



Development of a Physical Fitness Measurement Application for Creative Gymnastics

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Abstract

This study aims to develop an application designed as a measurement tool for physical fitness test results in the field of creative gymnastics. The product developed is a media application intended to facilitate systematic and objective fitness assessments. The research subjects consisted of 30 students aged 14–15 years. Validation was carried out by three experts: a media expert from the Physical Education Study Program (85%), a content expert who is a subject teacher (88%), and a language expert from the Indonesian Language Education Study Program (84%). Data were collected using questionnaires based on assessment indicators from each area of expertise. The average validation score was 86%, indicating that the application is suitable for use. Statistical tests showed a normality value of 0.089, a homogeneity value of 1.000, and an independent samples test value of 1.000. These results indicate that the application is valid, effective, and can be utilized as a supporting media in the teaching and learning process. Further research is recommended to develop the application for broader use across various sports disciplines.

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INTRODUCTION

The development of an application specifically designed for physical fitness testing in the creative gymnastics discipline presents a compelling innovation, as existing applications generally lack specificity toward individual sports. This new application builds upon previously designed systems aimed at assisting users in measuring the outcomes of physical fitness tests in creative gymnastics. It is expected that the application can be further enhanced through technological development, featuring test instruments and norms tailored specifically for creative gymnastics. Consequently, this application may offer faster and more effective test result processing.

Sport plays an essential role in human life and serves as a vital physical need (Iyakrus, 2018). It also functions as a medium for supporting physical development and achieving developmental tasks. According to Anty (2023), sport is a physical activity carried out by individuals with the intention of improving physical fitness and overall health. Regular physical exercise contributes to better physical fitness, maintains metabolic balance, and promotes long-term well-being. Furthermore, it supports a healthy lifestyle, helping the body recover from fatigue and stress induced by intensive daily activities.

Arifin (2018) asserts that physical fitness is a key determinant in achieving a healthy body, and it requires intentional effort. Fitness needs vary across academic disciplines, as each field demands different levels of physical readiness. Students in sports education programs, for example, should possess sufficient physical fitness to meet the demands of their academic training. This aligns with Jariono et al. (2020), who emphasize that physical fitness is not only important physically but also emotionally and socially, as it enhances organ function, motivation, and a spirit of sportsmanship in competitive contexts.

Darmawan and Indra Bayu (2022) highlight that improving fitness components involves skeletal muscle activities that require

energy, making planned physical activity essential. Regular exercise also improves emotional intelligence and reduces stress. Ghazali et al. (2021) similarly note that physical fitness, as a product of physical activity, plays a crucial role in combating illness, enhancing immunity, and supporting personal independence.

Based on these expert perspectives, physical fitness can be understood as a set of activities undertaken to maintain or improve a person's health status. In both athletes and students, fitness assessments inform appropriate decision-making based on individual strengths and limitations (Redho et al., 2023). Gumantan et al. (2021) define measurement as the quantitative value obtained through tests. A test, in this context, is an instrument used to perform measurement, which is a process, while evaluation refers to the interpretation of the resulting data. In sports, tests and measurements serve to assess performance levels, which must be supported by optimal physical condition to achieve peak performance (Kurdi & Nanda, 2024).

Creative gymnastics involves expressive movement, either accompanied by music or performed freely in a structured manner (Gandasari et al., 2021). It is a form of gymnastics created through the innovativeness of the instructor or community, integrating elements of sport, culture, and dance (Turnaloto et al., 2022). Movements are developed flexibly without strict adherence to fixed patterns or counts, with the goal of creating an engaging and motivating experience for participants (Setiawan et al., 2024). Creative movement can be initiated or developed by anyone, anywhere, as long as it is stimulated by psychomotor activities.

Fahmi et al. (2022) state that gymnastics plays a vital role in children's motor development. In physical education, gymnastics targets physical attributes such as muscle strength and overall energy. Psychomotor skills involve the interaction between muscles and physical actions. Gross motor skills are particularly important in activities like moving, lifting, jumping, running, and pushing—skills necessary for self-protection, survival, creativity, and daily

tasks both indoors and outdoors.

Scientific and technological advancements are vital in this field, particularly in developing tools for physical fitness assessment and measurement (Hartati et al., 2018). An application, in this context, refers to a software unit designed to meet the needs of various activities, including business operations, public services, games, and human-centered functions (Susanty et al., 2019). The application described in this study aims to document and calculate fitness test results in accordance with predefined standards and criteria.

The researcher believes that the development of this application will streamline the documentation and evaluation of fitness test results. However, limitations remain, particularly concerning the high cost of production. Akbar Rahmat Ramadhan et al. (2022) recommend that similar studies be expanded and improved.

Given these issues and opportunities, the researcher is motivated to develop a fitness test instrument and application tailored to the creative gymnastics discipline.

METHOD

This study employed a Research and Development (R&D) approach. The development steps followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

In the Analysis stage, a preliminary study was conducted through observations to understand the learning context of students aged 13–14 years. The researcher gathered information from various sources to support the needs analysis process.

During the design stage, the researcher created a blueprint for an application-based product, including the structure and flow of the digital fitness test instrument tailored for creative gymnastics. This stage included compiling relevant references and integrating them into the application design to ensure it aligns with physical fitness assessment principles.

In the development stage, the researcher managed content related to the standards and

norms of fitness assessment in creative gymnastics. The prototype was developed and then validated by several experts. Feedback and recommendations from media, content, and language experts were used to revise and improve the application.

The Implementation stage involved pilot testing the product with students to examine the differences in results between the manual and digital fitness testing methods.

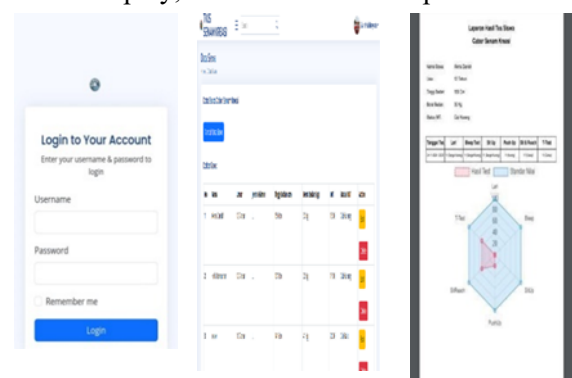
Finally, the Evaluation stage included both quantitative and qualitative data analysis. Quantitative data were derived from validation questionnaires and observation instruments, while qualitative data were collected from expert feedback and suggestions regarding product design and functionality.

This study was conducted with a sample of 30 students aged 13–14 years.

RESULTS

The initial stage of the product development focused on designing the foundation of the application. This phase aimed to establish a prototype of the measurement instrument tailored for physical fitness testing in the sport of creative gymnastics. The resulting application, titled "TKJS Application", consists of five integrated fitness test instruments along with automated test result generation. Notably, the application includes a feature to print test results, which supports practical implementation in the field.

Figure 1. Initial Application Interface, Dashboard Display, and Test Result Output



Initial Application Interface

Dashboard Display

Test Result Display atau Test Data Output

After the prototype was completed, expert validation was conducted involving three domains: sports content experts (creative gymnastics), media application experts, and language experts. The validation results are summarized in the following table:

Table 1. Expert Validation Results

Validator Type	Score (f)	(N)	(p%)	Feasibility Category
Media Expert	85	100	85	Good/Feasible
Content Expert	88	100	88	Good/Feasible
Language Expert	84	100	84	Good/Feasible

The average validation score was 86%, indicating that the TKJS application is feasible for use in physical fitness testing for creative gymnastics. Experts provided the following recommendations:

- (1) The application is suitable as an instrument for assessing fitness test results;
- (2) It serves as an alternative tool to aid in calculating physical fitness test outcomes;
- (3) The application is practical, as it reduces the need for manual tools and paperwork;
- (4) Further development utilizing modern technologies is encouraged.

Small-Scale Trial

A small-scale trial was conducted to assess the application's effectiveness in storing, calculating, and managing physical fitness test results compared to manual methods. The test involved 15 students aged 13–14 years. The data were analyzed using SPSS 22, employing tests of normality, homogeneity, and paired sample comparison. The Kolmogorov–Smirnov test was used to determine if residual values were normally distributed.

Table 2. Normality Test of Small-Scale Trial

Variable	Test Statistic	Sig.	Description
Digital Test	0.196	0.126	Normal

Since the significance value is $0.126 > 0.05$, the data are considered normally distributed and suitable for further statistical analysis.

Table 3. Homogeneity Test

Variable	Sig.	Conclusion
Digital Test	0.1000	Homogeneous

With a Sig. value > 0.05 , the test confirms homogeneous variance between manual and digital test groups.

Table 4. Independent Samples Test

Variable	t-value	Sig.	Significance Level
Manual vs Digital Test	0.000	0.1000	0.05

Since the Sig. value is $0.1000 > 0.05$, it indicates no significant difference between manual and digital fitness test results. Thus, the three statistical tests confirm that the TKJS technology-based application is valid for use in physical fitness testing.

Large-Scale Trial

A large-scale trial was conducted to further examine the effectiveness of the application in storing, calculating, and managing test results. This phase involved 30 students aged 13–14 years. The data were again analyzed using SPSS 22.

Table 5. Normality Test (Large Scale)

Variable	Test Statistic	Sig.	Description
Digital Test	0.127	0.200	Normal

As the Sig. value $0.200 > 0.05$, the residuals are normally distributed.

Table 6. Homogeneity Test (Large Scale)

Variable	Sig.	Conclusion
Digital Test	0.1000	Homogeneous

The Sig. value indicates that the variances between manual and digital groups are homogeneous.

Table 7. Independent Samples Test (Large Scale)

Variable	t-value	Sig.	Significance Level
Manual vs Digital Test	0.000	0.1000	0.05

The Sig. value $0.1000 > 0.05$ indicates that there is no significant difference between the manual and digital test results.

Product Output

The final product of this research is an improved version of the previous application for measuring physical fitness test results in creative gymnastics. The updated TKJS Application was successfully implemented in a large-scale trial, with input data from student participants being processed and displayed in the app interface. This confirms its effectiveness in supporting physical fitness test administration.

DISCUSSION

In the initial phase of this study, a needs analysis was conducted to assess the necessity for an application-based product. This step was essential as it formed the basis for making informed decisions regarding the development of a measurement tool for assessing physical fitness in the creative gymnastics discipline. The validity of the physical fitness test for students in Phase D was supported by validation results: 85% from the content expert (valid category), 88% from the language expert (highly valid), and 84% from the media expert (highly valid).

Through discussions with physical education teachers, it was revealed that manual data recording on paper was often complex and incomplete. In this regard, the development of the Indonesian Physical Fitness Test Application served as an effective solution. Based on the students' performance, the test completion rate reached 86%, which falls within the "very good" category.

At this stage, determining the effectiveness of the fitness application was critical. This was achieved by comparing test results obtained via the application and manual methods. The analysis was conducted using statistical components to determine the significance level between the two methods.

The study also affirms that technological advancements can enhance various aspects

of sports, including planning and evaluating training programs (Tampubolon et al., 2024). As technology evolves, its role in facilitating human activities becomes increasingly evident. According to Hartati et al. (2018), an application is a program designed with specific functions to help users achieve particular objectives. In line with Fahmi et al. (2022), as cited in the study by Widowati and Rasyono, gymnastics is a form of physical activity that supports optimal motor development in children. Gymnastics movements, as implemented in physical education, aim to meet specific physical demands such as strength and muscular power across various body parts.

Based on the test results involving components such as the 30-meter sprint, push-up, sit-up, beep test, and T-Test, the physical activity levels of students aged 13–14 were generally categorized as good to sufficient. Hartati et al. (2019) previously highlighted that fitness test applications lacked standardized measurements and norms for individual sports disciplines. However, with this technological development, it is now possible to tailor fitness assessment tools according to specific sports, and even identify athletic talent from an early age.

CONCLUSION

Based on the findings and discussion, it can be concluded that The physical fitness assessment for creative gymnastics in Phase D students is highly valid, as shown by expert evaluations: 85% (content), 88% (language), and 84% (media). Manual data collection was found to be inefficient, making the TKJS application an effective alternative. Student results showed an 86% success rate, categorized as very good. Further development is recommended to expand its use across other sports disciplines and enhance its features for broader implementation in physical education settings.

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