

The Effect of Musical Rhythm Use on Motor Coordination and Performance Score of Team Kata for Karate Performers

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The reality in which we live indicates that rhythm is around us everywhere and within our bodies regulating various organic functions perfectly in accordance with fixed periods and cycles. The individual's awareness of rhythm is often the first and crucial step when learning new motor performance. The motor rhythm represents time regulation distinguishing motor performance. The rhythm is also reflected in the dynamic track of power, as well as the temporal spatial of movement. It is one of the complementary qualities of motor composition and at the same time a distinctive

feature of motor coordination. This research aims to identify the effect of musical rhythm use on motor coordination and performance score of team kata for karate performers. The experimental method has been used. The sample has intentionally been selected from under 12-year kata performers of Port Said Karate Area. The most important finding has been that the training program accompanied by the musical rhythm has affected positively the improvement of the motor coordination and the increase of team kata scores for karate performers.

Key words: musical rhythm, motor coordination, team kata

Introduction

Athletic performance is filled with various forms of motor rhythm that cannot be counted. The human being's both general and sports movements are a fertile field to discuss the concept of motor rhythm. In order to clear the

concept of rhythm in motion, it can be said that rhythm is an organization form of each temporal aspect and the aspect of muscle performance or relaxation in each time unit of the first aspect, i.e. the dynamic aspect. [14]

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Both musical and motor rhythms have a common feature in that they both have the same strong "contagious" effect. When an individual sees movements of good and clear rhythm, he/she feels attracted to this dynamic track, such as what happens in dance and artistic exercise...etc. The contagious influence is usually stronger when motor rhythms issue audio signals at the same time when you can hear the sound of footstep occurred during marathons, for example, or when good performance is shown by good music. [12]

Thus, motor skills of any athletic activity is the performance essence of this activity, which performed by the athlete in the match. This performance is based on the individual's efficiency being prepared physically, tactically, intellectually and psychologically. The operations of skill preparation aim to gain, master and establish the athletic motor components of athletic activity applied by the individual during competition to reach athletic high levels in the activity performed. [4]

Sensory information plays a major role in motor

learning and achievement processes. That information contain the sense processes of distance and time, being important mental processes, which shows the importance of these perceptions and the importance they play in improving the technical performance of motor skills.

Hearing is the primary source of sensory information and the first phase of consciousness and reason, as hearing has a role and major importance in perception and understanding.

Scientists confirm that when the baby comes out of his/her mother's womb, the first sense that functions is hearing, the eyes see only on the second day of delivery or vision may be correct only on the second day of delivery. This gives us the importance of hearing as well. When a person sleeps, all organs and senses are in a state of stillness, but the ear or hearing is the organ or sense which has the most contact and stimulation of the brain. Man wakes up due to a sound, even a mild, or a person calls him/her and no one passes in front of him/her. [20]

Here, it should be noted that sound is defined as "a set

of vibrations or waves, these vibrations are the result of the changes that occur in the atmospheric pressure starting from the sound source to the so-called eardrum." The acoustic wave is a series of pressures and alternating vacuums in air. Each single molecule passes energy to near molecules, but after the sound wave passes, each molecule remains in the same position. [17]

Music in connection with ear and hearing is defined as "every tuned sound heard and accepted by ear." To sum up every sound coming from man not ordinary speech, is a musical sound (except screaming, of course). Hence, we deal with music in our daily lives hearing it, whether we want or not. [18]

Karate competitions are divided in accordance with the rules of the World Karate Federation in terms of participation grade into several types represented in imaginary fighting (kata) with two competitions, individual kata competition and team kata competition (a team of 3 performers), and the actual fight competitions (kumite) with two competitions,

individual kumite competition and team kumite competition (a team 5 performers).

According to Article V of World Karate Federation Rules, the criteria of decision-making during kata competitions are real demonstration and explanation of the kata meaning, understanding the techniques used (Bunkai), good timing, rhythm, speed, balance and power, use of the right and proper breathing to support the strength concentration, the correct stances with muscle tension required in the legs, the correct muscle tension in the abdominal area (Hara) while keeping the waist level fixed at when moving, the correct performance of the basics (Kihon) when performing kata in the school style he/she follows. In the team kata, uniformity without any external influences or hints is an additional factor in the evaluation process. [19]

Here, the role of motor coordination (performance uniformity) appears clearly among performers and the extent of its impact on the performance evaluation process for team kata teams during competitions, as

indicated by the eighth point of decision-making criteria, along with other important criteria in determining the score of kata performance.

It should be noted motor rhythm of kata in karate is important, which is called "tempo". The Japanese experts have developed a tempo perform each motor routine and also its own rhythm, through the number of movements per routine and the length or shortness of these movements. [10]

In order to clear the concept of rhythm in motion, it can be said that rhythm is an organization form of each temporal aspect and the dynamic aspect (of muscle performance or relaxation). The temporal aspect means time spaces for each part of the movement, which is in itself a measure of both motor learning processes and progress. For the dynamic aspect, it means a standard of forms taken by the forces associated with the movement, and every part of it, and that can be measured by the amount of energy made or by modern appliances. [14]

The question of developing a specific musical rhythm to each kata may

contribute significantly to adjust this estimate by the team and avoid subjectivity. It also harmonizes the performance and then an increase in the judges' evaluation score along with other technical conditions.

Ahmed Ibrahim (1995) confirms that the score is estimated according to three basic aspects of technical performance, the maximum score given to this aspect is 5 scores; the motor sequence, the maximum score given to this aspect is 2.5 scores; motor rhythm, the maximum score given to this aspect is 2.5 scores. Thus, the maximum score given to the performer after performing of the motor routine kinetic (kata) is ten (10) scores. [3]

Based on the foregoing, the researcher believes that kata is performed in the form of teams, a team consists of three performers, they are perform kata in a group in accordance with the technical requirements of the motor routine performed and according to a specific rhythm. It could be differently appreciated among the team members, which could lead to the disruption of the whole team performance, and then

low performance score, which indicates the importance of motor rhythm in the evaluation process of kata performance.

Rhythm is one of the determinants on which determining the score of team and reducing the score in the event of failure, as follows:

$\frac{1}{2}$ rhythm or less will be deducted 0.2 score, $\frac{1}{2}$ or full rhythm will be deducted 0.5 score, more than a full rhythm will be deducted 0.5 score for each $\frac{1}{2}$ rhythm increases.

In the under 12-year age group, motor growth development increases markedly. The performer can significantly meaningfully direct and control movements. The movements become more meaningful and economic in effort. The child's movements are also imbued with great agility, speed and strength. They are characterized by good timing, streamlining and good motion transition from the trunk, arms to legs, with reference to the importance of this stage to learn different skills and motor abilities to the extent that any other group age could parallel. Many think it is the appropriate age for early athletic specialization in most types of athletic activities. [9]

Therefore, the researcher seeks to take advantage of all that is new, to experiment them and introduce them into the training programs. By reviewing of literature in the karate and specifically kata competition, which could be reached by the researcher, the researcher has noted that there is a dearth of research on the effect of motor rhythm. [6, 11] Thus, the researcher has been prompted to conduct this study in order to identify the effect of musical rhythm use on motor coordination and performance score of team kata for karate performers, for one of the most important katas, unsu-kata, as one of the most important motor routines mostly chosen in competition, performed in the competitive stages under question and competitive stages that followed.

The Research Objective:

The research aims to identify the effect of musical rhythm use on motor coordination and performance score of team kata for karate performers under 12 years.

Hypotheses:

1. There would be statistically significant differences between pre- and

post-tests of motor coordination for experimental group in favor of post-test.

2. There would be statistically significant differences between pre- and post-tests of team kata performance for experimental group in favor of post-test.

Procedures:

Methodology:

The researcher has used the experimental approach using experimental design of pre- and post-tests of one group for its relevance to the nature of this study.

The Research Sample:

The basic research sample has been selected intentionally from kata performers of Port Said Karate Area under 12 years. The sample included 15 performers (five teams). The researcher also used 23 performers from the same research population and outside the basic research sample to conduct scientific treatments (validity and reliability) of the tests used. The pilot study was also conducted to rationalize the training loads of the proposed training program.

The Sample Homogeneity:

The homogeneity of the basic research sample was calculated in general variables (height, age, weight, training age), physical abilities of kata performers, auditory rhythm and unsu-kata performance score. The skewness

coefficients of these variables were limited between (-0.05, 1.26).

Coefficients of physical tests (validity and reliability):

The coefficients for battery of physical tests and audio test under question were calculated from 01/12 to 17/01/2013. That was to ensure the validity of those tests scientifically, the coefficients of discriminate validity of those tests were limited between (0.80, 0.94). The reliability coefficients for these tests were limited between (0.75, 0.94).

The Experimental Program Procedures:

The Musical Rhythm:

The researcher has translated (composed) motor rhythm into musical rhythm for the Italian team performance in the final match of the European Karate Federation Championship, team kata (Spain 2012). Where the translation movements and rests of the motor routine unsu-kata rhythmically to illustrate the extent and tempo for each part of the motor routine. Each movement and rest has a musical rhythm taking a certain time corresponding to the time of the movements and rests through the motor routine.

For example, the duration of crotchet (q) equals one quarter corresponded to movements such as palm at the beginning of the motor routines

unsu-kata. The same is for movements requiring greater time in performance, as well as for silent parts or with slow rhythm in the motor routine, which represents preparing movements for some swift movements inside unsu-kata which had specific duration known in music as a rest represented by semibreve note (w) equal to silent duration of four quarters.

Training with Musical Rhythm:

The musical rhythm of the motor routine unsu-kata was recorded on small-sized mp4 devices with earphones securely attached to each performer's belt. Each player was training on the agreed clip individually (each player separately) during the specified time for each clip according to the temporal distribution of skill performance for the motor routine unsu-kata throughout the program training stages.

The Exploratory Study:

The researcher conducted the exploratory study on the exploratory research sample of 3 performers from the original research population and outside the research sample to rationalize the training loads of the proposed program trainings, to determine the most appropriate way to attach

the mp4 device, in addition to the order of sound clips of each part of unsu-kata and frequency to repeat commensurate with the allotted time, from 01/12 to 17/01/2013.

The Basic Study:

- The rhythmic routine for the motor routine unsu-kata was designed from 26/01/2013 to 05/03/2013.

- Measurements of height, weight, age and training age, as well as pre-measurements for battery of physical tests for karate kata performers and auditory rhythm test of the basic research sample were conducted on Tuesday 15/06/2013 at six pm in Port Said Rabat Club Hall.

- The training program has been implemented from 22/06 to 13/09/2013, i.e., for twelve weeks, 4 training units per week.

- The pre-measurements of the physical tests under discussion for the basic research sample were conducted on Sunday 10/09/2013 at six pm in Port Said Rabat Club Hall.

The Statistical Treatment:

The researcher used the Statistical Package for Social Sciences (SPSS) to analyze the data.

Results:

Table (1)

Significance of differences between the pre- and post-tests for the physical tests of the experimental group using Wilcoxon Test (n = 15)

Tests	Measurement Unit	Number of Ranks		Mean of Ranks		Total of Ranks		Calculated W	Sig.	
		-	+	-	+	-	+			
Test of Side Trunk Rotation	Degree	0	15	0	8	0	120	-3.48	0.00	Sig.
Test of Front Kick Velocity	Degree	0	15	0	8	0	120	-3.44	0.00	Sig.
Test of Bent-Knee Sit-up (60 sec)	Degree	0	15	0	8	0	120	-3.45	0.00	Sig.
Test of Exchange Roundhouse Kick (20 sec)	Degree	0	15	0	8	0	120	-3.46	0.00	Sig.
Test of Standing on Preferred Instep	Degree	0	15	0	8	0	120	-3.43	0.00	Sig.
Test of Numbered Circles	Degree	0	15	0	8	0	120	-3.51	0.00	Sig.
Test of Standing Broad Jump	Degree	0	15	0	8	0	120	-3.45	0.00	Sig.
Test of Medicine Ball (3 Kg) Throws	Degree	0	15	0	8	0	120	-3.41	0.00	Sig.
Test of Auditory Rhythm	Degree	10	3	7.20	6.33	72	19	-1.88	0.06	Not Sig.

* W for Wilcoxon at 0.05 = 25

Table (1) shows that the value of W calculated by applying Wilcoxon signed rank test of significance differences between both pre- and post-tests for the experimental group in the physical tests under discussion, was, -3.48

for side trunk rotation with 0.00 for statistical significance; -3.44 for front kick speed with 0.00 for statistical significance; -3.45 for bent-knee sit-ups (60 sec.) with 0.00 for statistical significance; -3.46 for exchange roundhouse kick

with 0.00 for statistical significance; -3.43 for standing on preferred instep with 0.00 for statistical significance; -3.51 for numbered circles with 0.00 for statistical significance; -3.45 standing broad jump with 0.00 for statistical significance; -3.41 for medicine ball (3 Kg) throws with 0.00 for statistical significance. They are statistically significant, which indicates the presence of statistically significant differences, which means that

the differences between the pre- and post-tests of these variables are real and in favor of the post-measurement in the battery of physical tests for karate kata performers.

The value of W calculated by applying the Wilcoxon signed rank test of the significance differences between pre and post-tests for the experimental group in the auditory rhythm test, -1.88 with 0.06 for statistical significance, which is non-statistically significant.

Table (2) Significance differences between pre and post-tests for the experimental group in the unsu-kata motor routine score in karate using Wilcoxon test (n = 5)

Tests	Measurement Unit	Number of Ranks		Mean of Ranks		Total of Ranks		CalculatedW	Sig.
		-	+	-	+	-	+		
Unsu-kata Score	Degree	0	5	0	3	0	15	-2.07	0.038

* W for Wilcoxon at 0.05 = Zero

Table (2) shows that the value of W calculated by applying the Wilcoxon signed rank test of the significance differences between pre- and post-tests for the experimental group in the skill performance score of the unsu-kata motor routine in karate, was, -2.07 with 0.038 for statistical significance, which is

statistically significant, this means that the differences between the pre- and post-tests of these variables are real and in favor of the post-test.

Result Discussion:

The researcher has made two hypotheses as a practical attempt to achieve some specific results. After presenting the results, the

researcher explains the findings concluded to try to achieve the research objective:

- Validating the first hypothesis, which states that:

"There would be statistically significant differences between pre- and post-tests of motor coordination for experimental group in favor of post-test."

Regular observation on the performance of the experimental group teams contributed to judging the quality of performance and identifying the extent of motor coordination improvement among the performers of a team. The researcher used the method of visual observation, which is one of the most commonly used ways in athletic activities generally, particularly, kata competitions in karate, gymnastics, for these competitions depend on how to evaluate the technical performance using scores according to many parameters by which the quality of performance can be judged.

The researcher relied on some interim qualitative motor analysis models of performance, which observing sensitive features or characteristics of performance of its stages without going into

remedy or adjustment details, as well as some overall qualitative motor analysis models, which begin with preparation, then description, then diagnosis, thus provide the best intervention to fix errors.

That is consistent with the study of Tariq Abdel-Samad (2004), which used "Beveridges-Gangstead Model" and "Hawy-Reid Model" in evaluating the technical performance when teaching the most common skills in the Heian series. Those models relied on objective observation of the temporal aspects of performance stages "introductory, major, final", and spatial and movement track of the arms, legs, trunk and head. [15]

It should also be noted here that the musical rhythm played a positive role in increasing motor coordination among the three performers per team of the five experimental group teams, by adjusting the temporal timing for the performance of strikes, kicks, moves and rests inside the motor routine unsu-kata, which in turn is reflected in the judges' estimations of unsu-

kata performance in the post-measurement for the basic sample teams.

That is consistent with what confirmed by Smolensky (1995) that the correct timing and rhythm sequence in skill performance has a significant role in the accuracy and control of motor performance, and helps the performer to carry out all movements and feel each movement. [13]

- Validating the second hypothesis, which states that: "There would be statistically significant differences between pre- and post-tests of team kata performance for experimental group in favor of post-test."

The results showed an improvement in the score of motor routine unsu-kata performance. The results indicate the presence of a statistically significant difference between pre- and post-tests in favor of the post-test.

The researcher has attributed that improvement to content of skill using preparation using musical rhythm of the motor routine unsu-kata within the training program. The motor routine accompanying musical rhythm with increasing periods of training constantly in this

way led to the levels of work results being directed to the better performance, the reason for that is the musical rhythm is a way to adjust the performance according to the type of music selected for the movements.

Abdel-Sattar Jassim and Aida Hussein (1991) confirms that music improves or increases the ability to motor expression. It helps the learner and trainee control the performance of movements and create a state of harmony in their parts, especially if the music clip is consistent with movements to be performed. [1]

Under the experiment of the training program, it has been shown that the music accompaniment to performance has had an effective influence on controlling the motion technique properly by controlling the amount of muscle tension, speed extension of movement, and motor rhythm in it.

Here, it is important to refer to the recognized reality that rhythm is an effective way helping the learning process as being linked to kinesthetic sensation and a means to help clarify movement and facilitate

its explanation.

Many studies concluded many results that showed the positive effect of the training method used accompanied with rhythm at the technical performance level, as well as the role of musical rhythm in learning skills leading to progress in the performance level. It is visible when learning a new movement, we find that knowledge of and learning its rhythm have the main role in its learning and mastery of its performance. [5, 7, 8, 16, 2]

Conclusions:

In the light of the research objectives, hypotheses and results, the following conclusions could be reached:

1. The temporal rhythm of single and compound movements forming the motor routine unsu-kata varied for sample performers. The performance time has been reduced due to increased motor performance speed, as a result of sample performers' attempts to maintain the performance according to the musical rhythm designed for unsu-kata
2. Coordination and linkage between parts of the motor routine unsu-kata have increased, as reflected in the quality of motor and skill

performance, which had have a profound impact in elevating the level of the sample performers' individual performance, in addition to increasing motor coordination among each team's performers, five teams of research sample. It has been the reason behind the increase in skill performance score for each one of sample search teams.

3. The motor coordination of motor routine unsu-kata performance has increased among each team's performers for the basic research sample five teams, reflected in the judges' scores.

Recommendations:

Based on the findings, the researcher recommends the following:

1. To try to translate and compose a musical rhythm of all motor routines, undertaken by official bodies concerned with the responsibility of raising the technical level of kata performance of in karate, like the Egyptian Karate Federation, so that each motor routine has a recognized musical rhythm to contribute to training for team kata competitions in karate.
2. To be oriented to using the musical rhythm of motor

routines through mental training operations, so that they accompany mental training for team kata performers, listening to the musical rhythm, which may contribute to a large degree increasing the motor coordination for the team performers, which has been one of the more prominent research results.

3. To conduct studies and other research to find out the effect of musical rhythm in teaching and training skills in actual fighting competitions (Kumite) in karate.

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