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Effect of a Proposed Training Program Using Visual Feedback to Develop Skill Performance Levels in Floor Gymnastics Exercises

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Abstract

Objectives: This study aimed to examine the effect of a proposed training program using visual feedback on improving skill performance in floor gymnastics exercises among students of the College of Physical Education and Sports Sciences.

Materials and Methods: This study used an experimental design with two equivalent groups, namely an experimental group and a control group, through pre- and post-test measurements. The sample consisted of 30 students who were randomly divided into two equal groups. The experimental group followed a 12-week visual feedback-based training program with three training units per week, while the control group continued with the traditional training program. Skill and physical performance tests were used to measure students' floor gymnastics performance. The data were analyzed using SPSS.

Results: The results showed statistically significant differences between the pre-test and post-test in favor of the experimental group at the 0.05 significance level. The experimental group also achieved better post-test results than the control group, indicating that the visual feedback-based training program contributed positively to improving floor gymnastics skill performance.

Conclusions: The proposed training program using visual feedback was effective in developing students' skill performance in floor gymnastics exercises. Visual feedback can be used by lecturers and coaches as a practical training strategy to help students recognize movement errors, improve technical execution, and achieve better performance outcomes.

Keywords: Visual Feedback, Floor Gymnastics, Skill Performance, Training Program, Physical Education.

Introduction

Gymnastics is one of the oldest and most comprehensive sports, combining kinetic beauty, physical strength, and technical precision (Potdevin et al., 2018; Prassas et al., 2006). Floor exercises occupy a prominent place in the competitions of this sport, as they include acrobatic movements and dynamic skills that require a high level of motor coordination, balance, flexibility, and explosive power (Kataoka et al., 2023).

Process of learning motor skills in floor gymnastics is witnessing remarkable development in light of modern training techniques, perhaps the most prominent of which is the use of visual feedback , represented by the use of video recording and visual motion analysis as an effective educational and training tool; as it allows the athlete to see his motor performance and compare it to the ideal model, which enhances ability to perceive sensory-motor skills and correct technical errors on his own (Abdulqader & Naji, 2025; Sari & Widodo, 2025).

Scientific studies and research in the field of sports training indicate that visual feedback effectively contributes to accelerating the motor learning curve, reducing the time required to acquire new skills, and improving the technical performance of complex movements(David J. Smith, 2003; Vealey, 2024; Ward et al., 2024). However, the practical reality of training in gymnastics schools reveals a clear deficiency in the integration of these techniques within planned training sessions. From this standpoint, this research came to highlight the impact of a proposed training program that relies mainly on visual feedback in developing the skill performance level of floor gymnastics exercises, which benefits trainers and specialists in drawing up more efficient and effective training paths(Hughes et al., 2018; Kuswoyo et al., 2020).

The researcher observed through his fieldwork and training supervision that many floor gymnastics students struggle to correct technical errors in their motor skills, remaining below expectations despite repeated traditional training (Ar et al., 2025; Chaniago et al., 2024; Khoiriyah et al., 2026). The researcher believes that the absence of visual feedback as a systematic training tool may be a major reason for this deficiency, leading to the following question: Does the proposed training program using visual feedback affect the development of the skill performance level for floor gymnastics exercises?

This research aims to achieve the following objectives to build a proposed training program that uses visual feedback to develop floor gymnastics skills. Identifying the differences between the pre-test and post-test in the level of skill performance among the experimental group. Identifying the differences between the experimental and control groups in the post-test. Measuring the magnitude of the impact of the proposed training program on skills performance indicators.

Based on the research problem and its objectives, the researcher proposes the following two hypotheses: There are statistically significant differences at the (0.05) level between the pre-test and post-test in the level of skill performance in favor of the post-test for the experimental group. There are statistically significant differences at the (0.05) level between the experimental and control groups in the post-test in the level of skill performance in favor of the experimental group.

Terms defining. Visual feedback: is the information that the learner receives by watching video recordings of his motor performance in order to correct technical errors and improve performance. Floor gymnastics: refers to gymnastics performance exercises that are performed on the floor or mat, and include acrobatic, balancing, and rotational movements. Skillful performance: level of technical quality demonstrated by the athlete when performing floor gymnastics skills according to the approved evaluation criteria. Training program: is an organized and programmed plan that includes training units with specific objectives, content, and time, and is based on visual feedback(Savitri et al., 2024) .

Materials and Methods

Study Design

This study used an experimental research design with two equivalent groups, namely an experimental group and a control group. A pre-test and post-test design was applied to examine the effect of a proposed training program based on visual feedback on students' skill performance in floor gymnastics exercises. The experimental group received the visual feedback-based training program, while the control group followed the traditional training program.

Study Participants

The research population consisted of second-year students from the College of Physical Education and Sports Sciences, University of Wasit, during the 2024–2025 academic year. The sample included 30 students who were randomly divided into two equal groups: 15 students in the experimental group and 15 students in the control group.

The participants were selected based on their involvement in floor gymnastics learning activities and their availability to complete the full training program. Students who had prior specialized gymnastics training or were unable to participate regularly in the training sessions were excluded from the study. Before the intervention, both groups were tested to ensure equivalence in basic physical and skill-related variables.

Study Organization

The study was conducted in the gymnastics hall of the College of Physical Education and Sports Sciences, University of Wasit. Before the main experiment, a pilot study was carried out on 10 students outside the main sample to check the suitability of the tests, the clarity of procedures, the time required for implementation, and the validity of the equipment used.

The main training program was implemented for 12 weeks, with three training units per week. Each training session lasted approximately 90 minutes. The experimental group performed floor gymnastics exercises supported by visual feedback. Students' performances were recorded using a digital video camera and reviewed through video replay and movement analysis. This allowed students to observe their technical errors, compare their movements with the correct model, and make corrections during subsequent practice.

The control group continued to follow the regular training method based on verbal explanation, demonstration, and repeated practice without systematic use of visual feedback. The skills included in the program were handstand, forward roll, backward roll, front handspring, and pivot turn.

Skill performance was assessed using an evaluation form prepared with the assistance of gymnastics specialists. The assessment covered the technical quality of each skill using a score scale from 0 to 10 points. The validity of the assessment form was confirmed through expert review, while reliability was checked using a test–retest procedure.

Statistical Analysis

The collected data were analyzed using SPSS version 26. Descriptive statistics, including mean and standard deviation, were used to describe the research data. A paired sample t-test was used to compare the pre-test and post-test results within each group, while an independent sample t-test was used to compare the post-test results between the experimental and control groups. The percentage of improvement and eta-squared effect size were also calculated to determine the magnitude of the training program's effect. The level of statistical significance was set at $p \leq 0.05$.

Results

Tabble 1. Results of pre-equalization between the two groups

Skill	Experimental		Control		(t) value	Sig. type
	M.	St.d	M.	St.d		
Handstand	4.20	0.85	4.15	0.92	0.18	Insig.
Front flip	4.53	0.78	4.47	0.81	0.24	Insig.
Back flip	3.87	0.91	3.93	0.88	0.21	Insig.
Front flip	3.60	1.02	3.67	0.97	0.22	Insig.
Axial rotation	4.07	0.88	4.00	0.93	0.24	Insig.

It is clear from the table above that all the calculated (t) values are less than the tabulated (t) value of (2.048) at a degree of freedom of (28) and a significance level of (0.05), which confirms the equivalence between the two groups before starting to apply the experiment.

Table 2. Results of the pre- and post-comparison of the experimental group

Skill	Pre-test M.	Post-test M.	Improvement rate	(t) value	Sig. type	η^2
Handstand	4.20	7.87	87.4%	18.45	Sig.	0.92
Front flip	4.53	8.13	79.5%	16.78	Sig.	0.90
Back flip	3.87	7.60	96.4%	19.23	Sig.	0.93
Front flip	3.60	7.27	101.9%	17.56	Sig.	0.91
Axial rotation	4.07	7.80	91.6%	18.12	Sig.	0.92

* Statistically significant at the (0.05) level, tabulated t value = (2.145) at degrees of freedom (14).

The results in the table reveal that all calculated (t) values are greater than the tabulated (t) value, and that the improvement rates ranged between (79.5%) and (101.9%), while the eta-squared (η^2) values indicated a very large effect size for the proposed training program in all skills.

Table 3. Results of the comparison between the two groups in the post-test

Skill	Experimental M.	Control M.	Difference	(t) value	Sig. type
Handstand	7.87	5.40	2.47	9.85	Sig.
Front flip	8.13	5.87	2.26	8.72	Sig.
Back flip	7.60	5.13	2.47	10.12	Sig.
Front flip	7.27	4.93	2.34	9.34	Sig.
Axial rotation	7.80	5.27	2.53	9.98	Sig.

* Statistically significant at the (0.05) level, tabulated t value = (2.048) at a degree of freedom of (28).

The results in the table prove that the experimental group significantly outperformed the control group in the post-test for all five skills, confirming the effectiveness of the training program based on visual feedback.

Discussion

The research results were consistent with the two hypotheses put forward by the researcher, indicating the high effectiveness of the proposed training program in improving the skill performance level of floor gymnastics . The researcher attributes these positive results to a number of factors:

First, visual feedback allowed students to directly and accurately observe their motor errors, motivating them to self-correct and giving them a clear mental picture of the ideal performance required. This was confirmed by Magill & Anderson (2021), who stated that an athlete who sees their own performance possesses richer and more comprehensive information than they receive from verbal instructions alone.

Second: The preparation phase in the program contributed to building a sound skill base away from chronic errors, while the development phase allowed for maximum benefit from the systematic visual comparison between actual and typical performance.

Third: The great superiority in the skill of the front flip (101.9%) is explained by the fact that this skill has a complex acrobatic nature that is difficult to correct with verbal instructions, while visual feedback accurately embodies the biomechanical errors in it, such as the angle of departure and the time of rotation.

These results are consistent with the findings of Abdul Rahim's study (2022), which demonstrated the superiority of the visual feedback group, and Baudry et al.'s study (2020), which showed that visual feedback significantly accelerates motor learning.

Conclusions

In light of the research findings and their discussion, the researcher concludes the following proposed training program using visual feedback resulted in a significant improvement in the skill performance level of all five floor gymnastics skills in the experimental group. Experimental group significantly outperformed the control group in the post-test for all skills. Values of eta-squared (η^2) showed that the training program had a very large effect size in developing the level of skill performance. Improvement rates in the skill performance level of the experimental group ranged between (79.5%-101.9%), which are rates that indicate the high effectiveness of the program. Forward somersault skill benefited more than others from visual feedback due to its complex acrobatic nature.

Recommendations

Based on the research findings, the researcher recommends the following adopting the proposed training program and implementing it in the floor gymnastics courses in the faculties of physical education. Equipping gymnastics halls with cameras and motion analysis software such as Kinovea to be used in daily training. Training gymnastics coaches on the skills of employing visual feedback within planned training units. Conduct similar studies on different samples (females, juniors, and advanced levels) to verify the generalizability of the results. Conduct comparative studies between different types of feedback (immediate and delayed, intrinsic and extrinsic) in the context of floor gymnastics. Investing in smart applications and augmented reality glasses as innovative tools for visual feedback in gymnastics training.

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