The Effect of an Animation Training Program on Improving First Poomsae Performance in Taekwondo for Individuals with Intellectual Disabilities

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Abstract

This study aims to improve the performance of first poomsae in taekwondo for individuals with intellectual disabilities by developing and implementing a motivational training program specifically designed to meet their needs. The researcher followed an experimental approach with a single-group design (pretest/posttest).

The study was conducted at the Smouha Youth Center Club in Alexandria Governorate during the 2024/2025 training season. The research population consisted of children with intellectual disabilities, aged 9 to 12 years, with a sample size of 20 participants.

The results indicated that the proposed animated training program led to notable improvements across all targeted performance variables. Specifically: Speed-strength (Momtong Jireugi): Percentage improvement ranged from 36.60% to 38.40%. Speed endurance (Arae Makki): Percentage improvement ranged from 35.72% to 36.06%. Strength endurance (Momtong Makki): Percentage improvement ranged from 30.00% to 31.01%. Specific agility (Eolgol Makki): Percentage improvement ranged from 55.17% to 58.92%. For the skill techniques constituting the first Poomsae, performance improvements between the pre-test and post-test were as follows: Momtong Jireugi: 30.59% to 58.36%. Arae Makki: 60.36% to 75.00%. Momtong Makki: 34.43% to 48.49%. Eolgol Makki: 28.37% to 39.33%. Overall, the total performance level of the first Poomsae improved by 32.63%.

These findings demonstrate the effectiveness of the proposed animated training program in enhancing both the physical performance components and the technical execution of the first Poomsae.

Introduction and Research Problem

In recent years, there has been considerable interest in people with special needs in general, and individuals with intellectual disabilities in particular, across various sports fields. This is due to the unique characteristics and abilities of people with special needs, which, if properly invested, can contribute effectively to the development and progress of society. Sports federations and relevant official bodies have enacted laws and regulations that have facilitated the establishment and organization of various local and international sports championships and competitions. Among these is the International Taekwondo Federation, which has organized competitions and events for athletes with special needs, including those with intellectual disabilities, in the Poomsae discipline. These events have achieved significant success and received great interaction from both players and officials, providing these athletes with the opportunity to prove themselves alongside able-bodied athletes through training, participation, and achievement, as well as encouraging societal interaction, acceptance, and coexistence with them, motivating them to give their best.

Animated films are considered one of the modern training tools, capable of bringing about fundamental changes in concepts, relationships, and characteristics, thereby offering a new perspective on the scientific aspects of life. They also bridge the gap between theoretical and applied science and represent a relatively new form of art. Currently, they respond to various demands from diverse sources, each with its own style, level of challenge, imagination, and the tactical skill of the animation artist.

Short, engaging cartoons attract individuals' attention and stimulate their eagerness to enjoy them. Animated films hold significant value as an educational tool, especially when they feature beloved characters and engaging scenarios that capture children's interest. In the field of animated films, it has been established that humans acquire approximately 40% of their information through both hearing and sight, 30% through hearing alone, and the remaining 30% through other senses. This highlights the effectiveness of visual aids in the training process and their role in enhancing its quality. Experiments have shown that the amount of information retained in memory increases by 12% to 14% when films are used, compared to cases where they are not (70: 251).

Research Problem

The primary importance of the first Poomsae lies in it being the most commonly used form in Taekwondo for athletes with intellectual disabilities in the under-10 age category. It is the first sequence of movements learned by these athletes to earn the yellow belt, which qualifies them to participate in championships organized by the Taekwondo Federation. The regulations stipulate that athletes with intellectual disabilities must memorize the first Poomsae to compete in tournaments for the 9–12 age group.

Through the researcher's attendance and follow-up of more than one championship in Alexandria and Cairo for athletes with intellectual disabilities (2024–2025) and her analysis of their matches, she observed a low level of performance in the first Poomsae among athletes under 12 years old. Judges' evaluation scores for the performance of the first Poomsae were notably low. Additionally, during her multiple field visits to clubs training athletes with intellectual disabilities, the researcher noticed that most Taekwondo coaches rely primarily on demonstrating the movements of the Poomsae as a whole without breaking them down, explaining, or interpreting them to the athlete. This leads to weak performance and reduced effectiveness, as the athlete does not fully understand the meaning of the movement being performed—particularly since these athletes differ from their peers in having reduced comprehension and memory retention.

In light of the above, and after reviewing previous research on training athletes with intellectual disabilities in Taekwondo in general, and in the Poomsae in particular, the researcher found no scientific studies on training athletes with intellectual disabilities in Taekwondo using animated films, despite the existence of official championships organized and supervised by the Egyptian Taekwondo Federation. This highlights the need to establish a scientific foundation in this field for this specific group and to guide it toward practical application. Therefore, the researcher believes that designing a training program aimed at developing specific physical abilities, improving the technical skills that constitute the Poomsae, and dividing its content into training segments using animation for athletes with intellectual disabilities could positively enhance the performance of the first Poomsae.

Research Aim

The aim of this research is to improve the performance level of the first Poomsae for athletes with intellectual disabilities through:

-Designing a training program using animation for athletes with intellectual disabilities.

-Identifying the effect of the proposed animation-based training program on the level of specific physical abilities.

-Identifying the effect of the proposed animation-based training program on the technical skills of the first Poomsae.

-Identifying the effect of the proposed animation-based training program on the overall performance level of the first Poomsae for athletes with intellectual disabilities.

Research Hypotheses

- There are statistically significant differences between the pre- and post-measurements in improving the level of specific physical abilities for the first Poomsae.

- There are statistically significant differences between the pre- and post-measurements in improving the level of technical skills of the first Poomsae.

- There are statistically significant differences between the pre- and post-measurements in improving the overall performance level of the first Poomsae for athletes with intellectual disabilities.

Research Procedures

First: Research Methodology

In light of the research requirements, and to achieve its objectives and hypotheses, the researcher employed the experimental method using the one-group design. One of its pre-test/post-test designs was selected.

Second: Research Scope

a) Spatial Scope:
The study was conducted at the Smouha Youth Center in Alexandria Governorate.

b) Temporal Scope:
The training season (2024/2025).

c) Human Scope:

1. Research Population:
The original research population consisted of children with intellectual disabilities at the Smouha Youth Center in Alexandria Governorate. Their chronological ages ranged between 9 and 12 years, with a total number of 20 participants.

2. Research Sample:
A sample of 10 participants was deliberately selected from the original population. The main research sample consisted of 6 participants, while 4 participants were included in the pilot studies.

3. Statistical Description of the Research Sample:

Table (1)
Statistical description of the growth variables for the research sample (n = 6)

Variables	Unit of Measurement	Mean	SD	Median	Skewness
Age	Years	9.67	0.58	10.0	-1.732
IQ score	%	73.33	2.89	75.0	-1.732
Training age	Months	11.0	1.0	11.0	0.0
Weight	Kg	33.33	3.79	35.0	-1.597
Height	Cm	123.7	2.52	124.0	0.586

It is evident from Table (1) that the skewness coefficient for the main research variables (age, IQ score, training age, weight, and height) ranged between 0.586 and -1.732, which falls within ±3, indicating the homogeneity of the study sample.

Table (2)
Statistical description of the pre-test values for the specific physical abilities of the research sample (n = 6)

Variables under study	Performing side	Mean	SD	Skewness
Speed-strength (Momtong Jireugi)	Right	12.166	1.940	0.638
	Left	13.666	1.751	1.762
Speed endurance (Arae Makki)	Right	14.006	2.818	-0.847
	Left	13.961	2.539	0.422
Strength endurance (Momtong Makki)	Right	5.833	0.983	0.455
	Left	6.5	0.836	1.536
Specific agility (Jool Makki)	Right	24.166	3.250	1.507
	Left	26.666	3.141	2.318

it is evident from Table (2) that the skewness values for the specific physical abilities of the first Poomsae before the experiment ranged between -0.847 and 2.138, which falls within ±3 and approaches zero, indicating the homogeneity of the study sample.

Table (3)
Statistical description of the pre-test values for the performance level of individual technical skill(n = 6)

Variables under study	Performing side	Mean	SD	Skewness
(Momtong Jireugi)	Right	6.1	0.194	-0.9
	Left	5.483	0.083	0.312
(Arae Makki)	Right	5.55	0.054	0.857
	Left	5.166	0.167	0.312
(Momtong Makki)	Right	6.1	0.178	-0.384
	Left	5.533	0.083	-0.857
(Jool Makki)	Right	5.816	0.263	-0.268
	Left	5.466	0.151	-1.934

It is evident from Table (3) that the skewness values for the evaluation of individual technical skills forming the structural framework of the Poomsae before the experiment ranged between -0.9 and -1.934, which falls within ±3 and approaches zero, indicating the homogeneity of the study sample.

Table (4)

Statistical description of the pre-test values for the time and overall performance level of the first Poomsae (n = 6)

Variables under study	Unit	Mean	SD	Skewness
First Poomsae Performance Evaluation	Points	5.416	0.277	-0.659

It is evident from Table (4) that the skewness values for the overall performance level of the first Poomsae before the experiment ranged between -0.659 and 0.665, which falls within ±3, indicating the homogeneity of the study sample.

Third: Data Collection Methods and Tools

To collect the information and data relevant to this research, the researcher employed the following tools:

1. Analysis of References and Scientific Research:
The researcher conducted a comprehensive survey of references and previous studies related to the sport of Taekwondo.

2. Personal Interviews:
The researcher conducted personal interviews with:
a. The club director, to facilitate the researcher's work.
b. Several club coaches, to determine the training duration for athletes with intellectual disabilities.
c. The club's psychological specialist, to obtain information about the research sample (personal data and IQ scores).
d. The research sample itself, to psychologically prepare them for participation in the training program.

3. Forms:

- A player data registration form for primary variables.

- A form for evaluating the level of specific physical abilities.

- A form for evaluating the technical skills comprising the first Poomsae.

- A form for evaluating the overall technical performance of the first Poomsae.

4. Equipment and Devices Used:

- Medical scale to measure weight to the nearest kilogram (kg).

- Stadiometer to measure total height to the nearest centimeter (cm).

- Stopwatch accurate to 0.01 seconds.

- Video camera.

- Display screen.

- Chalk.

- Stickers.

- Colored markers.

- Small colored balls.

- Compartmentalized boxes.

- Wooden barriers.

- Cones.

- Hoops or circles drawn on the ground.

- Sandbags (punching and kicking bags).

- Colored lines drawn on the ground to indicate foot positions during performance.

- Colored lines drawn on the ground to mark the start and end positions of the first Poomsae under study.

Fifth: Tests Used

1. Specific Physical Ability Tests:

- Speed-strength (Momtong Jireugi).

- Speed endurance (Arae Makki).

- Strength endurance (Momtong Makki).

- Specific agility (Jool Makki).

2- Evaluation of the Technical Performance Level of the First Poomsae under Study:
The technical performance evaluation was conducted by a committee of three referees from the Higher Committee of Referees at the Egyptian Taekwondo Federation. Each referee awarded a score independently to the athlete, after which the scores of the three referees were summed, and the average score was taken as the final performance evaluation. The evaluation was carried out in accordance with the criteria and assessment materials of the World Taekwondo Federation.

Main Study

The researcher implemented the proposed training program on the main research sample as follows:

First: Pre-Measurements
The researcher conducted pre-measurements for the variables under investigation on the study sample during the period from **January 8, 2024** to **January 11, 2024**. These measurements included:

- Assessing the level of specific physical abilities under investigation.

- Assessing the performance level of the technical skills of the first Poomsae.

- Assessing the performance level of the first Poomsae.

Second: Proposed Training Program

The proposed training program was applied from **January 14, 2024** to **March 8, 2024**.
The program aimed to improve:

- The level of specific physical abilities for the first Poomsae (speed-strength, speed endurance, agility, balance, coordination).

- The performance level of the technical skills comprising the first Poomsae.

- The performance level of the first Poomsae as a whole.

Time Distribution of the Proposed Training Program

The researcher designed the proposed training program based on scientific principles and literature review, and it included the following elements:

Determining the Program Duration:

The total duration of the program was **eight weeks (two months)**, divided into three phases:

- Phase One (General Preparation): Duration of 2 weeks (one high-intensity week + one moderate-intensity week).

- Phase Two (Specific Preparation): Duration of 4 weeks (three high-intensity weeks + one moderate-intensity week).

- Phase Three (Pre-Competition): Duration of 2 weeks (one high-intensity week + one moderate-intensity week).

Number of Training Units:

Three training units per week were implemented for the study sample, resulting in **24 training units** for the entire program.

Duration of Each Training Unit:

- Total unit duration: **90 minutes**.

- Distribution: 15 minutes warm-up, 30 minutes physical preparation exercises, 40 minutes technical skill training, 5 minutes cool-down.

- Total duration of the overall program: 8×3×90=21608 \times 3 \times 90 = 21608×3×90=2160 minutes.

The participants implemented the proposed training program using an **interval training method** (low- and high-intensity). The exercises were selected based on similar studies, and each training unit consisted of three parts: warm-up, main part, and concluding part.
In this regard, *Essam El-Din Abdel-Khaleq* (2003) indicated that a training unit is composed of these three main parts.

Training Load Intensities and Corresponding Heart Rates:

- Moderate load: Heart rate between 120–150 beats/min.

- High load: Heart rate between 150–180 beats/min.

According to *Abu Al-Ala Abdel-Fattah* (1997), the physiological intensity of training based on heart rate can be determined as outlined in the following table.

Post-Measurements
After completing the implementation of the training program, the researcher conducted post-measurements on the research sample during the period from **March 9, 2024** to **March 12, 2024**, under the same conditions and in the same sequence as the pre-measurements. These included:

- Measuring the level of specific physical abilities under investigation.

- Measuring the performance level of the technical skills of the first Poomsae.

- Measuring the overall performance level of the first Poomsae.

Seventh: Statistical Treatments Used

In accordance with the nature and objectives of the study, the researcher employed the following statistical treatments:

- Arithmetic Mean.

- Standard Deviation.

- Skewness Coefficient.

- t-test for the significance of statistical differences.

- Correlation Coefficient.

- Percentage Coefficient.

Presentation and Discussion of Results

- Presentation and discussion of the results of the specific physical ability tests for the first Poomsae in the experimental group before and after the study implementation.

Table (5)

Significance of Differences and Percentage of Improvement Between the Mean Scores of the Pre- and Post-Measurements in the Specific Physical Abilities of the First Poomsae in the Research Sample

n = 6

Research Variable	Side	Pre-test Mean	Pre-test SD ±	Post-test Mean	Post-test SD ±	t-value	Improvement %
Speed-strength (Momtong Jireugi)	Right	12.166	1.940	16.833	2.136	0.00268* *	38.40%
	Left	13.666	1.751	18.666	1.751	0.000582* *	36.60%
Speed endurance (Arae Maki)	Right	14.006	2.818	8.952	3.683	0.0034* *	36.06%
	Left	13.961	2.539	8.973	0.435	0.000789* *	35.72%
Strength endurance (Momtong Maki)	Right	24.166	3.250	31.666	3.881	0.00462* *	31.01%
	Left	26.666	3.141	34.666	1.966	0.000354* *	30.00%
Specific agility (Geol Maki)	Right	5.833	0.983	9.000	0.894	0.000164* *	55.17%
	Left	6.500	0.836	10.333	1.366	0.00015* *	58.92%

Note: Tabulated t-value at $p \leq 0.05 = 2.36$; ** indicates statistical significance at $p \leq 0.05$.

Results Interpretation

The data in Table (5) show that there are statistically significant differences between the pre- and post-measurements in the level of the specific physical abilities of the first Poomsae under investigation in the research sample. The calculated *t*-values ranged between **0.00015** and **0.00462**, indicating statistically significant differences at the 0.05 significance level.

The percentage improvement in **speed-strength** (Momtong Jireugi) ranged between **36.60% and 38.40%**, while improvement in **speed endurance** (Arae Maki) ranged between **35.72% and 36.06%**. Improvement in **strength endurance** (Momtong Maki) ranged between **30.00% and 31.01%**, and in **specific agility** (Geol Maki) ranged between **55.17% and 58.92%**.

The researcher attributes these improvements in the level of specific physical abilities to the proposed animated training program, which was designed so that the player performs the movements in the same muscular direction as the skills constituting the first Poomsae under investigation.

This is consistent with the findings of **Ali Al-Bayk and Emad Abbas (2003)**, who stated that optimal performance of basic motor skills in any sport cannot be achieved without possessing the necessary physical abilities required for executing the skill. They emphasized that exercises resembling the motor structure of competition movements serve as direct preparation for the player and are among the most effective means of improving training condition. Furthermore, repeated execution of skills in situations similar to competition plays a major role in developing the specific physical abilities related to those skills.

Similarly, **Ahmed Mahmoud Ibrahim (2005)**, citing **Okazaki and Stricevic**, confirmed that it is preferable to develop the specific physical abilities required for a sport by using motor performances similar to the nature of the basic movements of that sport.

Presentation and Discussion of Results for the Skill Techniques Constituting the First Poomsae

Table (6)

presents the differences and percentage improvements between the pre-test and post-test mean scores for the performance level of the skill techniques constituting the first Poomsae in the experimental group (n = 6).

Research Variable	Side	Pre-test Mean	Pre-test SD ±	Post-test Mean	Post-test SD ±	t-value	Improvement %
Momtong Jireugi	Right	6.10	0.194	7.966	0.265	1.216**	30.59%
	Left	5.483	0.083	8.683	0.222	2.038**	58.36%
Arae Makki	Right	5.55	0.054	8.900	0.374	1.147**	60.36%
	Left	5.166	0.167	8.500	0.654	2.698**	75.00%
Momtong Makki	Right	6.10	0.178	8.200	0.252	2.858**	34.43%
	Left	5.533	0.083	8.216	0.132	9.530**	48.49%
Eolgol Makki	Right	5.816	0.263	7.466	0.388	6.149**	28.37%
	Left	5.466	0.151	7.616	0.567	4.026**	39.33%

Note: Tabulated t-value at p ≤ 0.05 = 2.36; ** indicates statistical significance at p ≤ 0.05.

The data clearly indicate statistically significant differences between the pre-test and post-test measurements for the performance level of the skill techniques of the first Poomsae. The calculated t-values ranged from **1.147 to 9.530**, all exceeding the critical value at the 0.05 significance level.

The percentage improvements between pre- and post-measurements were substantial, ranging from **30.59% to 58.36%** for *Momtong Jireugi*, **60.36% to 75.00%** for *Arae Makki*, **34.43% to 48.49%** for *Momtong Makki*, and **28.37% to 39.33%** for *Eolgol Makki*.

The researcher attributes these positive changes to the specific characteristics of the training loads and the methodological design of the proposed animated training program. The variance in improvement rates across the different skill techniques is likely due to the individualized application of training principles, particularly specificity and progression, tailored to each participant's needs. Furthermore, the training loads were structured using drills that closely mimicked the biomechanical patterns of the first Poomsae, ensuring a high degree of movement specificity.

By regulating the representation of energy systems during the execution of training loads and structuring the primary movement pathways of the first Poomsae into individualized, station-based training modules, the program maximized skill acquisition. The individualized pacing of

performance-similar drills contributed to noticeable improvements in executing the skill techniques along the Poomsae's structural path.

These findings align with the views of Abu Al-Ala Ahmed Abdel Fattah (1997), Ahmed Mahmoud Mohamed Ibrahim (2002, 2005), Mohamed Massad Hassan Hamed Awad (2012), Reda Youssef Yousry Abdel Qader (2008), and Rania Gaber Tawfiq Ahmed (2012), who emphasize that developing sport-specific skills is best achieved through training programs that replicate the mechanical and physiological demands of the target activity, combined with proper load management and individualized instruction.

Presentation and Discussion of the Results of the Performance Level Evaluation Tests for the First Poomsae in the Experimental Group Before and After the Study

Table (7)

Statistical treatments of the performance level evaluation tests for the first Poomsae in the experimental group before and after the study (n = 6)

Research Variable	Pre-test Mean	Pre-test SD ±	Post-test Mean	Post-test SD ±	t-value	Improvement %
First Poomsae performance level evaluation	**5.416**	**0.277**	**7.183**	**0.479**	****1.300**	**32.625%**

Note: Tabulated t-value at p ≤ 0.05 = 2.36; ** indicates statistical significance at p ≤ 0.05.

The data in Table (7) indicate that there are statistically significant differences between the pre- and post-measurements in evaluating the performance level of the first Poomsae, with an improvement rate of **32.625%**.

The researcher attributes this positive percentage change in the performance values of the training sequences composing the first Poomsae in the experimental group to the characteristics of the training loads and the implementation methods of the proposed animated training program. The variation in the degree of improvement is attributed to the application of training principles such as specificity and variation, in accordance with the individualization of the study sample. Additionally, the use of proposed training loads that mimic the nature of the motor performance within the structural framework of the studied movement sequence, along with the rational distribution of energy systems throughout the training load execution over the course of the proposed program, played a key role.

Moreover, employing the method of training sequences based on the structural framework, integrating animated illustrations according to their movement paths, and applying individualization, progression, and variation—particularly in the second and third parts of the daily training unit—contributed to this improvement. This enhancement in the performance of

training sequences and the first Poomsae is further linked to the characteristics of motor transfer training, such as training intensity, repetition, correct alternation between training load and recovery periods, and individualized guidance. These findings are consistent with the conclusions of Abu Al-Ala Ahmed Abdel Fattah (1997), Ahmed Mahmoud Mohamed Ibrahim (2002, 2005), Mohamed Massad Hassan Hamed Awad (2012), Reda Youssef Yousry Abdel Qader (2008), and Rania Gaber Tawfik Ahmed (2012).

Conclusions:

In light of the research objectives, hypotheses, and within the limits and characteristics of the study sample—and based on statistical analyses and research findings—the researcher concluded the following:

1- The proposed animated training program improved the level of special speed-strength performance by **36.60% – 38.40%**.

2- The program improved the level of special speed endurance by **35.72% – 36.06%**.

3- The program improved the level of special strength endurance by **30.00% – 31.01%**.

4- The program improved agility by **55.17% – 58.92%**.

5- The program improved the technical performance level of *Momtong Jireugi* by **30.59% – 58.362%**.

6- The program improved the technical performance level of *Arae Makki* by **60.360% – 75%**.

7- The program improved the technical performance level of *Momtong Makki* by **34.426% – 48.490%**.

8- The program improved the technical performance level of *Eolgul Makki* by **28.370% – 39.334%**.

9- The program improved the performance level of the first Poomsae by **32.625%**.

Recommendations:

In light of the research objectives, results, and within the limits of the sample, the researcher recommends the following:

1- Coaches should adopt the proposed animated training program due to its effectiveness and positive impact on the physical and technical performance of Taekwondo juniors.

2- Diversify training methods and tools for special groups, rather than relying solely on free training.

3- Standardize the use of the fundamental skills that compose the training sequences within training programs, as they contribute to improving the technical performance level of athletes with intellectual disabilities.

4- Use animated illustrations to explain and demonstrate the technical skills comprising the Poomsae sequences, as they help enhance the technical performance of athletes with intellectual disabilities.

5- Coaches should break down the Poomsae into individual skills and training sequences, incorporating animated illustrations into training programs for athletes with intellectual disabilities.

6- Conduct further similar studies on age groups not covered by the current research.**s**

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