UDC 796.323.2-056.26:796.012.1
doi: 10.5937/timsact16-41442

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2022. Fakultet za sport i psihologiju Tims, Novi Sad
TIMS Acta 16, 71–78

TESTS FOR THE EVALUATION OF THE SPECIFIC MOTOR SKILLS OF WHEELCHAIR BASKETBALL PLAYERS – A SYSTEMATIC REVIEW

TESTOVI ZA PROCENU SPECIFIČNIH MOTORIČKIH SPOSOBNOSTI KOŠARKAŠA U KOLICIMA – PREGLEDNA STUDIJA

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Abstract

The foundation for the improvement of the quality of each player are their basic skills, but success in wheelchair basketball is considered to mainly depends on the level of specific motor skills which represent the end result of work done during a specific training process.The paper aims to outline the used tests for the evaluation of specific motor skills of wheelchair basketball players in papers published between 2008 and 2022. To compile the existing studies the following databases were searched:PubMed, SCIndeks, PEDro, J-GATE, SCIndes, DOAJ and Google Scholar.Research published in the period from 2008 to 2022 was analyzed. The analysis of the compiled studies to evaluate the specific motor skills of wheelchair basketball players resulted in a recommendation for the use of several tests such as the: 20m sprint with ball test, Pick-up the ball test, the Lay-up test, the Pass for accuracy test, andthe Free-throw shooting test. Based on the results achieved on these tests, it is possible to perform a selection and monitor the progress of the players, as well as the impact of the applied specific training process on the development of motor skills on which success in wheelchair basketball depends.

Key words:
Wheelchair basketball, Motor abilities, Specific skills

Sažetak

Osnovu za nadgradnju kvaliteta svakog igrača predstavljaju bazične sposobnosti, ali se smatra da uspešnost u košarci u kolicima pretežno zavisi od stepena specifičnih motoričkih sposobnosti koje predstavljaju rezultat rada u toku specifičnog trenažnog procesa. Cilj ovog rada je prikazivanje korišćenih testova za procenu specifičnih motoričkih sposobnosti košarkaša u kolicima u objavljenim radovima u periodu od 2008. do 2022. godine. Za prikupljanje podataka iz dosadašnjih istraživanja pretražene su baze: PubMed, SCIndeks, PEDro, J-GATE, SCIndes, DOAJ i Google Scholar. Analizirani su objavljeni radovi u vremenskom periodu od 2008. do

Ključne reči:
košarka u kolicima, motoričke sposobnosti, specifične veštine

2022. godine. Analizom prikupljenih istraživanja za procenu specifičnih motoričkih sposobnosti košarkaša u kolicima preporučuje se korišćenje nekoliko testovova kao što su: Test sprinta za brzinu i kontrolu lopte na 20m (20m sprint with ball test), Test brzine podizanja lopte sa poda (Pick-up the ball test), Test „polaganja" lopte u koš za kontrolu lopte, brzinu i preciznosti šuta (Lay-up test), Test priciznosti dodavanja (Pass for accuracy test) i Test šutiranja slobodnih bacanja (Free-throw shooting test). Na osnovu ostvarenih rezultata u ovim testovima moguće je izvršiti selekciju i praćenje napretka igrača, kao i uticaj primenjenog specifičnog trenažnog procesa na razvoj motoričkih sposobnosti od kojih zavisi uspeh u košarci u kolicima.

Introduction

As one of the more attractive sports today adapted forpersons with disabilities, wheelchair basketball represents an ideal solution forsocial rehabilitation and social reintegration of individuals who have experienced trauma (Kasum,2015).When we analyze the basic rules of the game, we can note a considerable similarity with basketball for individuals without disability. The specific nature of wheelchair basketball as a Paralympic sport, in addition to the clear difference that the players compete sitting in wheelchairs, is also reflected in the clearly defined rules and classification of players which is used to equate team potential (Kozomaraet al., 2019). Increasing competitiveness, closely related to increased interest and the participation of young individuals with disability in wheelchair basketball, impacts the frequent analyses of certain motor tasks performed during the game itself, all with the aim of developing improved methods and training programs (Bergaminiet al., 2015).

Wheelchair basketball is characterized by numerous slaloms and changes in direction, frequent sprints and wheelchair stops, as well as alternations between aerobic and anaerobic energy processes during the game itself (Bloxham, et al., 2001; Chen, Limroongreungrat, & Change, 2005;Marszałeket al., 2019a).Bearing in mind that situations during the game itself take place in a dynamic and unstable environment and that the tasks of the players can be quite complex (Cohet al., 2018), the coach should as a necessity possess adequate knowledge of the individual characteristics of each player on the court (Mason, van der Woude, & Goosey-Tolfrey, 2013). Players in this intermittent sport must perform combinations of and possess a certain level of development of several complex skills such as using and maneuvering wheelchairs and controlling the ball (Cavedon, Zancanaro, & Milanese, 2015; Marszaleket al., 2019b).Based on the available literature, mobility in a wheelchair and the interaction between players,that isthe achieved level of physical performances (basic and specific motor skills) to a great extent determine success in wheelchair basketball (de Witte et al., 2016).The foundation for the improvement of the quality of each player,which is exceptionally important,are the basic motor skills, but success in sport primarily depends on the degree of development of specific motor skills which represent the end result of work during a specific training process (Stojiljković, 2003). Considering the aforementioned, and the fact that success in a certain sport is related to the features of that sport, but also of certain specific skills and the features of the athletes (Hadžović et al., 2019), the creation of a battery of tests for compiling relevant data and the evaluation of specific motor skills of wheelchair basketball players becomes an imperative.

The purpose of the subject research is to establish the tests used to assess the specific motor abilities of basketball players in wheelchairs in published works in the period from 2008 to 2022.

Methods

To compile studies which used batteries of tests to evaluatethe specific motor skills of wheelchair basketball players, the following electronic databases were searched: PubMed, SCIndeks, PEDro, J-GATE, SCIndes, DOAJ, and Google Scholar. Studies published between 2008 and 2022 were analyzed. To search the databases, the following keywords were used: wheelchair basketball, motor abilities, skills, specific.The titles of the studies were identified, and then the abstracts and entire texts were read and analyzed. The analysis was carried out by the authors, while the previously published studies were analyzed in detail based on set criteria.

Inclusion criteria

For an experimental study to be includedin the final analysis, it had to satisfy certain criteria:

- that the study was published between 2008 and 2022;
- that the sample of participants in the study was made up of players competing in official wheelchair basketball competitions;
- that the studies relied on field tests which were used to test specific motor skills of wheelchair basketball players whose results were presented numerically;
- that the study was written in English.

Exclusion criteria

The exclusion criteria were the following:

- studies which did not focus on specific motor skills of wheelchair basketball players;
- studies which used only laboratory teststo evaluate specific motor skills;
- duplicate studies and studies not written in English.

Research that met the set parameters was analyzed as follows: reference , sample of respondents, assessed abilities

and tests used to assess the motor skills of wheelchair basketball players.

Results

By applying the given parameters, 917 researches with the requested topic were found (Figure 1.),but only 12 of them were analyzed (Ergun et al., 2008;De Groot, et al., 2012;Ayán, Cancela, & Fernández, 2014; Cavedon et al., 2015; Gilet al., 2015; Granadoset al., 2015;Iturricastillo, Granados, & Yanci, 2015; Yanciet al., 2015; Oliveira et al., 2017; Yüksel & Sevindi, 2018; Kozomara et al., 2019; Marszalek et al., 2019b).

Figure 1: *The analysis of the studies*

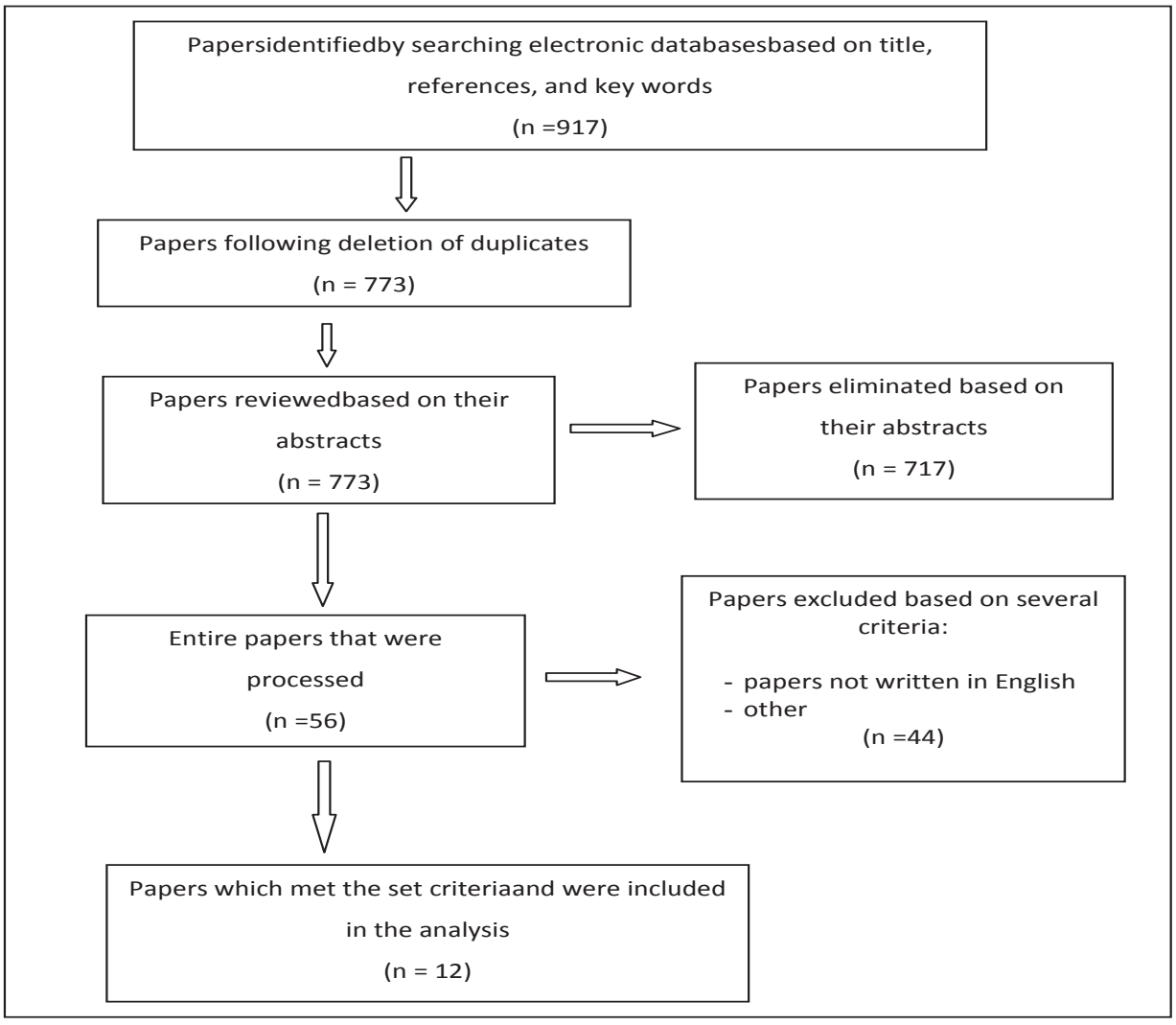

Table 1: *A systematic overview and characteristics of the studies included in the analysis*

Authors (year of publication)	Age of the participants	Number of the participants	Evaluated abilities/characteristics	Applied field tests
Ergun et al. (2008)	/	n =32	Morphological characteristics Basic motor abilities Specific motor abilities	Lay-up test; 20m sprint test; Figure eight with ball test; Zone-shot test; Pass for accuracy test

Authors (year of publication)	Age of the participants	Number of the participants	Evaluated abilities/characteristics	Applied field tests
De Groot et al. (2012)	18-52	n =19	Basic motor abilities Specific motor abilities	5 m sprint test; 20 m sprint with ball test; Free-throw shooting test; Maximal pass test; Slalom test; Lay-up test; Pick-up the ball test; Spot shot test; Suicide test
Ayán et al. (2014)	29.6±5.4	n =12	Specific motor abilities Evaluation of physical fitness	Pass-for-accuracytest; Free-throw shootingtest; Spot shottest; Lay-up test; 5m sprint test; Multi-stage fitness test; Maximal pass test; 20 m sprint with ball test; Pick-up the ball test; Slalom test
Cavedon et al. (2015)	18.1±4.06	n =52	Anthropometric characteristics Body composition Specific motor abilities	5 m sprint test; 20m sprint with ball test; Suicide test; Maximal pass test; Pass for accuracy test; Spot shot test; Lay-up test
Gil et al. (2015)	33.30±8.01	n =13	Anthropometric characteristics Basic motor abilities Specific motor abilities Physiological characteristics	Handgrip test; 5 m sprint test; 20 m sprint test; 5 m sprint with ball test; 20 m sprint with ball test; Agility T-test; Pick-up the ball test; Maximal pass test; Medicine ball throw test; Modified 10 m Yo-Yo Intermittent Recovery Test
Granados et al. (2015)	33.10±7.40	n =19	Anthropometric characteristics Basic motor abilities Specific motor abilities Physiological characteristics	5 m sprint test; 20 m sprint test; 5 m sprint with ball test; 20 m sprint with ball test;Agility T-test; Pick-up the ball test; Maximal pass test; Medicine ball throw test; Handgrip test; Yo-Yo Intermittent Recovery Test
Iturricastillo et al. (2015)	26.5±2.9	n =8	Anthropometric characteristics Body composition Basic motor abilities Specific motor abilities Physiological characteristics	5 m sprint test; 20 m sprint test; 5 m sprint with ball test; 20 m sprint with ball test; Agility T-test; Pick-up the ball test; Maximal pass test; Medicine ball throw test; Handgrip test; Modified 10 m Yo-Yo Intermittent Recovery Test
Yanci et al. (2015)	33.06±7.36	n =16	Morphological characteristics Basic motor abilities Specific motor abilities Physiological characteristics	5 m sprint test; 20 m sprint test; 5 m sprint with ball test; 20 m sprint with ball test; Agility T-test; Pick-up the ball test; Handgrip test; Maximal pass test; Modified 10 m Yo-Yo Intermittent Recovery Test
Oliveira et al. (2017)	22.5±5.3	n =22	Anthropometric characteristics Body composition Physiological characteristics Basic motor abilities Specific motor abilities	Test peak oxygen consumption; Wingate anaerobic test; Rectangular Agility test; 30 m sprint test; Medicine ball throw test; Handgrip test
Yüksel & Sevindi (2018)	34.33±7.52	n =21	Anthropometric characteristics Body composition Basic motor abilities Specific motor abilities Physiological characteristics	Modified functional reaching test; Modified sit-up test; Modified abdominal endurance test; Modified push-up test; Plate tapping test; Handgrip test; Back Scratch test; Maximal pass test; Lay-up test; 20 m sprint test; Zone-shot test; Slalom without a ball test; Slalom with a ball test; Pass for accuracy test; 6 min. endurance race test

				endurance race test
Kozomara et al. (2019)	27-47	n =6	Anthropometric characteristics Specific motor abilities	Maximal pass test; 5 m sprint test; 20 m sprint test; 5 m sprint with the ball test; 20 m sprint with the ball; Slalom without a ball test; Slalom with a ball test; Handgrip test
Marszalek et al. (2019b)	28.5±6.7	n =61	Physiological characteristics Basic motor abilities Specific motor abilities	Wingate Anaerobic Test; 3 m sprint, test 5 m sprint test, 10 m sprint test, 20 m sprint test; Basketball chest pass test; Medicine ball chest pass test; Bilateral handgrip test; 3-6-9 m drill test, 30-s sprint test, Agility drill test; 10 x 5 m sprint test

Discussion

An overview of the existing studies determined that the motor skills (basic and specific motor skills) is an inexhaustible topic for study, as well as a focus of interest of researchers in this domain of sport. In accordance with purpose of the current study, studies which primarily focused on specific motor skills in combination with other factors, mainly the morphological characteristics of athletes, and which relied on tests which estimate the specific motor skills of wheelchair basketball athletes, are presented (Table 1). As in basketball for players without disability, for basketball for persons with disabilities, the interaction between morphological and functional characteristics, as well as the motor skills which actually determine the position of a player on the basketball court, is significant (Drinkwater, Pyne & McKenna, 2008). An analysis of the studies also determined that in wheelchair basketball, tests which evaluate physiological characteristics are quite often used in combination with tests of motor skills(Ayán et al., 2014;Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Yanci et al., 2015;Oliveira et al., 2017; Yüksel & Sevindi, 2018; Marszalek et al., 2019b).

The analysis of the compiled studies indicates that researchers, with the aim of monitoring the current state of players' motor skills, the development of physical performances, and the selection of players, use modified standardized tests which are also applied in sports for persons with disabilities(the Agility T-Test, sprint tests at3m, 5m, 10m and 20m, the Handgrip test) in addition tostandardized tests of specific motor skills which due to the specific nature of the sport are mostly used by wheelchair basketball players (the Pick-up the ball,Lay-up test, Figure eight test, Maximal pass test, Pass for accuracy test).

Considering that wheelchair using belongs to a group of specific motor skills which are learned during the process of rehabilitation(Levinget al., 2016), andthat the technique of using a wheelchair is further improvedto meet the requirements of a certain sport for persons with disabilities(Yilla, 2004), most field tests which include maneuvering and using a wheelchair in combination with controlling the ball belong to the group of tests of specific motor skills. In the analyzed studies,the most frequently used tests which are related to the speed of movement in one direction while controlling the ball at the same time,in accordance with the rules of wheelchair basketball, include the5 m sprint with a ball test (Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Yanci et al., 2015; Kozomara et al., 2019)and the 20 m sprint with a ball test (De Groot et al., 2012; Ayán et al., 2014; Cavedon et al., 2015; Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Yanci et al., 2015; Kozomara et al., 2019). In addition, another test which is characteristic for wheelchair basketball and which is often used in the field by researchers to evaluate the speed and technique of maneuveringa wheelchair, and picking up a ball, is the Pick-up the ball test (De Groot et al., 2012; Ayán et al., 2014; Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Yanci et al., 2015).

Coaches of various sports, and thus wheelchair basketball coaches, are constantly on the lookout for tests of specific motor skills which reflect the specific nature of the game (Goosey-Tolfrey & Leicht, 2013; Marszalek et al., 2019a),which is why tests used to control speed, precision ball control, and passing and throwing (the Lay-up test;-Pass for accuracy test; Free-throw shooting test; Spot shot test; Zone-shot test)are often a topic of interest of experts in the field and are an unavoidable part of testing during the selection process. In the analyzed studies, some of the most frequently used tests, which reflect specific situations of scoring a basket during the game,include the Lay-up test (Ergun et al., 2008; De Groot et al., 2012; Ayán et al., 2014; Cavedon et al., 2015; Yüksel & Sevindi, 2018),and for the precision in passinga ball, the Pass for accuracy test(Ergun et al., 2008; Cavedon et al., 2015; Yüksel & Sevindi, 2018).Toassessthe power of the upper limbs, tests such as the Maximal pass test and Basketball chest pass test (De Groot et al., 2012; Ayán et al., 2014; Cavedon et al., 2015; Gil et al., 2015; Granados et al., 2015;Iturricastillo et al., 2015; Yanci et al., 2015;Yüksel & Sevindi, 2018; Kozomara et al., 2019; Marszalek et al., 2019b), the Handgrip test and Bilateral handgrip test (Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Yanci et al., 2015; Oliveira et al., 2017; Yüksel & Sevindi, 2018; Kozomara et al., 2019; Marszalek et al., 2019b)and the Medicine ball throw test and Medicine ball chest pass test (Gil et al., 2015; Granados et al., 2015; Iturricastillo et al., 2015; Oliveira et

al., 2017; Marszalek et al., 2019b) were used.

Research analysis indicates that there is a correlation between seat height and the functional class of the participants,and the parameters of specific motor skills (Cavedon et al., 2015), that force of the upper limbs correlate with players classification (Gil et al., 2015), and that there is a significant influence of the muscle tissue of the upper extremities on the athletic performance of basketball players (Oliveira et al., 2017).

Researchers indicate distinction in physiological performance between different classification categories (Marszałek et al., 2019a), and recommend to trainers to compose endurance and strength exercising in order to upgrade sprinting and harmonize them with the requirements of the physiological requirements of a certain competitive level (Granados et al., 2015). In addition, the authors claim that there are no differences in terms of the anthropometric characteristics of players of various competitive ranks at the national level (Yüksel & Sevindi, 2018) and that there were minimal differences in the amount of movement between various playing positions (back, wing, center) (de Witte et al., 2016), but they find differences in the results of the technical, tactical, and base motor skills (primarily in terms of endurance and coordination) (Erdemİr et al., 2009) and specific motor skills (Cavedon et al., 2015). At the same time, existing studies indicate that experience playing wheelchair basketball correlates with agility and the displayed technique of the players (Gil et al., 2015), as well as affecting physical fitness and sports skills (Ergun et al., 2008).

Based on theoretical findings of studying wheelchair basketball, we concluded that an advantage of one team over another could be achieved in several ways, that is, the approach must be multidimensional. This indicates that the advantage of one team, or viewed individually, the advantage of one player over another, is realized through the combination and mutual permeation of various aspects of sports preparation, such as the technical, tactical, psychological, fitness aspect, etc. Beginning with the multidimensionality of the approach, the anthropological space of the players certainly also impacts the results, where we primarily analyze the characteristics and skills which are relevant for sport, such as morphological and connate characteristics, as well as cognitive and motor skills. A multidimensional approach to a problem requires the study of all the aforementioned factors in order to obtain the complete picture, however, studies with such an approach are difficult to realize. Bearing that in mind, the research was conducted with purpose to find out answer which specific motor skills of basketball players in wheelchairs lead to differences between higher quality and lower quality players.

Conclusion

Finally, the analysis of the research established the existence of established tests of specific motor abilities of basketball players in wheelchairs.To evaluate the specific motor skills in wheelchair basketball, it is recommendable to use several tests such as: the 20m sprint with ball, the Pick-up the ball, the Lay-up, the Pass for accuracy, and Free-throw shooting. The aforementioned tests were used by both researchers and coaches for the purpose of selecting players and monitoring the impact of the applied specific training process on the progress of skills characteristic for wheelchair basketball and could be of considerable importance and assistance for coaches when planning and programming the training process.

REFERENCES

Ayán, C., Cancela, J. M., & Fernández, B. (2014). Changes in wheelchair basketball performance indicators throughout a regular season: a pilot study. *International Journal of Performance Analysis in Sport,* 14(3), 852-865. Downloaded from https://doi.org/10.1080/24748668.2014.11868763

Bergamini, E., Morelli, F., Marchetti, F., Vannozzi, G., Polidori, L., Paradisi, F., Traballesi, M., Cappozzo, A., & Delussu, A. S. (2015). Wheelchair propulsion biomechanics in junior basketball players: A method for the evaluation of the efficacy of a specific training program. *BioMed Research International,* 2015, 1-10. Downloaded from https://doi.org/10.1155/2015/275965

Bloxham, L. A., Bell, G. J., Bhambhani, Y., & Steadward, R. D. (2001). Time motion analysis and physiological profile of Canadian world cup wheelchair basketball players. *Sports Medicine, Training and Rehabilitation,* 10(3), 183-198. Downloaded from https://doi.org/10.1080/10578310210398

Cavedon, V., Zancanaro, C., & Milanese, C. (2015). Physique and Performance of Young Wheelchair Basketball Players in Relation with Classification. *PLoS ONE*, 10 (11), 1-20. doi:10.1371/journal.pone.0143621

Coh, M., Vodicar, J., Žvan, M., Šimenko, J., Stodolka, J., Rauter, S., & Mackala, K. (2018). Are Change-of-Direction Speed and Reactive Agility Independent Skills Even When Using the Same Movement Pattern?. *The Journal of Strength & Conditioning Research,* 32(7), 1929-1936. doi: 10.1519/JSC.0000000000002553

De Groot, S., Balvers, I. J., Kouwenhoven, S. M., & Janssen, T. W. (2012). Validity and reliability of tests determining performance-related components of wheelchair basketball. *Journal of Sports Sciences,* 30(9), 879-887. Downloaded from https://doi.org/10.1080/02640414.2012.675082

de Witte, A. M., Hoozemans, M. J., Berger, M. A., van der Woude, L. H., & Veeger, D. (2016). Do field position and playing standard influence athlete performance in wheelchair basketball?. *Journal of Sports Sciences,* 34(9), 811-820. Downloaded from https://doi.org/10.1080/02640414.2015.1072641

Drinkwater, E. J., Pyne, D. B., & McKenna, M. J. (2008). Design and interpretation of anthropometric and fitness testing of basketball players. *Sports medicine*, 38(7), 565-578. Preuzeto sa https://doi.org/10.2165/00007256-200838070-00004

Erdemİr, İ., Tekİn, H. A., Savucu, Y., & Tüfekçİoğlu, E. (2009). Evaluation of factors affecting the performance of players in the first and second wheelchair basketball leagues. *Sağlık Bilimleri Dergisi, Fırat Üniversitesi,* 23(2), 85-89. Downloaded from http://www.fusabil.org

Ergun, N., Duzgun, I., Aslan, E., & Fizyoterapi, R. (2008). Effect of the number of years of experience on physical fitness, sports skills and quality of life in wheelchair basketball players. *Fizyoterapi Rehabilitasyon,* 19 (2), 55-63. Downloaded from http://acikerisim.pau.edu.tr:8080/xmlui/handle/11499/7080

Gil, S. M., Yanci, J., Otero, M., Olasagasti, J., Badiola, A., Bidaurrazaga-Letona, I., Iturricastillo, A., & Granados, C. (2015). The functional classification and field test performance in wheelchair basketball players. *Journal of Human Kinetics,* 46(1), 219-230. DOI: 10.1515/hukin-2015-0050

Goosey-Tolfrey, V. L., & Leicht, C. A. (2013). Field-based physiological testing of wheelchair athletes. *Sports Medicine,* 43(2), 77-91. Downloaded from https://doi.org/10.1007/s40279-012-0009-6

Granados, C., Yanci, J., Badiola, A., Iturricastillo, A., Otero, M., Olasagasti, J., Bidaurrazaga-Letona, I., & Gil, S. M. (2015). Anthropometry and performance in wheelchair basketball. *The Journal of Strength & Conditioning Research,* 29(7), 1812-1820. doi: 10.1519/JSC.0000000000000817

Hadžović, M., Prvulović, N., Lilić, A., & Jorgić, B. (2019). A battery of tests used to evaluate the abilities of young basketball players. In T. Iancheva, S. Djobova, & M. Kuleva (Eds). Second international scientific congress *"Applied sports sciences"* (pp. 153-158). Sofia: National sports academy „Vassil Levski".

Iturricastillo, A., Granados, C., & Yanci, J. (2015). Changes in body composition and physical performance in wheelchair basketball players during a competitive season. *Journal of Human Kinetics,* 48(1), 157-165. DOI: 10.1515/hukin-2015-0102

Kasum, G. (2015). *Sport osoba sa invaliditetom*. Beograd:-Fakultet sporta i fizičkog vaspitanja, Beograd.

Kozomara, G., Petrovic, P., Nikolic, G., Jorgic, B., Kocic, M., & Aleksandrovic, M. (2019). The effects of preparation period on motor skills of wheelchair basketball players: a pilot study. *Journal of Anthropology of Sport and Physical Education,* 3(4), 11-14. DOI 10.26773/jaspe.191003

Leving, M. T., Vegter, R. J., De Groot, S., & Van der Woude, L. H. (2016).Effects of variable practice on the motor learning outcomes in manual wheelchair propulsion. *Journal of neuroengineering and rehabilitation,* 13(1), 1-15.DOI:10.1186/s12984-016-0209-7

Loturco, I., McGuigan, M. R., Reis, V. P., Santos, S., Yanci, J., Pereira, L. A., & Winckler, C. (2020). Relationship Between Power Output and Speed-Related Performance in Brazilian Wheelchair Basketball Players. *Adapted Physical Activity Quarterly,* 37(4), 508-517. Downloaded from https://doi.org/10.1123/apaq.2019-0158

Marszałek, J., Gryko, K., Prokopowicz, G., Kosmol, A., Mroz, A., Morgulec-Adamowicz, N., & Molik, B. (2019a). The physiological response of athletes with impairments in wheelchair basketball game. *Human Movement,* 20(4), 1-7. doi: https://doi.org/10.5114/hm.2019.84005

Marszalek, J., Kosmol, A., Morgulec-Adamowicz, N., Mróz, A., Gryko, K., Klavina, A., Skucas, C., Navia, H. A., & Molik, B. (2019b). Laboratory and non-laboratory assessment of anaerobic performance of elite male wheelchair basketball athletes. *Frontiers in Psychology,* 10, 514. doi: 10.3389/fpsyg.2019.00514

Mason, B. S., van der Woude, L. H., & Goosey-Tolfrey, V. L. (2013). The ergonomics of wheelchair configuration for optimal performance in the wheelchair court sports. *Sports Medicine*, 43(1), 23-38. Downloaded from https://doi.org/10.1007/s40279-012-0005-x

Oliveira, L., Oliveira, S., Guimarães, F., & Costa, M. (2017). Contributions of body fat, fat free mass and arm muscle area in athletic performance of wheelchair basketball players. *Motricidade,* 13(2), 36-48. Downloaded from http://dx.doi.org/10.6063/motricidade.8549

Stojiljković, S. (2003). *Osnove opšte antropomotorike*. Niš: S.I.I.C.

Wang, Y. T., Chen, S., Limroongreungrat, W., & Change, L. S. (2005). Contributions of selected fundamental factors to wheelchair basketball performance. *Med Sci Sports Exerc*, 37(1), 130-7. DOI: 10.1249/01.MSS.0000150076.36706.B2

Yanci, J., Granados, C., Otero, M., Badiola, A., Olasagasti, J., Bidaurrazaga-Letona, I., Iturricastillo, A., & Gil, S. M. (2015). Sprint, agility, strength and endurance capacity in wheelchair basketball players. *Biology of Sport,* 32(1), 71-78. DOI: 10.5604/20831862.1127285

Yilla, A. B. (2004). Anatomy of the sports wheelchair. *Athletic Therapy Today,* 9(3), 33-35. Downloaded from https://doi.org/10.1123/att.9.3.33

Yüksel, M. F., & Sevindi, T. (2018). Examination of performance levels of wheelchair basketball players playing in different leagues. *Sports,* 6(1), 1-8. Downloaded from https://doi.org/10.3390/sports6010018

Datum prijave: 28.11.2022.
Datum prihvatanja: 18.01.2023.
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