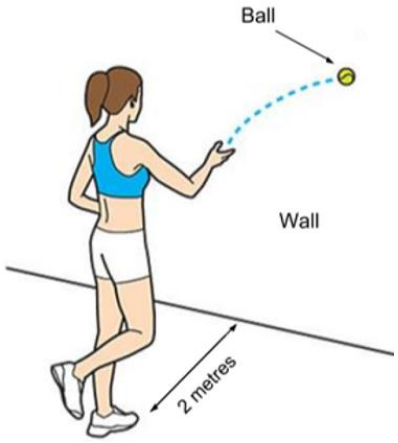


Figure 1. Illustration of the Data Collection Technique
Source: https://charlieconwaycoordination.weebly.com/coordination-fitness-test.html

Furthermore, the data collection technique was carried out in two stages. The first stage was conducted when students observed fasting during the month of Ramadan, namely on 25–26 February 2026 for the first data collection and 4–5 March 2026 for the second data collection among students under fasting conditions, while the second stage was conducted under normal or non-fasting conditions on 23–30 July 2026. To maintain comparability of results, measurements under both conditions were performed on the same subjects using the same instrument, procedure, testing duration, throwing distance, and testing environment. Testing was conducted between 08:30 and 10:00 WIB during physical education class hours; this timing was applied under both fasting and normal conditions to minimize the influence of time differences on students' physical condition. In addition, prior to the test administration, students were given instructions to perform the test without any special treatment; the hand-eye coordination test was administered to students after classroom learning activities and before the physical education class, as explained in Figure 2.



Figure 2. Implementation of Hand-Eye Coordination Test Data Collection

The implementation of Hand-Eye Coordination Test data collection refers to Table 1, which explains the grouping of research data based on the data assessment requirements according to the research theory of Beashel and Taylor (1997). On the other hand, information regarding sleep patterns, routine daily physical activity, and the physical type of athletic students was not controlled during the study, and was subsequently compared through descriptive statistical analysis and the comparative Paired Sample t-test.

Table 1. Research Data Grouping Assessment

Student Age	Excellent	Good	Average	Fair	Poor
15–18 Years	>28	22–28	16–21	10–15	<9

Source: Beashel and Taylor, 1997

Furthermore, the results of the hand-eye coordination test in this study constitute quantitative research conducted by seeking information pertaining to existing phenomena, clearly explaining the objectives to be achieved, planning the approach to be taken, and collecting various data as material for producing a report (Pristiwanto et al., 2022).

Results and Discussion

Results

This study constitutes a preliminary investigation conducted at SMK Negeri 2 Yogyakarta under the title Relationship Between Students' Physical Fitness Conditions During Fasting and Normal Conditions with Hand and Eye Coordination Testing at The Industrial Culture School (TICS) at SMK Negeri 2 Yogyakarta. The study involved 126 tenth-grade Muslim students selected randomly. Each student participated in hand and eye coordination measurements under two conditions, namely during the observance of fasting and under normal or non-fasting conditions. Measurement was conducted using the Hand-Eye Coordination Test with the Alternate Hand Wall Toss Test technique. The measurement data were used to describe and compare students' hand and eye coordination achievements under the two conditions within the context of learning at a school implementing industrial culture, or The Industrial Culture School (TICS).

Data analysis was conducted in two stages. First, descriptive statistical analysis was employed to present the frequency distribution, percentage, mean, and standard deviation of students' hand and eye coordination measurement results under fasting and normal conditions. The presentation of descriptive statistics in the results section is intended to provide a depiction of the characteristics of student achievement under each condition without interpreting performance improvement or decline. Second, prior to hypothesis testing, the data were examined through instrument validity and reliability analysis as well as normality testing as a basis for determining the use of parametric statistics.

To address the research question concerning whether or not differences exist in hand and eye coordination achievement between fasting and normal conditions, a comparative test was performed using the Paired Sample t-test. This test was employed because measurements were taken on the same subjects under two different conditions. Testing was conducted by comparing the mean values of The Alternate Hand Wall Toss Test results during students' fasting and under normal conditions. The results of the inferential statistical test are

subsequently presented based on the t-value, degrees of freedom (df), and significance value (p-value) to determine whether the mean difference between the two conditions is statistically significant. The results of descriptive and inferential statistical analysis are presented sequentially in the following section.

Table 2. Statistical Results of Validity Testing with Correlation Test

			Puasa	Normal
Kendall's tau_b	Puasa	Correlation Coefficient	1.000	.367**
		Sig. (2-tailed)	.	.000
		N	126	126
	Normal	Correlation Coefficient	.367**	1.000
		Sig. (2-tailed)	.000	.
		N	126	126
Spearman's rho	Puasa	Correlation Coefficient	1.000	.497**
		Sig. (2-tailed)	.	.000
		N	126	126
	Normal	Correlation Coefficient	.497**	1.000
		Sig. (2-tailed)	.000	.
		N	126	126

** Correlation is significant at the 0.01 level (2-tailed).
Source: data processed with IBM SPSS Statistics 27

The validity test in this study was employed as a measuring tool to demonstrate the accuracy of the testing instrument. The validity testing conducted in this study utilized the statistical data analysis application IBM SPSS Statistics 27. The criterion for the 5% alpha testing is that if r-count > r-table with $\alpha = 0.05$, the measuring instrument can be declared valid (a relationship exists), and conversely, if r-count < r-table with $\alpha = 0.05$, the measuring instrument can be declared invalid (no relationship exists). Furthermore, if the 5% alpha testing criterion indicates a P-value < 0.05, a significant effect can be declared to exist; however, if the test results indicate a P-value > 0.05, the instrument test results can be declared to have no significant effect.

Table 2 in this study presents the results of the validity statistical test indicated by a correlation coefficient value of 0.547 with a significance p-value of 0.001 < 0.05. These results indicate that the hand and eye coordination testing instrument possesses a relationship correlation at a moderate level and significantly influences the condition of physical fitness during fasting and normal (non-fasting) conditions at schools possessing an industrial work culture in the implementation of teaching factory (TEFA) at SMK.

Table 3. Statistical Results of Reliability Testing (Reliability Test–Cronbach's Alpha)

Cronbach's Alpha	N of Items
.704	2

Source: data processed with IBM SPSS Statistics 27

The reliability test aims to measure the consistency and stability of the testing instrument if measurements are performed repeatedly as recorded on the data collection form. The basis for determining data reliability uses the Cronbach's Alpha reference, which is sufficiently high (typically above 0.60 as the reference standard employed). Statistical analysis in testing data reliability utilized the statistical software IBM SPSS Statistics 27 with the Cronbach's Alpha testing technique. Meanwhile, in this testing, the hand-eye coordination test was also administered repeatedly to ensure that the test results of the testing instrument can be trusted when administered at different times and under particular conditions (fasting and normal).

Table 3 presents the statistical results of the reliability test indicating a reliability value of 0.704 > 0.60 (Cronbach's Alpha value), so that the results of the hand and eye coordination testing instrument (hand-eye coordination test) with respect to physical fitness conditions during fasting and normal are reliable or every statement employed as a measuring tool is reliable and usable for further research. After data processing using the IBM SPSS Statistics 27 application, the calculation results from the student data were obtained. The normality test here is used to determine whether the testing instrument administered produces normally or non-normally distributed data, with a significance level criterion of 0.05: if the obtained significance is > 0.05, the sample originates from a normally distributed population, but if the obtained significance is < 0.05, the sample does not originate from a normally distributed population. Testing was conducted at a confidence level of 0.05; from Table 4 it can be concluded that the test is normally distributed.

Table 4. Statistical Results of Normality Testing with One-Sample Kolmogorov-Smirnov Test

One-Sample Kolmogorov-Smirnov Test

			Pua sa	**Nor mal**
N			126	126
Normal Parameters[a,b]	Mean		15.67	17.79
	Std. Deviation		5.857	6.533
Most Extreme Differences	Absolute		.077	.080
	Positive		.077	.066
	Negative		-.048	-.080
Test Statistic			.077	.080
Asymp. Sig. (2-tailed)[c]			.064	.044
Monte Carlo Sig. (2-tailed)[d]	Sig.		.061	.044
	99% Confidence Interval	Lower Bound	.055	.038
		Upper Bound	.067	.049

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Source: data processed with IBM SPSS Statistics 27

Table 5 and Figure 3 in this study present information in the form of percentages of students' physical fitness measurement results on the hand-eye coordination test during fasting and normal conditions at a vocational school possessing an industrial culture learning pattern, or TICS. The measurement results state that the physical fitness conditions of 126 randomly selected students at SMK Negeri 2 Yogyakarta during fasting and normal conditions are expressed in percentage form.

Table 5. Results of Physical Fitness Measurement on the Hand-Eye Coordination Test under Fasting and Normal Conditions

Treatment	Excellent	Good	Average	Fair	Poor	Total
	>28	22–28	16–21	10–15	<9	
Puasa	2%	13%	31%	38%	15%	100
Normal	5%	22%	34%	29%	10%	100

Source: Primary Data on the Hand-Eye Coordination Test processed with Ms. Excel

Based on the testing results, during fasting and normal (non-fasting) conditions, students' physical fitness conditions generally ranged from below average (fair) to average, namely 38% and 31% (fasting), and 29% and 34% under normal or non-fasting conditions. Students' physical fitness during fasting showed the highest percentage at the fair or below-average level, namely 38%. This indicates that students' physical fitness conditions declined during fasting, consistent with the decline in students' physical performance on the test results. Furthermore, the data indicate a fairly significant increase in the physical fitness of vocational school students, reflected in the reduced percentage of 29% on the hand-eye coordination test conducted under normal or non-fasting conditions.

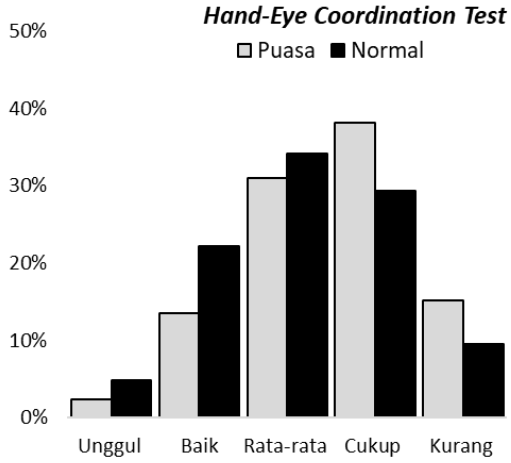


Figure 3. Results of Physical Fitness Measurement on the Hand-Eye Coordination Test under Fasting and Normal Conditions

Source: Primary Data on the Hand-Eye Coordination Test processed with Ms. Excel

SMK Negeri 2 Yogyakarta is a vocational school in the engineering field with a majority of male students, followed by female students. Details of the hand-eye coordination test results measuring students' physical fitness conditions during fasting and normal conditions are also differentiated by gender and presented in Table 6 and Figure 4.

Table 6. Results of Physical Fitness Measurement on the Hand-Eye Coordination Test According to Gender of the Student Data Sample

Gender	Treatment	Excellent >28	Good 22–28	Average 16–21	Fair 10–15	Poor <9	Total
Male	Puasa	3%	15%	33%	41%	8%	100%
	Normal	5%	18%	39%	31%	7%	100%
Female	Puasa	0%	8%	23%	27%	42%	100%
	Normal	4%	38%	15%	23%	19%	100%

Source: Primary Data on the Hand-Eye Coordination Test processed with Ms. Excel

In general, the research data indicate that male students' physical fitness ranged from the average to fair or below-average level, at 33% and 41%. Meanwhile, male students' fitness conditions under normal conditions also remained at the average to below-average (fair) level, at 39% and 31%. Nevertheless, male students' physical fitness conditions under non-fasting (normal) conditions exhibited an increasing tendency, from the fair level toward the average to excellent level, compared with during fasting. Furthermore, female students' physical fitness conditions at the vocational school possessing an industrial work culture learning pattern, or TICS, very significantly showed the highest percentage of 42% at the poor or far-below-average level and tended to be fitter under non-fasting (normal) conditions at the good level of 38%.

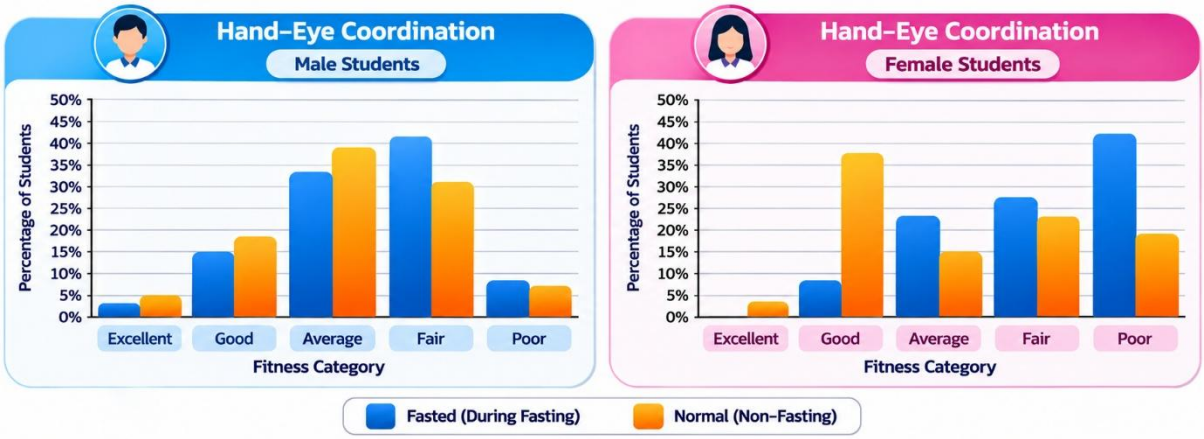


Figure 4. Results of Physical Fitness Measurement on the Hand-Eye Coordination Test According to Gender of the Student Data Sample
Source: Primary Data on the Hand-Eye Coordination Test processed with Ms. Excel

This indicates that, in general, female students' physical fitness conditions still require attention in the form of special treatment to enhance more stable physical fitness under any condition, so that they are better prepared during learning activities, field work practices, and working together with industry partners (DUDI) in the future.

Discussion

The results of hand and eye coordination testing using The Alternate Hand Wall Toss Test indicate a difference in the distribution of students' abilities between fasting and normal conditions. During fasting, the highest percentage was in the fair or below-average category at 38%, while the average category accounted for 31%. Conversely, under normal conditions, the

percentage of students in the below-average category decreased to 29%, while the average category increased to 34%, the good category to 22%, and the excellent category to 5%. This shift in distribution indicates that students' hand and eye coordination performance tended to be more optimal under normal conditions. This finding suggests that physiological conditions during fasting may be associated with students' ability to sustain performance in activities demanding movement precision, concentration, and response speed.

From a cognitive-motor perspective, hand and eye coordination is an ability involving visual stimulus reception, information processing by the nervous system, decision-making, and the execution of motor responses rapidly and accurately. In The Alternate Hand Wall Toss Test, students are required to repeatedly monitor the ball's direction, estimate its trajectory, determine responses, and coordinate hand movements precisely. Physiological conditions during fasting may potentially influence the body's readiness to sustain attention, concentration, and consistency of motor response. Thus, the increased proportion of students in the average, good, and excellent categories under normal conditions can be understood as an indication that a more stable physiological condition supports the visual, neural, and neuromuscular integration processes required to produce optimal hand and eye coordination.

Gender differences also warrant attention in explaining variations in students' hand and eye coordination achievement. Differences in body composition, hormonal characteristics, neuromuscular ability, and daily physical activity levels between male and female students may potentially influence reaction speed and motor response under both measurement conditions. However, gender cannot be positioned as the sole determining factor because coordination achievement is also influenced by sports experience, motor skills, and individual student conditions. Therefore, should differences in results between male and female students exist in this study, such differences need to be understood through the interrelationship between physiological characteristics and cognitive-motor processes in responding to changes in bodily conditions during fasting and normal conditions.

Fundamentally, the differences in students' physical fitness conditions at the two times can already be easily observed merely by visual inspection. The decline in physical performance during fasting is generally associated with dehydration, limited nutritional intake, insufficient rest, mood changes, and feelings of weakness. Based on its function, the primary purpose of the hand-eye coordination test is to measure the extent of cooperation between the eyes and hands in performing a task rapidly and accurately in response to visual stimuli (BGP Banten, 2026). The duration of fasting in a day worldwide ranges from 6 to 20 hours per day, depending on geographical location and season at the time (Prakota et al., 2025). Health experts state that the relatively long fasting duration may cause a person's eating time to be reduced and may affect nutritional adequacy, while daily activities must still be carried out unchanged.

Therefore, adequate intake of nutrients (energy, fiber, and fluids) is necessary to meet daily needs and enable the performance of activities properly (Prakota et al., 2025). The length of the fasting duration causes body fluids lost or reduced naturally by at least approximately 1% to 2% of total body weight and possibly more. A fluid deficit of merely 1% already has effects on memory decline; the greater the fluid loss, the more adverse the effects. Samodra (2020) states that research data also indicate that merely 1–2% already reduces cognitive, motor, and emotional performance. Adequate body fluid (hydration) is an important factor in optimizing

cognitive ability, emotion, and psychomotor performance. Daily hydration status is highly essential for everyone to understand, not only athletes. Other research results provide an illustration that dehydration to a level of 4% of 70% body weight is sufficient to cause a decline in achievement and performance of up to 30% (Samodra, 2020). Body fluid loss (dehydration) results in decreased power and increased fatigue and affects cardiovascular capacity. Magee et al. (2017) state that dehydration exceeding 2% will reduce body endurance. Research by experts states that dehydration is a highly important condition because at least 95% of the human brain is composed of water, 82% of water is in the blood, 75% of water is in the heart, 86% in the lungs, and approximately 83% of water is in the kidneys (Kusumawardani & Larasati, 2018).

SMK Negeri 2 Yogyakarta is a vocational school in the engineering field with a majority of male students, followed by female students. Details of the hand-eye coordination test results measuring students' physical fitness conditions during fasting and normal conditions are also differentiated by gender. In general, the research data indicate that male students' physical fitness during fasting ranged from the average to fair or below-average level, at 33% and 41%. Meanwhile, male students' fitness conditions under normal conditions also remained at the average to below-average (fair) level, at 39% and 31%. Nevertheless, male students' physical fitness conditions under non-fasting (normal) conditions exhibited an increasing tendency, from the fair level toward the average to excellent level, compared with during fasting. Furthermore, female students' physical fitness conditions at the vocational school possessing an industrial work culture learning pattern, or TICS, very significantly showed the highest percentage of 42% at the poor or far-below-average level and tended to be fitter under non-fasting (normal) conditions at the good level of 38%.

This indicates that, in general, female students' physical fitness conditions still require attention in the form of special treatment to enhance more stable physical fitness under any condition, so that they are better prepared during learning activities, field work practices, and working together with industry partners (DUDI) in the future. These results are supported by the finding that dehydration cases in Indonesia occur more frequently among adolescents such as students (48.1%) compared with adults (44.5%) (Gustam, 2012). Other dehydration research indicates that males experience dehydration more rapidly, up to 3%, compared with females (Harris et al., 2019). Based on experiments, it appears that marine mineral water is highly influential in dehydration recovery (Samodra, 2020).

Measurement on the hand and eye coordination test (using the measurement method of The Alternate Hand Wall Toss Test) was employed as a benchmark for students' health or students' performance in learning activities, identifying how efficiently physical fitness performance occurs under the two measurement conditions. Industry partners (DUDI) of SMK always hold expectations that prospective employees who are SMK graduates can work well cognitively, with full discipline and high dedication, in industrial work practices according to the TICS curriculum provided during their schooling. These expectations are always emphasized in the TICS curriculum and constitute a hope for SMK adopting industrial work culture to produce work-ready SMK students. In practice, industry sometimes expects and emphasizes that students undertaking field work practices and SMK graduates working in industry possess good work performance with reference to complying with the Standard Operating Procedures (SOP) existing in an industry or company, with minimal errors

committed. The SOP Compliance Indicators of the Teaching Factory (TEFA) include measures of discipline and work conformity to industry standards, encompassing the level of use of personal protective equipment (PPE), accuracy of production stages, effective working hours duration, zero work accidents, and conformity of final product quality (Romadin et al., 2026; Kisworo et al., 2026; Suhartatik et al., 2025; and Mangolo et al., 2025).

The establishment of this SOP also aims to create effective work flexibility within an organization, considering that employee performance is based on the level of compliance with policies or SOPs that have been established. SOPs are formulated as systematic guidelines in implementing the TEFA program, with the aim of detailing the stages of activity implementation in a directed manner, enhancing learners' practical skills, and strengthening partnership relationships between schools and industry parties (Suhartatik et al., 2025; Gultom, 2025). Physical fitness condition is a health determinant for every individual student undertaking field work practices and SMK graduates working in industry to avoid or minimize errors of SOP violation in the workplace.

From this, it may be possible to discover and identify more other SOP violations during field work practice activities or when working later. Furthermore, the expectations and hopes of DUDI regarding TICS are said to be successful and measurable from the results of students' performance or readiness being fit, indicating that the student is healthy during learning activities at school, field work practices, and in the future working period. This good practice is expected to provide benefits for schools by producing concrete and measurable data from measurements already conducted by experts. The benefits that produce data and are conveyed through scientific recommendations in a courteous manner. Through the delivery of these recommendations, it is expected that schools will formulate an ideal physical training program for all SMK students, because those possessing industrial work culture are not limited to only one or two specialized classes but are distributed evenly so that students' physical fitness is formed uniformly. Nevertheless, the practitioners of this good practice recognize that physical fitness is influenced by many factors, which give rise to other challenges.

From the recommended good practice activities, it is expected that schools can formulate physical training programs with an ideal training frequency to establish healthy and fit lifestyle habits in order to prepare superior individuals cognitively, disciplined, and possessing prime (fit) performance under any condition. The school is also expected to continue to encourage and cooperate with parents or guardians of students to supervise their children, to further motivate and instill a healthy lifestyle by independently accompanying ideal physical training at home, adequate rest, consuming healthy and balanced food and beverages, and avoiding activities that pose hazards. Students' readiness to face the world of work with physical conditions of prime performance. Thus, the arrangement of physical training programs for forming students' fitness produces students who are superior cognitively, disciplined, and fit, intended to be ready to face the industrial world of work at the local, national, multinational, or international level with discipline in fulfilling compliance with SOPs in accordance with operational regulations and production activities that are often considered highly crucial to be implemented appropriately during work.

Conclusion

This study concludes that there is a difference in the hand and eye coordination achievement of students at The Industrial Culture School (TICS) SMK Negeri 2 Yogyakarta between the condition of observing fasting and normal conditions. The average hand and eye coordination achievement during fasting was lower compared with normal conditions, with differences in achievement that also warrant attention based on students' gender characteristics. These results indicate that the fasting condition is associated with changes in students' physical achievement, particularly in activities demanding meticulousness, response speed, and hand-eye coordination. Measurement using The Alternate Hand Wall Toss Test provides a depiction of the differences in hand and eye coordination achievement under the two conditions, so that it can be used to support the evaluation of students' physical readiness in the context of learning and practical activities within the vocational school environment based on industrial work culture.

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Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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