

## THE EFFECTIVENESS OF RHYTHMIC GYMNASTICS IN IMPROVING CHILDREN'S GROSS MOTOR ABILITIES

**Ikadarny \*<sup>1</sup>**

Pendidikan Jasmani Kesehatan dan Rekreasi FIKK UNM, Indonesia  
E-mail: ikadarny@unm.ac.id

**Suriah Hanafi**

Pendidikan Jasmani Kesehatan dan Rekreasi FIKK UNM, Indonesia  
E-mail: suriah.hanafi@unm.ac.id

**Nur Indah Atifah Anwar**

Pendidikan Jasmani Kesehatan dan Rekreasi FIKK UNM, Indonesia  
E-mail: nurinda@unm.ac.id

**Akbar Yusuf**

Pendidikan Jasmani Kesehatan dan Rekreasi STKIP YPUP Makassar, Indonesia  
E-mail: akbaryusuf@gmail.com

### **Abstract**

Gross motor development is very important for children. The development of children's gross motor skills requires assistance from educators in educational institutions. The ability to carry out movements and physical actions for a child is related to self-confidence and forming a self-concept. One way to maintain body fitness is through rhythmic exercise. Rhythmic gymnastics are gymnastic movements or free movements accompanied by music that matches the rhythm that follows the movements. Rhythmic gymnastics aims to develop movement abilities, such as developing muscle endurance, strength, flexibility, agility and balance through physical activities, namely playing and exercising which are carried out systematically, directed and planned. Children who are directly involved in rhythmic gymnastics activities will develop flexibility and coordination. To improve a child's gross motor skills, training is needed that is appropriate to the child's characteristics. Gross motor development will be optimal if physical activities are carried out to stimulate it. First, perform coordinated body movements to train flexibility, balance and agility. Second, coordinate the movements of the legs, hands and head in imitating dance or gymnastics. Third, play a physical game with rules. Fourth, be skilled in using your right and left hands. Fifth, carry out personal hygiene activities.

**Keywords:** Rhythmic Gymnastics, Children's Gross Motor

---

<sup>1</sup> Correspondence author

## INTRODUCTION

Gross motor development is very important for children because gross motor development influences other developments. This is in accordance with Sumantri's opinion (in Williams, H. G., & Monsma, E. V, 2017) which states that there is a mutually influencing relationship between body fitness, motor skills and motor control. Children's motor skills will not develop without mature motor control, motor control will not develop without body fitness, body fitness will not be achieved without physical exercise. So it can be concluded that the relationship between motor control, body fitness and physical training is a unity where if one aspect is not fulfilled it will have an impact on the development of the child's motor skills.

Motor skills will not develop through maturity alone but must be learned. Educators need to know the needs of each child to develop their large and small muscles at each age level (Rey, E., et al, 2020). This means that educators need good equipment, but what is even more important is a good attitude at the child's level by letting the child know something and try various gross and fine motor activities that are appropriate to their age level.

Children's physical and motor development tends to follow relatively the same pattern so that it can be seen as normal or experiencing obstacles. However, there are differences in the rate of development between one child and another, so that no two individuals are exactly the same, both in physical growth and motor development. Motor development depends on the maturity of muscles and nerves, so it will be difficult for children to demonstrate certain skills when they are not yet mature.

Gross motor development in children trains physical movements in the form of coordinating body movements in children, such as crawling, running, tiptoeing, jumping, hanging, throwing and catching, and maintaining balance (Ozonoff, S., et al, 2008). Gross motor development is very important for children. The development of children's gross motor skills requires assistance from educators in educational institutions. The ability to carry out movements and physical actions for a child is related to self-confidence and forming a self-concept.

One way to maintain body fitness is through rhythmic exercise. Rhythmic gymnastics are gymnastic movements or free movements accompanied by music that matches the rhythm that follows the movements. Rhythmic gymnastics aims to develop movement abilities, such as developing muscle endurance, strength, flexibility, agility and balance through physical activities, namely playing and exercising which are carried out systematically,

directed and planned. Children who are directly involved in rhythmic gymnastics activities will develop flexibility and coordination. In addition, rhythmic gymnastics activities can contribute to enriching the movement repertoire of the participants (Xu, C., et al, 2020). Gymnastics also has the potential to develop basic movement skills for children. Because gymnastics involves all parts of the body to move. By moving all parts of the child's body, it will have an effect on improving the child's gross motor skills.

Rhythmic gymnastics are forms of gymnastic movements which are a combination of various forms of movement with accompanying musical rhythms (Manggau, A., & Usman, A, 2020). Through rhythmic gymnastics activities, children can move all their body parts, so that their gross motor skills will increase. Apart from that, the combination of hands and feet can be stimulated through rhythmic gymnastics activities.

In doing rhythmic gymnastics, the thing that must be done is to master the basic movements, attitudes and basic movements (Tincea, R. M, 2019). The basic stance is used at the beginning of rhythmic gymnastics, namely the initial stance of rhythmic gymnastics. The initial stance for rhythmic gymnastics is an upright stance with the body standing upright, the left leg straight as a support for the body weight, the right leg bent at the knee with the tip of the foot touching the floor in the middle of the sole of the left foot.

The basic movements in rhythmic gymnastics include arm movements, leg movements, and a combination of arm and leg movements (Sulistyowati, E. M., et al, 2022). Arm movements include one arm swing, two arm swing and arm rotation. Foot movements include leg swings, walking/stepping movements and jumping movements. Leg movements and arm movements are carried out simultaneously so that a combination of hand and leg movements is created.

## **RESEARCH METHOD**

The study in this research is qualitative with literature. The literature study research method is a research approach that involves the analysis and synthesis of information from various literature sources that are relevant to a particular research topic. Documents taken from literature research are journals, books and references related to the discussion you want to research (Earley, M.A. 2014; Snyder, H. 2019).

## **RESULT AND DISCUSSION**

### **Rhythmic gymnastics**

#### **A. Understanding Rhythmic Gymnastics**

According to Friana Rifdarmas (in Bobo-Arce, M., & Méndez Rial, B, 2013) in simple terms, rhythmic gymnastics is defined as gymnastic movements accompanied by music. This exercise, known as rhythmic gymnastics, basically has movements that are more or less the same as regular gymnastics. The only difference is the addition of the music feature which for some people makes them even more enthusiastic about doing exercise. Rhythmic gymnastics or also called rhythmic gymnastics are gymnastic movements performed to the rhythm of music, or free exercises performed rhythmically.

According to Elisabet B. Hurlock (in Leandro, C., et al, 2017) that some of the most important child development tasks in kindergarten and the early years of school consist of motor development which is based on the coordinated use of different muscle groups. In the early learning stages, there is a lack of coordination of nerve centers, nerves and muscles, so that children still make many mistakes and are not careful in their movements. Part of a child's kinesthetic intelligence activities depends on aspects of the child's physical fitness.

Rhythmic gymnastics is a natural expression of the soul that comes from the impulse of the soul, spontaneously and simply to move which can increase the sense of the art of movement (Purenović-Ivanović, T. M., et al, 2016). In simple terms, rhythmic gymnastics is gymnastics that prioritizes the same movements, can be accompanied by music or songs, counting or even tapping.

Rhythmic gymnastics can also be interpreted as an exercise that is done by following the rhythm of music or singing, which then forms a coordination of movements between the movements of the body parts and the rhythm. Rhythmic gymnastics is included in the general type of exercise, because it has the characteristics of being easy to participate in, does not require expensive costs, involves many participants, and is beneficial for body health (Hamza, L. D. J. S., & Ahmed, Z. S, 2020).

Based on the description above, it can be concluded that rhythmic gymnastics is a type of sport that is formed through coordinating the movements of body parts such as hands, feet and head with rhythm, either in the form of music or beats and can be done together and guided by an instructor. exercise.

## B. Benefits of Rhythmic Gymnastics

### 1. Physical Benefits

People who do rhythmic exercise regularly will develop endurance, muscle, strength, power, flexibility, coordination, agility and balance.

### 2. Mental benefits

People who regularly do rhythmic gymnastics are able to use their thinking abilities actively and creatively by solving movement problems.

### 3. Social benefits

In this case, if gymnastics activities are carried out together, social interaction will be realized (Batista, A., et al, 2019).

Based on the opinion above, the author can conclude that rhythmic gymnastics is a form of movement that emphasizes rhythm, accompanied by music or songs, counting and even beats with foot movements, arm swings, movement stages and the end of the movement. Examples of exercise movements for children include warm-up movements, core movements and cooling movements.

## C. Principles of Rhythmic Gymnastics

Rhythmic gymnastics has several principles that must always be considered so that the activity can run optimally. The principles of rhythmic gymnastics include rhythm, body flexibility in movement (flexibility) and continuity of movement (Bobo-Arce, M., et al, 2021).

### 1. Rhythm

When carrying out rhythmic gymnastics activities, the most important thing is to know and feel the rhythm in the songs that will be used as accompanying music. The rhythm in a song can be determined from the sound of the bass, namely the loudness and slowness of the bass passage. When someone can feel the rhythm of a song, that person will naturally feel happy to move their body. Additionally, one can easily adapt the rhythm to one's movements.

Woerjati, et al. stated that the rhythms in songs are divided into 2/4, 4/4, 3/4 and 6/8 rhythms. The use of each rhythm of the song in rhythmic gymnastics activities varies, depending on the exercises being carried out. The rhythm of the song used during warm-up will be different from the rhythm of the song used during core training and calming down.

In the warm-up exercises, the songs used are songs that are rhythmically lively and encouraging. This is because the activities in warm-up exercises function to raise the child's body temperature and

prepare the child's body to carry out further, more complicated activities. If the music used is encouraging, children will be interested in moving their bodies. Thus, the songs used are songs with a 2/4, 4/4, or 3/4 (fast) rhythm, for example the song Cut Duck Goose, Gelang Sipatu Gelang, Jump-Jump Kukatak, march songs, and so on.

In body exercises that contain elements of normalization, the exercises used are movements that are relaxing and carried out with correct movements. Songs that can be used in this exercise are songs with a slow 3/4 or 4/4 rhythm, such as the songs Up-Up to the Top of the Mountain, Old Cockatoo and Si Patokaan.

Balance training in rhythmic gymnastics requires a good combination of body muscles. Therefore, a calming musical rhythm is needed, such as a slow 3/4 or 4/4 rhythm. Rhythmic gymnastics movements that require strength and agility should use songs that contain enthusiasm and have a clear (firm) rhythm. Because this training is a training exercise and training to achieve achievement. The song rhythms that are usually used for strength and agility training are songs with a 4/4 or 3/4 rhythm.

## 2. Fleksibilitas

Flexibility in rhythmic gymnastics is meant as a person's ability to bend (fold) and contort the body, so that there is elasticity and flexibility in body movements. Examples of movements that require body flexibility are bending the body, turning the body to the side, and twisting the body. Body flexibility is very important in rhythmic gymnastics activities so that it does not cause stiff movements.

## 3. Continuity of movement

The various movements carried out in rhythmic gymnastics activities are a continuation. One movement with the next movement is a series that cannot be broken. The movements carried out are a continuous unity from the beginning to the end of the activity.

Based on the description above, it can be concluded that the principles contained in rhythmic gymnastics activities include rhythm, body flexibility in carrying out movements (flexibility) and continuity of movements.

## **Application of Rhythmic Gymnastics to Improve Gross Motor Skills**

One of the best stimulations given to improve kinesthetic intelligence in children is through rhythmic gymnastics because children really like to

move, especially if they are accompanied by enthusiastic and happy music and songs so they can express themselves. Gymnastics is an optimization of physical activity for children's development (Handayani, S. G, 2020). The child's development that can be formed is endurance, agility, intelligence, flexibility, and good body coordination cooperation. The classification of gymnastics is rhythmic or rhythmic gymnastics. Rhythmic gymnastics is a gymnastic movement that combines various forms of movement with accompanying rhythms, for example combining the rhythm of clapping, tapping, tambourine, singing, music and so on (Hardasari, R., & Diana, D, 2020). The results and discussion of this literature review focus on the application of rhythmic gymnastics carried out by teachers for children at school.

Motor development has a huge effect on the development of cognitive, social and physical behavior (Jusuf, J.B. K., et al, 2020). Motor development, especially motor skills, can be useful for diagnosing problems in individuals who may be developing abnormally and it is important to help individuals improve their motor performance by engaging in developmentally appropriate activities.

Gross motor development as progressively more and more skillful use of the totality of the body in activities that involve large muscle groups and that require spatial and temporal coordination of simultaneous movements of several body segments (Fotiadou, E. G., et al, 2009). "Gross motor development includes especially the abilities used to move the body from one place to another (locomotion) and to move and pick up objects.

Rhythmic gymnastics are gymnastic movements carried out with rhythm or music or movement activities carried out rhythmically (Muslim, D. A., & Kristiana, I. F, 2023). Rhythmic gymnastics are gymnastic movements performed to the rhythm of music or free exercises performed rhythmically (Ahmed, R. H, 2016). Here rhythmic gymnastics can be done with predetermined gymnastic movements or free movements according to each individual's wishes. Meanwhile (Fotios, M., et al, 2013) explains that rhythmic gymnastics is gymnastics that is accompanied by a rhythm and the movements must still follow the rhythm. Rhythmic gymnastics is a combination of sports movements and dance. Rhythmic gymnastics prioritizes beautiful movements and can be done by walking or running. Furthermore, Ahmad in (Chiriac, Ş., et al, 2020) stated that rhythmic gymnastics can also be interpreted as an exercise that is done by following the rhythm of music or

singing, which then forms a coordination of movements between the movements of the body parts and the rhythm.

Based on the opinions of the experts above, it can be concluded that rhythmic gymnastics is a combination of various forms of movement following the rhythm of music. The movements carried out must be appropriate and in harmony with the rhythm that accompanies them so that the movements carried out look harmonious and then a movement coordination is formed between the movements of the body parts and the rhythm.

Motor skills are all movements carried out by the whole body. Meanwhile, gross motor skills are physical activities that involve the coordination of large muscles such as the arms, leg muscles, shoulder muscles, back muscles and stomach which are influenced by the child's physical maturity, such as running, jumping, throwing, walking slowly and quickly, rolling, standing on tiptoes, etc. spin (Law, M. P., Côté, J., & Ericsson, K. A, 2007).

In order to recognize and understand their environment, children must do physical activity. The more children are trained to move their muscles, the more honed and developed their motor skills will be (Russo, L., et al, 2021). When their motor skills become more honed due to frequent physical activity, children will get used to doing gross motor activities without difficulty. According to Harsono (in Napo, P, 2024) when the body's senses are frequently trained, the body will become balanced. Characteristics of body imbalance in children include falling for no reason, fear of heights, often bumping into things when walking or running, and difficulty being able to focus. Palmizal, A., et al (2020) stated that improving children's motor skills is beneficial for children's physiological, social and emotional and cognitive development. From a physiological perspective, if children engage in movement or exercise, it will stimulate all their physiological processes, such as blood circulation and breathing.

If children are taught to do physical exercise or exercise from an early age, it will have a good impact on their body posture in the future. It is very important to continue to develop children's gross motor skills because it will have an impact on facing life problems in the future, therefore the gross motor exercises carried out are preparation for children to face these problems (Rudd, J, 2016).

When a child is dealing with problems or issues regarding his gross motor skills, he already knows what to do to solve them. According to Culjak, Z., et al (2014), this development process cannot be separated from the

important elements that play a role in helping children through it, these important elements are none other than teachers and parents. Teachers and parents work together to stimulate children's gross motor development. At school the teacher stimulates it with activities that involve the child's large muscles and at home parents stimulate it with daily activities that the child usually does.

Developing gross motor skills specifically related to the ability to step, to move the body, and to swing the arms to the right and left was proven to be effective in this study and indeed is also supported by several previous studies. Battaglia, C., et al (2014) found that there was an increase in children's ability to perform coordinated movements after regularly doing rhythmic gymnastics. Also, training children with rhythmic gymnastics can improve their ability to combine leg and arm movements, to jump and walk and rhythmic gymnastics with traditional songs can improve elementary school students' gross motor skills.

Gross motor skills are very important for a child's current and future growth and development. These skills will form a child's sense of self-confidence, independence and acceptance from their peers. Teachers or parents must understand appropriate stimulation to develop their children's gross motor skills including locomotor skills, non-locomotor skills, and self-accepting and projecting skills. To develop gross motor skills, children can be treated with rhythmic exercises. Exercises are easy to do and effective for optimizing children's physical growth and development (Suryadi, D., et al, 2024). Apart from that, rhythmic gymnastics combines various movements and musical rhythms such as clapping, tapping, tambourine, singing and music. Thus, it is clear that rhythmic dance is closely correlated with children's gross motor development.

To improve a child's gross motor skills, training is needed that is appropriate to the child's characteristics. Gross motor development will be optimal if physical activities are carried out to stimulate it. First, perform coordinated body movements to train flexibility, balance and agility. Second, coordinate the movements of the legs, hands and head in imitating dance or gymnastics. Third, play a physical game with rules. Fourth, be skilled in using your right and left hands. Fifth, carry out personal hygiene activities.

Rhythmic gymnastics is a combination of forms of movement with accompanying rhythm. Rhythmic gymnastics activities are an effort to develop children's gross motor skills. Through rhythmic gymnastics, basic body movements will be trained expressively and will provide significant changes

for children who experience motor skills because they require strength and dexterity, so that their physical motor skills will become healthier and fitter (Purenović-Ivanović, T. M., et al, 2016).

Rhythmic gymnastics is divided into three stages (Hamza, L. D. J. S., & Ahmed, Z. S, 2020), namely: warm-up stage, core stage and cool-down stage. The warm-up stage is carried out before the core movements. The warm-up is carried out in rhythmic gymnastics to prepare the body's condition physiologically and psychologically, preparing the respiratory system, blood circulation, muscles and joints. The core movements in rhythmic gymnastics are gross motor movements that train flexibility, balance, agility, suppleness and coordination of moving muscles. Cooling down is done after core movements, this stage is done to relax the muscles, calm the body, and regulate breathing so that the body relaxes.

## **CONCLUSION**

Children's gross motor development can be done with one of the activities, namely rhythmic gymnastics. Gross motor development is an aspect of motor behavior and motor control that is related to changes in motor performance throughout the life span. The development of children's gross motor skills aims to introduce and train gross movements, improve the ability to manage, control body movements and coordination, as well as improve body skills and healthy lifestyles. To improve a child's gross motor skills, exercises are needed that are appropriate to the child's characteristics. Gross motor development will be optimal if physical activities are carried out to stimulate it. First, perform coordinated body movements to train flexibility, balance and agility. Second, coordinate the movements of the legs, hands and head in imitating dance or gymnastics. Third, play a physical game with rules. Fourth, be skilled in using your right and left hands. Fifth, carry out personal hygiene activities.

## **REFERENCES**

- Ahmed, R. H. (2016). IMPACT OF COORDINATION ABILITIES PROGRAM ON ACCURACY AND SPEED IN RHYTHMIC GYMNASTICS. *Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health*, 16(2).
- Batista, A., Garganta, R., & Ávila-Carvalho, L. (2019). Body difficulties in rhythmic gymnastics routines. *Science of Gymnastics Journal*, 11(1), 37-55.

- Battaglia, C., D'Artibale, E., Fiorilli, G., Piazza, M., Tsopani, D., Giombini, A., ... & di Cagno, A. (2014). Use of video observation and motor imagery on jumping performance in national rhythmic gymnastics athletes. *Human movement science*, 38, 225-234.
- Bobo-Arce, M., & Méndez Rial, B. (2013). Determinants of competitive performance in rhythmic gymnastics: a review.
- Bobo-Arce, M., Sierra-Palmeiro, E., Fernández-Villarino, M. A., & Fink, H. (2021). Training in rhythmic gymnastics during the pandemic. *Frontiers in Psychology*, 12, 658872.
- Chiriac, Ş., Teodorescu, S., & Bota, A. (2020). Preliminary study on psychomotor abilities decisive for technical routines in rhythmic gymnastics. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 11(4Sup1), 62-80.
- Culjak, Z., Miletic, D., Kalinski, S. D., Kezic, A., & Zuvela, F. (2014). Fundamental movement skills development under the influence of a gymnastics program and everyday physical activity in seven-year-old children. *Iranian journal of pediatrics*, 24(2), 124.
- Earley, M. A. (2014). A synthesis of the literature on research methods education. *Teaching in Higher Education*, 19(3), 242-253.
- Fotiadou, E. G., Neofotistou, K. H., Sidiropoulou, M. P., Tsimaras, V. K., Mandroukas, A. K., & Angelopoulou, N. A. (2009). The effect of a rhythmic gymnastics program on the dynamic balance ability of individuals with intellectual disability. *The Journal of Strength & Conditioning Research*, 23(7), 2102-2106.
- Fotios, M., Miltiadis, P., Eirini, A., & Andromahi, S. (2013). DYNAMIC BALANCE IN GIRLS PRACTICING RECREATIONAL RHYTHMIC GYMNASTICS AND GREEK TRADITIONAL DANCES. *Science of Gymnastics Journal*, 5(1).
- Hamza, L. D. J. S., & Ahmed, Z. S. (2020). The history of rhythmic gymnastics for women. *International Journal of Psychosocial Rehabilitation*, 24(03), 6605-6612.
- Handayani, S. G. (2020). The effect of implementing rhythmic gymnastics to improve motor skills of primary school students. In *1st Progress in Social Science, Humanities and Education Research Symposium (PSSHERS 2019)* (pp. 777-779). Atlantis Press.
- Hardasari, R., & Diana, D. (2020). The Application of Taiso Radio Gymnastic in Improving Gross Motor Ability of Children Aged 5-6 Years. *BELIA: Early Childhood Education Papers*, 9(1), 34-39.

- Jusuf, J. B. K., Khatimah, K., Rahmawati, Y., Mahardhika, N. A., & Santoso, J. A. (2020). Rhythmic Gymnastics Development to Increase Rough Motor Skills in Elementary School Student. In 1st Borobudur International Symposium on Humanities, Economics and Social Sciences (BIS-HESS 2019) (pp. 351-354). Atlantis Press.
- Law, M. P., Côté, J., & Ericsson, K. A. (2007). Characteristics of expert development in rhythmic gymnastics: A retrospective study. *International journal of sport and exercise psychology*, 5(1), 82-103.
- Leandro, C., Ávila-Carvalho, L., Sierra-Palmeiro, E., & Bobo-Arce, M. (2017). Judging in rhythmic gymnastics at different levels of performance. *Journal of human kinetics*, 60(1), 159-165.
- Manggau, A., & Usman, A. (2020). Developing the Gross Motor Skills of Children by Simultaneously Training Them with Rhythmic Gymnastics. *Journal of Educational Science and Technology" EST"*, 6(2), 205-216.
- Muslim, D. A., & Kristiana, I. F. (2023). Optimization of Gross Motor Skills Development in Early Childhood by Conducting Physical Training Activities. In *International Conference on Integrated-Holistic Early Childhood Education (ICIHECE)* (Vol. 1, pp. 53-59).
- Napo, P. (2024). Rhythmic Gymnaastics: Exploring Its Benefits And Contributions In The World Of Education (A Literature Review). *JUPE: Jurnal Pendidikan Mandala*, 9(1), 68-76.
- Ozonoff, S., Young, G. S., Goldring, S., Greiss-Hess, L., Herrera, A. M., Steele, J., ... & Rogers, S. J. (2008). Gross motor development, movement abnormalities, and early identification of autism. *Journal of autism and developmental disorders*, 38, 644-656.
- Palmizal, A., Pujianto, D., & Nurkadri, A. A. N. P. L. (2020). Development of a Creative Gymnastics Model to Improve Basic Locomotor Movements for Students in Elementary School. *International Journal of Human Movement and Sports Sciences*, 8(6A), 78-84.
- Purenović-Ivanović, T. M., Popović, R., Stanković, D., & Bubanj, S. (2016). The importance of motor coordination abilities for performance in rhythmic gymnastics. *Facta Universitatis, Series: Physical Education and Sport*, 63-74.
- Rey, E., Carballo-Fazanes, A., Varela-Casal, C., Abelairas-Gómez, C., & ALFA-MOV Project collaborators. (2020). Reliability of the test of gross motor development: A systematic review. *PLoS One*, 15(7), e0236070.

- Rudd, J. (2016). The efficacy of gymnastics to improve movement skill competence in children (Doctoral dissertation, Victoria University).
- Russo, L., Palermi, S., Dhahbi, W., Kalinski, S. D., Bragazzi, N. L., & Padulo, J. (2021). Selected components of physical fitness in rhythmic and artistic youth gymnast. *Sport Sciences for Health*, 17, 415-421.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research*, 104, 333-339.
- Sulistiyowati, E. M., Suherman, W. S., Sukamti, E. R., Rahmatullah, M. I., & Mitsalina, D. (2022). Specifics of basic biomotor components for rhythmic gymnastics. In *Conference on Interdisciplinary Approach in Sports in conjunction with the 4th Yogyakarta International Seminar on Health, Physical Education, and Sport Science (COIS-YISHPESS 2021)* (pp. 27-30). Atlantis Press.
- Suryadi, D., Nasrulloh, A., Yanti, N., Fauzan, L. A., Kushartanti, B. W., Suhartini, B., ... & bin Abdullah, N. M. (2024). Stimulation of motor skills through game models in early childhood and elementary school students: systematic review in Indonesia. *Retos*, 51, 1255-1261.
- Tincea, R. M. (2019). The development of mobility and coordination in rhythmic gymnastics performance at children and hopes level. *Bulletin of the Transilvania University of Braşov. Series IX: Sciences of Human Kinetics*, 145-150.
- Williams, H. G., & Monsma, E. V. (2017). Assessment of gross motor development. In *Psychoeducational assessment of preschool children* (pp. 397-464). Routledge.
- Xu, C., Yao, M., Kang, M., & Duan, G. (2020). Improving physical fitness of children with intellectual and developmental disabilities through an adapted rhythmic gymnastics program in China. *BioMed research international*, 2020(1), 2345607.