Vol. XXVI, Issue 1/ 2025

G Y M N A S I U M

Scientific Journal of Education, Sports, and Health

Original Article

Identification of Biometric Potential in Middle School Classes with Vocational Sports Profile in Kayak-Canoe through the Evaluation of Coordinative Capacity

Alecu Aurel [1]
Cojanu Florin [2*]
Naiba George Octavian [3]
Visan Paul Florinel [4]
[1,2,3,4] *National University of Science and Technology Politehnica Bucharest, Pitesti University Center, no1 Targul din Vale,110040, Romania*

DOI: 10.29081/gsjesh.2025.26.1.7

Keywords: *potential, biomotor, kayak-canoe, coordinative capacity.*

Abstract

Aim of our paper is to identify the biometric potential of students, aware of the link between the inherited biomotor potential of the research subjects and their motor learning capacity. The design of paper show as extracurricular activities with exercises focused on developing coordinative capacity was selected and adjusted in full accordance with the age and training characteristics of the students and the specifics of the sport. The comparative analysis reveals significant differences between the six specific parameters of kayaking included in the experimental evaluation, showing a notable differentiation trend between the initial and final tests, significance level (0.001). We attribute this to our proposed experimental approach. In conclusion, it is crucial to understand the "natural or acquired heritage" of the "biomotor potential" to subsequently set the objectives and content of the training process.

1. Introduction

Kayaking and canoeing, as sports disciplines with a long history, play a crucial role in helping children at the middle school level develop essential skills and biometric potential (Alecu, 2020). These sports provide opportunities for performing different actions and improving the development of basic and specific motor qualities, allowing new experiences in a unique aquatic environment. (Amzar & Stancu, 2019) They significantly facilitate the learning of new skills and preparation

* *E-mail*: coj_florin@yahoo.com, tel. +40742088317

for sports performance, and such modifications can positively affect motivation (Deutsch & Mirelman, 2007; Stirn, Carruthers, Sibila, & Pori, 2017). At this age, the foundation of sports performance is methodically and naturally established. (Stirn, Carruthers, Sibila, & Pori, 2017). At the beginning of the middle school cycle, at the age of 11-12 (5th grade), identifying the potential, capacity, or biometric level is essential for designing the content of the training process and setting objectives (Alecu, 2019).

The programming process should include specifications such as the specific muscles required for action, their precise order and level of activation, relative timing, sequencing of contractions, and the duration of each contraction. (Rada, Amzar, Amza, & Cojanu, 2024). There is no precise study on the didactics problem or teaching methods in middle school, especially since in the early part of primary education, there is no vocational education for this discipline.(Stancu, 2009) Future athletes at this age go through physical and mental changes, where cognitive, social, emotional, and physical skills develop rapidly(Rosu, Cojanu, Stefanica, & Enache, 2022; Stefanica, 2022). However, it is important to note that the influence of feedback depends on the skill and the performer, and the type of feedback used is known to significantly alter motor learning (Mihai et al., 2024).

Sports performance in this discipline is influenced by various factors, including the athlete's effort capacity, the level of development of basic motor qualities (speed, strength, endurance, coordinative capacities, flexibility), the level of psycho-intellectual skills (attention, concentration, thinking, imagination, memory, anticipation, decision-making), psycho-affective skills (stress resistance, emotional stability), (Rebollo, & Bunuel 2023) and volitional self-regulatory skills (voluntary effort, perseverance, combativeness) as well as technical-tactical skills (Alecu, 2012). It is important to note that feedback can provide information about the movement outcome (knowledge of results) or the movement quality (knowledge of performance) (Wulf, Shea, & Lewthwaite, 2010).

Coordinative capacities generally designate a complex of predominantly psychomotor qualities, which imply the ability to quickly learn new movements, adapt quickly and efficiently to varied conditions, specific to different types of activities, through the restructuring of the existing motor background (Dragnea, Teodorescu, & Paunescu, 2008; Mateescu, & Mihaiu, 2022).

Biometric potential represents the optimal development ratio of essential components of motor life. Evaluated using the Oseretsky-Guillmann Test, it provides a general examination of motor skills. The test targets essential behaviors of motor life under its four aspects: speed, strength, coordination, and endurance, focusing on the dynamic coordination of hands, general dynamic coordination, balance, speed, and spatial orientation (Balint, Gauzenhuber, Balint, & Spulber, 2013).

2. Material and methods

The aim of our research was to identify and select specific kayaking and canoeing exercises to strengthen coordination skills through the use of capacity-building exercises that can serve as instructional alternatives in sports training

lessons, aligned with the competencies established for middle school students in this discipline.

The research Hypothesis

We hypothesize that by identifying and implementing programs with specific kayaking and canoeing exercises aimed at enhancing coordination skills, we will be able to harness and increase the biometric potential of middle school student-athletes.

The research was conducted during lessons held outside of the school's physical education and sports activities, with students from Mihail Kogalniceanu Theoretical High School in Snagov, who had no practical experience in performance sports.

The initial testing took place at the beginning of the school year in September, when the subjects underwent initial control tests to evaluate their general motor skills and coordinative capacity, based on tests from the School Curriculum for Practical Sports Training (for speed, strength, and endurance). The experimental group's training program included 12 male students from the 5th grade, with 3 training sessions per week, each lasting 60 minutes.

Conducted as extracurricular activities, the identified exercises focused on developing coordinative capacity and were selected and adjusted in full accordance with the age and training characteristics of the students and the specifics of the sport. These were supplemented with complementary exercises (recovery, active restoration, paddling technique) within the training sessions. The experiment concluded after 4 months with a final test.

Table 1. *Programming of Specific Training Sessions Tb1 – 3 Training Lessons*

	monday	tuesday	wednesday	thursday	friday	saturday	sunday
P.M. 60'	A1	L	A2	L	A3	L	L

Our research focused on two very important and suggestive directions:

1. Strengthening coordination skills by effectively using capacity in the execution of normal balance, orientation, rhythm, reaction, transformation, differentiation, and movement combination.
2. Improving the conditional aspects, increasing strength, speed, endurance, and joint mobility specific to paddling.

3. Results and Discussions

The experiences from sports training cover a wide range of aspects in the trajectory Performance of Middle School Student-Athletes

For this study, we primarily focused on the initial and final tests and on rigorously implementing the program designed around the 5 items for strengthening coordination skills, identifying, and harnessing biometric potential.

Biometric Measurements – Initial testing – Final testing

General Parameters:

1. Long jump with momentum;

2. Trunk lifts in 30 seconds;
3. Hanging hold;
4. Speed running 1x50m;
5. Shuttle run - 10x5m back and forth;
6. Endurance run 1x800m.

Table 2. *Initial testing - Biometric measurements*

Nr crt.	Name	Long jump	Trunk lifts 30"	Kept hanging	1x50m speed run	10x5m shuttle run	Endurance 1x800m
Mediate		*2.54*	*18.333*	*35.583*	*8.625*	*8.1*	*3.498333*
Stdeviation		*0.007*	*1.49747*	*2.9063*	*0.13568*	*0.374166*	*0.033257*
CV %		*0.278*	*8.16803*	*8.1677*	*1.573103*	*4.61933*	*0.950667*

Table 3. *Final testing - Biometric measurements*

Nr crt	Name	Long jump	Trunk lifts 30"	Kept hanging	1x50m speed run	10x5m shuttle run	Endurance 1x800m
Mediate		*2.68*	*22.3333*	*54.5*	*8.2916*	*7.125*	*3.4066*
St. deviation		*0.0435*	*1.4354*	*3.0301*	*0.0996*	*0.4371*	*0.0317*
CV %		*1.6264*	*6.4275*	*5.5599*	*1.2014*	*6.1360*	*0.931*

The comparative analysis presented in table no 4, reveals significant differences between the six general parameters included in the experimental evaluation, showing a notable differentiation trend between the initial and final tests, with an extremely relevant significance level (0.001). We attribute this to our proposed experimental approach. It is also evident that the most substantial progress was observed in the long jump and speed running tests, which primarily involve the motor quality of coordination, a key element in the creation of our proposed content and implicitly in validating our experimental hypothesis.

Table 4. *Comparative result analyze initial-final*

	long jump	trunk lifts 30"	kept hanging	1x50m speed run	10x5m shuttle run	endurance run 1x800m
Calculated t-test	11.94	6.709	13.27	7.22	5.98	6.23
p	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Biometric Measurements – *Initial testing – Final testing*
Specific Parameters:
1. Paddling 1x100m maximal;
2. Paddling 1x100m with a turn at 50m slalom maximal;
3. Paddling 1x50m on the left side maximal;
4. Paddling 1x50m on the right side maximal;

5. Paddling 1x50m maximal;
6. Paddling 1x200m maximal.

Table 5. *Initial testing - Biometric measurements – specific parameters*

Nr. crt.	Name	Paddle 1x100m	Paddle 1x100 with turnstile	Paddle 1x50m left	Paddle 1x50m right	Paddle 1x50m	Paddle 1x200m
Mediate		27.41667	38.25833	18.90833	17.96667	14.258	53.8
St deviation		0.98427	1.025545	0.839327	0.734022	0.6430	2.3159
CV %		3.590043	2.680579	4.438926	4.085464	4.5102	4.3047

Table 6. *Final testing - Biometric measurements – specific parameters*

Nr. crt.	Name	Paddle 1x100m	Paddle 1x100 with turnstile	Paddle 1x50m left	Paddle 1x50m right	Paddle 1x50m	Paddle 1x200m
Mediate		23.5166	30.14167	16.98333	15.04545	12.55833	46.55
Standard deviation		0.98427	1.372097	0.792961	0.799204	0.677314	1.605389
CV %		4.18541	4.552162	4.669057	5.311931	5.154456	3.44874

Table 7. *Comparative result analyze initial-final*

	Paddle 1x100m	Paddle 1x100 turnstile	Paddle 1x50m left	Paddle 1x50m right	Paddle 1x50m	Paddle 1x200m
Calculated t-test	9.79	16.44	5.804	8.63	6.35	8.81
p	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

The comparative analysis presented in table no 7, reveals significant differences between the six specific parameters of kayaking included in the experimental evaluation, showing a notable differentiation trend between the initial and final tests, with an extremely relevant significance level (0.001).

We attribute this to our proposed experimental approach. It is also noteworthy that the most substantial progress was observed in the 1x100m paddling with a turn and the 1x200m paddling tests, which mainly involve correct paddling techniques based on coordination skills, an essential component of our proposed training content.

Discussions

It is known that certain abilities provided by somatic nature (height, reach, body constitution) or motor nature (motor perceptions and skills) together form the basis for the ability to practice a sports discipline.

New discoveries regarding the mechanisms and ways in which students learn motor and sports skills change the vision of teaching and didactic instruction, raising new questions about teaching methods and sports training didactics to achieve better results.

A similar paper, presents a monitoring system (Canoe-Sense) for canoe motion

based on wearable Body Sensor Net-works (BSNs). An effective motion segmentation method wasapplied to competitive sport, which can segment human motionphases automatically based on raw time series data that wasacquired through wearable Inertial Measurement Units (IMUs). (Wang, Wang, Zhao, Yang, & Fortino, 2016).

An interesting study focuses on the analysis of nautical activities in school environments. The primary objective is to highlight the pivotal role of educators in optimizing the benefits and mitigating the risks associated with water activities in educational settings. The results demonstrate that nautical activities offer physical and cognitive benefits, promote ecological awareness, and foster values such as group cohesion, leadership, and respect. Further more,these activities have a positive impact on the physical and mental health of participants, encouraging socialization and conflict resolution. (Rebollo, Ozcorta, Bunuel, & Gavira, 2023); (Rebollo, Ozcorta, & Bunuel, 2024)

In the final we elaborate a strengthening programe for Coordination Skills at Ages 11-12 with Specific Exercises Identified for Kayaking and Canoeing:

Item 1: Static Coordination

Description:

- Standing in the kayak in paddling position, standing upright with the paddle on the head and eyes open, the boat is lightly rocked by pressing the left and right foot. After 30 seconds, the eyes are closed for 10 seconds.
- The test is not considered successful if the boat loses balance, the paddle position is altered, touches the water, the body's vertical position is changed, balance is lost, or the boat capsizes.
- The test is rated positively if both upper limbs hold the paddle on the head and maintain the body's vertical position.
- A second attempt is allowed for those who do not succeed on the first try.

Item 2: Dynamic Hand Coordination

Description:

- Standing in the kayak in the paddling position, the kayak is anchored by a bungee cord from the tail, and the athlete faces away from the shore. The boat is deliberately destabilized by the coach pressing five times on the left side and five times on the right side. The athlete holds the paddle in the start position and uses the upper limbs to stabilize by placing the paddle blade on the water.
- The test is not successful if the athlete does not maintain the kayak's position, loses balance, and capsizes.
- The test is successful if the athlete maintains the kayak's position. The speed of handling the left hand on the left side and the right hand on the right side of the paddle is evaluated.
- A second attempt is allowed for those who do not succeed on the first try.

Item 3: General Dynamic Coordination - Description:

- Standing in the kayak in the paddling position, the athlete paddles a 50-meter slalom course with buoys every 5 meters against the clock, starting from a stationary position.
- The test is not successful if the athlete loses balance and hits the buoys.
- The test is successful if balance is maintained, and buoys are not hit.

Evaluation considers the number of buoys hit, kayak balance, and time achieved.

- Two attempts are allowed.

Item 4: Speed of Movements - Description:

- Standing in the kayak in paddling position, paddling 50 meters with a buoy at 25 meters against the clock starting from a stationary position. The first 25 meters are paddled with the left hand and the next 25 meters with the right hand at maximum speed.
- The evaluation considers the speed of movements, stroke length, kayak speed, and time taken with each hand.
- The test is rated positively if the time difference between the left and right hands is less than 5 seconds.
- Two attempts are allowed.

Item 5: Simultaneity of Movements - Description:

- Standing in the kayak in paddling position, paddling on the spot without the paddle, with one hand paddling forward and the other backward with equal and simultaneous force. When the left palm enters the water in front, the right palm enters in the back, paddling in opposite directions. The position of the kayak should remain stationary, and the simultaneity of movements with the palms is evaluated.
- The test is considered successful if the kayak remains stationary. Two attempts are allowed.

Will make comparisons between the results obtained with data values or statistics from other works with similar themes. Will make comparisons with other opinions and authors with similar research themes. (compulsory) (Alecu, Botila, & Cojanu, 2021; Alecu, 2013).

4. Conclusions

The statistical-mathematical interpretation indicators of the general and specific parameters demonstrate that our research hypothesis is confirmed. Thus, we have demonstrated that by identifying and implementing programs with specific kayaking and canoeing exercises aimed at strengthening coordination skills, we can harness and increase the biometric potential of middle school student-athletes.

Identifying and analyzing the biometric potential of middle school students in vocational sports profiles such as kayaking and canoeing serves as instructional and content objectives for the development of future learning and training plans. This specific biometric potential of kayaking and canoeing is largely influenced by components of coordinative capacity:

- Static coordination;
- Dynamic hand coordination;
- General dynamic coordination;
- Movement speed;
- Movement simultaneity.

Our study demonstrated the influence and interdependence between the level of coordinative capacity and the level of biometric potential in middle school student-athletes. As outlined by the methodology in the field of study, Practical Sports Training, educators have the freedom to contextualize the school curriculum

to local conditions and design personalized learning paths, defined as an applied curriculum. Following the development of an applied curriculum, which can be highly diverse, adapted to local conditions and personalized according to the characteristics of the involved student-athletes, a variety of conceptual and practical approaches will emerge, resulting in multiple possible pathways for school programs

Identifying biometric potential leads to the valorization of individual skills in an organized selection system for the third stage of sports selection, training, and competition for junior cadets, as well as students with disabilities, ensuring the formation of specific competencies for practicing kayaking and canoeing, as well as promoting optimal health and a healthy lifestyle.

References

1. AMZAR, E.L., & STANCU, M. (2019). *Motric activities for well being,* Pitesti: University of Pitesti.
2. ALECU, A. (2012). *Effort dynamics in kayak training*, Iasi: Pim.
3. ALECU, A. (2013). *Initiation-Didactics-Competition in Kayak Canoe*, Iasi: Pim.
4. ALECU, A. (2019). *Methodological aspects of sports training in kayaking and canoeing*, Pitesti: University of Pitesti.
5. ALECU, A. (2020) *Practical-methodological applications of training in kayaking and canoeing*, Pitesti: University of Pitesti.
6. ALECU, A., BOTILA, V., & COJANU F. (2021). Effects of recreational activities nautical sports in leisure on the strengthening of motor skills in children of school age, *Bulletin of the Transilvania University of Braşov Series IX: Sciences of Human Kinetics, 14*(63), 119-124.
7. DRAGNEA, A., TEODORESCU, S., & PAUNESCU, A.C. (2008) *Theoretical Sports Training,* Bucuresti: CD PRESS Publishing.
8. BALINT, Gh., (coord.), GANZENHUBER, P., BALINT, T., & SPULBER, F. (2013). *Methods of evaluating the biomotor and somato-functional potential for the selection of children in order to practice ski jumping*, ISBN 978-606-93561-1-1, Volume produced within the MTS Selection Program , preparation and realization of competitions for children "Pierre de Coubertin".
9. WULF, G., SHEA, C., & LEWTHWAITE, R. (2010). Motor skill learning and performance: a review of influential factors, *Med Educ., 44*(1), 75-84.
10. DEUTSCH, J., & MIRELMAN, A. (2007). Virtual Reality-Based Approaches to Enable Walking for People Poststroke, *Topics in Stroke Rehabilitation, 14*(6), 45-53.
11. STIRN, I., CARRUTHERS, J., SIBILA, M., & PORI, P. (2017). Frequent Immediate Knowledge of Results Enhances the Increase of Throwing Velocity in Overarm Handball Performance, University of Ljubljana, *Journal of Human Kinetics, 56*(1), 84-91.
12. MATEESCU, A., & MIHAIU, C. (2022). Effects on Fat Mass Through 2 Types of Training. *Gymnasium - Scientific Journal of Education, Sport and*

Health, *23*(2), 106-121.

13. REBOLLO, D.M., BUNUEL, PSL. (2023). The use of nautical activities in formal education a systematic review, *Behavioral Science*, *13*(11), 905;
14. REBOLLO, D.M., OZCORTA, E.J.F., BUNUEL, P.S.L., & GAVIRA, F.J. (2023). Analysis of the Practice of Nautical Activities in Schools. *Education Sciences*, *13*(12), 1200-1202.
15. REBOLLO, D.M., OZCORTA, E.J.F., & BUNUEL, P.S.L. (2024). Diseno de una entrevista conocer desarrolo de las actividas nauticas en centros educativos, *Retos: nuevas tendencias en educación física, deporte y recreación*, *51*, 1275-1281.
16. ROSU, D., COJANU, F., STEFANICA, V., & ENACHE, S. (2022). Experimental management of work collectives through social and socialization activities. *Journal of Physical Education and Sport*, *22*(7), 1742-1747.
17. STANCU, M. (2009). The pre-school children physical education and sport objectives encompassed in a model of curriculum fit for the active contemporary family*, 2nd Annual International Conference,,Physical education, sport and health*, p 474-476.
18. RADA, L., AMZAR, E. L., AMZA, L., & COJANU, F. (2024). Systematization and Rationalization of Training for under 17 Female Volleyball Players through Specialized Plyometric Programs. *Revista Romaneasca Pentru Educatie Multidimensionala*, *16*(4), 595-608.
19. MIHAI, I., RADA, L., ENACHE, C., BEJTKA, M., BAKIKO, I., & ALEXE C.I. (2024). Trends regarding the living environment and body composition among university students. *Physical Education of Students*, *28*(4): 242-249.
20. STEFANICA, V. (2022). Study on the dynamics of the use of food supplements in amateur sports. *Journal of Physical Education and Sport*, *22*(8), 1900-1904;
21. WANG, Z., WANG, J., ZHAO, H., YANG, N., & FORTINO G. (2016). CanoeSense: Monitoring Canoe Sprint Motion using Wearable Sensors, *IEEE International Conference on Systems, Man, and Cybernetics*, *Budapest, Hungary, October 9-12, 2016*, pp. (124-132).