

The Effect of Using Both Immediate and Delayed Feedback on Learning the Passing Skill in Basketball: A Field Study on Male Middle School Students (12–14 years old) in Bougardoun Yamina, Fkirina, Oum El Bouaghi

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Abstract---This study investigated the effect of providing immediate and delayed feedback on the acquisition of passing skills in basketball among middle school students aged 12 to 14. The researchers employed an experimental method suitable for the nature of the study, utilising a control group and two experimental groups. The study included 27 students, who were divided equally into three groups. A skill test was used to collect data. The researchers found statistically significant differences in the pre-test and post-test measurements for learning the passing skill, favouring the post-test. They also concluded that the group that received immediate feedback achieved the highest level of motor learning of the passing skill in basketball.

Keywords---immediate feedback, delayed feedback, passing, basketball.

1. Introduction and study problem

Learning and teaching are central issues of concern for researchers and specialists as they are fundamental to establishing civilisations and advancing nations and their leadership. They are also essential for the development of individuals in all fields. In light of today's scientific development and technological progress, the field of learning and teaching has benefited from advanced research and experiments utilising contemporary scientific findings, including new tools, technologies, ideas and theories. These contributions have enhanced the effectiveness of the educational process, elevating it to

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distinguished levels and achieving the high efficiency required by modern educational work while aligning with pedagogical needs.

One type of learning is motor learning. Rossi (2014) indicates that this category of learning holds significant importance in human life. Humans learn the movements necessary to meet their daily needs and adapt to life's changes. These motor skills are fundamental to building physical competence and the ability to interact appropriately with one's environment. 'Motor learning is a scientific field concerned with studying how individuals acquire and modify movement, and with identifying the principles and foundations that should be considered when teaching or correcting sports skills. This facilitates the speed of learning' (Talha Hossam al-Din et al., 2006, p. 8). Interest in this type of learning has recently increased, as it is linked to the practice of sports, which has now become a highly competitive field of global interest and popularity. This specialisation receives substantial funding and resources, placing it at the highest level.

One of the most important and well-known sports worldwide is basketball, which 'has taken its prestigious place in the Olympic Games and other global events after being merely a recreational game' (Al-Omrani, 2017, p. 5). It is now practised worldwide by diverse social groups, whether for entertainment or competition.

One notable aspect of basketball in Algeria is its prominent role in physical education classes, particularly in middle schools affiliated with the Ministry of Education. Basketball is considered one of the most important team sports practised in these institutions. Therefore, physical education teachers prioritise this activity, aiming to teach the sport, including its rules and the necessary motor skills for its proper practice. This education is appropriately tailored for students at this stage, taking into account various factors to help them learn as effectively as possible.

Feedback is one of the main factors in the motor learning process. Al-Dulaimi (2016, p. 95) states that 'some emphasise that types of learning, especially motor skills, cannot be acquired without knowing the results, or what is called feedback'. Baqi (2010, p. 161) also asserts that feedback is crucial in monitoring, controlling and adjusting the teaching and learning process.

Based on the above, the focus of this study is on teaching fundamental basketball skills to 12- to 14-year-olds using feedback. We focused on the passing skill and selected two types of feedback: immediate and delayed. Based on this, we posed the following research question:

1.2 General question:

Does using both immediate and delayed feedback affect learning the passing skill in basketball?

1.3 Sub-questions:

- Are there statistically and practically significant differences at the 0.05 significance level between the pre-test and post-test measurements for learning the passing skill among the groups under study?
- Are there statistically and practically significant differences at the 0.05 significance level in the post-test measurements for learning the passing skill among the groups under study?

2. Hypotheses:

We formulated the following hypotheses as an initial solution to the study problem:

2-1 Main hypothesis:

Using both immediate and delayed feedback affects learning the passing skill in basketball.

2-2 Sub-hypotheses:

- There are statistically and practically significant differences at the 0.05 significance level between the pre-test and post-test measurements when learning the passing skill, favouring the post-test measurement.
- There are statistically and practically significant differences at the 0.05 significance level in post-test scores for learning the passing skill among the groups under study, favouring the immediate feedback group.

3. Importance of the research:

This study is important because it seeks to understand the effect of immediate and delayed feedback on motor learning in basketball. It seeks to delve deeper into the motor learning process in basketball among middle school students, for whom basketball is one of the most important school activities. The study focuses on passing, which is considered one of the most fundamental skills in basketball. The study aims to determine whether immediate or delayed feedback has the greatest impact on learning the passing skill.

4. Research objectives:

The objectives of this research can be summarised as follows:

- To contribute to the field of feedback and motor learning in a scientific way.
- Gaining a deeper understanding of the role of feedback in motor learning processes.
- To discover the effect of providing immediate and delayed feedback when learning the passing skill.
- To produce research findings that will make the process of learning motor skills in basketball more effective.

5. Concepts and terminology of the study:

5.1 Feedback:

Definition: 'All information that a learner can obtain from various sources (internal, external, or both) before, during, or after the task to modify behaviour or achieve the desired response' (Ahmed, 2006, p. 19). (Ahmed, 2006, p. 19).

Operational definition: 'All guidance, instructions and information provided to individuals under study regarding learning the passing skill in basketball.'

5.2 Immediate feedback:

'Providing information to the player or learner about the outcome of each response immediately after it occurs.' It is directly connected to and follows the observed behaviour, supplying the learner with the necessary information, guidance or directions to reinforce, develop or correct the behaviour (Naheda Abdul Zaid Al-Dulaimi, 2016, pp. 103–104). (Naheda Abdul Zaid Al-Dulaimi, 2016, pp. 103–104).

'Immediate feedback is directly connected to and follows the observed behaviour, providing the learner with the necessary information, guidance or directions to reinforce, develop or correct it.' (Al-Arnousi, 2016, p. 342).

5.3 Delayed feedback:

Al-Arnousi (2016, p. 342) defines this as 'feedback given to the learner after a period of time has passed since the task or performance was completed'. This duration may vary depending on the circumstances.' It is also defined as 'providing information to the learner about the outcome of their response after a certain period of time has passed since completing the task or performance'. This period may be long or short depending on the circumstances (Naheda Abdul Zaid Al-Dulaimi, 2016, p. 104). (Naheda Abdul Zaid Al-Dulaimi, 2016, p. 104).

5.4 Learning:

Herbert Clausmier defines learning as 'a change in behaviour resulting from experience, certain types of activity, training or similar processes'. Learning due to pathological conditions or as a result of drug use is not considered learning' (Ibrahim, 2014, p. 20). (Ibrahim, 2014, p. 20).

5.5 Motor Learning:

Definition: Schmidt (1988) describes motor learning as 'a set of processes related to practice and experience that lead to relatively permanent changes in the ability to perform a motor skill' (Talha Hossam al-Din et al., 2006, p. 19). (Talha Hossam al-Din et al., 2006, p. 19).

Operational definition: it is the change in behaviour observed in individuals under study as they acquire a skill, characterised by its relative stability.

5.6 Basketball:

Basketball is a highly popular team sport played between two teams of five players. Each team's objective is to score in the opponent's basket while preventing the other team from scoring. (Amjad Muhammad Al-Atoom et al., 2012, p. 15).

5.7 Passing:

Passing is a means of transferring the ball between players. Most passes are accompanied by a step forward to increase their strength, followed by a hand movement to ensure accuracy. (Abd Rabbo, 2010, p. 35).

6. Previous and Similar Studies:

6.1 Study by Mustafa Salah al-Din and Samer Mansour Jamil (2018) — Article

Study topic: The effect of immediate (direct) and delayed final feedback on learning freestyle swimming movements among beginner students.

Objective of the study: This study aimed to investigate the effect of delayed and immediate final feedback on the level of learning of freestyle swimming movements in the research sample, and to determine which type of feedback (delayed or immediate final) has a greater impact on learning freestyle swimming movements.

Methodology: The researchers employed an experimental method in this study.

The study was conducted on a sample of 16 students, who were divided into two groups for the purpose of the study. The first experimental group was taught using immediate final feedback, while the second experimental group was taught using delayed feedback after several repetitions.

- Study results: The results showed the following:

- Both immediate and delayed feedback positively impacted the learning of freestyle swimming movements.
- Immediate feedback was more effective than delayed feedback in the first group in the post-tests.
- Immediate feedback was more effective than delayed feedback for beginners learning freestyle swimming movements.

6.2 Study by Muqaddad Tarwana (2019) – article

Study topic: The effect of immediate and delayed feedback on breaststroke performance improvement.

Objective of the study: This study aimed to investigate the effect of using immediate and delayed feedback on improving performance in some fundamental breaststroke skills.

Methodology: The researcher employed an experimental method.

The study sample consisted of 30 students, who were divided into two groups of 15. The first group received immediate feedback, while the second group received delayed feedback.

- Study results: The researcher concluded the following:

- There were statistically significant differences between the pre-test and post-test measurements, favouring the post-test for both groups.
- There were statistically significant differences in the post-test results between the two groups, favouring the group that received immediate feedback in terms of arm movement performance.
- There were no statistically significant differences between the two groups regarding leg kick performance.

6.3 Commentary on Previous and Similar Studies:

Previous and similar studies serve as a helpful model for researchers in their work. They also help researchers to formulate a scientifically sound plan and organise the stages, steps and procedures of the research to achieve the specified objectives. From these studies, we can conclude the following:

- Both studies focused on the process of learning motor skills.
- Both studies employed the experimental method.
- Both studies applied delayed and immediate feedback.

Regarding the benefits to the researchers, we summarise them as follows:

- Selection of an appropriate research methodology.
- Organisation of research stages.
- Structuring fieldwork.
- Determining statistical methods compatible with the study hypotheses and research sample.
- Defining how to present the data and results, and the analysis method.

7. Methodological procedures followed:

7.1 Research method:

The experimental method was used for this study because it was suitable for the research topic.

7.2 Population and sample of the study:

N'Da (2015) indicates that the population to be studied by the researcher is the target community. The research population comprised male students (aged 12–14 years) from Bougardoun Yamina Middle School, defined as 'all elements of the phenomenon studied by the researcher, including all individuals, persons or objects that constitute the subject of the research problem' (Salman Akab Al-Janabi & Haidar Naji Al-Shawi, 2015, p. 29). The study sample consisted of 27 students, who were randomly selected and divided into three groups: nine individuals in the control group using the traditional method; nine individuals in the first experimental group using immediate feedback; and nine individuals in the second experimental group using delayed feedback.

7.3 Controlling research variables:

- Independent variables:
 - Immediate feedback.
 - Delayed feedback.
- Dependent variable:
 - The passing skill in basketball.

7.4 Defining the scope of the research:

- Temporal scope: year 2024.
- Spatial scope: the sports complex.

7.5 Exploratory study:

The exploratory study for this research included several procedures aimed at assessing the suitability of the sports complex for conducting the study. These procedures included:

- Assessing the condition of the court and identifying the resources available at the complex.
- Communicating with the complex's management to gather necessary data on conducting the study and determining the appropriate timing for the work.
- Identifying potential difficulties that could hinder fieldwork.
- Working with a group of nine students to test the reliability of the test, which was later excluded from the main study sample.

7.6 Study tools:

Sources and references.

- Data collection form.
- Observation.
- Tests.

7.7 Description of the test used:

Fast Passing:

A line is drawn parallel to the wall at a distance of 1.5 metres. The player stands behind this line with the ball. They then pass the ball 15 times quickly and powerfully to the wall using a chest pass with both hands.

- Recording:

The player counts the seconds between receiving the start signal and the ball touching the wall on the fifteenth pass. If the player takes more than one step forward to receive the ball that rebounds off the wall, the entire test must be repeated. (Salama, 2013, p. 167). According to Salama (2013), this test is considered the second part of the Nox test.

7.8 Scientific Foundations of the Test:

7.8.1 Validity of the test:

To ensure the test's validity and suitability for addressing the research hypotheses, it was presented to several professors from the Institute of Sciences and Techniques of Physical Activities and Sports. They confirmed its validity and suitability.

7.8.2 Reliability of the test: Reliability of the test:

The test-retest method was used to verify the test's reliability. This was conducted on a sample of nine individuals from the study population and outside of it. The interval between the first and second tests was seven days, after which the Pearson correlation coefficient was calculated.

Table 1 shows the Pearson correlation coefficient between the first and second applications of the test.

Test	First application		Second Application		Correlation coefficient value	P-value	Statistical significance
	Mean	Standard Deviation	Mean	Standard Deviation			
Passing speed	21.89	2.42	21.44	2.24	0.747	0.021	significant

As can be seen from Table 1, the mean score for the first application was 21.89, compared to 21.44 for the second application. The respective standard deviations were 2.42 and 2.24. The correlation coefficient between the first and second applications was 0.747, and the p-value was 0.021, which is less than 0.05, indicating the reliability of this test.

7.8.3 Objectivity of the test:

The test used in the study was presented to a group of specialist professors, who reviewed it and confirmed its objectivity and lack of bias.

7.8 Statistical methods:

- Mean
- Standard Deviation
- Pearson correlation coefficient
- T-test
- One-way ANOVA

Scheffé's test for post-hoc comparisons

Effect size (Cohen's d and η^2)

Note: SPSS v25 and Jamovi v2.7.9 were used for statistical processing.

8. The educational programme used for the three groups:

The programme consists of 12 instructional units, with three units delivered per week and each unit lasting 50 minutes. The instructional unit is divided as follows:

- Preparation Phase: 10 minutes

Includes physical and psychological preparation.

Explaining the objectives of the session.

- Performing general and specific warm-up exercises in preparation for the activity.

Main Phase: 30 minutes

This phase involves implementing the educational activities chosen to achieve the objectives of the session.

- Closing Phase: 10 minutes

This includes light cool-down exercises and returning to a normal state.

Purposeful discussion.

9. Scientific foundations of the programme:

Accurately defining objectives.

Designing instructional units that are suitable for students' characteristics and appropriate for their developmental stage.

Progressing from simple to complex and from general to specific.

- Considering safety and security principles during the session.
- Diversifying situations and exercises.

Taking into account the students' physical and skill levels.

Utilising all available resources that support the educational programme.

- Allocating sufficient time for each educational activity.
- Considering individual differences among students.
- Providing appropriate recovery intervals.

Utilise data from the exploratory study to inform the programme's development.

10. Equivalence between study groups:

10.1 Shapiro–Wilk test for normal distribution of data across the three groups for height, weight, age and pre-test.

10.1.1 Normal distribution of control group data:

Table 2 shows the results of the Shapiro–Wilk test for the normal distribution of the control group's data.

Variables	Mean	Standard deviation	Level of significance	P-value	Statistical significance
Height	1.53	0.07	0.05	0.652	Not significant
Weight	46.94	5.41	0.05	0.400	Not significant
Age	12.77	0.75	0.05	0.180	Not significant
Pre-test	22.14	1.79	0.05	0.77	Not significant

Table 2 shows that the p-values for height, weight, age and pre-test are 0.652, 0.400, 0.180 and 0.77 respectively; all are greater than the 0.05 significance level. This indicates that the data for these three variables follow a normal distribution.

10.1.2 Normal distribution of immediate feedback group data:

Table 3 shows the results of the Shapiro–Wilk test for the normal distribution of the immediate feedback group data

Variables	Mean	Standard deviation	Level of significance	P-value	Statistical significance
Height	1.52	0.10	0.05	0.121	Not significant
Weight	44.12	4.99	0.05	0.414	Not significant
Age	13.33	0.43	0.05	0.132	Not significant
Pre-test	24.14	2.27	0.05	0.146	Not significant

The p-values for height, weight, age and the pre-test are 0.121, 0.414, 0.132 and 0.146 respectively. All of these values are greater than the significance level of 0.05, indicating that the data for the three variables follow a normal distribution. This means that the data for the three variables follow a normal distribution.

10.1.3 Normal distribution of delayed feedback group data: Table 4 shows the results of the Shapiro–Wilk test for the normal distribution of the delayed feedback group data.

Table 4 shows the results of the Shapiro–Wilk test for the normal distribution of the delayed feedback group data

Variables	Mean	Standard deviation	Level of significance	P-value	Statistical significance
Height	1.55	0.23	0.05	0.250	Not significant
Weight	44.45	6.39	0.05	0.504	Not significant
Age	13.00	1.13	0.05	0.830	Not significant
Pre-test	21.74	2.22	0.05	0.210	Not significant

Table 4 shows that the p-values for height, weight, age and the pre-test are 0.250, 0.504, 0.830 and 0.210 respectively. All of these values are greater than the significance level of 0.05, indicating that the data for these three variables follow a normal distribution. This indicates that the data for the three variables follow a normal distribution.

10.2 Homogeneity between study groups:

Table 5 presents the results of Levene's test for homogeneity of variance among the study groups for height, weight, age and post-test scores

	Variable	Levene's statistic	Degrees of freedom 1	Degrees of freedom 2	P-value
According to the mean	Height	0.547	2	24	0.586
According to the median	Height	0.533	2	24	0.594
According to the mean	Weight	0.088	2	24	0.916
According to the median	Weight	0.022	2	24	0.978

	Variable	Levene's statistic	Degrees of freedom 1	Degrees of freedom 2	P-value
According to the mean	Age	2.055	2	24	0.150
According to the median	Age	1.440	2	24	0.257
According to the mean	Pre-test	0.788	2	24	0.466
According to the median	Pre-test	0.243	2	24	0.786

Table 5 presents the results of Levene's test for homogeneity of variance among the study groups for height, weight, age and post-tests. It notes that the p-values for all these variables are greater than the significance level of 0.05. Thus, there is homogeneity among the three groups in terms of height, weight and age for the post-tests.

10.3 One-way ANOVA to determine the significance of differences between groups in height, weight, age and pre-test:

Table 6 shows the results of the one-way ANOVA for equivalence among the groups in terms of height, weight, age and pre-measurements

Variables	Source of variance	Degrees of freedom	F-value	P-value	Statistical significance
Height	Between groups	2	0.947	0.402	Not significant
Weight	Within groups	24	0.716	0.499	Not significant
Age	Between groups	2	1.865	0.177	Not significant
Pre-measurement	Within groups	24	3.337	0.053	Not significant

Table 6 shows the results of the one-way ANOVA test for equivalence among the groups in terms of height, weight, age and pre-measurements. The p-values for all these variables are greater than the significance level of 0.05, indicating that the three groups are equivalent in terms of height, weight and age for the post-tests.

11. Analysis of Results and Discussion:

11.1 Presentation and analysis of the first hypothesis results:

This hypothesis states that there are statistically and practically significant differences at the 0.05 significance level between the pre-test and post-test measurements of the passing skill among the groups under study, favouring the post-test measurement.

To test this hypothesis, a paired-sample t-test was used. However, it was first necessary to confirm the normal distribution and homogeneity of variance of the post-test data.

11.1.1 Normal Distribution of the Three Groups' Data in the Post-Test:

Table 7 shows the results of the Shapiro–Wilk test for the normal distribution of the three groups' post-test data

Group	Degree	Mean	Standard Deviation	Level of Significance	P-Value	Statistical significance
Control Group	Second	20.34	1.49	0.05	0.252	Not significant
Immediate Group	Second	15.44	1.90	0.05	0.915	Not significant
Delayed Group	Second	17.33	2.14	0.05	0.113	Not significant

The table presents the results of the Shapiro–Wilk test for the normal distribution of the three groups' post-test data. It notes that the p-values for the three groups are 0.252, 0.915 and 0.113 respectively, all

of which are greater than the significance level of 0.05. This indicates that the data for the three groups in the post-test follow a normal distribution.

11.1.2 Homogeneity among study groups in the post-test data:

Table 8 shows the results of Levene's test for homogeneity of variance among the study groups for height, weight and age in the post-test

	Variable	Levene's statistic	Degrees of freedom 1	Degrees of freedom 2	P-value
According to the mean	Post-test	0.068	2	24	0.935
According to the median	Post-test	0.122	2	24	0.885

Table 8 shows the results of Levene's test for homogeneity of variance among the study groups in the post-tests. It should be noted that the p-value is 0.935 based on the mean and 0.885 based on the median. As these values are greater than the significance level of 0.05, this indicates homogeneity among the three groups in the post-tests.

11.1.3 Paired Sample t-Test for Significance of Differences Between Pre-Test and Post-Test Measurements for Study Groups:

Table 9 presents the results of the paired sample t-test for the significance of the differences between the pre-test and post-test measurements for the study groups

Group	Mean of pre-measurement	Mean of post-measurement	P-value	Level of significance	Significance
Control Group	22.14	20.23	0.013	0.05	Significance
Immediate Group	24.14	15.44	0.000		
- Delayed Group	21.74	17.33	0.000		

From Table 9, we can see that the mean for the control group in the pre-test was 22.14, compared to 20.33 in the post-test. For the immediate feedback group, the means were 24.14 and 15.44 for the pre-test and post-test, respectively, while for the delayed feedback group, the means were 21.74 and 17.33. The p-values for the three groups are also noted in the same table: 0.013, 0.000 and 0.000 respectively. All of these values are less than the significance level of 0.05, indicating that the differences between the pre-test and post-test measurements for the three groups are statistically significant.

11.1.4 Confidence intervals and effect size for the results of the t-test among study groups:

Table 10 shows the confidence intervals and effect size for the t-test among the study groups

Comparison	Difference between means	Degrees of freedom	Confidence interval for the difference (95%)	Effect size (Cohen's d)	Confidence interval for effect size (95%)
Pre and post/control	1.91	8	[0.518 – 3.31]	1.05	[1.86 – 0.207]
- Pre and post/immediate	8.70	8	[6.43 – 10.96]	2.95	[4.50 – 1.38]
- Pre and post/delayed	4.41	8	[3.34 – 5.48]	3.18	[4.83 – 1.51]

The researchers relied on effect size standards as established by Cohen (1988), where values of $d = 0.20$, 0.50 , and 0.80 indicate small, medium, and large effects, respectively. From Table 10, it is observed that all comparisons between the pre-test and post-test across all groups showed significant large effects, with effect size values ranging from 1.05 to 3.18, exceeding $d = 0.80$. These values indicate that the changes observed between the pre-test and post-test were not merely statistical differences but represented a clear practical effect of the educational program, as well as the use of immediate and delayed feedback on the study groups.

Additionally, all confidence intervals showed that they did not include the value 0, which reinforces the reliability of the results and confirms that the positive effect is not due to chance.

From the above, we can conclude that there are statistically and practically significant differences at the 0.05 significance level between the pre-test and post-test results for learning the passing skill among the groups under study, favouring the post-test results. The confidence intervals indicate that these differences are real and not due to chance. The large effect sizes suggest that these differences are not just statistical, but also have clear practical significance. Thus, the first hypothesis is confirmed.

11.2 Discussion of the Results of the First Hypothesis:

As can be seen from Table 9, there are statistically and practically significant differences at the 0.05 significance level between the pre-test and post-test in learning the passing skill among the groups under study, favouring the post-test.

The researchers believe this is due to the effectiveness of the traditional method, as well as the immediate and delayed feedback when learning motor skills. The control group, which utilised the educational programme through the traditional method, showed improvement due to the educational programme that was designed based on scientific standards and principles. It was not created randomly, but carefully constructed with scientific principles in mind. The educational situations were precisely selected to serve the objectives of each session, while considering the age and maturity level of the students. Teaching basic skills is challenging and requires consideration of multiple factors. In this regard, Atoum et al. (2012, p. 126) state that 'the stage of teaching basic skills is one of the most difficult stages in teaching the game to beginners, due to the absence of competitive and exciting elements characteristic of the game during the teaching phase'.

The improvement observed in the two experimental groups indicates the positive impact of immediate and delayed feedback on the motor learning process. This aligns with the findings of Mustafa Salahuddin and Samer Mansour Jamil (2018), who found that immediate and delayed feedback positively affects the learning of freestyle swimming movements. It also corroborates the findings of Muqaddam Tarawneh (2019), who revealed significant differences in favour of the post-test between the pre-test and post-test for both the immediate and delayed feedback groups. The researchers attribute this to the critical importance of feedback. In this context, Al-Arnousi (2016) notes that this importance arises from its use in improving and modifying behaviour to achieve better outcomes, as well as its role in enhancing motivation to learn by providing learners with support, thereby eliminating incorrect responses and reinforcing correct ones. This is also supported by Marwan Abdul Majid Ibrahim's statement: 'Through feedback, students' ability to focus their senses and attempt to perceive and reach what is required through observation, listening and thinking increases' (Ibrahim, 2002, p. 231). This helps them to constrain their responses according to criteria derived from feedback.

11.3 Presentation and Analysis of the Results of the Second Hypothesis:

This hypothesis posits that there are statistically and practically significant differences at the 0.05 significance level in the post-test measurements between the groups under study when learning the passing skill, favouring the immediate feedback group.

11.3 Presentation and analysis of the results of the second hypothesis

This hypothesis posits that there are statistically and practically significant differences at the 0.05 significance level in the post-test measurements between the groups under study in learning the passing skill, favouring the immediate feedback group.

11.3.1 One-way ANOVA to determine the significance of differences in post-test measurements between the study groups

Table 11 presents the results of the one-way ANOVA for the significance of differences in post-test measurements among the study groups.

Source of variance	Degrees of freedom	F-value	Probability value	Statistical significance	Impact size η^2	Effect size
Between groups	2	25.33	0.000	Significance	0.68	Large
- Within groups	24					

Degrees of freedom, F-value, p-value, statistical significance, effect size (η^2)

Table 11 shows the results of the one-way ANOVA test for significance in the differences between the study groups' post-test measurements. It reveals that the calculated F-value is 25.33, with a p-value of 0.000. As the p-value is less than 0.05, this suggests that there are statistically significant differences between the groups in terms of passing the test.

The same table also illustrates the effect size and type of effect, which are interpreted according to the criteria provided by Cohen (1988). Values of η^2 are categorised based on the derived F-value: $\eta^2 = 0.01$ represents a small effect; $\eta^2 = 0.06$, a medium effect; and $\eta^2 = 0.14$, a large effect. With an effect size of $\eta^2 = 0.68$, these differences are not merely statistical, but also of practical importance and real impact in the applied field.

To identify the locations of the differences, the researchers used Scheffé's test for post hoc comparisons between means; Table 12 illustrates these.

Comparison groups	Difference Between Means	Level of Significance	P-Value	Confidence Intervals (95%)	Effect Size (Cohen's d)	Type of Effect
Immediate – Control	4.903-	0.05	0.000	[-6.72, -3.09]	3.26	Large
Immediate – Delayed	1.888-	0.05	0.040	[-4.83, -1.20]	2.00	Large
Delayed; Control	3.014-	0.05	0.001	[-3.70, -0.08]	1.26	Large

Table 12 shows that the difference in means between the immediate feedback group and the control group was -4.903, with a p-value of 0.000. As the p-value is less than 0.05, this suggests that there are statistically significant differences between the two groups in the post-test for the passing skill, favouring the immediate feedback group. The 95% confidence interval is [-6.72, -3.09], indicating that the difference between the two groups is not due to chance and that the true difference in the statistical population lies within this range. The effect size is very large at Cohen's d = 3.26, reflecting the strong and effective impact of immediate feedback.

In the second comparison, the difference between the means of the immediate feedback group and the delayed feedback group was -1.888 with a p-value of 0.040. Since the p-value is less than 0.05, this indicates that there are statistically significant differences between the immediate feedback group and

the delayed feedback group in the post-test for the passing skill, favoring the immediate feedback group, with a 95% confidence interval of [-4.83, -1.20], showing that the difference between the two groups is not due to chance and that the true difference in the statistical population lies within this range. The effect size is large at $d = 2$, indicating a significant and effective impact of immediate feedback compared to delayed feedback.

In the third comparison, the difference in means between the delayed feedback group and the control group was -3.014, with a p-value of 0.001. As the p-value is less than 0.05, this suggests that there are statistically significant differences between the two groups in the post-test for the passing skill, favouring the delayed feedback group. The confidence interval is [-3.70, -0.08], which indicates that the difference between the two groups is not due to chance and that the true difference in the statistical population lies within this range. The effect size is also large, at $d = 1.26$, reflecting the significant impact of delayed feedback.

Based on these results, it is clear that immediate feedback is more effective than delayed feedback in improving performance, and that both are more effective than no feedback at all. It should be noted that the reduction in time reflects an improvement in performance.

We conclude that there are statistically and practically significant differences at the 0.05 significance level in the post-test measurements among the study groups for learning the passing skill, favouring the immediate feedback group. The confidence intervals indicate that these differences are real and not due to chance. The large effect sizes demonstrate that these differences are not only statistical, but also have clear practical and applied significance. Thus, the second hypothesis is confirmed.

11.3.2 Scheffé's test for post-hoc comparisons to determine the locations and significance of differences in the post-test among study groups, along with confidence intervals and effect sizes:

Table 12 presents the results of Scheffé's test for post hoc comparisons between groups in the post-test, along with confidence intervals and effect sizes.

11.4 Discussion of the Results of the Second Hypothesis:

From the analysis of the results in Table 6, the following is evident:

There are statistically and practically significant differences between the immediate feedback group and the control group in the post-test for the passing skill, favoring the immediate feedback group, with a large effect size. The researchers attribute this to the strong impact that immediate feedback has on learning motor skills, as it ensures continuous interaction between the teacher and the learner and helps frame motor behavior to align with the desired goals. Immediate feedback provides direct and rapid information and guidance about performance, allowing for a comparison between what the learner has achieved and the ideal performance, which is often lacking in traditional methods. The magnitude of the difference in motor learning between the two groups indicates that the absence or lack of feedback limits the level of progress in the motor learning process and the effectiveness of that process. In this regard, Ibrahim (2014) notes that feedback is considered a key to effective learning, and research has shown that one of the most significant factors that weaken the learning process is the absence of feedback.

Statistically and practically significant differences were found between the immediate and delayed feedback groups in the post-test for the passing skill, favouring the immediate feedback group with a large effect size. Clearly, the immediate feedback group outperformed the delayed feedback group. This aligns with the findings of Mustafa Salahuddin and Samer Mansour Jamil (2018), who found that immediate feedback is more effective than delayed feedback for beginners learning freestyle swimming movements. This is also consistent with a result found by Tarawneh (2019), who confirmed statistically

significant differences in the post-test between the two groups, favouring the immediate feedback group in terms of arm movement performance.

The researchers attribute the superiority of immediate feedback over delayed feedback to the immediate observations, information, and guidance provided after the motor performance, which helps in quickly modifying behavior. Immediate feedback addresses incorrect behaviors following each response performed by the learner, enabling rapid correction of errors. Baqi (2010) indicates that immediate feedback provides information about the correctness or error of the response immediately after the motor response. Additionally, immediate feedback helps capture the learner's attention by continuously supplying information and guidance related to performance. Muhammad (2009) notes that immediate feedback provides the student with the results of all their responses as soon as they occur, fostering continuous interaction between the teacher and the learner, thereby increasing the likelihood of performance improvement compared to delayed feedback, which may affect the quality of the observations made and the accuracy of the information provided.

Statistically and practically significant differences were found between the delayed feedback group and the control group in the post-test for the passing skill, favouring the delayed feedback group with a large effect size. This is attributed to the effective use of feedback in the motor learning process, which is structured and thoughtful, providing clear and organised information related to performance. The guidance and observations offered to learners are precise and relevant to their performance. They are carefully selected to help learners achieve the desired level of motor performance and modify their motor responses to align with the target motor model. Feedback helps learners integrate into various educational contexts due to its ability to control and modify motor responses in the desired direction while maintaining ongoing interaction. In this regard, Al-Arnousi (2016) emphasises that feedback significantly contributes to learners' integration into different educational situations and enhances the effectiveness of the learning process.

12. Conclusions and recommendations:

12.1 Conclusions:

The results demonstrated that immediate feedback was the most effective in developing the passing skill in basketball among middle school students (aged 12–14), achieving the highest improvement rate compared to other groups.

Delayed feedback also contributes to the development of passing skills, albeit to a lesser extent than immediate feedback.

- Feedback in general helps to reinforce the acquisition of motor skills and improve performance levels compared to traditional educational programmes.
- A programme lacking a specific feedback style leads to limited improvement and the lowest progress rate.
- The experiment showed that students aged 12–14 respond strongly to immediate feedback, making it the optimal teaching method for motor skills.

The use of feedback increases interaction between teachers and learners, thereby enhancing the effectiveness of the educational process.

Selecting appropriate guidance and observations, and timing their delivery, is key to learning motor skills.

- The results highlight the importance of prioritising information and instructions to ensure an optimal impact on the learning of motor skills.

Immediate feedback is deemed more suitable for teaching the passing skill in basketball to this age group.

Recommendations:

Emphasise careful monitoring of motor performance to identify strengths and weaknesses, followed by appropriate action.

- Provide feedback in a constructive and motivating manner that encourages learners to exert more effort and continually improve their performance level.
- Prioritise immediate feedback when teaching motor skills to 12- to 14-year-olds, given its high effectiveness at this developmental stage.
- Enhance motivation among learners through continuous encouragement and support during physical education classes.
- Implement feedback systematically and plan it within motor learning programmes to achieve the best educational outcomes.

Utilise modern tools and technologies to improve the quality of feedback, such as video analysis, applications and motion analysis software.

Select appropriate information and guidance, presenting it in a way that aligns with learning objectives and the learner's stage of skill acquisition.

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