Journal of Physical Education and Sport ® (JPES), Vol. 22 (issue 12), Art 392, pp. 3094-3100, December 2022
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

The effect of blocked and random practice on the underhand throw ability in male Boccia athletes with cerebral palsy

RUMI IQBAL DOEWES[1], GUNATHEVAN ELUMALAI[2], SITI HARTINI AZMI[3]
[1,2,3,]Fakulti Sains Sukan dan Kejurulatihan, Universiti Pendidikan Sultan Idris, MALAYSIA
[1]Faculty of Sport, Universitas Sebelas Maret, Jl. Ir. Sutami, 36A, Kentingan, Surakarta, INDONESIA

Published online: December 25, 2022
(Accepted for publication December 15, 2022)
DOI:10.7752/jpes.2022.12392

Abstract:
The purpose of this study was to determine the effects of blocked and random practice on underhand throw ability in boccia and to determine the best practice for improving this skill. Eighteen male athletes of Indonesian boccia with cerebral palsy participated in this study. The subjects were 18 male athletes of boccia in Indonesia with cerebral palsy with a mean age of 23.11±1.02 years, height of 160.22±4.94 cm, and weight of 65.26±2.23 kg. The subjects underwent an initial underhand throw test to be divided into two intervention groups, i.e. blocked practice and random practice (each group consisted of 9 athletes), and then underwent an intervention for 8 weeks. Data were collected by using an underhand throw test using the Boccia Ball Throwing Accuracy Test Instrument. T-test was used for data analysis to test the effect of practice on the ability to underhand throw in boccia. The paired t test showed that there was an effect of blocked practice and random practice on the underhand throw ability of male boccia athletes with cerebral palsy ($p = 0.000$ for blocked practice and $p = 0.002$ for random practice). Independent t test showed that blocked practice had a better effect than random practice for improving the underhand throw ability of male boccia athletes with cerebral palsy ($p = 0.006$), as shown by percentage increase in blocked practice by 118.333% compared to that in random practice of 57.895%. Thus, blocked practice and random practice have a statistically significant effect on underhand throw ability in boccia, and blocked practice has a better effect than random practice.
Keywords: Blocked Practice, Random Practice, Underhand Throw, Boccia

Introduction

Participation in sports for persons with disabilities will improve their quality of life not only in terms of health but also in social relations with other people, so that they can be accepted by society (Rasid, et al., 2022). One sport for people with disabilities is boccia. The boccia game was developed for individuals with cerebral palsy and is a strategy-based game (Calado et al., 2020). This developed sport provides valuable assistance to promote independent living and to promote social inclusion for persons with disabilities especially cerebral palsy, which over the years Paralympic games have supported competitions with an ever-increasing number of disciplines and federations (Palma et al., 2016). Individuals with cerebral palsy experience non-progressive motor disorders caused by developmental imperfections and damage to one or several parts that are responsible for controlling the brain and motor activity, especially movement so that because of this nervous control disorder, individuals tend not to have conscious and effective movement control. Raharjo, et al., 2021).

Boccia is a target sport that is competed in world championships and is one of the official sports in Paralympics matches that was designed for people with cerebral palsy and is played with a soft leather ball that requires precision and strong tactical skills (Roldan et al., 2020). This sport requires a scale of effort and ability that varies according to the physical abilities of the players, while psychologically it requires maximum attention and concentration, before and between throws, so that coordination and muscle control can be easier (Amorim, et al., 2017). Boccia can be considered a useful physical rehabilitation strategy for people with severe mobility limitations (cerebral palsy or neuromuscular and neurological disorders). This is because boccia involves control of the wrists, elbows and shoulders as grabbing, gripping and releasing movements, to control the landing point, trajectory and speed of the ball's spin, which hand control is a severe challenge for individuals with cerebral palsy. During the game, players are required to stabilize the torso, control the body's extremities and coordinate hands and eyes (Huang et al., 2014). Playing boccia involves motor tasks and requires optimizing timing and reducing errors (Amorim et al., 2022). In this case, the boccia player performs a throwing technique to approach the jack ball, and points will be awarded to the player whose color ball (red/blue) is closest to the jack ball, so accuracy is needed. Boccia coaching and development efforts, which are organized through existing clubs, have run as smoothly as expected. Based on observations in the field, the Indonesian boccia male athlete is less than perfect in the underhand throw technique at approaching the white target ball. Boccia athletes must be able to throw long (far on the court) or short with more accuracy using one of the throws to help them execute their game strategy. Lack of mastery of throwing techniques causes athletes to lack points to win matches. Therefore, there is need for an improved training method for the underhand throw technique.

Corresponding Author: RUMI IQBAL DOEWES, E-mail: king.doewes@staff.uns.ac.id

Boccia is a game that encourages thinking, planning game tactics and trying to predict the opponent's moves (Suchecki, 2021). Efforts to improve underhand throw skills must be made by applying good and appropriate training methods. Therefore, it is necessary to design an appropriate training method so that players can easily learn it, while managing players and providing training methods that involve interesting materials that can stimulate players' interest in training so that the players do not get bored easily. The application of the right training method in the underhand throw skill training process will also provide opportunities for the coach or trainer to make maximum use of the available facilities so that there is no excuse for the coach or trainer due to delays in the training process and because of inadequate facilities available. Exercise is an activity that is repeated systematically in practice to obtain maximum proficiency, aiming to establish, maintain, and improve performance with regularity and repetition.

Blocked practice can be used by coaches because they allow athletes to practice in a focused manner, namely to practice a skill repeatedly without being disturbed by other activities. Blocked practice is a sequence in which all task trials are carried out together, uninterrupted by the practice of other tasks (Jeon et al., 2021). In addition to blocked practices, there are also random practices. Random practice is a sequence in which all task trials are performed unexpectedly, and other tasks are inserted (Wambaugh, 2021). The random practice method is a form of exercise of carrying out training tasks randomly or not sequentially at each meeting, meaning that if the first meeting is with a sequence of tasks 1, 2, and 3, then, the second meeting and so on can be carried out with a sequence of tasks 2, 3, and 1. Blocked and random practices have different effects. Sharp stated that blocked practice benefits skill performance in practice in the short term, but random practice increases learning retention and transfer of skills performance in the long term because it increases the ability to adapt to changes in performance (Sharp et al., 2020). In 2010, the results of Morris & Wittmannova showed that blocked practice provided a greater advantage for improving the performance of boccia skills compared to random practice (Morriss & Wittmannova, 2010). Furthermore, in 2018, results from Aiken & Genter showed a better improvement in random practice in chip shot golf practice where during acquisition, individuals significantly improved their chipping performance, but no group differences emerged. Random conditions were significantly more accurate in chipping performance during the random retention test, but no group differences emerged for the blocked retention test (Aiken & Genter, 2018). In addition, Sharp et al. applied both of these exercises to baseball batting. The results show that random practice improves hitting performance on both dominant and non-dominant sides. Random practice routines can be used as a tool to improve performance of well-learned skills, such as dominant-side baseball (Sharp et al., 2020). According to Aiken & Genter, the increasing difference in random practice and blocked practice is due to the effect of contextual interference during task practice where varying practice is important for schema development, which is responsible for assembly, increased retention, and transfer of motor learning (Aiken & Genter, 2018). Based on the explanation of the blocked and random practice method, it can be seen that these two training methods have differences in the training process and the results in the process of achieving the expected goals. Therefore, this study aimed to investigate the effect of blocked and random practice on the ability to underhand throw in boccia using throw tasks with different distances and to determine which practice is better for improving this skill in boccia. The findings of this study will assist boccia coaches in deciding how to train the boccia players to throw the boccia ball at different distances. This is important to because in the game of boccia, the athlete throws the boccia ball to get as close to the jack ball as possible.

Materials & methods

The study was carried out at the Sport Faculty, Sebelas Maret University for 8 weeks, starting from July 2021 to August 2021, with a meeting frequency of three times a week (Sermaxhaj et al., 2021). Overall, the treatment lasted for 24 meetings. **The researcher used an experimental design that was carried out by comparing the changes in two different groups by measuring the underhand throw ability in the period before and after different exercises (two groups of pretest vs. posttest).**

Research subjects

The research subjects included 18 athletes using the purposive sampling technique. The research sample criteria were: (1) boccia athletes classified as BC1, BC2, and BC3, (2) who were male, and (3) willing to take part in training or treatment.

Procedure

Participants underwent an initial underhand throw test to determine the intervention group (group 1 = blocked practice intervention group, group 2 = random practice intervention group). The division of exercise groups was carried out using ordinal pairing. Participants underwent a final test to determine the effect of the exercise that had been undertaken. Each training session consisted of three tasks, namely: (1) throwing the jack and throwing the first color (red/blue) boccia ball; (2) jack ball placement at a distance of 5, 7, and 9 m; (3) pushing the ball jack as far as possible. Task 1 aims to assist athletes in throwing jack balls to stay in the field area. Task 2 aims to help athletes throw accurately at close, medium, or long distances. For task 3, if the athlete is blocked by the ball from his opponent, the goal is that the athlete must be able to open a shooting path for his ball to the ball that is blocking it. Therefore, athletes should practice pushing the opponent's ball to create a clearer path to the jack.

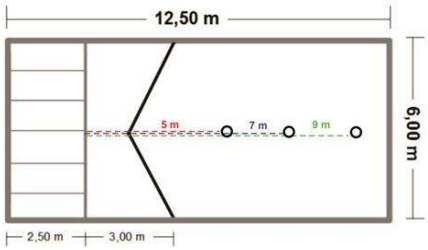


Figure 1. Jack Ball Placement for Tasks 2 and 3

Implementation of Task 1: Throw the jack and throw the first ball

1 It begins with one of the athletes throwing a jack ball in the field area.
2 The athlete throws a jack ball and then throws a color (red/blue) boccia ball as close as possible to the jack,
3 Other athletes also throw one color (red/blue) boccia ball in turn.
4 The athlete whose color (red/blue) ball is furthest from the jack is given the first opportunity to make a second throw.
5 The color (red/blue) boccia ball is tossed up to six times in turn.
6 After completing six throws, then the task is carried out again from the beginning with a jack ball thrown by another athlete.

Implementation of Task 2: Placing jack balls at distances of 5, 7, and 9 m

1 The jack is placed at a distance of 5 m.
2 Athletes toss one color (red/blue) boccia ball as close as possible to the jack in turn.
3 The athlete whose color (red/blue) ball is furthest from the jack is given the first opportunity to make a second throw.
4 The color (red/blue) boccia ball is thrown up to six times.
5 After completing six throws, then the task is carried out again by placing the jack ball at a distance of 7 m. Steps 2–4 are carried out again.
6 After completing six throws, then the task is carried out again by placing the jack ball at a distance of 9 m. Steps 2–4 are carried out again.

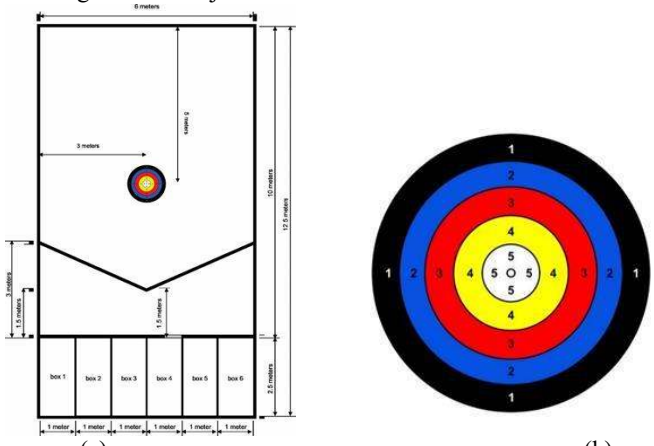
Implementation of Task 3: Push the jack ball

1 The jack is placed at a distance of 5 m.
2 The athlete throws a boccia colored ball (red/blue) to push the jack as far as possible.
3 Each athlete is given six attempts to make a throw.
4 After all athletes have made a throw, the task continues with placing the jack ball at a distance of 7 m. Stages 2 and 3 are carried out again.
5 After all athletes have made a throw, the task continues with placing the jack ball at a distance of 9 m. Stages 2 and 3 are carried out again.

Implementation of exercises, i.e., blocked practice, is carried out in the order of tasks 1, 2, and 3. Meanwhile, random practice is carried out randomly. Each task is carried out for 30 min before moving on to another task (Morriss & Wittmannova, 2010).

Data Collection and Research Instruments

Data were collected from the underhand throw test. The research instrument used was the Boccia Ball Throwing Accuracy Test Instrument (Doewes et al., 2020). The target in the form of a circle measured as 5 cm × 5 cm was placed at a distance of 3 m × 5 m. Each subject was instructed to throw the ball using their underhand throw technique towards the target. Each subject threw six times.



(a) (b)

Figure 2. (a) Field Systematics of the Boccia Ball Throwing Accuracy Test Instrument; (b) Target in the Boccia Ball Throwing Accuracy Test Instrument (Doewes et al., 2020)

Data analysis

The prerequisite test in the form of normality was carried out using the Liliefors method to examine normally distributed data (Ordonhes et al., 2021). T test was used to examine differences between groups (Aliberti et al., 2021). Parametric paired and independent tests were used to examine changes in the two different groups in underhand throw ability after treatment. Statistical analysis was carried out using SPSS 16.

Results

Table 1. Boccia Underhand Throw Score Data

Group	Test	N	Lowest Score	Highest Score	Mean	SD	Improvement
Blocked Practice Group	Initial	9	3	15	6.67	3.84	
	Final	9	9	24	14.56	5.70	118.333%
Random Practice Group	Initial	9	2	10	6.33	2.87	
	Final	9	5	15	10.00	3.12	57.895%

Table 1 shows the Boccia underhand throw score data for each group. In the blocked practice group, the initial test of underhand throw showed an average score of 6.67 ± 3.84, lowest score of 3, and highest score of 15; the final test of underhand throw showed an average score of 14.56 ± 5.70, lowest score of 9, and highest score of 14.56; thus, there was an increase of 118.333%. In the random practice group, the initial test of underhand throw showed an average score of 6.33 ± 2.87, lowest score of 2, and highest score of 10; final test of underhand throw showed an average score of 10.00 ± 3.12, lowest score of 5, highest score of 15, and an increase of 57.895%.

Table 2. Data Normality Test

Group		Sig.
Initial_Test	Blocked Practice	0.161
	Random Practice	0.200
Final_Test	Blocked Practice	0.176
	Random Practice	0.200

As shown in Table 2, the significance of each group was > 0.05, so it can be concluded that the data were normally distributed.

Table 3. Difference Test between Pre-Test and Post-test of Underhand Throw Skills after Blocked Practice

Test	Mean	Mean Difference	t	df	Sig. (2-tailed)
Blocked_End Blocked_Initial	14.56 6.67	7.889	7,443	8	0.000

Table 3 shows the paired t test underhand throw in the blocked practice group. Paired t test shows t_{count} (7.443) > t_{table} (2.306) and significance (0.000) <0.05; thus, it can be concluded that there was an effect of blocked practice on the underhand throw skills in boccia.

Table 4. Difference Test between Pre-Test and Post-Test of Underhand Throw Skills after Random Practice

Test	Mean	Mean Difference	t	Df	Sig. (2-tailed)
Random_End Random_Initial	10.00 6.33	3.667	4.690	8	0.002

Table 4 shows the paired t-test underhand throw boccia in the random practice group. Paired t-test shows t_{count} (4,690) > t_{table} (2,306) and sig (0.002) <0.05, so it can be concluded that there is an effect of random practice on the underhand throw boccia.

Table 5. Overall Difference in Underhand Throw Skills in Boccia after Blocked and Random Practice

Underhand Throw Improvement	Mean Difference	t_{count}	df	Sig. (2-tailed)
Blocked Practice Group Random Practice Group	4.222	3.206	16	0.006

Table 5 shows the independent t test for underhand throw skills between blocked and random practice groups.

Independent t test shows t_{count} (3,206) > t_{table} (2,120) and significance (0.006) < 0.05, so it can be concluded that there was a difference between blocked and random practice on underhand throw skills in boccia, and blocked practice had a better effect than random practice, which can be seen from the average difference between the two groups (blocked practice and random practice) of 4.222.

Discussion

The game of boccia requires the player to throw the ball accurately to get it as close to the jack as possible (Roldan et al., 2020). Planned and systematic training needs to be performed to improve the athlete's readiness and achievement in the boccia game, especially motor skills, exercises that are realized in various models and have different levels of effectiveness (Eliso, 2017). In this case, blocked practice and random practice can be applied to improve proficiency in throwing tasks (Edwards, 2011). Based on our data analysis, the results showed that there is a statistically significant difference in the effect between blocked practice and random practice. A higher increase in the average underhand throw score was shown by athletes using blocked practice than by those using random practice (blocked practice at 118.333%, random practice at 57.985%). In blocked practice, if three different skills are scheduled for instruction during a practice session, all the first skills will be practiced and completed before moving on to the second skill, which will then be practiced before moving on to the third skill. In this way, each skill is practiced in one block for the total number of trials instructed before instruction and practice are provided for the next skill (Chua et al., 2019).

Playing boccia requires good player tactical and concentration skills, the ability to analyze the game, and good accuracy (Setiakarnawijaya, et al., 2021). Blocked practice is more effective for improving underhand throw boccia in terms of achieving accuracy; this is because repetitive work allows athletes to find and adjust their focus and attention to the right environmental cues, achieve and maintain the right level of arousal, and increase their level of motivation because of the increase in the success rate of one movement. The results of this study are supported by Morris & Wittmannová (Morriss & Wittmannova, 2010); their study showed statistically significant results supporting blocked exercises to improve the performance of boccia skills.

Blocked practice is one variation of a task that is practiced for several trials before moving on to another variation of the task (Zipp & Gentile, 2010). Through this exercise, the athlete only concentrates on one task at the time of training so as to make the athlete pay more attention and improve memory about the task being taught, making it easier for the coach to make corrections to the movements made by the athlete and leading to more optimal training performance. By practicing skills using the blocked practice method, athletes will not be burdened by complex exercises because blocked practice only repeats one aspect, so training becomes simpler and is easier for athletes to practice. As stated by Edwards (Edwards, 2011) on the blocked practice method, there is repetition of the same skill during several trials, allowing athletes to adjust performance via working memory.

Regarding the stages of learning motor skills, there are three stages of learning motion, namely cognitive, associative, and automation (Houwink et al., 2011). Through the blocked practice method, all stages of movement learning can be achieved by athletes. Starting from the cognitive phase where the athlete receives information about the concept of motion and then tries to understand and repeat the movement. The movement is repeated before moving on to the next task, and the athlete can reach the associative stage. At this associative stage, athletes can carry out tasks effectively and efficiently, meaning that mistakes are reduced, and athletes can adjust to clumsy movements, such as timing, speed, and lack of movement strength. After the associative stage, the athlete will reach the automation stage, meaning that the athlete begins to perform the movement automatically because the athlete has practiced the movement repeatedly on a regular basis and with a lot of repetition frequency before moving on to the next movement over a relatively long period of time.

Motor skills training will produce relatively permanent changes in performance ranging from movements that are initially inappropriate and then become more precise (Roberta et al., 2020). Individual changes because of motor skills training can occur due to changes in the nervous system and muscular system. In the nervous system, individuals will be more familiar with forms of stimuli similar to those they have received during the training process. This condition will make it easier and faster for individuals to respond to the same stimulus. Meanwhile, changes in the muscular system include becoming stronger, more resistant, and faster in responding to any stimulus in the form of motion.

Finally, the limitations of this study relate to the sample used because we used male boccia cerebral palsy athletes, while female boccia cerebral palsy athletes were not included; thus, whether blocked practice also provides a significant performance improvement in female boccia cerebral palsy athletes needs to be investigated. Therefore, future researchers can study female boccia cerebral palsy athletes to examine the application of these two exercises. Furthermore, a comparison can be made between male and female boccia athletes in using the two different trainings.

Conclusions

Based on these results, blocked practice and random practice both showed a statistically significant effect on the underhand throw ability of male boccia cerebral palsy athletes. Blocked practice showed a better effect than random practice. This is because each skill is practiced in one block with a certain number of trials before

moving on to the next skill. This exercise is repetitive in nature, which allows the athlete to adjust focus and attention appropriately and become motivated by the success of one movement.

Maximizing sports performance is the most efficient way and is the focus of important research. It is therefore necessary to have knowledge of how to organize training sessions to increase the skill level and performance of athletes. The current findings provide insight into the development of training and motor skills, as well as how it applies to athletes with cerebral palsy in terms of boccia's underhand throw ability.

Conflicts of interest - There were no conflicts of interest.

Acknowledgements

The authors would like to thank Falcon Scientific Editing (https://falconediting.com) for proofreading the English language in this paper

References

Aiken, C. A., & Genter, A. M. (2018). The effects of blocked and random practice on the learning of three variations of the golf chip shot. Int J Perform Anlys in Sport, 18, 339–349. https://doi.org/10.1080/24748668.2018.1475199

Aliberti, S., Ceruso, R., & Lipoma, M. (2021). Modification of the wheelchair sports dance classification system for a fair competition. J Phy Edu Sport, 21, 675–680. https://doi.org/10.7752/jpes.2021.s1081

Amorim, A. P., Travassos, B., & Duarte-Mendes, P. (2017). Imagery ability in Boccia: Comparison among federate athletes from different medical sport groups. Motricidade, 13, 46-53. http://dx.doi.org/10.6063/motricidade.11780

Amorim, A., Travassos, B., Monteiro, D., Baptista, L., & Duarte-Mendes, P. (2022). Effects of an imagery programme on the performance of federated and non -federated Boccia athletes. *Cuadernos de Psicología del Deporte,* 22, 68-78

Calado, A., Marcutti, S., Silva, V., Vercelli, G., Novais, P., & Soares, F. (2020). Towards a virtual coach for boccia: Developing a virtual augmented interaction based on a boccia simulator. VISIGRAPP 2020 - Proceedings of the 15th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, 2, 217–224. https://doi.org/10.5220/0009142602170224

Chua, L. K., Dimapilis, M. K., Iwatsuki, T., Abdollahipour, R., Lewthwaite, R., & Wulf, G. (2019). Practice variability promotes an external focus of attention and enhances motor skill learning. Human Movement Sci, 64, 307–319. https://doi.org/10.1016/j.humov.2019.02.015

Doewes, R. I., Nuryadin, I., Hendarto, S., Adi, P. W., Shidiq, A. A. P., & Putro, B. N. (2020). The development of boccia ball throwing test instruments on palsy cerebral athletes. Euro J Molecul Clinic Med, 7, 265–273.

Edwards, W. (2011). Motor Learning And Control: From Theory To Practice. In Cengage Learning Inc.

Eliso, M. (2017). Effects of early regular physical therapy treatment on gross motor function of children with cerebral palsy. J Phy Edu Sport, 17, 284-287.

Houwink, A., Aarts, P. B. M., Geurts, A. C. H., & Steenbergen, B. (2011). A neurocognitive perspective on developmental disregard in children with hemiplegic cerebral palsy. Research in Develop Disab, 32, 2157–2163. https://doi.org/10.1016/j.ridd.2011.07.012

Huang, P., Pan, P., Yu, Y., & Tsai, Y. (2014). Motion analysis of throwing Boccia balls in children with cerebral palsy. Research Develop Disab, 35, 393-399.

Jeon, M. J., Jeon, H. S., Yi, C. H., Kwon, O. Y., You, S. H., & Park, J. H. (2021). Block and Random Practice: A Wii Fit Dynamic Balance Training in Older Adults. Research Quart Excs Sport, 92, 352–360. https://doi.org/10.1080/02701367.2020.1733456

Morriss, L., & Wittmannova, J. (2010). the Effect of Blocked Versus Random Training Schedules on Boccia Skills Performance in Experienced Athletes With Cerebral Palsy. Euro J Adapt Phy Act, 3, 17–28. https://doi.org/10.5507/euj.2010.006

Ordonhes, M. T., Hercules, E. D., & Cavichiolli, F. R. (2021). Using distance learning as a strategy for maintaining income of Physical Education professionals during the COVID-19 pandemic. Edu Infor Techno, 26, 7133–7144. https://doi.org/10.1007/s10639-021-10545-9

Palma, D. D., Raiola, G., & Tafuri, D. (2016). Disability and sport management: a systematic review of the literature. J Phy Edu Sport, 16, 785-793.

Raharjo, S., Wibowo, A., Andiana, O., Ibrahim, Pelana, R., Susiono, R., Sujarwo, Antoni, R., & Amalian, E. F. (2021). Throw and catch the ball games for children with dyskinesia-type cerebral palsy to improve eye-hand coordination movements. J Phy Edu Sport, 21, 2419-2424.

Rasid, A. R. B. A., Fat, O. T., & Hussin, R. N. J. B. R. (2022). Determinants of public personality in acceptance of people with disabilities' participation in physical activity. J Phy Edu Sport, 22, 2312-2317.

Roberta, M., Belfiore, P., & Liparoti, M. (2020). Neuroplasticity and motor learning in sport activity. J Phy Edu Sport, 20, 2354–2359. https://doi.org/10.7752/jpes.2020.s4318

Roldan, A., Barbado, D., Vera-Garcia, F. J., Sarabia, J. M., & Reina, R. (2020). Inter-rater reliability, concurrent validity and sensitivity of current methods to assess trunk function in boccia player with cerebral palsy. Brain Sciences, 10, 1–10. https://doi.org/10.3390/brainsci10030130

Sermaxhaj, S., Arifi, F., Havolli, J., Luta, F., & Isufi, I. (2021). The effect of physical exercise according to a programme for the development of flexibility in the motor abilities of young football players. Sport Mont, 19, 25–29. https://doi.org/10.26773/SMJ.210209

Setiakarnawijaya, Y., Kuswahyudi, Pelana, R., Yuliasih, Oktafiranda, N. D., Ilham, M., & Mitsalina, D. (2021). Correlation study between arm muscle endurance and arm length with pointing accuracy in Petanque. J Phy Edu Sport, 21, 2413-2418.

Sharp, M., Sharp, M. H., Gheith, R. H., Reber, D. A., Stefan, M. W., LoDuca, S., Lowery, R. P., & Wilson, J. M. (2020). The effect of blocked versus random practice on dominant and non-dominant baseball swing. J Sport Human Perform, 8, 0–8.

Suchecki, K. (2021). Role of university sports in health promotion among people with disabilities in Poland. J Phy Edu Sport, 21, 1203-1210.

Wambaugh, J. L. (2021). An expanding apraxia of speech (AOS) treatment evidence base: An update of recent developments. Aphasiology, 35, 442–461. https://doi.org/10.1080/02687038.2020.1732289

Zipp, G. P., & Gentile, A. M. (2010). Practice Schedule And The Learning Of Motor Skills In Children And Adults: Teaching Implications. J Collg Teach Learn, 7, 35–42. https://doi.org/10.19030/tlc.v7i2.87