

Improving the level of eye and hand coordination for second-level students using a modified coordination training program

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Abstract: The objective of this study was to improve the level the level of eye and hand coordination using a modified coordination training program for second-level students at primary school in Sarawak, Malaysia. The study involved 20 students (N = 20) including 10 boys and 10 girls over 11 years old. The sample involved in this study consisted of students who were found to be weak in eye and hand coordination and never represented the school in any sports. The instrument used in this study was “Hand Wall Toss” which was run on a sample twice before and after the coordination training program. The researcher provided 4 weeks coordination training program consisting of 5 types of coordination activities per session and conducted 3 sessions per week. The results showed that there was a significant difference between the pre test of Hand Wall Toss score (M = 5.70, SD = 3.95) and the post test (M = 14.35, SD = 3.34), $t(19) = -10.83$, $p = .000$. Therefore, it can be concluded that the 4-week modified coordination training program is effective in improving the level of coordination of the eyes and hands of second-level students.

Keywords: modified coordination training program, level of eye and hand coordination, second-level students, Hand Wall Toss test

I. INTRODUCTION

Coordination is one of the skills in skill-based fitness. Coordination is the ability to unite two or more types of movement into a special movement (Agung Kristriawan & Sukadiyanto, 2016). This skill is important to ensure someone's motor skills are carried out quickly, efficiently and effectively.

The researcher was directly involved with second-level students at the school because had been entrusted to teach the Physical Education subject for Year 5 and are an advisory teacher for the handball club in co-curriculum activities. While teaching Physical Education Year 5 Unit 10: Pass and Receive, it is found that some students were in performing skills of passing and receiving ball during a small game session. They are often missed when it comes to receive the ball sent by a friend and fail to properly respond. Additionally, balls sent to their friends are also inaccurate. These weaknesses can also be detected when they carry small games in handball and netball during co-curriculum activities in the afternoon. Researchers are of the opinion that second-level students unable to master basic skills and techniques in sports and games due of their weak of eye and hand coordination.

The researcher also conducted a screening test using the tests used by Dwi Aprilinato (2017), the Tennis Ball Throwing Test on the Year 5 students of 47. The results of the screening test showed that only 2 people were classified in the Very Good category, 9 in the Good category, 12 in the Moderate category while 16 in the Weak categories and the rest 8 in the Very Weak category. The results of this test further reinforced the findings of observers that the level of eye and hand coordination of pupils of the second level is moderate and weak. If this problem is not resolved it will cause a student to become inappropriate and agile while moving in search of space during the game. This is in line with Mu'ammara's (2017) finding that players with low levels of coordination will move slowly, rigidly and will have difficulty in developing some game skills.

Additionally, researches on previous studies on eye and hand coordination as conducted by Anuar Qistina (2014), Desmond (2014) and Shahrul Nizam (2013) only involve one-year students, Year 1 to Year 3. In addition, the Aznia Ismail (2014) study

conducted on 10 male subjects in a primary school also suggested that tests and interventions conducted on female subjects also be able to see the level of serviceability for women subjects and assess whether interventions which is run for one gender or both. The results of the study have attracted the attention of researchers to studying second-level students by conducting training programs that involve both student gender. This is because the weakness of coordination observed on second-level pupils is not dominant to one gender alone. Both genders show weaknesses especially in the skills of sending and welcoming the ball at the right time and often missed.

Effective training programs for games and sports need to be developed to ensure the level of student eye and hand coordination can be enhanced. Therefore, the researcher intends to conduct action studies to improve the level of eye and hand coordination of second-level students using modified coordination training program.

II. RESEARCH OBJECTIVES

There are three objectives targeted by the researchers in this study:

- i. To identify the level of eye coordination and second-hand students before undergoing modified coordination training programs.
- ii. To increase the level of eye and hand coordination of second-level students in primary schools using a modified coordination training program.
- iii. To identify whether the gender factor affects the level of eye coordination and second-hand pupils.

III. METHODOLOGY

This study is an experimental study of 'one group pre and post test' to improve the level of eye coordination and second-hand students found to be weak using a modified coordination training program. In this study, the researcher used an action research model developed by Kemmis and Mc Taggart in 1988 that has four research steps which are reflect, plan, act and observe.

This study was conducted at one of primary school in Sarawak, Malaysia. The population of the study consisted of male and female students from three classes of Year 5 consist of 82 students. The researcher uses the sampling method to select 20 samples from the population of two level students comprising 10 male and 10 female students. The purpose of the researcher to choose the equal number of sample between male sample and female sample is that the researcher wants to identify whether there is a significant difference in the mean score of the eye-hand coordination level between male and female students after conducting the modified coordination training program provided.

The researchers has provide intervention programs that use modified coordination training programs on selected sample sets. This training program is a modification of eye and hand coordination training programs conducted by Marina Tsetseli, Eleni Zetou, Vasiliki Maliou et al (2010) and training program by Nursyazwani & Ikmal Hisyam (2013). The sample will be divided into five small groups and placed at each station which are group 1 starting at station 1, group 2 at station 2, group 3 at station 3, group 4 at station 4 and group 5 at station 5. The station position weekly according to the order set by the researcher. The steps of modified coordination training program are shown in Table 1.

Table 1 Modified Coordination Training Program

Week	First	Second	Third	Fourth
Session	3 sessions per week			
Duration	4 minutes/ station	5 minutes/ station	6 minutes/ station	6 minutes/ station
Activity	Station 1: - Bounce the ball to the floor. Station 2: - Throwing the ball into the basket. Stesen 3: - Ruffle the shuttlecock use a racket. Station 4: - Dribble the ball with hands.	Station 1: - Throwing the ball into the basket. Station 2: - Ruffle the shuttlecock use a racket. Station 3: - Bounce the ball to the floor. Station 4: - Throw and catch the ball.	Station 1: - Ruffle the shuttlecock use a racket. Station 2: - Dribble the ball with hands. Station 3: - Throwing the ball into the basket.. Station 4: - Ruffle the shuttlecock use a racket.	Station 1: - Throw and catch the ball. Station 2: - Bounce the ball to the floor. Station 3: - Dribble the ball with hands. Station 4: - Throwing the ball into the basket. Station 5:

	Station 5: - Throw and catch the ball.	Station 5: - Dribble the ball with hands.	Station 5: - Bounce the ball to the floor.	- Ruffle the shuttlecock use a racket.
Remarks	First week : The "Hand Wall Toss" Pre-Test is carried out before the intervention is given. Sixth week: The "Hand Wall Toss" test was conducted on the sample.			

To obtain pre-test and post-test data in this study, the instrument used by the researcher is the "Hand Wall Toss" test. The following is a Hand Wall Toss test procedure performed on a sample of the study:

- Instrument** : *Hand Wall Toss Test*
Objective : To measure the level of the eye-hand coordination.
Sources : Tennis ball, flat and solid wall, marker tape, stopwatch, score form, 2 assistants.
Procedure
- i. The session warms up for 5 minutes.
 - ii. The sample stands behind a line placed at a distance of 1.5 meters from the wall.
 - iii. The assistant will give a 'Start' command and press the stopwatch.
 - iv. The sample begins the test by throwing the tennis ball with one hand under the arm against the wall and trying to retrieve it with the opposite hand.
 - v. The tennis ball was then thrown back to the wall and caught with one hand.
 - vi. The test is repeated over a period of 30 seconds and the number of successful shots is recorded in the score form.

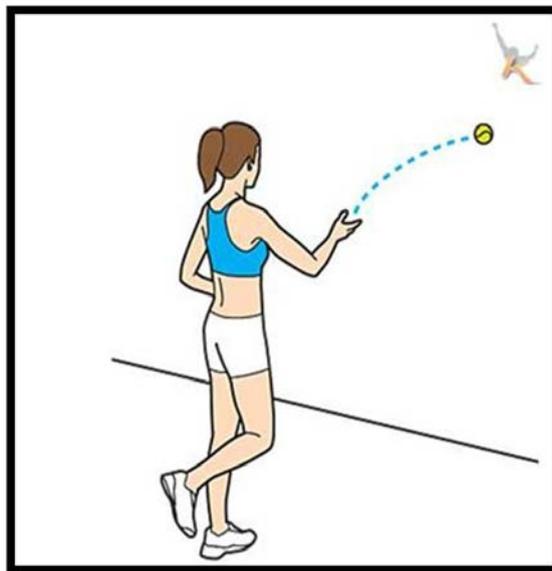


Figure 1 Hand Wall Toss practical test illustration

Then, the scores were processed using Statistical Package For Social Science (SPSS) Version 21 software to analyze the data. There are two types of analysis that researchers need through SPSS Version 21 software which are descriptive statistics analysis and inference analysis. Descriptive statistics analysis such as mean scores are used to see improvements in sample coordination level based on predefined data norms. Inference analysis, T-test was used to obtain significant differences in mean scores by gender, male and female sample for hand-eye coordination.

IV. FINDINGS

The results of the research presented in this section are to see whether the objectives of the targeted study can be achieved or not.

Level of eye and hand coordination samples before undergoing a modified coordination training program

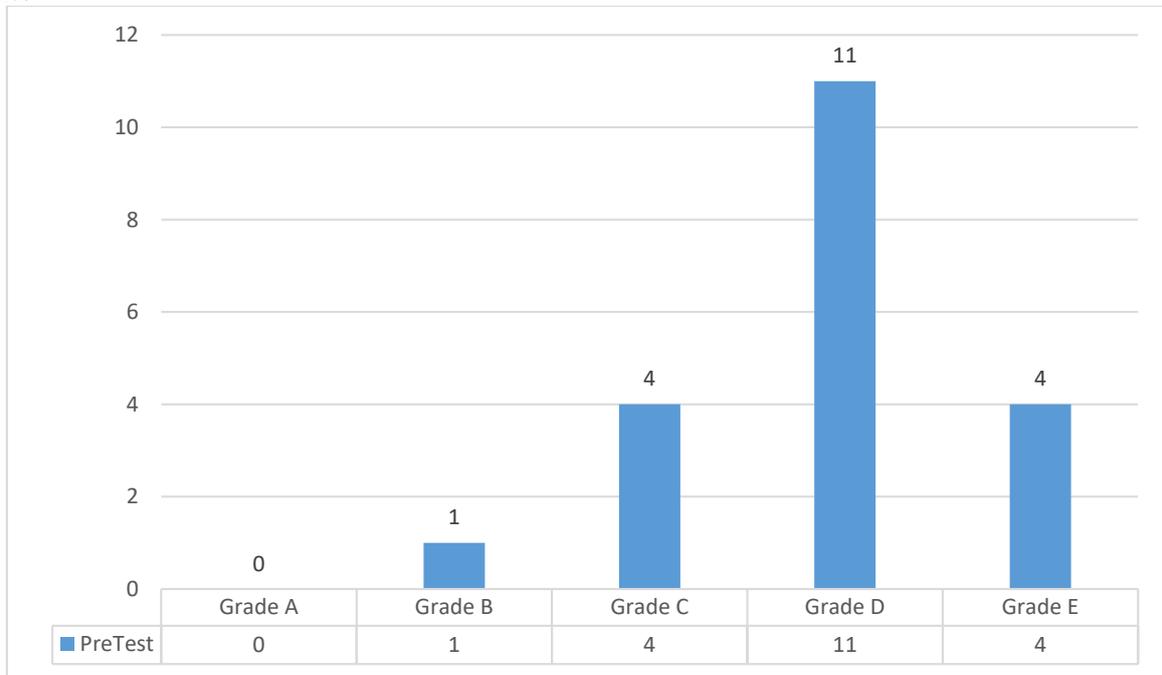


Figure 2 Grade pre test results of Hand Wall Toss

Figure 2 shows the results of pre test Hand Wall Toss. The results show that no samples obtained grade A in the pre-test of Hand Wall Toss. Only one sample is categorized in grade B while grade C and grade E have the same sample size of 4 samples. The Grade C sample was the highest number of 11 people.

Comparison of sample scores between pre and post test

The researcher used paired sample t test to see if there was a significant difference between the score mean of pre and post test after the sample undergoes a modified coordination training program.

The post-test results of Hand Wall Toss show that there are 4 samples of grade A which are Very Good category in post-test as compared to those without grade A in pre-test. Grade B, which is a Good category, increased from one sample only to the pre-test to 7 in the post-test. In addition, the Moderate category C also experienced an increase of 9 samples in the post-test compared to 4 in the pre-test. Grades D and E recorded a decrease in the number of samples, of which 11 samples received D grade and 4 received grade E to no samples received both in the post test. Figure 3 shows the grade comparison of pre and post of Hand Wall Toss test results in graph form.

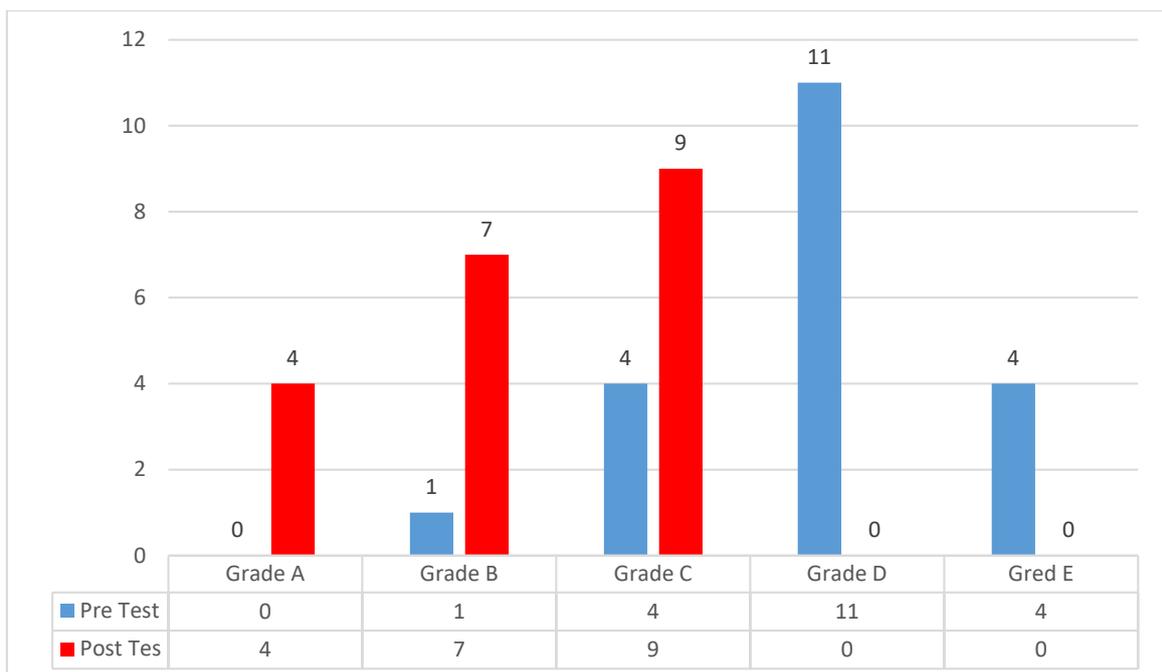


Figure 3 Comparison of pre and post test results of the Hand Wall Toss

The results of both tests were converted into standard mean and standard deviation to facilitate analysis and subsequently evaluate whether there was a significant improvement between pre- and post-Hand Wall Toss tests after the sample participates in a modified coordination training program.

Table 2 Comparison of pre and post test mean scores of Hand Wall Toss

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreTest	5.7000	20	3.94835	.88288
	PostTest	14.3500	20	3.34467	.74789

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PreTest PostTest	-8.65000	3.57292	.79893	-10.32218	-6.97782	-10.827	19	.000

Table 2 shows that the mean post-test score of the Hand Wall Toss ($M = 14.35$, $SD = 3.34$) is higher than the pre-test mean score ($M = 5.70$, $SD = 3.95$), $t(19) = -10.83$, $p = .000$. This result shows that the scores obtained in the sample are higher in the post-test of Hand Wall Toss than in the pre-test.

Pre-test and post-test scores based on gender

Researcher used independent sample t tests to compare mean scores for male and female samples to see if the mean scores between the two groups differed significantly.

Table 3 Results of the pre-test mean score analysis of Hand Wall Toss based on gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Pre Test	Male	10	7.7000	4.34741	1.37477
	Female	10	3.7000	2.26323	.71570

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre Test	Equal variances assumed	6.852	.017	2.581	18	.019	4.00000	1.54991	3.74376	7.25624
	Equal variances not assumed			2.581	13.545	.022	4.00000	1.54991	.66525	7.33475

Table 3 shows the mean scores results of the sample in the pre-test Hand Wall Toss obtained before undergoing the modified coordination training program. The results showed that $t(13.55) = 2.58$, $p = .022$ was not significant. These results indicate that there was no significant difference between pre-test scores between male samples ($M = 7.70$, $SD = 4.35$) and female samples ($M = 3.70$, $SD = 3.36$).

Table 4 Results of post-test mean score analysis of Hand Wall Toss based on gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Pre Test	Male	10	15.9000	3.21282	1.01598
	Female	10	12.8000	2.82056	.89194

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post Test	Equal variances assumed	.420	.525	2.293	18	.034	3.10000	1.35195	.25965	5.94035
	Equal variances not assumed			2.293	17.703	.034	3.10000	1.35195	.25623	5.94377

Table 4 shows the mean score results of the sample in post-test of Hand Wall Toss obtained after undergoing a modified coordination training program. The results showed that $t(18) = 2.293, p = .034$ was not significant. This result showed that there was no significant difference between the mean post-test mean scores between male samples ($M = 15.90, SD = 3.21$) and female samples ($M = 12.80, SD = 2.82$).

V. DISCUSSION

The level of eye and hand coordination of second-level students before undergoing a modified coordination training program.

Findings on the level of eye and hand coordination of second graders before undergoing the modified coordination training program can be broken down by grade and percent. In terms of grade, the findings show that no sample has grade A. For grade B, only one sample has grade B whereas grade C and grade E have the same sample size of 4 people. Grade C showed the highest number of samples at 11 people. In terms of percentages, the lowest percentages are samples with grade A of 0%. Only 5% of the samples received Grade B which is a good category. Grade C and E grade respectively accounted for 20% of the samples categorized in the simple and very weak categories. Whereas grade C averaged the highest percentage of 55% of the total sample. In conclusion, the analysis results showed that 19 out of 20 samples were categorized as moderate to weak in the pre-test prior to the modified coordination training program.

Improvement the level of eye and hand coordination of second-level students after undergoing a modified coordination training program

The researcher compared the results of the two tests, the pre and post Hand Wall Toss tests, to see if there were any significant differences between of the two tests. The results of the data analysis showed that there were 4 samples who received grade A which was in a Very Good category in the post-test compared to none of the students who had grade A in the pre-test. Grade B, which is a Good category, increased to 7 samples compared to only one in the pre-test. In addition to grade B, samples with grade C also increased to 9 compared to only 4 in the pre-test. Meanwhile, the number of samples obtained in grades D and E was reduced at the post-test. During the pre-test, 11 samples received grade D and 4 samples received grade E but there are no samples received both grades in the post-test. Figure 6 shows the grade comparison of pre and post Hand Wall Toss test results in graph form. Although overall the number of samples was higher in the post-test compared to the pre-test, it was not clear whether there was a significant increase or not between the two tests. Therefore, the researcher analyzed the two test results using paired t tests to see if there was a significant difference between pre and post tests after the sample had run a modified coordination training program. The analysis showed that the mean post-test score of the Hand Wall Toss ($M = 14.35, SD = 3.34$) was higher than the pre-test mean score ($M = 5.70, SD = 3.95$), $t(19) = -10.83, p = .000$. In conclusion, modified coordination training programs are very effective in improving the level of eye and hand coordination of second-level students in primary schools.

Level of eye and hand coordination of second-level students based on gender

To address the third objective, the researcher should look at both gender-based and pre and post test results. Researchers used independent sample t tests to compare mean scores for male and female samples to see if the mean scores between the two groups differed significantly. For the pre-test, the analysis of the test results showed that $t(13.55) = 2.58, p = .022$ was not significant. These results indicate that there was no significant difference between pre-test scores between male samples ($M = 7.70, SD = 4.35$) and female samples ($M = 3.70, SD = 3.36$). The post-test results showed that the mean score of the Hand Wall Toss obtained after undergoing the modified coordination training program was not significant at $t(18) = 2.293, p = .034$. This result showed that there was no significant difference between the post-test mean scores between male samples ($M = 15.90, SD = 3.21$)

and female samples ($M = 12.80$, $SD = 2.82$). In conclusion, the result of the study was showed that gender did not influence the level of eye and hand coordination before and after the modified coordination training program.

VI. CONCLUSION

Based on the results of the data analysis and discussion above, all three research objectives targeted at the beginning of the study were successfully achieved. Researcher have found that the level of coordination of second-levels students is at a moderate, weak and very low level before undergoing the modified coordination training program. The 4-week modified coordination training program consisting of five types of coordination activities conducted 3 sessions a week clearly showed an increase in the level of eye and hand coordination in second-level primary school students . In fact, the number of students who received grades A, grade B and grade C increased while none of them received grades D and E in the post-test. The results of the study also indicate that the level of eye and hand coordination between male and female students did not significantly differ between pre and post test. In conclusion, the modified coordination training program is an appropriate intervention program to improve the eye and hand coordination of second-level primary school students and it is also suitable for coaches to use in a variety of games, especially involving eye and hand coordination.

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