

## Research Article

# Relationship Between Using a Balance Bike and the Improvement in Balance Among Children

Siti Ainun Marufa, Natasya Anjani, Atika Yulianti, Nurul Aini Rahmawati, Zidni Imanurrohmah Lubis

Department of Physical Therapy, Faculty of Health Science, University of Muhammadiyah Malang

**ORCID**

Siti Ainun Marufa: <https://orcid.org/0000-0002-7001-346X>

**Abstract.**

0-6 years old are commonly categorized as 'the golden age period for kids.' During this time, development of the cognitive, motoric, sensory, language, and socio-emotional functions can be cultivated easily. The improvement of motoric skills is influenced by education and game. A balance bike is a fun game and sport that promotes rough motoric skills and improves posture stability. The aim of this study was to analyze the relationship between balance bikes and the improvement in balance among children. We used a cross-sectional study design. 30 healthy children who have at least 4 weeks of experience using a balance bike, with no health issues and no disability in the lower extremity were recruited as study participants. We utilized the Y balance test to assess whether the dynamic balance among children is good or poor. As a result, 37% of participants played balance bike within 1 year, while 63% within 2 years. A total of 13% of participants had a very good balance, 80% had a good balance, and 7% had a moderate balance. Furthermore, balance bike use is significantly correlated to balance improvement among children ( $P < 0.000$ ). We concluded from our finding that balance can be improved through functional activities, including games considering the participants are children.

**Keywords:** balance bike, balance, children

Corresponding Author: Siti Ainun Marufa; email: [ainunmahruf@umm.ac.id](mailto:ainunmahruf@umm.ac.id)

**Published** 23 June 2023

Publishing services provided by Knowledge E

© Siti Ainun Marufa et al. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the HSIC Conference Committee.

## 1. INTRODUCTION

Recent technological advances have brought many changes in human life and also children's play patterns (1). Nowadays, many traditional and physical games have been supported by online games on smartphone applications (2). Currently, the tendency to use gadgets, especially at an early age, is something to watch out for because it can have a negative impact on children's growth and development, such as lack of social interaction and lack of creativity due to monotonous activities carried out (3). Children need to do early physical movements with the aim of increasing their physical motor growth, both motor and gross motor (4).

**OPEN ACCESS**

Children in the age range of 0 to 6 years are experiencing a potential period known as the golden age. At that time, the developmental aspect will be easily stimulated by children (5)(6)(7). Development in early childhood takes place gradually in the ability of cognitive, motor, language, and socio-emotional skills that continue until they reach a certain age (8)(9). It would be even better if the environment in which children grow and develop supports their freedom of movement. In addition, parental support is also needed during the child's growth and development, especially in gross motor development (10). Gross motor skills are body movements that use large muscles, such as walking, running, sitting, jumping, and so on (5). Gross motor skills require several elements, such as speed, strength, endurance, agility, flexibility, coordination, and balance. One of the gross motor elements that play an important role in balance (11).

Balance is the ability to maintain the body in different positions. Factors that affect body balance include the Center of Gravity (COG), Line of Gravity (LOG), and Base of Support (BOS). Balance can be divided into two, namely static balance and dynamic balance. Static balance is the body's ability to maintain while maintaining balance in a stationary position so as not to sway or collapse. While dynamic balance is the body's ability to maintain balance so as not to fall when making movements (12). Improved motor skills in early childhood can be achieved through the provision of education and games. Through play, children can meet the demands and developmental needs of the motor, cognitive, language, creativity, social, emotional, values, and attitudes to life (4). The games chosen must be adapted to the child's age, gender, interests, and development (10).

One of the games that can train gross motor movements to improve body balance is playing a with a bicycle, which is a toy that can be occupied and ridden. When cycling, children will make adjustments to movements that are quite complex, such as controlling the steer, balancing the body, pedaling, and focusing on paying attention to the road. That way, it will train balance and focus in children. Cycling can be used as a means because based on the phenomena seen, most children are familiar with and enjoy this game (10).

A previous study showed that the balance of a child's body can be trained through the traditional game of spoon marbles (13). According to other studies, traditional engklek games can train gross motor skills (body balance) in children (14). Research on balance bikes has been conducted by the Faculty of Architecture, Design and Planning, Sepuluh Nopember Institute of Technology, Surabaya, but only focuses on its design (10). Based on the literature study we did, a study on balance bikes on optimizing balance in early

childhood is rarely done. The aim of this study is to analyze the relationship between the use of balance bikes on optimizing the balance of children aged 4-5 years in the balance bike community in Gor Ken Arok, Malang City.

## 2. MATERIALS AND METHODS

### 2.1. Characteristic of participants

In this present study, a total of 30 healthy children aged 4-5 y.o participated with the criteria as follows; no health issues; no disability in lower extremity; actively playing balance bike in the past month; and willing to participate in this study. All of the participants and parents were explained the study process and were given an informed consent sheet once they agreed to participate.

### 2.2. Study process

To find out if there is a change in balance, it can be done through measurement. Balance has several measuring tools, including the stork stand test, time up and go test, berg balance test, Y balance test, and modified bass test (15). The measuring instrument used in this study is the Y balance test to measure dynamic balance in children (16). The instructions for implementing this balancing test are: (a) first, we made a Y balance test measuring instrument using isolation. each line measures 1 meter; (b) participant was asked to stand at the midpoint by lifting one leg and hands on the hips; (c) participant was instructed to move the other leg in every direction (anterior, posteromedial, and posterolateral) as far as possible; (d) We recorded the extent of the foot distance that can be achieved by the participant; (e) it failed, if during the measurement the respondent's hands are not on the hips, the heels are raised, and they lose their balance. The interpretation result of this test include: poor (<40), medium (40-70); good (40-90); and very good (>90) (17).

### 2.3. Statistical analysis

All statistical analyses used SPSS (software version: 24.0; doc number: 724325, New York, US). Pearson's rho coefficients were used to analyze the relationship between the use of balance bikes on optimizing the balance of children aged 4-5 years in the

balance bike community. A two-tailed correlational significance was set at 0.05 levels ( $p < 0.05$ ).

### 3. RESULTS

The demographic result in table 1 showed that the user of balance bikes among participants in this present study was dominated by males (53%) compared to females (47%). The average age among participants is 4.5 y.o. We found the highest percentage of playing period is within 2 years (63%), while the new player categorized within 1.5 years at the following percentage (37%). From the result of the Y balance score, it can be summarized that participants with a ‘good’ result placed at the first rank (80% of total participants), while the ‘very good’ result at the second rank (13% of total participants), and ‘medium’ result at the third rank (7% of total participants).

TABLE 1: Demographic Data.

| Demographic Characteristic |              | %  |
|----------------------------|--------------|----|
| <b>Sex</b>                 | Male         | 53 |
|                            | Female       | 47 |
| <b>Age</b>                 | <b>Years</b> |    |
|                            | 4            | 40 |
|                            | 5            | 60 |
| <b>Playing Period</b>      | <b>Years</b> |    |
|                            | 1.5          | 37 |
|                            | 2            | 63 |
| <b>Y balance score</b>     | Poor         | -  |
|                            | Medium       | 7  |
|                            | Good         | 80 |
|                            | Very good    | 13 |

Table 2 showed that the result of relationship analysis by Pearson’s rho coefficient where the use of balance bikes significantly correlated to optimizing the balance of children ( $p = 0.000$ ;  $r = 0.872$ ).

TABLE 2: Pearson’s analysis

| Variable                                  | Result      |
|---|-------------|
| Balance bike used and balance improvement | $r = 0.872$ |
|   | $p = 0.000$ |

## 4. DISCUSSION

30 participants in this present study consist of 12 children aged 4 years and 18 children aged 5 years. At the age range of 4-5 years, children's motor development has begun to be honed and well-coordinated. At this time children are able to control gross movements quickly, such as walking, running, and jumping, children are also able to adjust visual motor movements, such as adjusting eye movements with limbs and body simultaneously (18). At the age of 5 years, the coordination of muscles is getting better, so the child's movements occur in smaller muscles, such as throwing, cutting, catching, and so on (19).

There are 2 things that become obstacles to motor development in early childhood, namely the inability of children to control balance, delays in capturing responses, and poor coordination. The inability to achieve optimal balance can result in disruption of functional activities that make it possible for children to fall and get injured more easily, and difficulty maintaining posture when doing activities such as sitting, standing, and walking (20).

There are differences in how to play between boys and girls. In general, boys play more roughly and are more active than girls (21). Boys prefer games that involve physical, limb, strength, and challenging play. Examples such as cycling, and playing soccer. Meanwhile, girls prefer varied games, such as playing with dolls, cooking, and selling (22). Therefore, it was found that the balanced development of boys was better than that of girls (23). It was also due to the presence of estrogen and lipoprotein hormones in women which causes more fat to increase than in men, it can affect the balance of the body (24). In addition, there are differences in the balance in terms of gender between men and women, namely in muscle tissue. In boys, muscle tissue is 43% of the total body weight, while in girls it is only 36% of the total body weight (25).

The results of the data analysis showed that respondents who used a balance bike for 1.5 years were 11 children (37%) and respondents who used a balance bike for 2 years were 19 children (63%). The balance bike can be used after the child is able to walk alone, at the age of 18-24 months. It doesn't take long to learn to use a balance bike, depending on how long the child uses it. If children exercise regularly, their balance will be more trained and optimal and will foster more self-confidence (26). The research conducted also found that the duration of use had an effect on the level of balance in children. The longer the child practices, the more optimal the child's balance will be (27).

Body balance is regulated by the cerebellum. The cerebellum is under the back of the cerebrum which functions to coordinate muscle movements, balance, and body position (5). The inability to achieve optimal balance can result in disruption of daily functional activities. As a result, it makes children fall and get injured more often, it is difficult to stabilize the body while doing movements, it is difficult to maintain posture when doing activities such as walking, running, sitting, standing, and difficulty doing other activities (20).

Train a child's body balance can be done by giving a balance bike. Balance bike is one of the best games to stimulate their gross motor skills, especially balance. The balance bike exercises can strengthen leg muscles and arm muscles, while riding a balance bike, children will actively move their legs to push, so they can improve children's movement coordination, and train agility, speed, and train concentration skills. To run a balance bike, children can move and stop the bike using both legs. So that it can train children's balance to be more optimal (28).

In this study, the same results were obtained where there was a relationship between balance bikes and optimizing the balance of early childhood. Balance bikes can make a big contribution to stimulating children's gross motor development, especially balance (27).

## 5. CONCLUSION

The results of data analysis showed the balance of most of the balance bike communities in Gor Ken Arok in children aged 4-5 years is in a good category. The results of data analysis show that the use of balance bikes is associated with optimizing the balance of children aged 4-5 years in the balance bike community in Gor Ken Arok, Malang City. We concluded from our finding that balance can be improved through functional activities, including games considering the participant is children.

## Acknowledgments

The authors would like to acknowledge all teachers and laboratorians in the physical therapy department for supporting us during the process of taking the data.

## References

- [1] Listiana A, Guswanti N. Dampak positif penggunaan smartphone pada anak usia 2-3 tahun dengan peran aktif pengawasan orang tua. *Pedagogia*. 2020;18(1):97–111.
- [2] Maryati S, Nurlaela W. Permainan Tradisional Sebagai Sarana Mengembangkan Kemampuan Fisik Motorik Anak Usia Dini. *PAUD Lect J Pendidik Anak Usia Dini*. 2021;4(2):49–61.
- [3] Miranti P, Putri LD. Waspada Dampak Penggunaan Gadget Terhadap Perkembangan Sosial Anak Usia Dini. *Jendela PLS*. 2021;6(1):59.
- [4] Brantasari M. Bermain Sepeda untuk Melatih Kemampuan Motorik Kasar Anak Usia 5-6 Tahun. *J Pendidik dan Pembelajaran Sekol Dasar*. 2020;5(2):119–25.
- [5] Fitriani R, Adawiyah R. Perkembangan fisik motorik anak usia dini. *J Golden Age*. 2018;2(01):25–34.
- [6] Oktaviana NE, Elan E, Mulyana EH. DASAR KEBUTUHAN PENGEMBANGAN BUKU PANDUAN BERMAIN PERAN UNTUK MENGOPTIMALKAN PERKEMBANGAN SOSIAL EMOSIONAL ANAK USIA DINI. *J Paud Agapedia*. 2021;5(1):50–61.
- [7] Heineman KR, Schendelaar P, Van den Heuvel ER, Hadders-Algra M. Motor development in infancy is related to cognitive function at 4 years of age. *Dev Med Child Neurol*. 2018 Nov;60(11):1149–55.
- [8] Lamsal R, Dutton DJ, Zwicker JD. Using the ages and stages questionnaire in the general population as a measure for identifying children not at risk of a neurodevelopmental disorder. *BMC Pediatr*. 2018 Apr;18(1):122.
- [9] Goodway JD, Ozmun JC, Gallahue DL. *Understanding motor development: Infants, children, adolescents, adults*. Jones & Bartlett Learning; 2019.
- [10] Wibisono LN. Desain Mainan Konstruksi Bertransformasi Untuk Melatih Motorik Anak Usia 4-6 Tahun. Institut Teknologi Sepuluh Nopember; <https://doi.org/10.12962/j23373520.v7i1.29889>.
- [11] Fitri R, Imansari ML. Permainan Karpet Engkle: Aktivitas Motorik untuk Meningkatkan Keseimbangan Tubuh Anak Usia Dini. *J Obs J Pendidik Anak Usia Dini*. 2020;5(2):1186–98.
- [12] Rahman D, Hakim AA. PENGARUH MODIFIKASI AKTIFITAS FISIK KESEIMBANGAN TERHADAP KETERAMPILAN MOTORIK ANAK USIA DINI PADA MASA ADAPTASI KEHIDUPAN BARU. *J Kesehatan Olahraga*. 2022;10(01):197–204.
- [13] Zuhriyah I, Kusumaningtyas N. Upaya Meningkatkan Keseimbangan Tubuh Anak Melalui Permainan Tradisional Kelereng Sendok Pada Kelompok B Tk Mardisiwi

- Il Tuksongo Temanggung Tahun Ajaran 2015/2016. PAUDIA J Penelit dalam Bid Pendidik Anak Usia Dini. 2015;4(2 Oktober).
- [14] Pratiwi Y, Kristanto M. Upaya Meningkatkan Kemampuan Motorik Kasar Keseimbangan Tubuh Anak Melalui Permainan Tradisional Engklek Di Kelompok B Tunas Rimba II Tahun Ajaran 2014/2015. J Penelit PAUDIA; 2015. pp. 18–39.
- [15] KHADHIROH M. KUMAAT NA. Peningkatan Keseimbangan Statis Dan Dinamis Pada Wanita Lansia Melalui Senam Bugar Lansia Posyandu Lansia Berseri Bancar Tuban. J Kesehat Olahraga. 2018;6(2).
- [16] Neves LF, Souza CQ, Stoffel M, Picasso CL. The Y balance test—how and why to do it. *Int Phys Med Rehab J.* 2017;2(4):261–2.
- [17] Rozaq BA, Halimah N, Wardoyo P, Pradita A. Pengaruh Core Stability Exercise Terhadap Keseimbangan Dinamis Pemain Sepak Bola Syarekah Jaya Usia 12-15 Tahun. *J Keperawatan Muhammadiyah.* 2022;7(1).
- [18] Widi SC. Kemampuan Motorik Kasar dan Halus Anak Usia 4-6 Tahun. *J Pendidik Jasm Indones.* 2015;11(2).
- [19] Mayar F, Sriandila R. Pentingnya Mengembangkan Fisik Motorik Anak Sejak Dini. *J Pendidik Tambusai.* 2021;5(3):9769–75.
- [20] Fitri R, Imansari ML. Permainan Karpets Engkle: Aktivitas Motorik untuk Meningkatkan Keseimbangan Tubuh Anak Usia Dini. 2021;5(2):1187-1198.
- [21] Ridwan R, Astuti SD. Pendidikan Jasmani dan Olahraga Anak Usia Dini. Anugera Pratama Press; 2021.
- [22] Zaifullah Z. KAJIAN TEORI ANDROGINI TERHADAP JENIS PERMAINAN DALAM PEMAHAMAN KARAKTER GENDER ANAK. *Musawa J Gend Stud.* 2019;11(2):202–21.
- [23] Permana DFW. Perkembangan Keseimbangan pada Anak Usia 7 s/d 12 Tahun Ditinjau dari Jenis Kelamin. *Media Ilmu Keolahragaan Indones.* 2013;3(1).
- [24] Habut MY, Nurmawan IPS, Wiryanthini IAD. Hubungan indeks massa tubuh dan aktivitas fisik terhadap keseimbangan dinamis pada mahasiswa fakultas kedokteran Universitas Udayana. *Maj Ilm Fisioter Indones.* 2016;2(1).
- [25] Sari S. Peranan Gender dalam mempertahankan keseimbangan statis dan dinamis pada Mahasiswa STKIP PGRI Pontianak. *J Pendidik Olah Raga.* 2013;2(2):195–203.
- [26] Alamsyah WN, Sukanti ER, Kurniawan F. Pengembangan rocking bike untuk mengoptimalkan keseimbangan tubuh pada anak usia dini [Jurnal Olahraga Prestasi]. *JORPRES.* 2021;17(2):130–41.

- 
- [27] Pursitasari I, Wijaya A, Helfiyanti Y. EFEK STIMULASI DINI MENGGUNAKAN BABY WALKER DAN BALANCE BIKE PADA PERKEMBANGAN MOTORIK ANAK. *J Bahana Kesehat Masy (Bahana J Public Heal.* 2021;5(2):72–7.
- [28] Marwan I, Setiawan D, Wahidah I. Pengembangan Model Alat Peningkatan Kekuatan Otot Lengan Dan Otot Tungkai Pada Siswa Sekolah Dasar. *J Siliwangi Seri Pendidik.* 2015;1(1).