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ADVANCING OUR SPORT THROUGH KNOWLEDGE
FAIRE PROGRESSER NOTRE SPORT PAR LA CONNAISSANCE
ПРОДВИЖЕНИЕ НАШЕГО СПОРТА ЧЕРЕЗ ЗНАНИЕ
PROGRESO PARA NUESTRO DEPORTE MEDIANTE CONOCIMIENTO

International Journal of Wrestling Science

The official journal of the International Network of Wrestling Researchers (INWR)

David Curby, EdD
Editor in Chief

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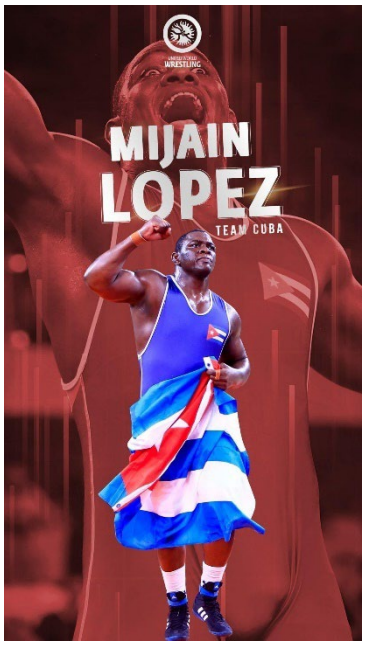
International Journal of Wrestling Science
The official journal of the International Network of Wrestling Researchers (INWR)

Volume 14, Number 1 2024

TABLE OF CONTENTS

Editor's Comments

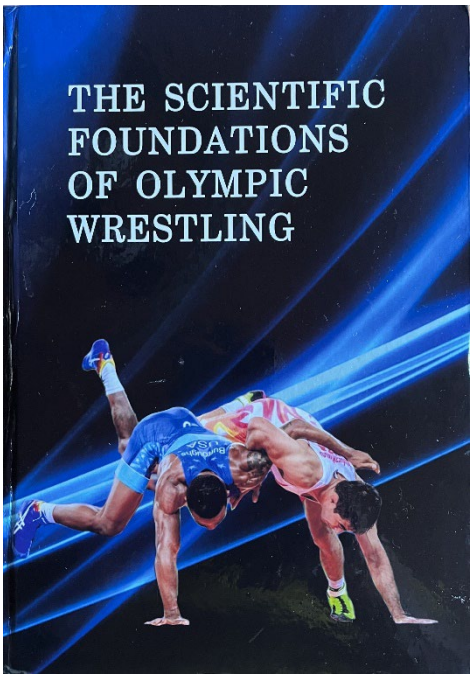


Welcome to the Olympic issue of the International Journal of Wrestling Science!

This issue contains articles from a variety of wrestling parameters: Training Theory, Physiology, History and Pedagogy, as it continues to address the entire spectrum of Wrestling Science.

As our attention turns to Paris, wrestling fans wonder if Mijain Lopez will make history with a 5th Olympic Gold Medal.

Finally, in Paris our book will be released! *The Scientific Foundations of Olympic Wrestling* was produced through the efforts of the International Network of Wrestling Researchers (INWR) and the UWW Scientific Commission. It has 16 chapters in 370 pages. Ordering information will be posted on the INWR website: inwr-wrestling.com



Sincerely yours in the advancement of Wrestling,

David Curby

David Curby EdD
Director of the International Network of Wrestling Researchers
davcurb@gmail.com

LEG ATTACK PROFICIENCY AND PHYSICAL FITNESS OF NATIONAL TOURNAMENT WINNERS AMONG JAPANESE MALE ELEMENTARY (U-12) AND JUNIOR HIGH SCHOOL WRESTLERS (U-15)

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ABSTRACT

This research aims to clarify the relationship between the tackle technique and physical fitness/motor skills of male elementary school wrestlers(U-12) and junior high school wrestlers(U-15). It also aims to compare the developmental trends of physical fitness and motor skills from the perspective of competitive levels and create foundational data contributing to the development of wrestling skills. The participants included 69 male wrestlers from 5th grade elementary to 3rd grade middle school. The measured variables consisted of height, weight, body fat percentage, standing long jump, lateral jump (side steps), and repetition training of the tackle technique used in actual wrestling practice. As a result, it was suggested that explosive power and agility may be involved in the tackle technique of elementary and middle school wrestlers who win medals at national tournaments in Japan. Furthermore, it was revealed that medal-winning athletes excel in agility, and the proficiency in tackle technique differs at the boundary of the middle school level.

Keywords: Leg attack, National competition, Explosiveness, Agility, Medalist

INTRODUCTION

Wrestling is a sport that requires high-intensity training (Stanev & Dimitrova, 2011). In wrestling training, many teams incorporate practice sessions that involve repeating tackle movements within a specific time frame. This training aims to improve the success rate of tackles during matches by allowing wrestlers to initiate multiple tackles within a limited time. As a result, research on wrestling in Japan has reported that winners in national tournaments have a high success rate in the attack maneuvers, specifically tackles (Fujiyama et al., 2007). From these findings, it is anticipated that high-level athletes have a higher tackle success rate and perform a greater number of repetitive tackle movements.

On the other hand, tackle jumps, which are supplementary training for mastering tackle movements, have been reported to show a strong correlation with standing long jumps and lateral jumps (Kimura et al., 2018). However, tackle jumps do not evaluate the tackle technique itself (Kimura et al., 2022). A report on the experiences of national tournament winners in elementary school wrestling states that there are sex (gender) differences in physical fitness and motor skills among medalists (Kimura et al., 2022). However, this report focuses on a comparison between male and female national tournament winners, and there are no apparent reports comparing the physical fitness and motor skills of national tournament medalists and those who did not win medals. Additionally, these reports are limited to elementary school wrestlers, with no known reports focusing on middle school wrestlers.

Therefore, this study aims to clarify the relationship between tackle movements and physical fitness/motor skills of male elementary and middle school wrestlers. It also aims to compare the developmental trends of physical fitness and motor skills based on school grade and competitive level, contributing to the foundational data for the development of wrestling skills in Japan.

METHODS

a) **Participants**

In conducting this research, the participants and their parents were provided with written explanations about the potential use of research data, and consent was obtained from the participants who participated in this study. Furthermore, this research was conducted with the approval of the Ethical Committee of the Senshu University Sports Research Institute.

The participants included male junior wrestling athletes from 5th grade elementary to 3rd grade middle school in Tokyo, Kanagawa, Yamanashi, Aichi, Gifu, and Osaka. The participants were asked to provide their date of birth and the age at which they started participating in wrestling through a questionnaire. From the measurement date, the age at which they began wrestling and the number of years of wrestling experience up to the measurement date were calculated.

Before the analysis, 5th and 6th-grade elementary school students were classified as "Elementary school boys(U-12)," and 1st to 3rd-year middle school students were classified as "Junior high school boys(U-15)." Additionally, participants who had experienced winning medals in national tournaments were categorized as the "Medalists group," while those who had not won medals were categorized as the "Non-Medalists group."

In the "Elementary school boys(U-12)" category, the Medalists group started wrestling at an average age of 4.91±1.14 years, while the Non-Medalists group started at an average age of 5.86±1.86 years. In the "Junior high school boys(U-15)" category, the Medalists group started wrestling at an average age of 4.65±2.11 years, and the Non-Medalists group started at an average age of 6.13±2.54 years. Furthermore, in the "Elementary school boys(U-12)" Medalists group, the average number of years of wrestling experience was 6.90±1.05 years, while the Non-Medalists group had an average of 5.43±2.01 years. In the "Junior high school boys(U-15)" Medalists group, the average number of years of wrestling experience was 9.85±2.23 years, and the Non-Medalists group had an average of 7.94±2.71 years.

b) **Measurement Period**

The research survey was conducted between January 2022, February 2022, March 2022, September 2022, and February 2023, and it targeted all 69 individuals for whom no data was missing in all measurement items.

c) **Measurement Items**

To assess the physical fitness and motor skills of the participants, this study adopted measures for physique, general physical fitness, and motor skills, as well as a specific test called the "tackle test," which is used in actual wrestling training (referred to as the "tackle test" in this study).

For physique, measurements were taken for height, weight, and body fat percentage. Height was measured using a digital height gauge (AD-6227, A&D Company). Weight and body fat percentage were measured using an impedance method with a body composition analyzer (InnerScan BC-521, Tanita) with four electrodes between both legs. The standing long jump test measured the distance from the nearest point to the takeoff line when landing after jumping forward. The repetitive lateral jump test（referred to as the "side steps" in this study） measured how many times a participant could step over a line placed 100 cm apart in 20 seconds. Both the standing long jump and repetitive side steps were performed twice, and the better record of the two was used.

As for evaluating wrestling tackle movements, a tackle test was used. The measurements for the tackle test were conducted on a wrestling mat. The procedure for the tackle test is shown in Figure 1. The tackle test involved two participants: the executor of the tackle (referred to as "A") and the defender (referred to as "B"). B would prepare a defensive posture, and A would take a double-leg tackle as part of the wrestling technique. After the first double-leg tackle, A and B would return to their wrestling postures and A would execute another double-leg tackle. B would not actively defend, and after A completed the tackle motion, they would immediately reset. Prior to the measurements, exemplary practical instruction was provided by the measurement implementer.

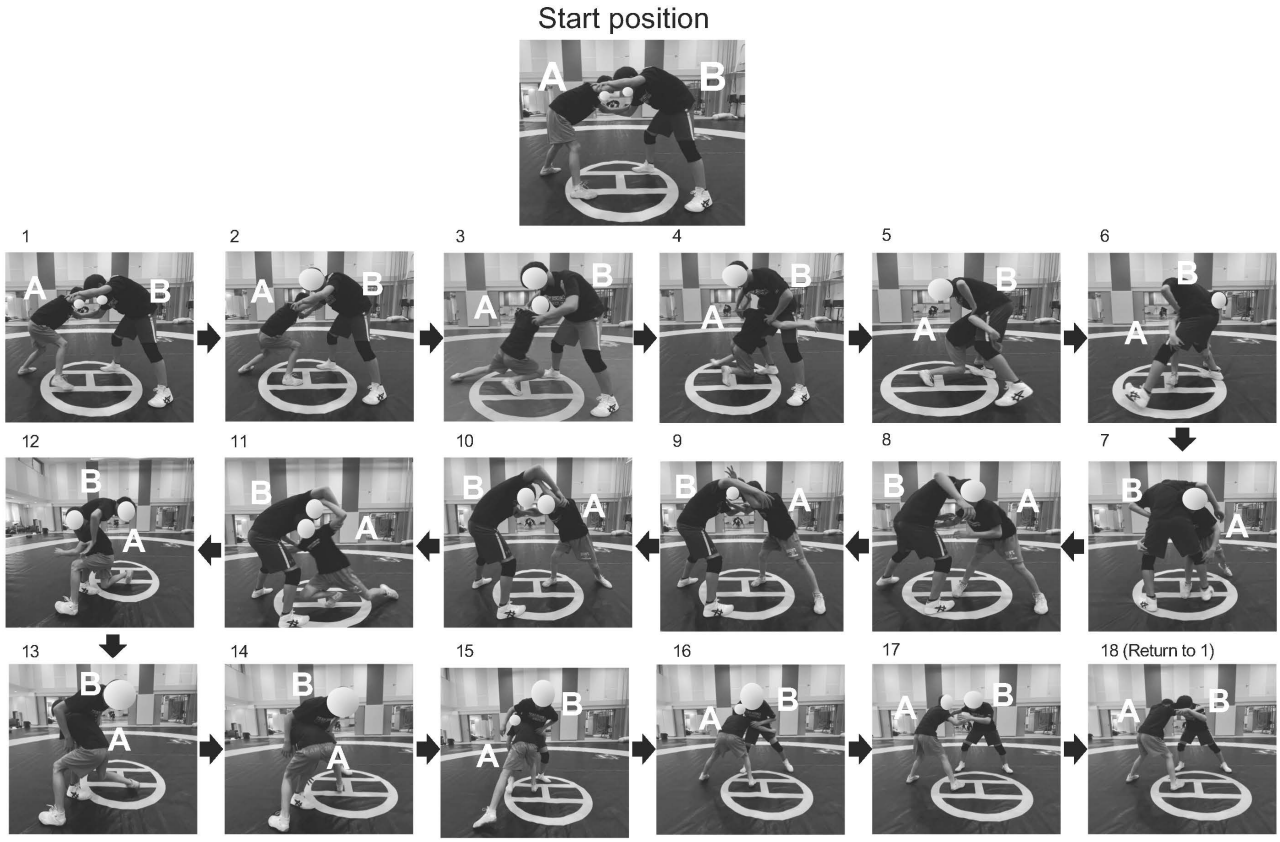

Figure 1. Tackle test method.

The evaluation of the tackle test involved conducting double-leg tackles for two sets of 30 seconds each (with a 5-second break between sets). Those who could complete more double-leg tackles were considered to have a better grasp of the tackle motion and higher motor skills related to tackling.

d) **Statistical Analysis**

The measured values were all expressed as mean ± standard deviation. The correlation between general physical fitness and the tackle test was calculated using Pearson's correlation analysis. To compare the differences in measured values between school grades and competition levels, an unpaired two-way analysis of variance without correspondence was conducted, with factors being School grade (2 levels: Elementary school boys(U-12), Junior high school boys(U-15)) and Competition level (2 levels: Medalists group, Non-Medalists group). In cases where interactions were observed, separate tests for simple main effects were conducted for each factor. In cases where interactions were not observed, main effects of each factor were tested. In case of significant differences, a multiple comparison test was performed using the Holm method. The data analysis was conducted using the statistical analysis software R version 4.2.1. The significance level was set at less than 5%.

RESULTS

Figure 2 presents the results of a simple correlation analysis between general physical fitness and the wrestling tackle test. In the Medalists group, there were significant positive correlations between the total wrestling tackle test and the standing long jump ($r = 0.531$, $P < 0.05$) and side steps ($r = 0.626$, $P < 0.05$). The Medalists group also showed significant positive correlations between the first half of the wrestling tackle test and the standing long jump($r = 0.586$, $P < 0.05$) and side steps ($r = 0.735$, $P < 0.05$). In the Non-Medalists group, there were significant positive correlations between the total wrestling tackle test and the side steps ($r = 0.323$, $P < 0.05$). Similarly, there

were significant positive correlation was between the first half of the wrestling tackle test and the side steps (r = 0.333, P < 0.05).

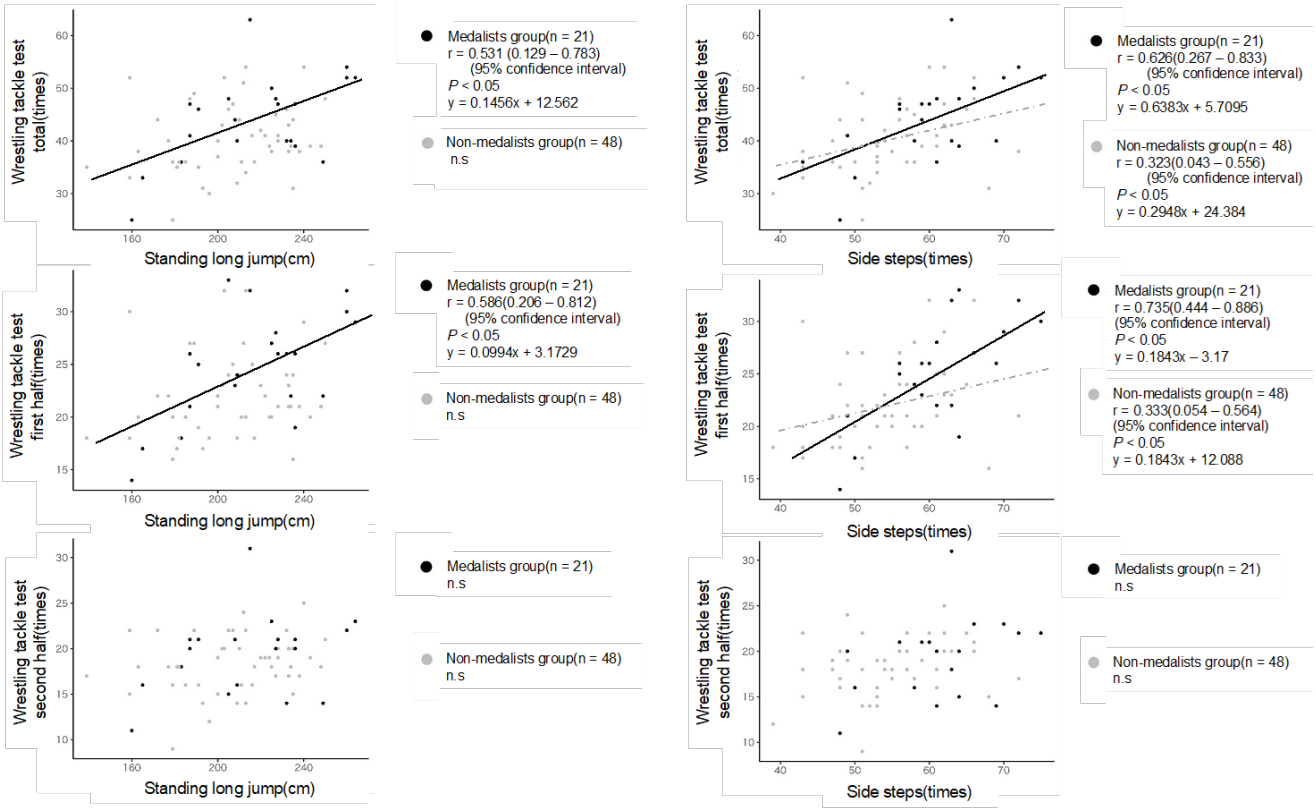

Figure 2. The correlation between tackle test and explosiveness, quickness

Table 1 presents the results of the differences in physical characteristics and physical fitness measurements. There were no significant interactions for body height (F = 0.9958, P = 0.32, partial η2 = 0.0151). Body height exhibited a significant main effect only for school grade, increasing significantly as school grade advanced in both the Medalists and Non-Medalists groups (F = 53.5598, P<0.05, partial η2 = 0.4518). Similarly, there were no significant interactions for body weight (F = 2.2160, P = 0.14, partial η2 = 0.0330). Body weight had a significant main effect only for school grade, increasing significantly with advancing school grade in both the Medalists and Non-Medalists groups (F = 16.8871, P < 0.05, partial η2 = 0.2062). For body fat percentage, no significant interactions were observed (F = 2.8750, P = 0.09, partial η2 = 0.0424). Body fat percentage exhibited a significant main effect only for school grade, decreasing significantly as school grade advanced in both the Medalists and Non-Medalists groups (F = 5.5922, P < 0.05, partial η2 = 0.0792). Similarly, there were no significant interactions for standing long jump (F = 0.9074, P =0.34 partial η2 = 0.0138). The standing long jump exhibited a significant main effect only for school grade, increasing significantly with advancing school grade in both the Medalists and Non-Medalists groups (F=89.8800, P <0.05, partial η2 = 0.5803). In the case of side steps, there were no significant interactions (F=1.2082, P =0.28, partial η2 = 0.0182). Significant main effects were observed for school grade and competition level. Both the Medalists and Non-Medalists groups showed significant increases with advancing school grade (F = 41.6793, P <0.05, partial η2 = 0.3907), and the Medalists group was significantly higher than the Non-Medalists group in terms of competition level (F = 10.8082, P < 0.05, partial η2 = 0.1426). No significant interactions were observed for the total wrestling tackle test (F=2.8419, P =0.10, partial η2 = 0.0419). The total wrestling tackle test showed a significant main effect only for school grades, increasing significantly as school grades advanced in both the Medalists and Non-Medalists groups (F = 8.9763, P <0.05, partial η2 = 0.1213). However, a significant interaction was observed for the first half of the wrestling tackle test(F= 4.1220, P < 0.05, partial η2 = 0.0596). Junior high school boys(U-15) in the Medalists group scored significantly higher than elementary school boys(U-

12) in the Non-Medalists group (F= 10.4316, P <0.05, partial η2 =0.1383), and junior high school boys(U-15) in the Medalists group scored significantly higher than junior high school boys(U-15) in the Non-Medalists group (F=10.3001, P <0.05, partial η2 =0.1368). No significant interactions were observed for the second half of the wrestling tackle test, and no significant main effects were observed for school grade or competition level.

Table 1. Differences in physical characteristics and physical fitness of junior male wrestlers school grade and competition level

Items	Medalists group		Non-medalists group		Interaction	School grade	Competition level	Multiple comparison (holm)
	A : Elementary school boys(U-12)	B : Junior high school boys(U-15)	C : Elementary school boys(U-12)	D : Junior high school boys(U-15)				
	n = 7	n = 14	n = 15	n = 33	*p*	*p*	*p*	*p*
Body height(cm)	146.61 ± 6.55	161.56 ± 7.93	143.83 ± 8.70	163.49 ± 8.90	n.s	＊＊	n.s	-
Body weight(kg)	47.44 ± 17.16	56.19 ± 9.28	40.74 ± 9.01	59.43 ± 12.86	n.s	＊＊	n.s	-
Body fat(%)	26.20 ± 15.88	17.40 ± 3.95	21.52 ± 8.24	20.07 ± 6.27	n.s	＊	n.s	-
Standing long jump(cm)	183.14 ± 16.46	234.21 ± 18.67	178.47 ± 18.02	220.21 ± 17.06	n.s	＊＊	n.s	-
Side steps(times)	52.00 ± 6.14	64.43 ± 5.42	48.40 ± 5.12	57.21 ± 6.34	n.s	＊＊	＊＊	-
Total wrestling tackle test(times)	38.29 ± 7.70	47.14 ± 7.11	38.73 ± 6.57	41.21 ± 6.55	n.s	＊＊	n.s	-
First half of wrestling tackle test(times)	20.71 ± 4.54	26.79 ± 4.23	21.13 ± 3.96	22.58 ± 3.99	＊	-	-	B > D(＊＊), B > A(＊＊)
Second half of wrestling tackle test(times)	17.57 ± 3.60	20.36 ± 4.38	17.60 ± 3.09	18.64 ± 3.12	n.s	n.s	n.s	-

MEAN±SD

p < 0.01 : ＊＊, *p* < 0.05 : ＊

DISCUSSION

a) Relationship between physical fitness and wrestling tackle test

In relation to the general physical fitness and athletic ability, standing long jump showed a moderate positive correlation with the total tackle test and the first half only in the Medalists group. In the case of side steps, a weak correlation with the total tackle test and the first half was observed in the Non-Medalists group, while the Medalists group exhibited a stronger positive correlation compared to the Non-Medalists group. These findings suggested that explosive power and agility are involved in the performance of tackle as physical characteristics of elementary and junior high school wrestling athletes who win medals at national competitions in Japan. Explosive power and agility are related to the development of lower limb muscles (gluteus maximus, quadriceps, biceps femoris, and triceps surae) (Mishima et al., 2017). In wrestling training, training for the Stretch-Shortening Cycle (SSC) is conducted to develop the lower limb muscles (Kimura et al., 2022). The ability to perform SSC movements in the lower limbs is related to sprinting and footwork ability, and a similar relationship has been reported in children (Hioki et al., 2022). Wrestling training often includes exercises to improve footwork abilities, such as side steps. Additionally, dash training is conducted as part of the warm-up. It is possible that wrestling training contributes to the development of lower limb muscles, and as a result, the tackle test may be related to explosive power and agility.

b) Differences between physical fitness and wrestling tackle test in the Medalist and Non-Medalists groups

In side steps, both elementary school boys(U-12) and junior high school boys(U-15) in the Medalists group showed significantly higher performance compared to the Non-Medalists group. While there was no significant difference in the total tackle test score between the different levels of competition, the first half of the tackle test showed that junior high school boys(U-15) in the Medalists group performed significantly better than elementary school boys(U-12) and junior high school boys(U-15) in the Non-Medalists group. From these findings, it is suggested that elementary and junior high school students who win medals in Japan's national competitions excel in agility compared to those who do not win medals. There is also a potential implication that as athletes progress to junior high school, their tackle skills may improve, with Medalists performing better than Non-Medalists. However, while junior high school boys(U-15) in the Medalists group performed significantly better in the first half of the tackle test, there were no significant differences in the second half, and the tackle test repetitions decreased for all groups. During the deceleration phase of sprinting, running speed and pitch decrease (Graubner & Nixdorf, 2011). This

suggests that the alternating leg activity in the tackle movement decreases in speed and pitch over time, which might explain the lack of significant differences in the second half of the tackle test. However, further investigation from the perspectives of muscle activity and movement analysis is needed to clarify these phenomena.

CONCLUSION

This study aimed to reveal the relationship between tackling performance and physical fitness and athletic abilities in male elementary school wrestlers(U-12) and junior high school wrestlers(U-15). It also aimed to compare the developmental trends in physical fitness and athletic abilities from a grade and competition level perspective, with the goal of creating foundational data that contributes to the development of competitive wrestling skills. As a result, it was suggested that explosive power and agility are involved in the tackling performance of elementary school wrestlers(U-12) and junior high school wrestlers(U-15) who win medals at national competitions in Japan. Additionally, athletes who win medals excel in agility, and the mastery of tackling skills shows a difference between junior high school and elementary school students.

Acknowledgments

I would like to express my heartfelt gratitude to all the players and coaches who cooperated in conducting this study, as well as to the parents who kindly consented to participate in the measurements.

Disclosure of interest

The authors report no conflict of interest.

SUPPLEMENTARY COMMENTS

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UKRAINIAN ROOTS OF IVAN PIDDUBNY

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[2]Vice-President of the Greek-Roman Wrestling Federation of Ukraine, member of the supervisory board of the Cherkasy National University
[3]Director-International Network of Wrestling Researchers

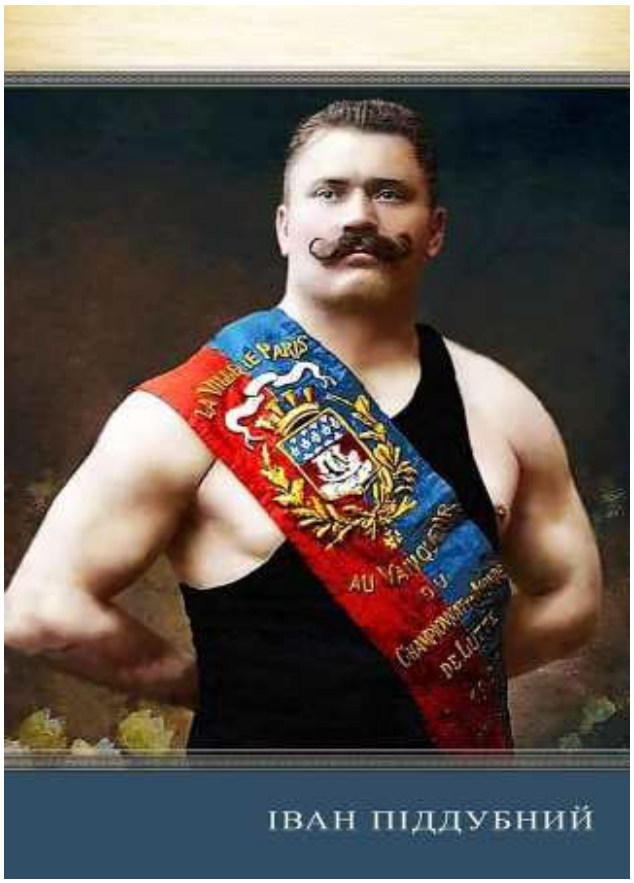


Fig. 1. Ivan Piddubny

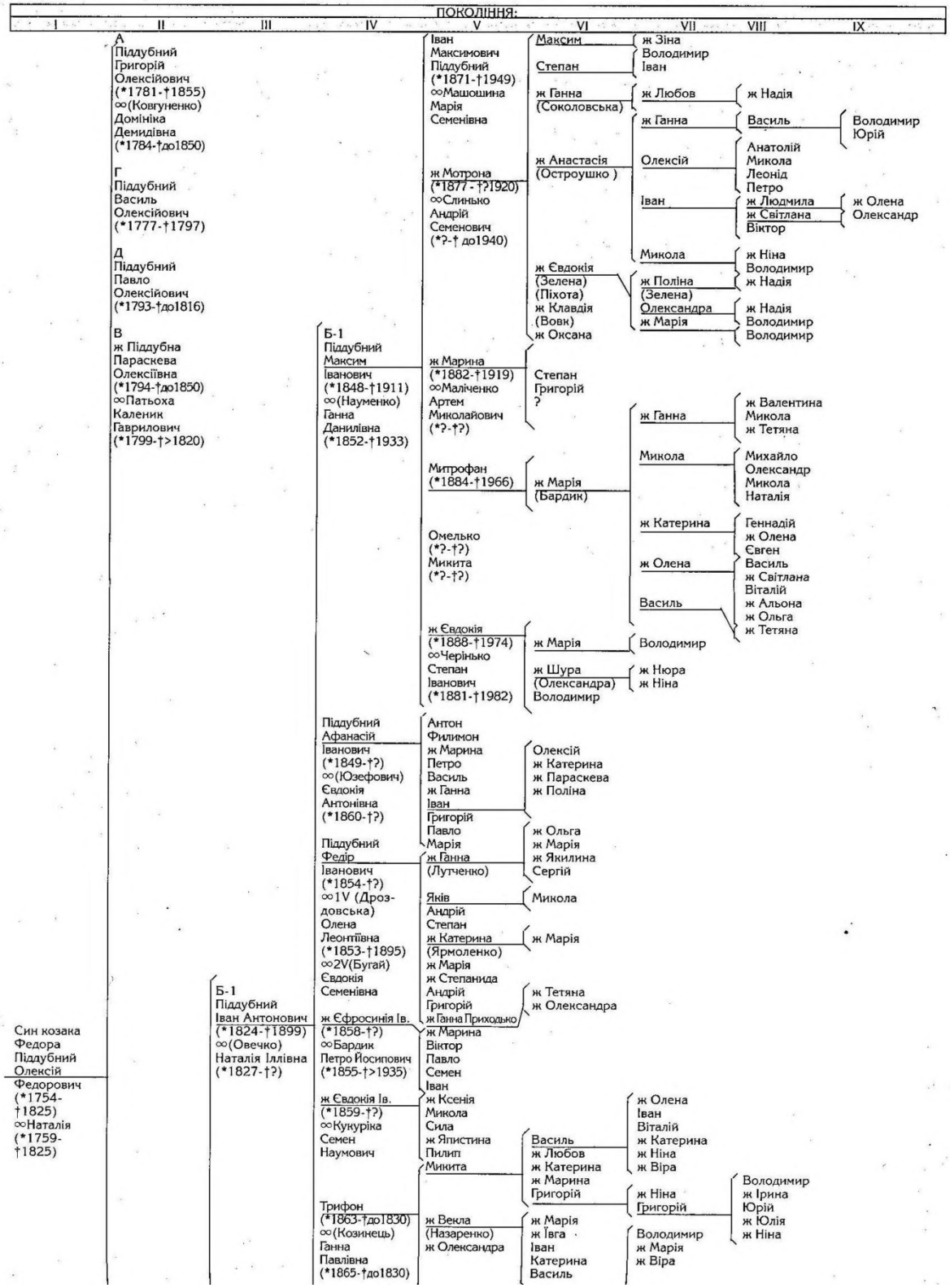
The Ukrainian philosopher Hryhoriy Savych Skovoroda said, “Know your land... Yourself, your family, your people, your land - and you will see your way in life”. Human identity is determined by two main factors: genealogy and self-identification. In total, more than 250 families, about 700 people, were investigated in the genealogical tree of the great Piddubny family. The main documents are stored in the state archives of Ukraine. These are original documents that do not raise doubts about their authenticity. Records of church metric books are informatively valuable. Ivan Piddubny’s ancestors, like other Cossacks, were farmers and defenders of their homeland. Thus, there is the Piddubny surname in the “Register of the Zaporizhzhia Army of 1649”, which was compiled after the signing of the Peace of Zborivsk.(Fig. 2).

Fig. 2 Title of the “Register of the Zaporizhzhia Army of 1649” with the coat of arms of Hetman Bohdan Khmelnytskyi

The genealogy was founded by Fedor Piddubny, a Cossack of the Kropyvnytsky Hundred of the Pereyaslav Regiment.

ГЕНЕАЛОГІЧНЕ ДЕРЕВО РОДУ ПІДДУБНИХ

Рід, започаткований козаком Кропивнянської сотні Переяславського полку Піддубним Федором, прапрадідом 6-разового чемпіона світу, уродженця с. Красенівка Піддубного Івана Максимовича



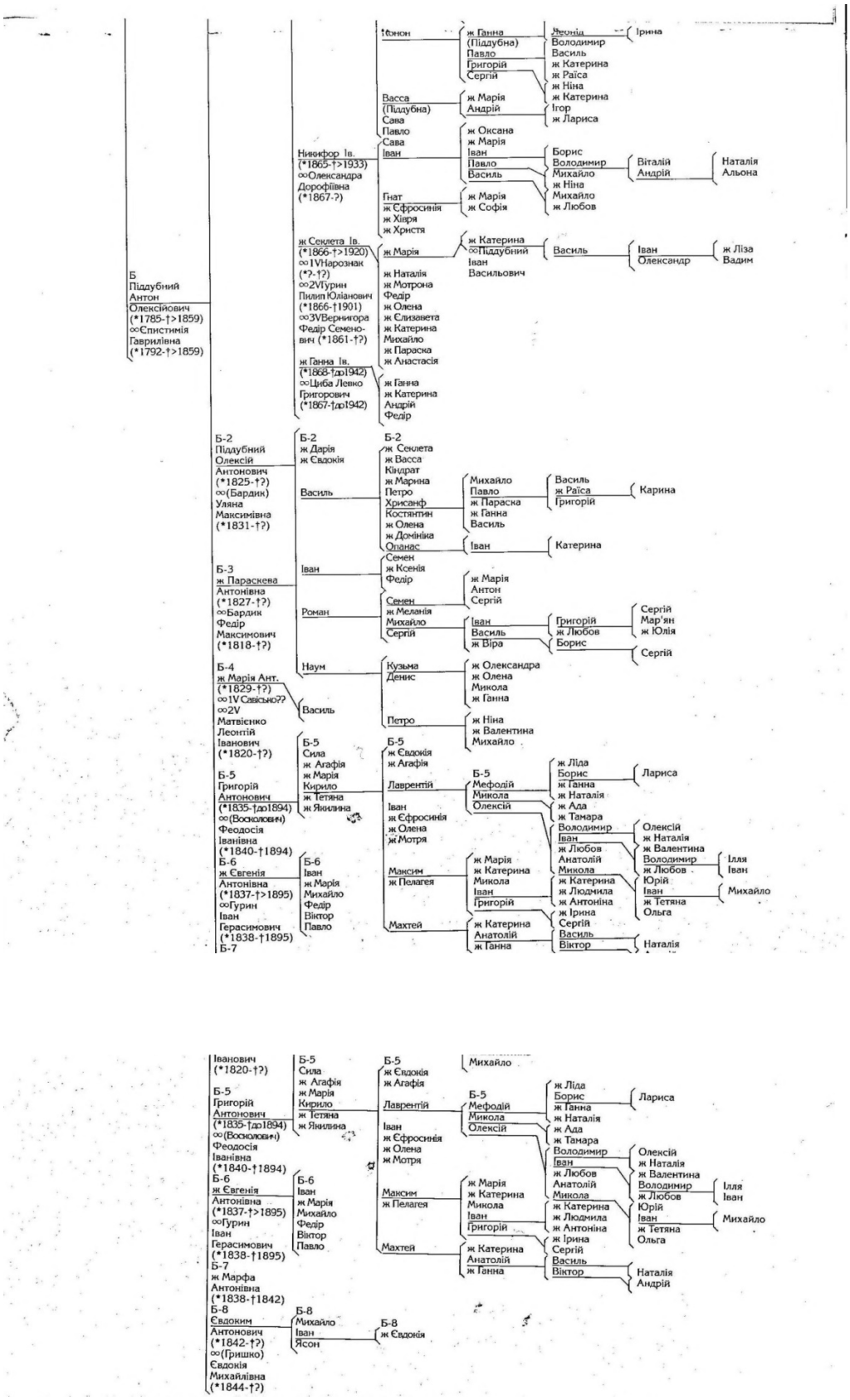


Figure 3. Family tree of Piddubny family

It is a part of the tree of the great family marked “B”, a branch of the Anton Oleksiyovych Piddubny’s family, a grandson of the Cossack Fedor Piddubny, the great-grandfather of Ivan Maksymovich Piddubny. All branches of the great family were researched by Maria Prylipko. The lineage of Masym Ivanovych, the father of Ivan Maksymovych Piddubny, has been revealed in full. It should be noted that the descendants on the female line already have other surnames: Slynko, Ostroushko, Bardyk. The genealogy of other families is conducted only through the male line. The exception is only those from Piddubny who did not change their surname when they got married.

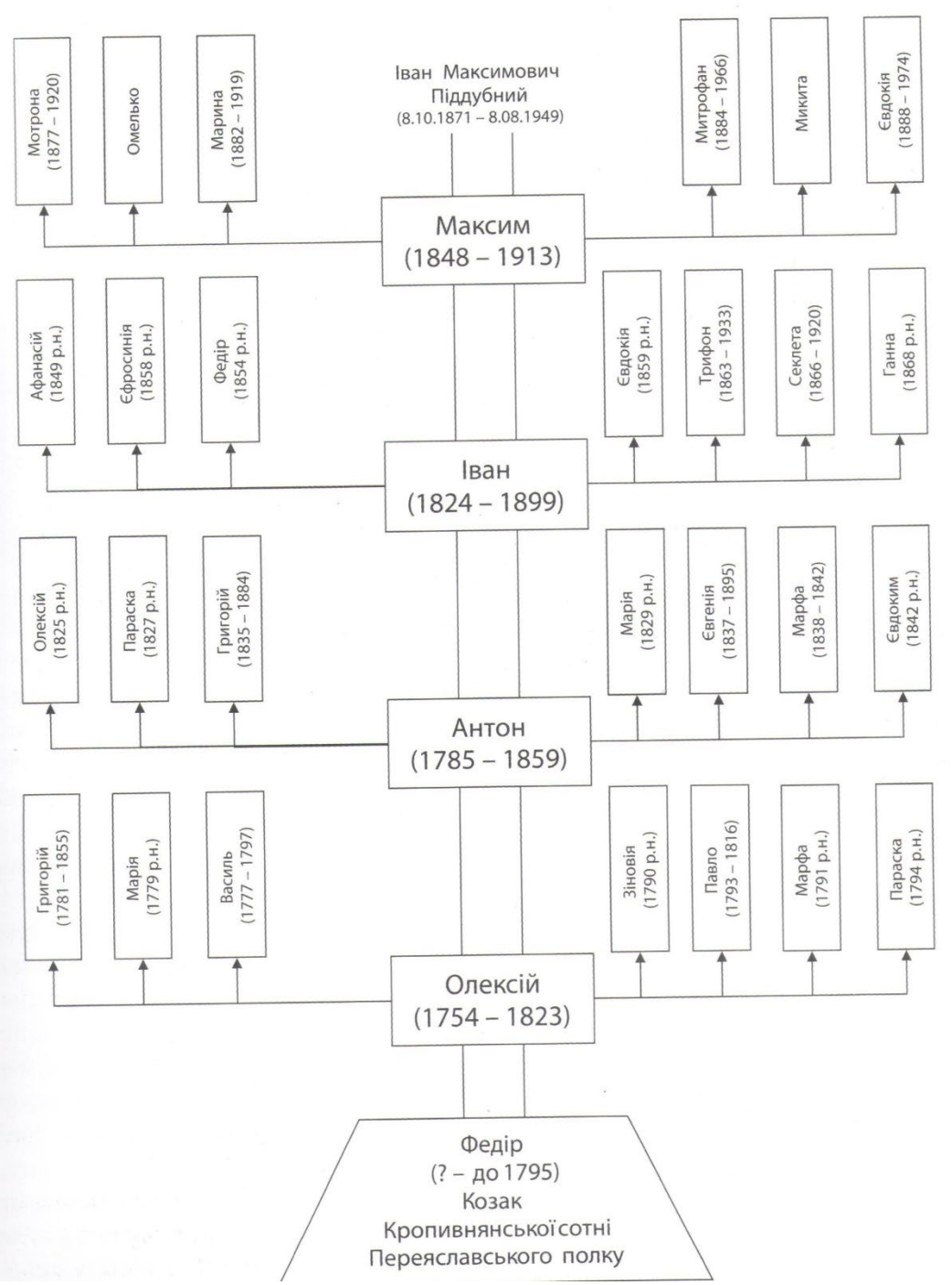


Figure 4. Piddubny lineage 1754 to 1949

The village of Krasenivka was listed as a village of Krasionivka in ancient documents. It was in this village that the Poddubny family settled and multiplied.

The name of the village comes from the name of one of the first settlers, a distinguished comrade of the Pereyaslav Regiment, Grigory Krasion, who owned land here and in 1769 built the Nativity of the Virgin Church with the help of parishioners. “Description of Kyiv Governorate” of 1770-1780 confirms the fact of entering the village of Krasenivka to the Kropovnytsky Hundred of the Pereyaslav Regiment. The village of Krasenivka was part of the Zolotonosha District of the Kyiv Governorate after the liquidation of the regimental system, and at the beginning of the 19th century, the village of Krasenivka became a part of Zolotonosha district of Poltava province, which was formed in 1802.

Figure 5. The map of the Zolotonosha District from the “Description of Kyiv Governorate in 70s-80s of the 18th *century”*

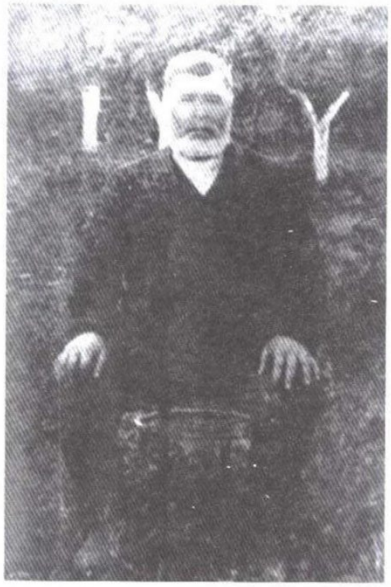
Карта Золотоніського повіту 1821 р.

Fig. 6. The map of the Zolotonosha District in 1821

Карта Золотоніського повіту Полтавської губернії 1895 р.

Fig. 7. The map of the Zolotonosha District of Poltava Region in 1895.

In 1848, Maksym Ivanovych Piddubny, the father of Ivan Maksymovich Piddubny, was born, and in 1852, Anna Danylivna Naumenko, the mother of Ivan Maksymovych Piddubny, was born.



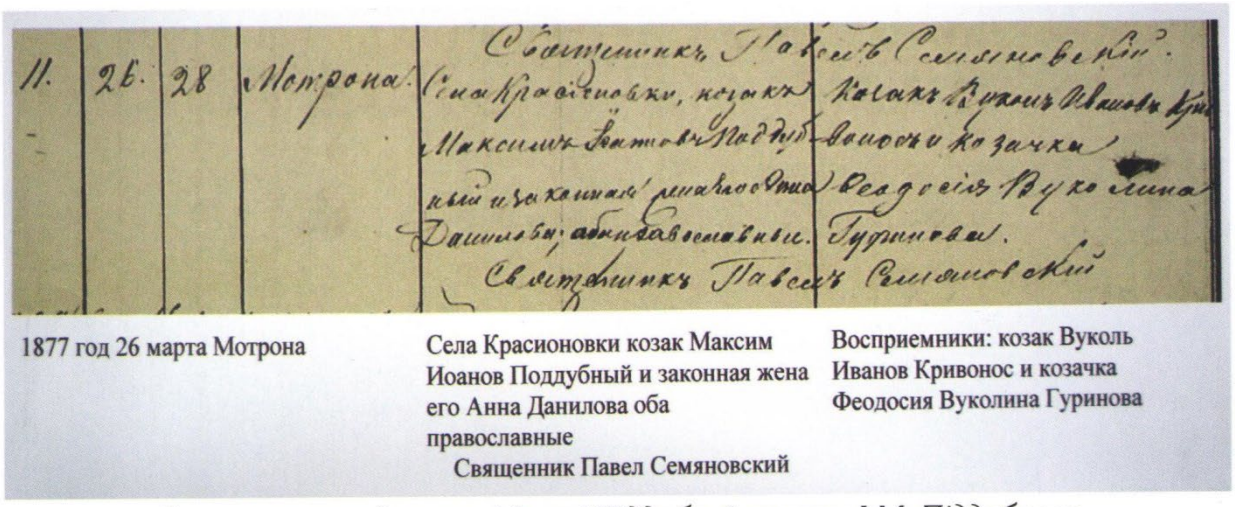
Максим Іванович Піддубний — батько славного богатиря І.М. Піддубного, 1910 р.

Мати І.М. Піддубного з дочками та внучками, 1914 р.

Fig. 8. Maksym Ivanovych Piddubny

Fig. 9. Anna Danylivna Naumenko

In 1870, Maxim Ivanovych Piddubny and Anna Danylivna Naumenko got married. They gave birth to and raised four sons and three daughters: Ivan, Omelko, Mykyta, Motrona, Maryna, Mytrofan, Yevdokiya.



1877 год 26 марта Мотрона

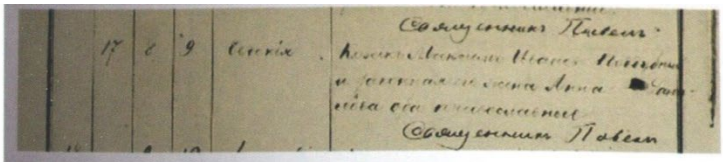
Села Красионовки козак Максим Иоанов Поддубный и законная жена его Анна Данилова оба православные

Священник Павел Семяновский

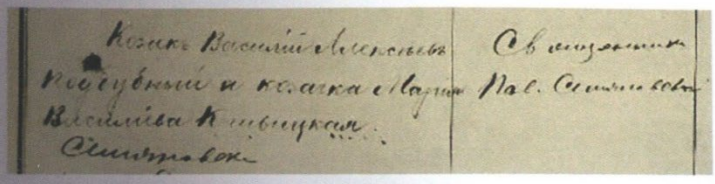
Восприемники: козак Вуколь Иванов Кривонос и козачка Феодосия Вуколина Гуринова

Запис про народження Мотрі Піддубної, сестри І.М. Піддубного

Fig. 10. Birth record of Motria Piddubna, I.M.Piddubny's sister



1888 год, июль 8 Евдокия козак Максим Иванов Поддубный и законная его жена Анна Данилова оба православные

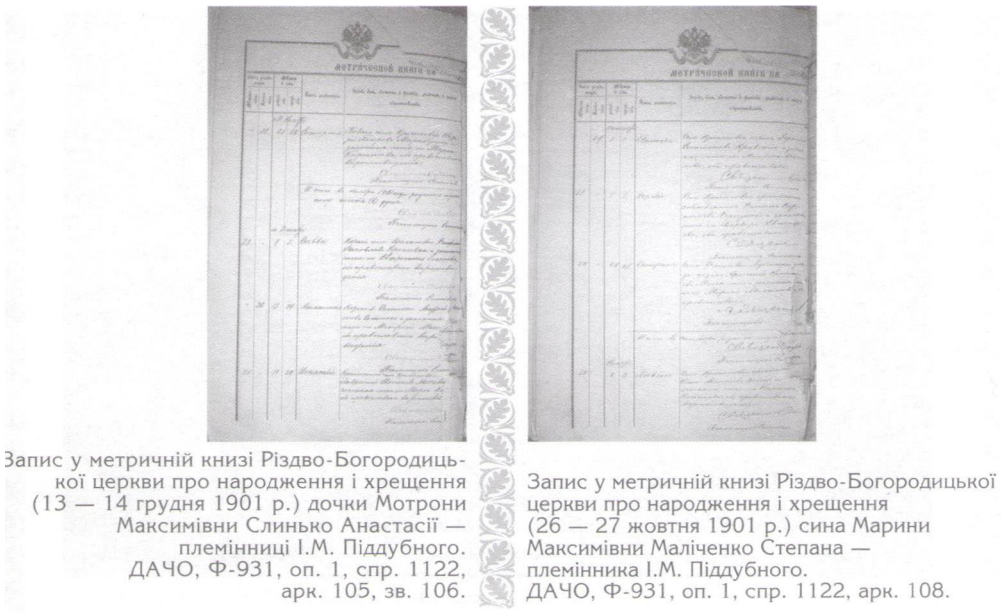


Восприемники козак Василий Алексеев Поддубный и козачка Мария Васильева Кривицкая

Крестил священник Павел Семяновский

Запис про народження Євдокії Піддубної, сестри І.М. Піддубного

Fig. 11. Birth record of Yevdokiya Piddubna, I.M.Piddubny's sister

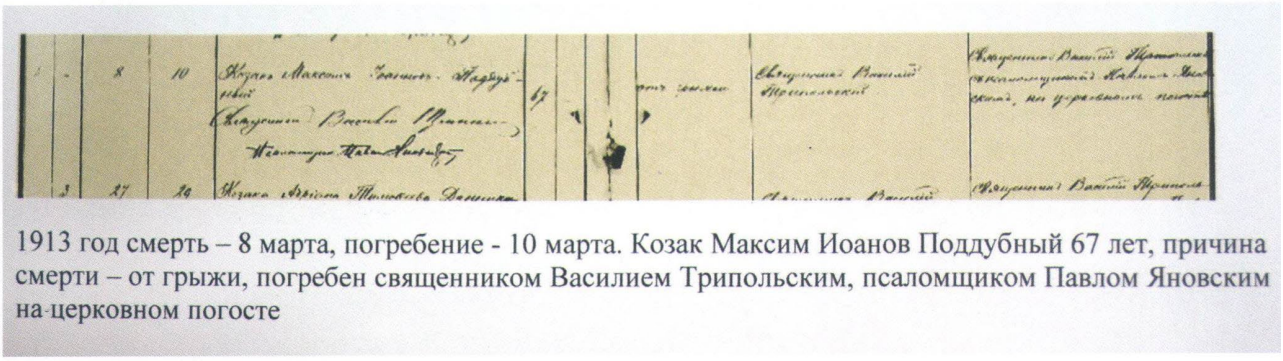


Запис у метричній книзі Різдво-Богородицької церкви про народження і хрещення (13 — 14 грудня 1901 р.) дочки Мотрони Максимівни Слинько Анастасії — племінниці І.М. Піддубного. ДАЧО, Ф-931, оп. 1, спр. 1122, арк. 105, зв. 106.

Запис у метричній книзі Різдво-Богородицької церкви про народження і хрещення (26 — 27 жовтня 1901 р.) сина Марини Максимівни Маліченко Степана — племінника І.М. Піддубного. ДАЧО, Ф-931, оп. 1, спр. 1122, арк. 108.

Fig. 12 The indicate of birth of I.M.Piddubny's niece (on right) and I.M.Piddubny's nephew (on left)

Ivan Piddubny's father, Maxim Ivanovych, died on March 8, 1913. Ivan Piddubny's mother, Anna Danylivna, died in 1933. They are buried in their native land.



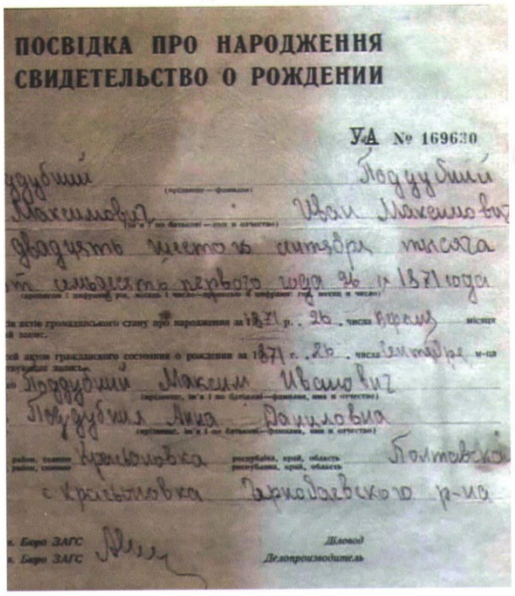
1913 год смерть – 8 марта, погребение - 10 марта. Козак Максим Иоанов Поддубный 67 лет, причина смерти – от грыжи, погребен священником Василием Трипольским, псаломщиком Павлом Яновским на-церковном погосте

Запис про смерть Максима Піддубного – батька І.М. Піддубного

Fig. 13. Death record of I.M.Piddubny's father, Maxym Piddubny

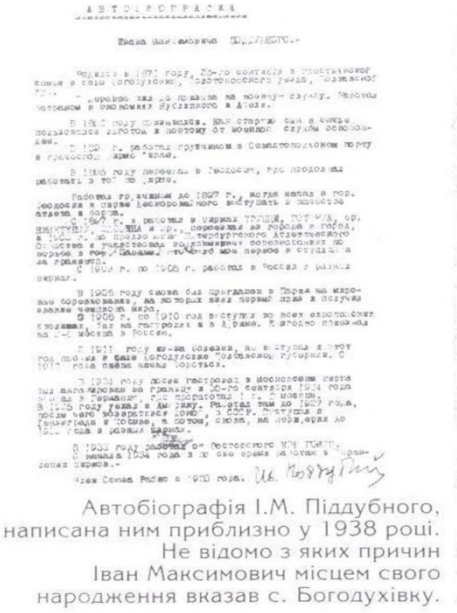
A careful examination of primary sources allows us to say with all confidence that the Piddubny family has strong Ukrainian roots, and Ivan Maksymovych himself is of Ukrainian origin, from the Cossacks.

Ivan Piddubny was born on October 8 (September 26 according to the old style) in 1871 in the village of Krasenivka of the Poltava province in the family of the Cossack Maksym Ivanovych Piddubny and lived with his parents until he was 20 years old.



Свідоцтво про народження І.М. Піддубного. Фото з музею м. Єйськ

Fig. 14. Birth Certificate of Ivan Piddubny



Автобіографія І.М. Піддубного, написана ним приблизно у 1938 році. Не відомо з яких причин Іван Максимович місцем свого народження вказав с. Богодухівку.

Fig. 15. The Piddubny's autobiography (1938)

Ivan Piddubny is also known for the fact that when he received a passport of a citizen of the USSR, his surname was written with the second letter “o”, namely “Poddubny”, and his nationality was written “Russian”. In this document, Ivan Piddubny himself corrected “o” to “i” and wrote the nationality “Ukrainian”. So, the fact shows that Ivan Maksymovych clearly identified himself as a Ukrainian.

After the end of professional performances at the “champion of champions” world championships, six-time world champion Ivan Piddubny returns to his native land. Ivan Piddubny chose the village Bohodukhivka for his farming life, where he worked for a landlord as a young man. Ivan Maksymovich purchased land, movable and immovable property.

І.М. Піддубний. Таким його побачило рідне село у 1908 році.

Fig. 16. I.M.Piddubny in the native land in 1908

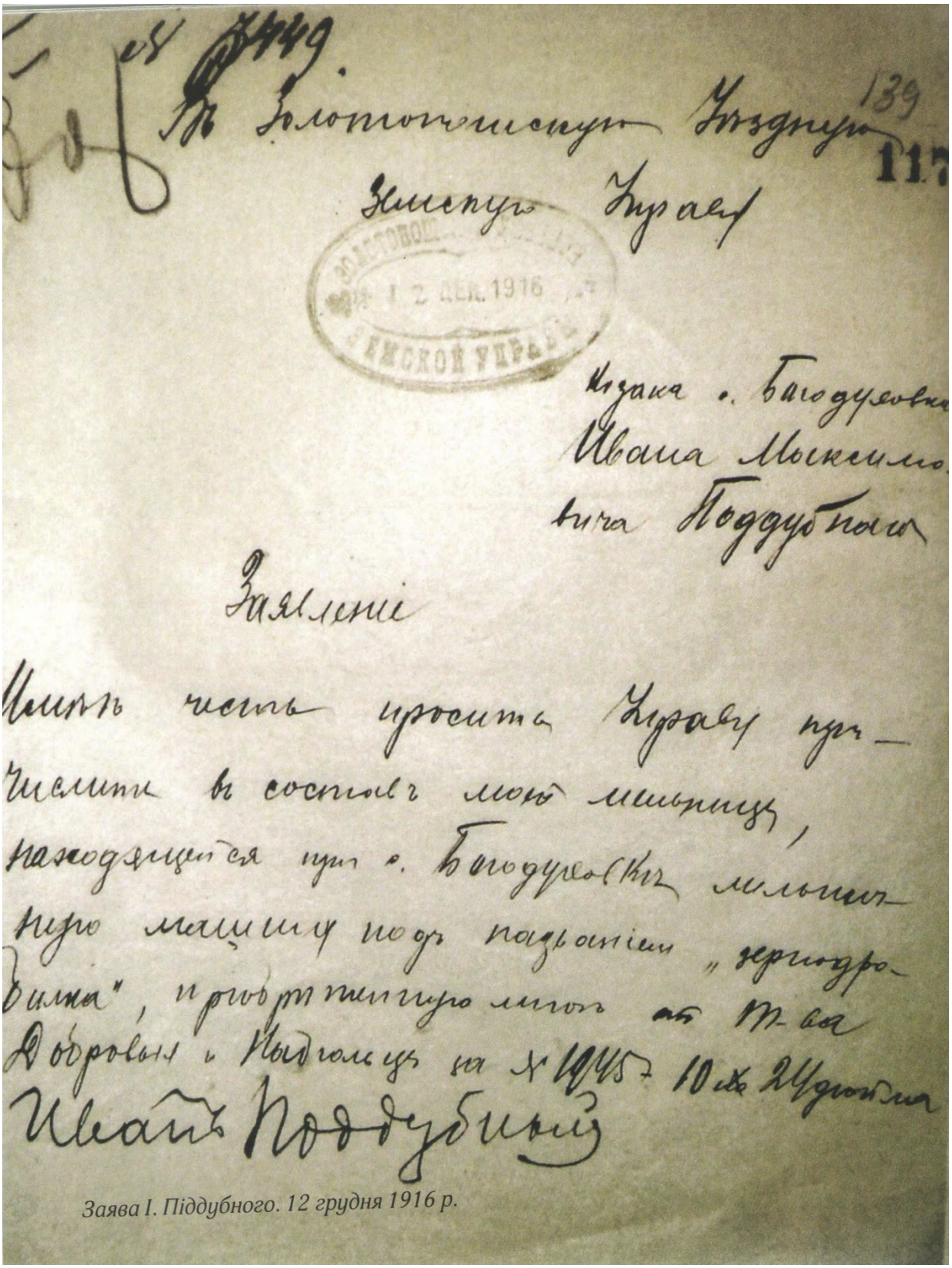
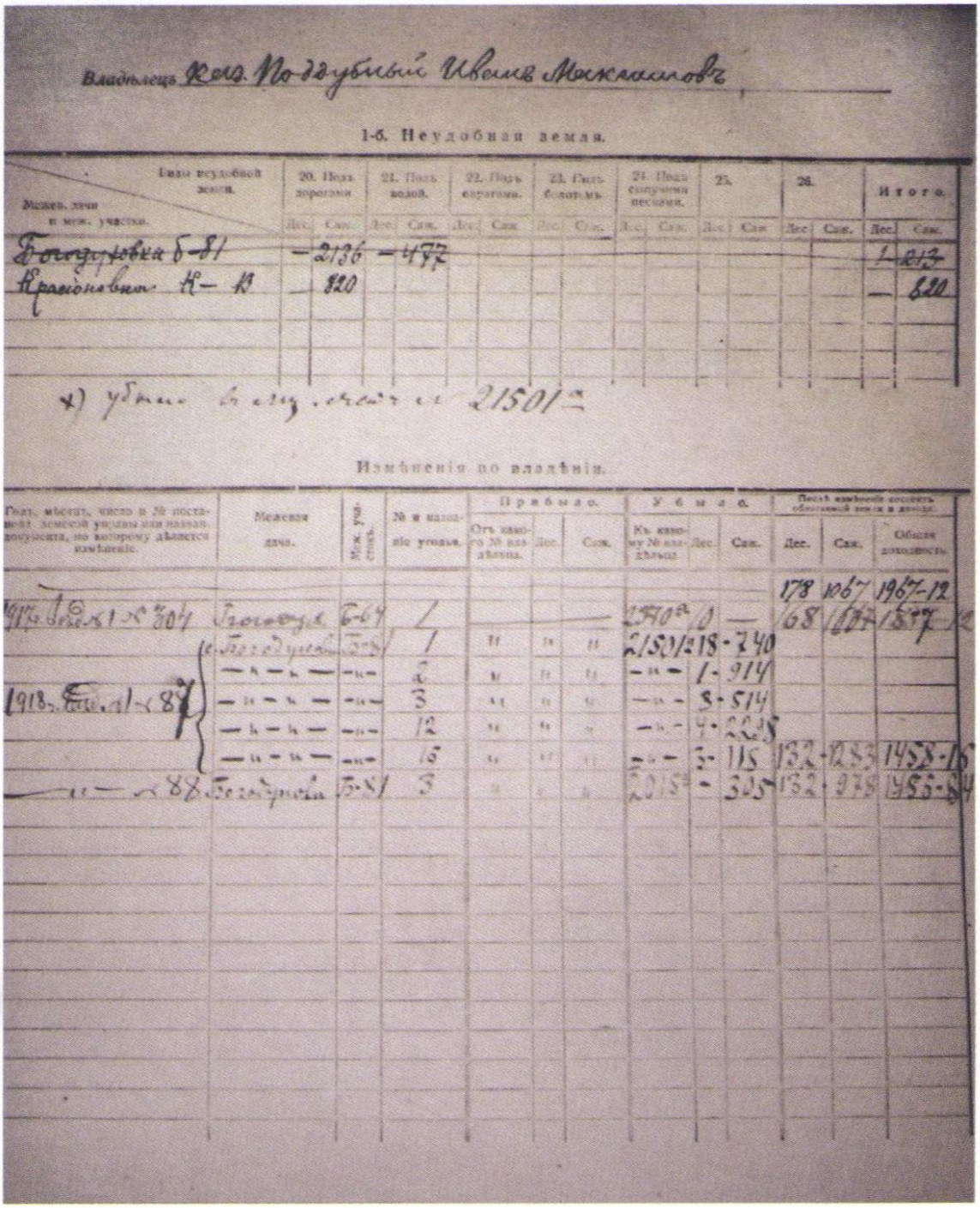
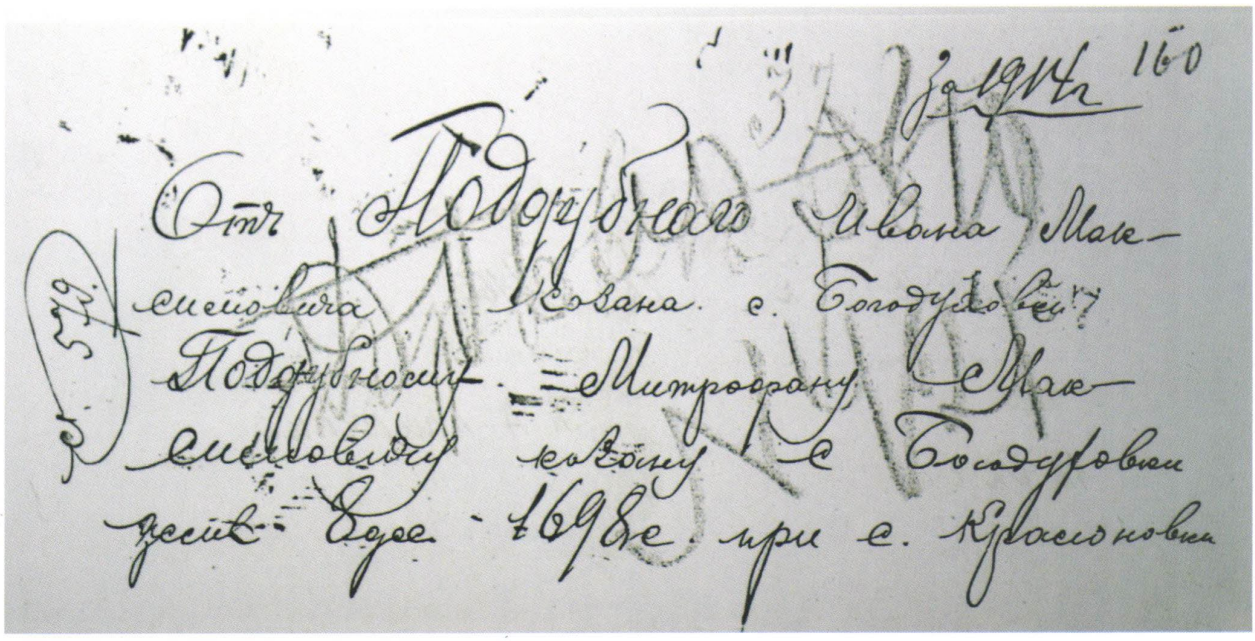


Fig. 17. Application to the village council (Bohodukhivka, 1916)



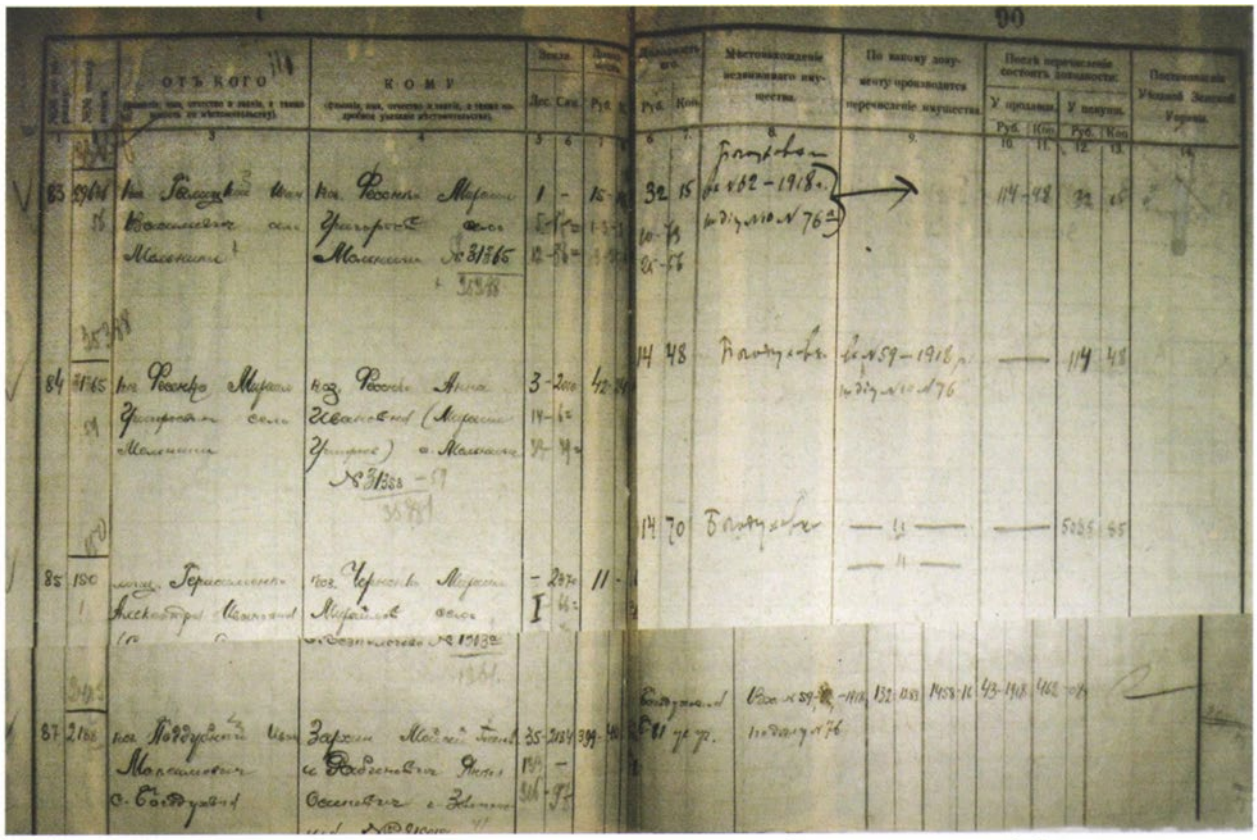
Статистична інформація про землеволодіння І.М. Піддубного в Богодухівці та Красенівці, 1911 р.

Fig. 18. Information about I.M.Piddubny's land ownership in Bohodukhivka and Krasenivka, 1911



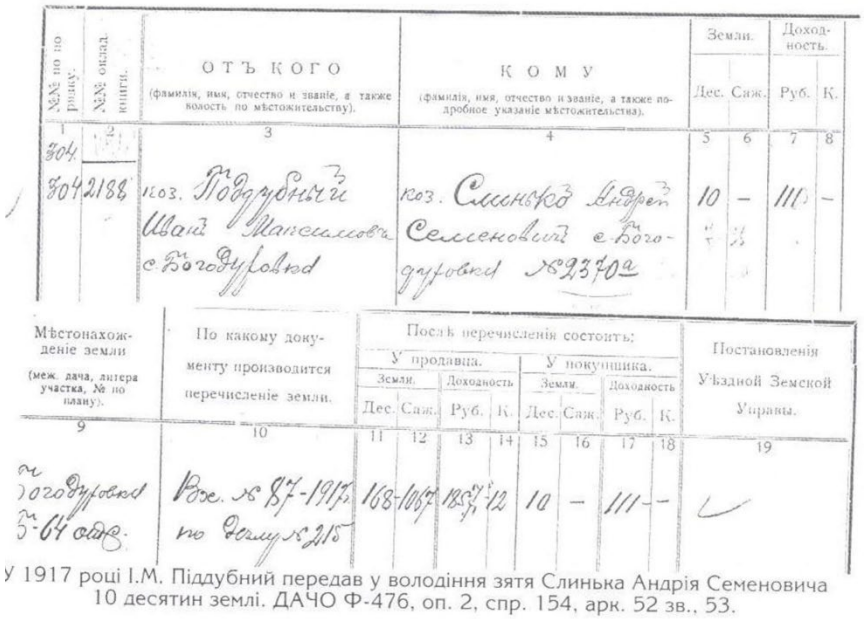
Повідомлення про перехід землі від Івана Піддубного до його брата Митрофана, 1914 р.

Fig. 19. Notice of the land transfer from Ivan Piddubny to Mytrofan, his brother, 1914



Дані Золотоніської повітової управи про продаж чотирьох будинків, вальцевого млина з просорушкою і кузнею, землі І.М. Піддубного, 1918 р.

Fig. 20. Data from the Zolotonosha district administration on the sale of four houses, a roller mill with drying and a forge, land of I.M.Poddubny, 1918



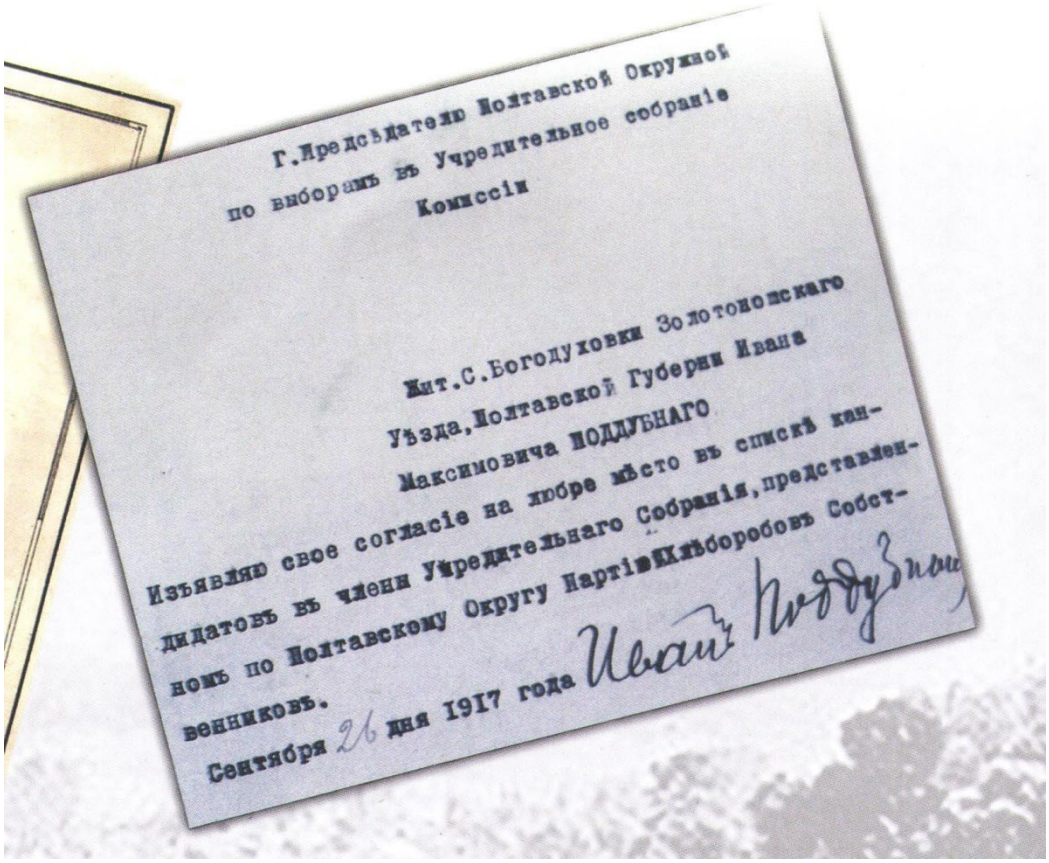
№№ по порядку	№№ оклад. книги	ОТЪ КОГО (фамилія, имя, отчество и званіе, а также колость по мѣстожительству)	КОМУ (фамилія, имя, отчество и званіе, а также подробное указаніе мѣстожительства)	Земли. Дес.	Земли. Саж.	Доходность. Руб.	Доходность. К.
1	2	3	4	5	6	7	8
304	3042188	коз. Поддубный Иван Максимовъ с Богодуховки	коз. Слинько Андрей Семеновичъ с Богодуховки №2370а	10	–	111	–

Мѣстонахожденіе земли (меж. дача, литера участка, № по плану)	По какому документу производится перечисленіе земли	После перечисленія состоитъ: У продавца. Земли. Дес.	Саж.	Доходность Руб.	К.	У покупщика. Земли. Дес.	Саж.	Доходность Руб.	К.	Постановленія Уѣздной Земской Управы.
9	10	11	12	13	14	15	16	17	18	19
Богодуховка 5-64 сад.	Вх. №87-1917 по Земству №215	168-1067		185 12		10	–	111	–	✓

У 1917 році І.М. Піддубний передав у володіння зятя Слинька Андрія Семеновича 10 десятин землі. ДАЧО Ф-476, оп. 2, спр. 154, арк. 52 зв., 53.

Fig. 21. Piddubny transfers land ownership to his son-in-law (1917)

Ivan Maksymovych was also engaged in social activities.



Г. Председателю Полтавской Окружной по выборамъ въ Учредительное собраніе Комиссіи

Жит. С. Богодуховки Золотоношскаго Уѣзда, Полтавской Губерніи Ивана Максимовича ПОДДУБНАГО

Изъявляю свое согласіе на любое мѣсто въ спискѣ кандатовъ въ члены Учредительнаго Собранія, представленномъ по Полтавскому Округу Партіи Народныхъ Соціалистовъ.

Сентября 26 дня 1917 года Иванъ Поддубный

Fig. 22. Piddubny's statement on consent to participate in the constituent assembly of the Poltava district

Ivan Piddubny's genetic Ukrainian origin is reflected in his gravitation to agricultural activities.
Ivan Maksymovich Piddubny died on August 8, 1949 in the city of Yeysk, where he lived in his last years.

СВИДЕТЕЛЬСТВО О СМЕРТИ

Гражданин(ка) Поддубный
Иван Максимович
умер(ла) 8 августа 1949 году
тысяча девятьсот
сорок девятого
в возрасте 78 лет, о чем в книге регистрации актов о смерти
19 49 года августа месяца 13 числа
произведена запись за № 188
Причина смерти инсульт
миокардит
Место смерти: город, селение Ейск
район
область, край Краснодарский
республика
Место регистрации
ОТДЕЛ ЗАГСа
Администрация города Ейска
Краснодарского края
Дата выдачи 23 ноября 1995 г.
АЛ № 360949

Свідоцтво про смерть І.М. Піддубного.
Серпень 1949 р.

Fig. 23. I.M. Piddubny's Death Certificate. August, 1949

The name of Ivan Piddubny belongs to the whole world, and his small homeland is the village of Krasenivka in Ukraine. The Ukrainian people solemnly honor the memory of Ivan Piddubny. In the center of his native village of Krasenivka, a museum was opened, and his monument was erected.

Fig. 24. Monument in Krasenivka

Fig. 25. I.M. Piddubny history museum in the village of Krasenivka

Streets in many settlements are named after him, his name appears in the names of educational institutions. In 2006, the book “Ivan Piddubny - the strength of Ukraine” by Maria Prylipko was published, a film about the life of I. Piddubny was created. Every year in the Cherkasy region, the All-Ukrainian holiday of heroism in memory of I. Piddubny is held, the program of which includes a Greco-Roman wrestling tournament.

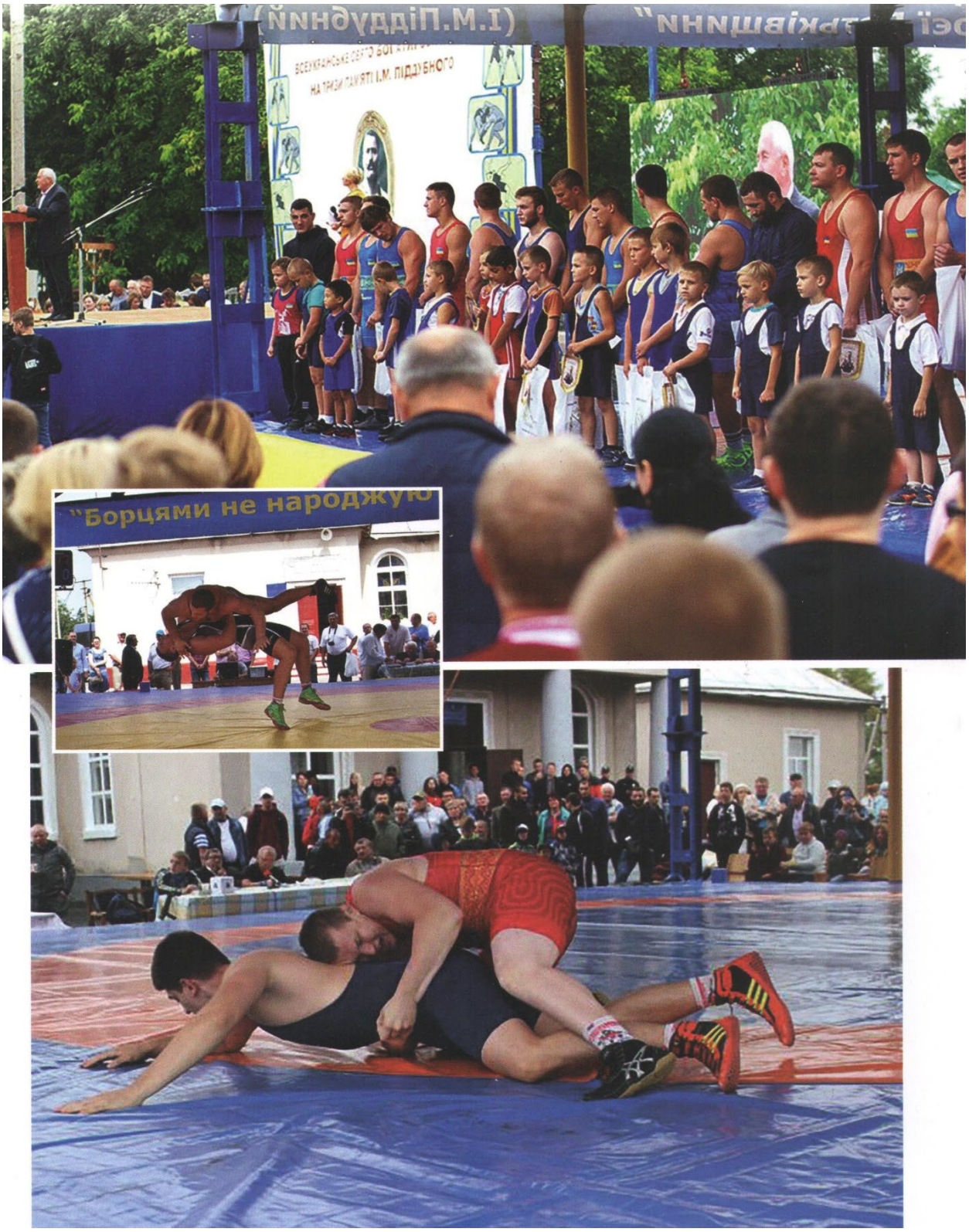


Fig. 25. Annual Tournament held in honor of Piddubny

Fig. 26. Guests at the holiday in the village of Krasenivka

Олександр Чернецький. Абсолютний чемпіон 2019 р.

Fig. 27. Oleksandr Chernetsky, absolute champion. 2019

2021 is the year of the 150th anniversary of Ivan Piddubny's birth. The jubilee date was marked by the Resolution of the Verkhovna Rada of Ukraine, which referred to the commemoration of that year's commemorative dates and anniversaries. With this document, the name of Ivan Piddubny is placed in the same row with outstanding Ukrainians who made Ukraine famous throughout the world. On the 150th anniversary of I. Piddubny, the following events were held in our country, particularly, in the Cherkasy region:

- a commemorative coin and a commemorative medal issued by the National Bank of Ukraine
- the Cup of Ukraine for Greco-Roman wrestling among adults
- the All-Ukrainian holiday of heroic strength in memory of Ivan Piddubny
- the Third Satellite Symposium of the Scientific Commission of the United World Wrestling "Challenges and Prospects in Wrestling"
- the championship of Ukraine in Greco-Roman wrestling among adults
- the book "Ivan Piddubny: the whole world fell at your feet" published by Iryna Prylutska.

Пам'ятна медаль до 150-річчя

Fig. 28. Commemorative coins for the 150th anniversary

Медалі богатирського свята, 2021 р.

Свято богатирської сили 2021 р.

Fig. 29. Medals and participants for wrestling tournament during the Holiday of Heroic Strength, 2021

Fig. 30. Exhibition of masters of decorative arts Holiday of Heroic Strength

So, by origin and self-identification, by his non-sports activities, Ivan Maksymovych Piddubny is a Ukrainian. He lived in difficult times, despite this, he never shied away from his Ukrainian origin and considered himself a Ukrainian. There is every reason to return the name of Ivan Piddubny to Ukraine and the Ukrainian nation, and to transfer the international Greco-Roman wrestling tournament in memory of Ivan Piddubny to Ukraine.

By honoring the memory of Ivan Piddubny by holding an international Greco-Roman wrestling tournament in his homeland - Ukraine, we exalt the dignity of the global wrestling community, and achieve the goal of consolidation, formation of historical consciousness and memory of all peoples of the world. This will be a new impetus in the formation of a positive image of the United World of Wrestling in the world community and the further development of the Olympic movement.

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Prylutska I.O. Ivan Poddubny: the whole world has fallen at your feet. Cherkasy, TOP Introleague, 2021. 200p.

Geneo- International Genealogical Forum. Accessed from: http://forum.genoua.name/viewtopic.php?id=3854

УКРАЇНА МОЛОДА 06.11.2014. Ukrainian Hercules. Accessed from: https://umoloda.kyiv.ua/number/2557/222/90305/

INVESTIGATION OF THE EFFECT OF A COMPREHENSIVE WARM-UP PROGRAM ON THE FUNCTIONAL MOVEMENT PATTERNS AND LANDING ERROR OF YOUNG MALE WRESTLERS

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1. Sports Science Department, Kish International Campus, University of Tehran, Kish, Iran
2. Sports Rehabilitation Department, Shahid Beheshti University, Tehran, Iran
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4. Department of Sports Medicine and Health, University of Tehran, Tehran, Iran
5. Professor at Payam Noor University of Alborz, Iran

ABSTRACT

The current study aims to investigate the effect of a comprehensive warm-up program on the functional movement patterns and landing errors of young male wrestlers.

Method: For this purpose, 50 wrestlers from Karaj City were selected as available to participate in the research and then randomly divided into two equal experimental groups (25 people) and a control group (25 people). Then, The LESS test was used to evaluate the landing error, deep squat, lunge, shoulder mobility and rotational stability tests were used to measure the quality of movement patterns, and finally, the Nordic questionnaire was used to measure musculoskeletal pain. The experimental group performed special wrestling warm-up exercises for eight weeks and three sessions of 30 minutes per week.

Results: The results of the Chi-square test showed that the musculoskeletal pain in the knee area of the subjects in the experimental group improved significantly after eight weeks of training ($P=0.04$), but the musculoskeletal pain in the shoulder and trunk of the wrestlers did not improve significantly ($p>0.05$). The results of the U-Man-Whitney test showed that among the variables related to performance, no significant difference was observed in the post-test in the right and left shoulder mobility test ($P<0.05$) and in other research tests, a significant difference was observed between the two groups ($P<0.05$).

Conclusion: We conclude that trainers can use the training protocol of the present research to improve landing error and musculoskeletal pain in the knee joint, along with other common training protocols. A comprehensive wrestling warm-up program can reduce musculoskeletal pain, improve functional movement patterns, and reduce landing errors in young male wrestlers.

INTRODUCTION

Wrestling is one of the oldest Olympic sports with a large following. It is the national sport of Iran and one of the most successful sports in the country. However, it is also a physically demanding sport with a high risk of injury. Studies have shown that the most common injuries among young wrestlers are shoulder injuries (8.2%), ankle injuries (6.4%), and knee injuries (5.3%) [1].

The rising popularity of competitive and recreational sports has led to a significant increase in the incidence of joint injuries, especially in the ankles and knees. This has resulted in significant psychological and financial losses for sports clubs and athletes. Epidemiological studies have indicated that wrestlers' training injuries are associated with various risk factors. These include weight loss [2], low physical fitness [2], excessive fatigue, past injuries, incorrect technique, non-sporting movements, inappropriate mental states [3], as well as the opponent's errors and inadequate warm-up routines [4]. Therefore, based on previous research, it has been established that one crucial aspect for athletes, coaches, and even individuals engaging in basic sports activities to maintain their well-being is how they commence their physical endeavors and the specific type of warm-up employed during training or competition. While it has been advised over the past few decades that athletes should incorporate preliminary exercises and warm-up routines before embarking on intense training sessions or participating in competitive events, the findings of certain studies have given rise to some disagreement among researchers regarding the required level of intensity and duration associated with these warm-up activities [5].

In today's world, the majority of athletes view warming up as an integral component of their expertise. They firmly believe that engaging in warm-up routines both during training sessions and actual competitions leads to enhanced physical and mental performance, while also effectively minimizing the risk of injuries during exercises. From a physiological standpoint, scientific evidence has solidly established that elevating body temperature triggers the release of oxygen from both myoglobin and hemoglobin. Additionally, it promotes a heightened blood flow to the muscles, amplifies the receptiveness of nerve receptors, accelerates the speed of nerve impulses, diminishes the energy required for fuel reactions, and decreases muscle viscosity [6]. Researchers have also explored variables that influence heating effects, such as the duration of the warm-up program, the intensity of the warm-up, and the time interval between the warm-up and the main activity. The impact of these variables is contingent upon various factors, including the athlete's characteristics, the type and nature of the sport, weather conditions, and the objective of the training session or competition.

Multiple studies have been conducted to examine the impact of specialized warm-up exercises in various sports such as soccer, basketball, handball, and others [8-10]. However, the researcher's findings indicate that very limited research has been done to understand the effects of specialized warm-up exercises in wrestling. For instance, Bayati et al. (2017) conducted a study to explore the influence of a 12-week wrestling+ warm-up program on the dynamic balance of young wrestlers. The experimental group followed the wrestling+ warm-up program three times a week, over 12 weeks, while the control group adhered to their usual warm-up routine during the same duration. Ultimately, the researchers concluded that implementing a specific warm-up program for wrestling can enhance the balance of wrestlers [11].

In their study, Polat et al. (2018) investigated how ballistic warm-up impacts various aspects of performance, including isokinetic strength, balance, agility, flexibility, and speed, in freestyle wrestlers who had a mean age of 20 years. The participants were divided into two groups, with one group performing 10 minutes of sub-maximal running as part of their warm-up and the other group performing 10 minutes of ballistic exercises that engaged most of their muscle groups. The researchers found significant differences in flexibility, right-hand grip strength, dynamic balance, and the strength of the quadriceps and hamstring muscles in the right and left legs. Accordingly, the study concluded that ballistic warm-up exercises are more beneficial than regular warm-up exercises for improving muscle strength and other variables [12].

As previously mentioned, multiple studies have looked into the impact of warm-up exercises on wrestlers' performance and have found conflicting results. However, there has been a lack of research on the effects of these exercises on injury prevention in wrestlers. Additionally, previous studies have shown that coaches and players are often reluctant to implement preventive programs unless there is a direct impact on performance [13]. As a result, this research aims to examine the effects of a comprehensive warm-up program specifically designed for young male wrestlers, including its impact on musculoskeletal pain, landing error, and overall performance.

METHODS

The Sports Sciences Institute has issued the ethics code 1873-2209-SSRI REC for the ongoing research. The research is designed as a field trial. The wrestlers were selected between the ages of 20 and 30 years who had a minimum of three years of experience in this field as our statistical population. Using Power G software and referring to previous studies [12, 14, 15], a statistical sample of 45 individuals has been obtained. The sample was chosen with a power of 0.95 to 0.05 and an impact factor of 0.50. Ultimately, 50 individuals participated in the study, taking into account a 10% chance of dropouts. These individuals were selected based on specific entry and exit criteria and were randomly assigned to either an intervention group or a control group, with each group comprising 25 individuals. The test has a power of 0.80 and the selection of the effect size is based on previous research. The starting point for the effect size is 1.02. It is important to mention that previous studies on LESS landing error tests and functional movements [11, 14, 16-19] found effect sizes ranging from 0.69 to 2.5. The starting point for the effect size was determined to require a significant sample size of 1.02, which resulted in a calculated sample size of 50 people. To be eligible for this research, individuals must meet several criteria. Firstly, they must fall within the age range of 20-30 years. In addition, they must have a minimum of three years of sports experience in the field of wrestling. Furthermore, participants must provide voluntary consent to take part in the research. It is also required that they do not exhibit any pathological symptoms or have a history of surgical fracture or joint diseases in their lower limbs or spine within the past five years [20, 21]. Moreover, individuals should not have a history of knee and ankle ligament damage within the past 18 months [22]. Lastly, they should not have any sensory or motor disorders as diagnosed by a specialist doctor [23]. On the other hand, certain exclusion criteria must be met. Participants must not miss more than three training and competition sessions during the research period. Additionally, they must not have had a previous injury at the start of the research. Lastly, individuals who are older than 30 years or younger than 20 years are also not eligible for participation.

Once the subjects had been selected and given their consent, the test was conducted on them. The individuals who took part in this study were duly informed about the purposes, methods, and advantages of their participation. They were assured that all of their personal information and data would be kept confidential, and they were also given the option to decline participation in the research at any given moment.

The research samples were instructed to go to the wrestling hall at the designated schedule to obtain measurements for the pre-test. Once the subjects arrived, they were required to fill out a basic information form, and then each person underwent anthropometric measurements. To assess landing error, the Landing Error Scoring System Test (LESS) was employed. Padua et al. (2009) reported that the intra-examiner reliability of this test was excellent, with an ICC value of 0.91 [24]. Additionally, Hanzlíková et al. (2011) reported moderate to excellent self-validity of this test [25]. During the test, the subject was instructed to stand on a 30 cm box. The target line was drawn on the surface, with a distance equal to half the person's height. The subject was then instructed to jump forward from the box and land with both feet simultaneously on the surface, in front of the marked line, followed immediately by a maximum vertical jump.

The subject must maintain a continuous motion from landing on the ground to starting the vertical jump without any pauses. After the examiner demonstrated the test, each subject was given two opportunities to practice. The examiner did not provide any instructions to the subject regarding proper landing mechanics. Overall, the subject made four attempts, and the examiner observed and evaluated the subject from both the front and side views. During the first and second attempts, the examiner captured a picture of the subject from the front view, while during the third and fourth attempts, a picture was taken from the side view. Based on the existing errors, the subject's landing error was graded, determining their score. The scoring method for the LESS test is explained below. It is important to note that the score increases with more mistakes, with the highest possible score being 17 and the lowest score being 5.

Experts can successfully use the Landing Error Scoring System (LESS) as a systematic and easy-to-use format to evaluate specific movement patterns that typically occur during ACL and lower limb injuries, such as knee valgus, excessive leg rotation, and decreased knee flexion, which can be seen, for instance, in flat-footed landing [26]. They can then adopt a corrective strategy for this movement disorder based on the information obtained from LESS.

The performance tests used to assess athletes included deep squats, lunges, shoulder mobility, and rotational stability tests. These tests, which are part of the functional movement (FM) screening tests [27, 28], are effective in identifying any restrictions or deviations from the usual movement patterns. They are specifically designed to evaluate the correlation between the mobility of the movement chain and the stability required for executing functional movement patterns [29].

Below, an explanation of the motor performance test can be observed, including instructions on how to carry it out and how to score it. In this test, subjects are awarded two points if they perform the required movements correctly and without any compensatory movements. However, if subjects perform the movements with compensatory actions, they will not receive the full two points. Instead, they will earn one point for their inability to perform the movements without compensatory actions. Furthermore, if a subject experiences pain while performing any of the movements, they will not be awarded any points at all [30].

To perform the lunge test, the participants were required to hold the balance stick against the back of their head, upper back, and hips. They were instructed to place their right hand behind their neck and their left hand behind their waist while assuming this position. Then, they would take a step forward. This movement was repeated for both legs. If the stick remained in contact with the head, back vertebrae, and sacrum, there would be no observable movement in the trunk. In addition, the leg and the stick would remain in the sagittal plane. Finally, if the knee behind the front leg made contact with the board, the person would receive a score of three. On the other hand, if the stick was not in contact with the head, back vertebrae, and sacrum, there would be no observable movement in the trunk. Moreover, the leg and the stick would deviate from the sagittal plane, and the knee behind the front leg would not touch the board. In this case, the person would receive a score of two. If the individual executed the motion while experiencing imbalance, a score of one was assigned to them; ultimately, if they were unable to execute the motion altogether, they received a score of zero [30].

To conduct the shoulder range of motion test, an individual should stand with their legs together and their hands hanging by their sides. They should then wrap their fingers around their thumbs and form a fist. Then, the person should raise their right hand, with the fist still clenched, above their head and lower it as much as possible. Simultaneously, they should also move their left-fisted hand from behind their back as far as they can. During this

test, if the distance between the fists is 20 cm or less, the person will receive three points. If the distance is between 20 and 30 cm, they will receive two points, and if the distance is more than 30 cm, they will be given one point.

For the rotational stability test, the subject is positioned with the elbow underneath the shoulder and the knee underneath the pelvis. In this specific stance, the hands, knees, and toes on one side of the body are placed on the balance board. The individual then extends their right hand forward while simultaneously moving their right foot backward. Without touching the ground, they proceed to bring the elbow of their right hand in contact with their right foot and return to the original position. This sequence is also repeated for the opposite side. The correct execution of the movement occurs when the spine is parallel to the ground, the knees and elbows are in contact with each other, and there is no contact with the ground [30]. The person can earn a score of three by performing a one-sided repetition while keeping their spine parallel to the board. Additionally, they need to bring their knees and elbows together and have minimal rotation of the trunk. If they perform a two-way repetition while keeping their spine parallel to the board and also reaching their knees and elbows together, they will receive a score of two. If they cannot perform a two-way repetition, they will receive a score of one. Finally, if the person is unable to perform the movement at all, they will receive a score of zero [30].

During the deep squat test, the individual positions themselves by standing with their feet placed shoulder-width apart and toes pointing forward. Subsequently, while ensuring that the shoulders and elbows form a 90-degree angle, the person grasps a horizontal balance stick with both hands and holds it above their head. Simultaneously, they maintain their heels firmly planted on the ground while descending as far as possible without compromising their balance. Once in this lowered position, they maintain their stance until the examiner counts to one, after which they return to their initial standing position.

If the upper body is aligned with the tibia or is at a right angle to the ground, and the thigh is positioned lower than the horizontal level and aligned with the knee and foot, a score of three is given. If the individual meets all the requirements for grade three but is unable to execute the movement on the ground or place the heels on the board, a score of two is given. However, if the upper body and tibia are not parallel, the thigh is not positioned lower than the horizontal level, the knee is not aligned with the leg, and there is flexion of the vertebral column, a score of one is given. In cases where the person is unable to perform the movement at all, a score of zero is assigned to them [30].

Researchers investigated the prevalence of musculoskeletal disorders by utilizing the Nordic questionnaire, a self-report method consisting of two sections: individual information and specific inquiries. This questionnaire was originally developed at the Institute of Professional Health in Scandinavian countries and its Persian version's validity was deemed good (ICC=0.70) by Mokhtari Nia et al. (2014) [31]. The questionnaire has a dual-completion method, either through an interview or a self-administered format. It consists of two parts: a general questionnaire and a specific questionnaire. The general questionnaire aims to assess and evaluate overall musculoskeletal disorder symptoms in the entire body. The specific questionnaire, on the other hand, focuses on a detailed analysis of these symptoms in specific areas such as the neck, shoulder, waist, wrist, and hand [32]. Only the results from the specific questionnaire were analyzed for this research. The standard questionnaire covers nine parts of the body including the neck, shoulder, upper back, elbow, wrist, lower back, back of thigh, knee, and ankle. Each section contains relevant questions related to the respective body parts.

1. Have you experienced any issues like pain, discomfort, or numbness in these areas within the past 12 months?
2. Have you encountered any problems in these areas over the past year that hindered your ability to carry out your daily activities, both at work and home?
3. Have you faced any problems such as pain, numbness, etc. in these specific body regions during the past week?
The current study examined the musculoskeletal pain experienced by wrestlers last week.

PROCEDURES

The participants in the experimental group began their exercises immediately after their initial measurement session. These exercises were conducted for 8 weeks, with three sessions taking place each week and every other day at Motahari of Karaj Wrestling Club. In addition, all participants were instructed to refrain from engaging in any form of exercise other than the designated exercise program during this period. They were, however, permitted to carry out their normal daily activities. It was important for the participants to not miss three consecutive training sessions, as failure to adhere to this rule would result in their exclusion from the research process. Furthermore, a qualified examiner was present at all training sessions, directly supervising the exercises. This decision was based on previous findings indicating that exercising under the guidance of an expert yields better results compared to unsupervised workouts [33].

The researcher implemented a warm-up exercise routine for the participants in wrestling. The exercises had a duration of 23 minutes, with rest periods between sets lasting almost 30 minutes. The first part of the warm-up consisted of running exercises for seven minutes, aimed at increasing the athletes' heart rate. The second part included joint mobility and rotation exercises, focusing on the joints used in wrestling, for one minute. The third part involved stretching exercises to improve flexibility in the muscles used during the activity, lasting 2.5 minutes. In the fourth part, participants completed gymnastic exercises to simulate the target activity, lasting about one minute. The fifth section involved central stability exercises for 2.5 minutes, followed by balance exercises in the sixth section for the same duration. The seventh section included strength exercises for approximately 2.5 minutes, while the eighth section focused on agility exercises for approximately one minute. The ninth part of the warm-up routine included plyometric exercises for one minute, and the tenth part ended with a two-minute slow-running activity (Table 1). Throughout the warm-up, the researcher controlled the timing of exercise and rest periods using a stopwatch. After completing the training period, all subjects underwent post-test measurements.

Table 1. Comprehensive warm-up exercise protocol

Running exercise, 7 minutes		
Exercise No.	Exercises	Duration
1	Running forward and straight	2 minutes
2	External thigh internal rotation and rotation with running	1
3	running both sides to the side and butterflying (foot boxing)	1
4	Running on the guard and forward	1
5	Running on the guard to the side	1
6	Back and forth with fast-running	1

Joint rotation exercises, 1 minute, part 2

Exercise No.	Exercises	Duration
7	Rotation of the ankle joint	Each foot 10 repetitions (10 seconds)
8	Rotation of the knee joint in two directions	10
9	Back rotation	10
10	Rotation of the shoulder joint	10
11	Elbow rotation	10
12	Wrist rotation	10

Part 3: Stretching exercises, 2.5 minutes

Exercise No.	Exercises	Duration
13	Stretching the neck muscles (bending on all four sides with hands)	10 seconds
14	Stretching the hands above the head	10 seconds
15	Stretching the arms and bending to the sides on both sides	10 seconds
16	Stretching the arms towards the front of the bent upper body	10 seconds
17	Stretching the arms in front of the chest with the other hand	10 seconds
18	Stretching the fingers and forearm with the other hand up and down in an outstretched hand position	10 seconds
19	Stretching the sides (bending to the side)	10 seconds

20	Bending the upper body on the legs (do not bend the knees), stretching the gluteal muscles and hamstrings	10 seconds
21	Leg muscle stretching (pulling the tip of the foot with the hand in a straight knee position)	10 seconds
22	Stretching the inner leg muscles (bending one knee and leaning to the same side)	10 seconds
23	Giant swing	4 x10
24	Stretching of the muscles of the forearm, shoulder and chest (kneeling position and hands on the sides)	10 seconds

Part 4: Gymnastics exercises, about 1 minute

Exercise No.	Exercises	Duration
25	Front leg roll together	5
26	Back leg roll together	5
27	Open front roll	5
28	Open leg back roll	5
29	Skip step	5

Part 5: Central stability exercises, 2.5 minutes

Exercise No.	Exercises	Duration
30	Plank movement (elbows and toes on the floor)	3x20
31	Bridging the back and reversing the movement (such as sitting and standing still)	3x20
32	**Lateral bridg**e	2x15

Part 6: Balance exercises, 2.5 minutes

Exercise No.	Exercises	Duration
33	One foot on the balance	2x20 seconds per foot
34	A balancing exercise, standing on one leg	2x20 seconds per foot
35	standing on the palms and ankles with the help of a wheelbarrow (fourgon)	2x25 second

Part 7: Strength training, about 2.5 minutes

Exercise No.	Exercises	Duration
36	Squat	2x20
37	Launch	2x20
38	Swedish swimming	2x20
39	Nordic hamstring outward contraction movement	2x10

Section 8: Agility exercises, about 1 minute

Exercise No.	Exercises	Duration
40	4x9 agility exercise	2 iterations

41	Passing between a friend or an obstacle to the left and right (foot box)	2x20

Part 9: Explosive power (plyometric), 1 minute

Exercise No.	Exercises	Duration
42	Jumping over players or obstacles	2x15
43	Jump over the side to the left and right	2x15

Part 10: Running exercises, 2 minutes

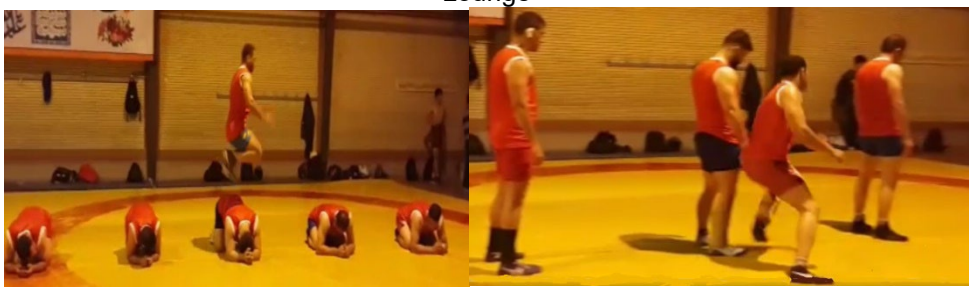
Exercise No.	Exercises	Duration
44	soft running	2 min

Figure 1 displays some exercises:

Standing on one leg

Plank

Lounge



Crossing the obstacle

Wheelbarrow

Nordic hamstring outward contraction movement

The researchers used the Shapiro-Wilk test to determine the normality of the data. Additionally, they employed the Chi-square and Mann-Whitney tests to compare the results between the different groups in the post-test. Moreover, they conducted a marginal mean test to assess and compare the impact of exercises.

RESULTS

The demographic characteristics of the subjects are presented in Table 2, illustrating the results.

Table 2. The anthropometric characteristics of the research subjects (mean ± standard deviation) (n=25 per group)

Group	Experimental group	Control group	P
Age (year)	24.24±2.94	25.36±2.92	0.18
Height (m)	1.71±0.06	1.71±0.07	0.75
Weight (kg)	68.20±7.74	70.76±9.18	0.29
BMI (kg/m^2)	23.21±1.10	23.86±1.14	0.08

The Shapiro-Wilk test results indicated that the data for all variables in the research did not follow a normal distribution (P<0.05). As a result, non-parametric statistical methods were used to analyze the research hypotheses. After conducting the Chi-square test (Table 2), it was determined with 95% confidence that there is a significant difference in musculoskeletal pain levels of wrestlers' knee joints between the pre-test and post-test, specifically after eight weeks of engaging in dedicated wrestling warm-up exercises within the experimental group (P=0.001). Conversely, this difference was found to be statistically insignificant within the control group (P=0.16). In addition, the subjects within the experimental group experienced significantly less knee pain than those in the control group during the post-test. Furthermore, the results demonstrated that there was a significant difference between the two groups regarding the number of musculoskeletal pains experienced during both the post-test and the period of eight weeks following the intervention (P=0.04). Conversely, there was no significant difference observed in the occurrence of musculoskeletal pain in the shoulder joint of wrestlers in either the experimental group or the control group before or after the intervention involving specific warm-up exercises for eight weeks (P=0.16 in the experimental group and P=0.84 in the control group).

Additionally, the results of the group comparisons revealed that there was no significant difference in musculoskeletal pain during the post-test and after eight weeks of intervention between the two groups (P=0.39). It is noteworthy that neither the experimental group nor the control group exhibited any significant difference in musculoskeletal pain before the intervention, after the intervention, and after eight weeks of specific warm-up exercises for wrestling (P=0.84 in the experimental group and P=0.54 in the control group, respectively). Moreover, the results of the group comparisons demonstrated that there was no significant difference in musculoskeletal pain in the trunk region during the post-test and after eight weeks of intervention between the two groups (P=0.77).

Since the data related to rotational stability, lunge, deep squat, shoulder mobility, and landing error of wrestlers were not normally distributed, the Mann-Whitney test was used to compare the differences between the two groups in the post-test. The results indicated that there were significant differences in the variables of deep lunge squat, landing error (LESS), and right and left rotational stability after eight weeks of comprehensive exercises between the two groups (P=0.001 for all variables). However, there was no significant difference in the variable of right and left shoulder mobility in the post-test (P=0.45 and P=0.07, respectively) (Table 3).

Table 3. Chi-square test results to investigate the difference in musculoskeletal knee joint pain in two groups

Target joint	Groups	Pretest				Posttest				Total observed frequency	Intragroup p	Inter-group p
		Observed frequency		Expected frequency		Observed frequency		Expected frequency				
knee injury		Injured	Non-injured	Injured	Non-injured	Injured	Non-injured	Injured	Non-injured		0/001	
	Experimental	11	14	12/5	12/5	3	22	12/5	12/5	25		0/04
	Control	9	16	12/5	12/5	9	16	12/5	12/5	25	0/16	
	Total	20	30	25	25	12	38	25	25	50		
shoulder injury	Experimental	13	12	12/5	12/5	16	9	12/5	12/5	25	0/16	0/39
	Control	14	11	12/5	12/5	13	12	12/5	12/5	25	0/84	
	Total	27	23	25	25	29	21	25	25	50		
trunk injury	Experimental	15	10	12/5	12/5	13	12	12/5	12/5	25	0/84	0/77
	Control	13	12	12/5	12/5	14	11	12/5	12/5	25	0/54	
	Total	28	22	25	25	27	23	25	25	50		

Table 4. Mann-Whitney test results to compare injury risk variables between two groups in the post-test

Variable	Mann-Whitney test	Z statistic	P Value
Right rotational stability	165/00	-3/46	0/001
Left rotational stability	133/00	-3/89	0/001
landing error (LESS)	43/00	-5/31	0/001
Right shoulder mobility	279/50	-0/74	0/45
Left shoulder mobility	243/50	-1/79	0/07
Lounge on a line	129/50	-4/07	0/001
deep squat	142/50	-3/74	0/001

The estimated marginal mean revealed that comprehensive warm-up exercises have a greater impact on reducing landing errors in the experimental group (37.3), enhancing lunge performance on a line (2.76), deep squat (2.66), as well as improving the right (26.2) and left (2.48) rotational stability when compared to the control group. Furthermore, in terms of right and left shoulder mobility variables, although the differences between the groups were not significant, the experimental group demonstrated a performance increase of 15.2 and 22.2 respectively, which was only marginally higher compared to the control group (Table 5).

Table 5. Test results of the marginal mean of movement patterns and landing error score in the post-test

Variable	Experimental group	Control group	Standard error
Landing error score (LESS) (number of errors)	3/37	4/10	0/21
Lounge on a line	2/76	1/96	0/08
Deep squat	2/66	1/86	0/09
Right rotational stability	2/26	1/78	0/07
Left rotational stability	2/48	1/67	0/10
Right shoulder mobility	2/15	2/13	0/10
Left shoulder mobility	2/22	2/01	0/08

Discussion and conclusion:

The present study aims to examine how a comprehensive warm-up program impacts functional movement patterns and errors in young male landers. The findings demonstrated a significant improvement in musculoskeletal knee pain among the subjects in the experimental group after eight weeks of training. However, there was no substantial improvement observed in musculoskeletal shoulder and trunk pain among the wrestlers following the same duration of training. The results of the Mann-Whitney test revealed that among the functional movement pattern variables, there was no significant difference observed in the post-test for the right and left shoulder mobility test. However, in the tests for rotatory stability of lunge and deep squat, a significant difference was observed between the two groups in the post-test, following eight weeks of specific warm-up exercises. Additionally, there was a significant decrease in landing errors (LESS) after eight weeks of performing the exercises. These findings align with previous research conducted by Rahimi et al. (2021) [34], Bayati et al. (2019) [15], and Jahanshahi et al. (2022) [35].

In their research titled "Comparing the Effect of Central and Neuromuscular Stability Exercises on the Functional Screening Test of 9-12-Year-Old Boy Wrestlers," Rahimi et al. (2021) investigated a total of 45 wrestlers in Esfrayen City. The wrestlers underwent the FMS test and were then randomly divided into three groups: control group, experimental group 1, and experimental group 2. The control group engaged in common wrestling exercises, while the experimental group 1 performed neuromuscular exercises and the experimental group 2 performed central stability exercises. These exercises were conducted over six weeks. The overall results demonstrated the impact of central stability and neuromuscular stability exercises on the FMS scores of the wrestlers (34).

One of the reasons why Rahimi's research is aligned with the current research is the inclusion of specific training protocols. In Rahimi's study, the experimental group underwent a single neuromuscular exercise, while the control group engaged in two central stability exercises. In the current research, participants were assigned to perform both central and neuromuscular stability exercises, which included activities focused on balance, agility, and plyometrics.

Bayati et.al (2019) examined how standard warm-up exercises in wrestling impact the scores of young wrestlers on the FMS test. The findings of their research revealed a significant improvement in scores for the deep squat test, stepping over the obstacle, and lunge test, both immediately after the test and after 12 weeks of performing the exercises, when compared to the pre-test. However, no significant difference was observed between the two groups in terms of shoulder flexibility, active lifting, Swedish foot swimming, and rotational stability tests [15]. These results were in line with the findings of the current research, and one possible reason for this alignment could be the presence of similar exercises in both studies.

The shoulder mobility test assesses the range of motion of the shoulder joint by measuring both unilateral and reciprocal movements. It involves performing internal rotation and adduction in one shoulder, and external rotation and abduction in the other shoulder. This test requires proper mobility of the scapula bone and extension of the spine. Inadequate performance in this test can be attributed to various factors, one of which is an imbalance in the range of motion between external and internal rotation in the shoulder joint [36].

Regarding the impact of the current exercise protocol on subjects' performance, the results of this study indicate that after 8 weeks of exercise, there was no significant difference in shoulder flexibility between the two groups. Since exercises number 13 to 18 included stretching exercises for the upper limb in the injury prevention program of this research, it is important to note that the number of sets and the duration of holding each stretch (10 seconds) were likely low. Moreover, it is crucial to highlight that the flexibility of the rotator cuff muscles in the shoulder is of great importance in the shoulder mobility test. Surprisingly, none of the stretching exercises in the research

specifically targeted these muscles. As a result, considering the principle of exercise similarity, it can be concluded that the stretching exercises used in the program do not align with the measured test.

During the rotational stability test, it is important to assess neuromuscular coordination and energy transfer throughout the entire body, specifically from the upper to lower limbs and vice versa. In addition, it is crucial to evaluate the stability of the trunk in multiple planes. Weakness in trunk stability, as well as difficulties in scapula and hip stability, and limitations in knee, thigh, and trunk mobility, are identified as factors contributing to weakness in this test [37]. It is plausible that incorporating central stability exercises into the training protocol has addressed these issues and subsequently led to improved outcomes and higher scores during the post-test.

The deep squat test requires coordination, mobility between organs and muscles, central stability, and general body mechanics to control neurovascular movement, as well as stability in the shoulders, shoulder area, and thoracic region of the spine [37]. A person who performs poorly in the deep squat can be attributed to three factors: 1) limitations in upper limb mobility and weakness in the glenohumeral joint, and 2) limitations in lower limb mobility and motor control in the central stability region [37]. In the single-line lunge test, restrictions in the thoracic spine area and reduced mobility in the hips, knees, and ankles can contribute to lower FMS scores. By incorporating exercises like squats and lunges (while maintaining similar movement patterns), along with central stability and balance exercises, improvements can likely be observed in the scores of these mentioned tests.

As previously stated, in the majority of the aforementioned tests, the performance and timely activation of the central stabilizing muscles hold significant importance. Confirming the first hypothesis of the research, which suggests that engaging in exercises results in enhanced endurance of the central stability muscles, it is plausible to consider that one of the contributing factors to the improvement in the quality of movement patterns observed in the mentioned tests is the enhanced performance of the central stability muscles. In addition, it is possible to refer to the mechanisms outlined in the closed movement chain when discussing the control of movement. Hodges et al. conducted a study on the sequence of muscle activity during lower limb movements, and their findings revealed that before lower limb movements, several central stabilizing muscles remain consistently contracted [38].

Central stability plays a crucial role in enhancing power generation in the thigh and trunk muscles across different movement planes [39]. If the central muscle structure is weak, it can result in reduced effectiveness of accurate movement patterns and the development of compensatory movement patterns [40]. Moreover, proper coordination among these muscles is essential for generating, transferring, and controlling forces under body movements. Coordinated activation of the central muscles likely facilitates improved movement patterns, postural stability, and enhanced functional efficiency [41]. Hence, the improvement in movement pattern quality observed in the post-test and after eight weeks of exercises can be justified.

One reason why special warm-up exercises in wrestling affect reducing the landing error score of wrestlers between two groups is that the wrestling warm-up program includes exercises like lateral plank exercises, standing on one leg, squats, and jumping exercises. These exercises can improve the activity of certain central stabilizing muscles and thighs, leading to increased neuromuscular control [42]. Another task of the central body area is to aid in preventing incorrect movement patterns and maintaining body alignment and dynamic postural balance during dynamic movements [4].

If the central region of the body functions optimally, the relationship between the length and tension of the agonist and antagonist muscles is maintained. This aspect serves as one of the reasons for enhancing the kinematics of the joints in the lumbar-pelvic-thigh complex and providing maximum stability for lower limb movements [44]. In this study, the lower limb muscles, particularly the external rotators and hip abductors, were not strengthened in isolation. However, the researcher emphasized to the subjects the importance of correct landing techniques during single-leg plyometric and balance exercises, as well as cutting movements. Additionally, the focus was on maintaining proper movement patterns and alignment of the lower limbs during all exercises. These measures may potentially improve abnormal movements of the hip joint, such as excessive approximation and internal rotation of the thigh [45], as well as knee valgus and external rotation of the subjects' tibia [46]. It is worth noting that if the exercise is performed incorrectly, the researcher will provide feedback to the wrestler to help them correct their technique. According to Dallinga et al. (2017), the use of training and feedback is crucial in accelerating the learning of new movement patterns, including jumping and landing techniques [47]. The research conducted by Dallinga et al. concluded that feedback has a positive impact on modifying landing strategies in men [47]. The reduction in the number of landing errors in the post-test after eight weeks of warm-up exercises can be attributed to the inclusion of strengthening and endurance exercises for the central muscles, along with targeted training and necessary feedback to correct improper movement patterns during the exercise.

One of the limitations of the research can be attributed to the lack of control and isolation of the control group while performing their exercises. Additionally, the research process could not account for the psychological and nutritional issues of the subjects, which potentially influenced the results. Lastly, the research was constrained by the small number of subjects.

CONCLUSIONS

However, the reduction of musculoskeletal pain in the shoulder and trunk joints of wrestlers is not significantly affected by it. As a result, trainers are recommended to incorporate the training protocol from this study into their practice to enhance knee joint landing error and alleviate musculoskeletal pain, in addition to other commonly used training protocols. There is a severe lack of research on the optimal and all-encompassing warm-up training protocol specifically tailored for wrestling, indicating the need for additional investigation.

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Participation and contribution of authors

The authors of the article have the following contributions: Mehdi Babaei Jafari and Amir Hossein Barati Mahdieh came up with the idea and designed the study, Mehdi Babaei Jafari and Mohammad Hossein Alizadeh collected the data, and Mehdi Babaei Jafari interpreted the results.

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THE METHODOLOGICAL PROCESS FOR TEACHING AND LEARNING OF TECHNIQUES – TACTICS IN OLYMPIC WRESTLING "In Search of Sports Mastery."

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ABSTRACT

This material is developed under a descriptive methodological paradigm and aims to invite the coaches in charge of the sports training of the Olympic Wrestler to reflect on the importance that is acquired from the pedagogical and methodological point of view when the responsibility is assumed. To perform functions as a professional. Sports training in Wrestling must be seen as a process of Comprehensive Education, which requires detailed attention in multiple aspects, in order to guarantee a sufficiently complete sports development in these athletes.

When objectives are established focused on teaching Technique – Tactics. Not only should attention be paid to technical movements; Likewise, aspects that are related to acyclic psychomotor skills, physical preparation and the psychological-mental factor must be addressed. Not paying attention to the joint development of these methodological components would undoubtedly create deficiencies in the fighters that would harm their life as a competitor. The training of fighters increasingly makes you more demanding and among its Technical-Tactical preparation components, we cannot fail to mention what is related to the Mental and Psychological part. Mental training is as important as technical – tactical and physical. The objectives for the mental and psychic part are aimed at the ability to concentrate, pressure management, motivation, resilience and the ability to maintain a positive attitude and emotional control during their training and competition programs.

Seen from another perspective, in the process of learning to fight, it is of great interest to keep the pedagogical precepts in mind. These refer to structured teaching and learning in a systematized manner promoting an environment where fighters can acquire effective skills and abilities, while developing their physical and mental capabilities safely and efficiently.

Likewise, the medical component and applied sciences must be considered. They ensure that all practices are backed by scientific evidence paying attention to the health and safety of the fighters. This involves an understanding of exercise physiology, sports nutrition, injury recovery and prevention, among others. Ignoring these precepts or not applying them properly in teaching-learning and training programs can result in poor training, increase the risk of injury and limit the sporting success of Olympic Wrestlers. Therefore, for Olympic Wrestling, it is essential to adopt a multidisciplinary approach to training, which takes into account all these factors and consolidates the comprehensive development of each wrestler.

Wrestlers have great biopsychophysiological and kinesthetic potentialities, which will be used to the maximum when the pedagogical, medical, sociological and science precepts applied to sports are respected. A fighter with extraordinary physical work capabilities and a deficiency in his technical-tactical-mental development would be of no use; or have high technical-tactical-mental development and present a deficiency in the physical aspect, apart from the values that sports practice promotes. Therefore, the essential thing about comprehensive sports training in wrestling, and especially at school or developmental ages, is the awareness of the meaning of the CEF (Physical Effort Capacity) as well as the educational and scientific principles, as mechanisms to guarantee high-level development in future fighters.

INTRODUCTION

The teaching programs in Olympic Wrestling undoubtedly become a complex and multidimensional process that requires a comprehensive approach to achieve the objectives set. The technical, tactical, physical, medical – psychological, sociological factors, etc. They interrelate with each other playing a crucial role in athletic and personal development. Martínez (2024). He points out "Sport can offer numerous benefits to the person, healthy habits,

socialization, personal values, as long as the context of application is the most appropriate. The development of technical-tactical skills and abilities together with the physical-psychological-mental aspects. They are essential for fighters to consolidate their potential in this sport.

The consolidation of this development allows these athletes to respond to the demands demanded by the preparation and competition of wrestling today. Technical teaching involves mastery of low-medium and high-difficult movements of psychomotor skills and tactics, referring to the ability to apply these techniques in combat situations, combining the latter with physical and mental capabilities.

The need to apply an adequate teaching methodology obeys aspects such as: 1) Motor diversity in the execution of technical movements due to high motor acyclicity. 2) Biological, chemical, physiological, psychological processes, etc. 3) High variability of tactical combat strategies as a result of the advantages and disadvantages of competitors, etc. The correct teaching methodology, especially at the developmental or school ages, will allow the wrestlers to adapt more optimally to the demands imposed by the different levels of training and competitions, that is, to motor efforts, physical and mental beyond their own limits.

Such parameters invite us as coaches in charge of providing the sports training of our fighters, to develop learning strategies aimed at technical-tactical improvement; based on pedagogical, medical and sociological precepts; that the modern struggle demands. Castillero (2017). Point out in this regard: we are in constant contact with other people who have their own thoughts, behaviors, intentions, attitudes, motivations and beliefs. These elements are transmitted through different communicative processes, causing different changes in the behavior and even perception of the person.

TECHNICAL EDUCATION A COMPLEX SPORTS TRAINING PROCESS.

Lucena. F (2019). When talking about the teaching process in sports, we are entering into a topic of high didactic complexity. Such complexity deepens further when it comes to a sport where the learning process requires the Biopsychophysiological development of the individual's capabilities. The teaching and learning of the technique involves the transmission of motor, physical and mental abilities and skills. Initially, a group of low motor complexity techniques is taught. After basic learning, the objectives focus on mastering the most complex techniques in their execution and finally developing the ability to combine technical mastery with combat tactics. This procedure, which starts from basic movements to tactical mastery, is the basis of consolidation to achieve "Sports Mastery". It is essential to have pedagogical support that guides the fighter's training, as well as medical and scientific knowledge that ensures that training methods are safe and effective. This could include, for example, neuromental training.
Matveiev (1983) sports training is the fundamental form of preparation of the athlete, based on systematic exercises, and which represents, in essence, a pedagogically organized process with the aim of directing the evolution of the athlete. The pedagogical approach, which includes methodological procedures, represents a priority to ensure understanding and effective application in strengthening motor skills and abilities.

TECHNIQUE TEACHING PROCESS – TECHNIQUE.

Seúl-lo Vargas (1987). It maintains the following: "The conception of technique as a set of procedures and resources used by an activity, science, or art, which tend with their application to perfect the object of such activity, can be considered as the basis on which determines a initial approach to technique in sports. It is based on: biological maturation, physical training, movement complexity, age/sex, athletic biotype and constant adaptation of training strategies, etc. All these principles are focused on paying attention to the Biopsychophysiological bases of the fighters including higher nervous activity. These factors will allow you to assimilate new knowledge, adaptation and transformations of complex neural and motor networks and a better neuronal synapse; With these patterns, fighters with extraordinary potential would be trained, becoming more intelligent athletes; becoming able to master the techniques with optimal saving of physical effort and high mental education. Getting closer to being more and more perfect athletes. Physiological, biomechanical and psychological structural phases for the progress of technical teaching.

Preparatory phase: serves the optical and mental preparation of the main phase, creates the conditions for the economic and effective realization of the movement; This phase is highly decisive to increase performance in technical actions and total execution. Main phase: its objective is to prepare the action path of the muscles based on the dynamics of the technique and ensure that the joints are located at appropriate angles. This phase also allows external forces to be taken advantage of, especially the force of gravity; which has great importance in the effectiveness of application of the technique. Final phase: as the word says, it is the completion of the movement, it is still essential in the effectiveness of a technical action; It is part of the success of overall execution. It allows control of the opponent and sometimes obtains definitive victory.

SPECIFIC COMPONENTS IN TECHNICAL EDUCATION.

1st component. Main technical foundation: It is related to the basic movement. The following examples can be cited. 1) Greco-Roman Style: Takedown with trunk control. 2) Freestyle: Takedown with two-leg control. 2nd component. Variants of the main technical foundation: This aspect has to do with the combinations that start from the basic movement studied, allowing greater brain plasticity in the fighter. Continuing with the previous examples, the following can be noted: 1st example. Variants of the main Greco-Roman style technical movement: A) Takedown through the trunk without arm control. B) Takedown through the trunk with control of one and two arms. C) Takedown by the trunk with near and far arm halos. D) Knockdown along the trunk with a change of level. 2nd example. Variants of the main technical freestyle movement: A) Front takedown with control of two legs "with support of" one knee. B) Front takedown with two-leg control "without knee support". C) Takedown with control of two legs "with support of one knee and change of direction." D) Takedown with "two-legged" control without knee support and change of direction.

3rd component. Continuous execution of the technical foundation studied from the standing position to the ground position. It consists of the execution of the chain movement or continuous path to the ground. This component is fundamental for technical mastery in both foot-to-ground combat situations. This seeks motor coordination and develops the richness of coordinative mobility, in different combat positions. 4th component. Execution of technical movements on the right and left. The objective of this type of work is to develop the integral coordinative skills of the brain. This aspect is important, to raise the competitive level, there are many cases where a fight is lost, due to not developing the technical executions in a balanced way on the aforementioned sides.

5th component. The study of the defense of the studied technical movement. Perfecting offensive technical execution is equally important, as is its defense. The study of the defense of technical movements is a guarantee of success in competition. 6th component. Executions of technical movements from the offensive – defensive situation. The mistake can be made of only perfecting technical execution from a combat situation that is generally on the offensive. However, technical improvement from the situation of defensive combat takes on great importance in modern fighting as a result of the constant change of regulations, this requires maintaining a maximum combat intensity rhythm.

This merits paying attention to the technical executions in the two situations to combat. Below are two examples for this component: Offensive: execution of a hip flip to an opponent who is passive and easily controlled. Defensive: application of the hip turn to an opponent who initiates an action. Example: an attack on the trunk; The person attacked with his ability to anticipate executes the hip flip.

CONCLUSION

In the complex teaching and learning process, in the training of Olympic Wrestlers, it is necessary to delve into the pedagogical, medical, sociological, etc. Precepts. That lead to the development of fighters with great sporting potential. To achieve these objectives, it is essential to apply training methods that consider the physical, kinesthetic and neural aspects, factors that will allow these fighters to achieve "High Sports Mastery" and sporting success.

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EXERCISES TO DEVELOP THE MUSCULATURE IN THE EXECUTION OF PROJECTION TECHNIQUES IN WRESTLERS

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ABSTRACT

In Olympic Wrestling, high levels of strength are required to execute technical movements; physical activity requires conditioning of the muscular structure that allows knowing the state of operation that makes it possible to make decisions as corrective measures in combat, the study that is present aims to select exercises to develop the muscles involved in the execution of throwing techniques in youth wrestlers of the Greco-Roman style, so as to verify the conditions in which they are to achieve outstanding results in the short and medium term in competitions; The investigation is directed to the search of an approach to the determination of exercises to develop the musculature in the execution of projection techniques in wrestlers of the Greco-Roman style of the Villa Clara province in the category 16-18 years. It responds to one of the problems present in the training process in general, since currently a large number of exercises are used to control and plan work with overloads, which is aggressive for the integrity of the health of the athlete because he manages to make maximum efforts in each of the exercises to be measured. To achieve this, different research methods at the theoretical, empirical and statistical-mathematical levels were used. The study was carried out taking into account the guidelines of the Comprehensive Athlete Preparation Program, the Technological Demands of Olympic Wrestling and the application of control and evaluation of projection techniques during competitions; It was distinguished by the theories that support and organize them, which allows controlling the progress of the current process and the future preparation of these youth fighters. The work carried out during the construction, evaluation and application of the research made it possible to demonstrate that it meets the essential scientific-technical requirements to efficiently conduct this process. The main results obtained are: the assessment of the solidity of the study carried out, determination of the conditions in which the youth wrestlers are found.

Keywords: Olympic Wrestling, exercises, muscles, strength, competition.

INTRODUCTION

In Olympic Wrestling, the development of all physical abilities is necessary, but, in particular, strength takes on the greatest role. Pérez and Jiménez (2014) consider that this represents a determining factor in performance, since technical skills cannot be executed without the appropriate level of muscular strength development. In coincidence with the above, González et al., (2017), considers fast strength and resistance to fast force as determining directions of performance in Olympic Wrestling. As a combat sport, Pérez (2014) states that it presents tendencies of intermittent effort and anaerobic predominance and that it stands out for its intensity, and the importance of tolerance to fatigue. Added to the above are that the demands of the quality of the competitions, and in them the influences of the competitive loads are close to the limit.

In this direction, Ibañez and Navelo (2019); Fernández et al., (2022), propose that the majority of the manifestations of force together with the technical-tactical directions are decisive in the performance of the fighter, the work that is generated aims to constantly carry out explosive actions, in a short time. time, those that can be observed in combat or in a round of combat, so mechanisms must be sought that guarantee the performance of these actions and improve the sporting performance of the fighters. Therefore, adequate strength preparation becomes an essential element for achieving high sporting performance in wrestlers.

The high level of intensity that characterizes the competition is an indicator of a high concentration of lactate in the blood, which increases significantly as the time of the match increases. On this topic, it is considered that it is during puberty, when the anaerobic lactic metabolism begins to develop significantly, simultaneously with the development of muscle mass, (Verdugo, 2015; Izquierdo, 2017; Lugo, 2023), this being the one that guarantees the energy needed for these types of anaerobic strength endurance efforts.

According to the above, if the intensification in the development of this energy system culminates already at the ages of 17-18, then its development in the youth category will be decisive. Particularly in Olympic Wrestling, the results of studies carried out by specialists such as (González, et al., 2017; Noriega, 2020), show that if the direction of strength training is insufficient, causing limitations in programming, organization and process control. In this sense, the results and contributions of González (2014) are also highlighted, which are used by Arística et al., (2021) in the development of the Comprehensive Athlete Preparation Program (PPID), governing document of the Cuban Federation of Fights.

In the international context, according to the results of studies on the development of muscular strength (Méndez-Pérez, 2020; Alizadeh et al., 2020), the need to modify the concepts for its training is confirmed. This research responds to the needs of the Greco-Roman Wrestling team, youth category of Villa Clara, to develop the muscles involved in the execution of throwing techniques. In practice, it could be seen that the fighters present deficiencies in the development of resistance to arm strength, evidenced by the appearance of signs and symptoms of fatigue in combat, specifically in their last period; Being consistent with these criteria, it is important to address the difficulties that arise in the programming of loads for strength preparation in these youth wrestlers. Being consistent with these criteria, it is important to address the difficulties in programming loads in the preparation of strength in youth wrestlers. Since 2021, the difficulties in planning and controlling the preparation of the force have been a technological demand of the Cuban Federation of Associated Struggles (FCLA), which has also been a need in the province of Villa Clara. The main objective of the research was to select exercises to develop the muscles involved in the execution of throwing techniques in youth wrestlers of the Greco-Roman style.

MATERIALS AND METHODS

During the development of the research and to achieve compliance with the proposed objective, different methods and techniques were used, both at the theoretical level (Historical-logical, analytical-synthetic, inductive-deductive, document analysis and structural systemic approach), as well as empirical (empirical exploration, structured observations (30), surveys (19), filming, editing and video processing as biomechanical techniques for the study and analysis of sports technique, among others). This is aimed at the application of indices and criteria of the Verjoshanski load (1990), to develop the musculature in the preparation of strength in the execution of projection techniques in fighters, as well as combat distances and execution phases in a structure of integrated macrocycles. In specifying the results and as a way to determine regularities, methodological triangulation was used, from which the following results are obtained:

- There is little specialized literature that addresses the issue of force preparation programming, and its treatment is guided by the methodological indications of the PIPD, which are insufficient, since only general recommendations are considered.
- Lack of actions that facilitate the organization of the preparation of the force in terms of its structure to obtain performance in the preparatory competitions.
- Inaccuracies in the succession and interconnection of the loads for the manifestations of force at different moments of the preparation cycle.

Two methodological workshops were held with the participation of specialists from wrestling. These were intentionally selected from the population of coaches, members of the methodological technical section and wrestling teachers of the province based on the following criteria: being a graduate of a Bachelor's degree in Physical Culture, having more than two years of experience in training, competitions in teams in school, youth and high-performance games, and have knowledge of contemporary training planning models.

12 specialists were selected, of these, four Wrestling coaches from the Sports Initiation School (EIDE) of the province of Villa Clara, three Wrestling professors from the Faculty of Physical Culture (FCF) of the "Marta Abreu" Central University of Las Villas (UCLV) and five specialists belonging to the Technical Methodological Section of the province itself.

In the workshops, the theoretical representations of the structures to be used for strength preparation in the youth category were modeled, as well as their temporal distribution, and through a systemic approach, the interrelationships between the different elements of the structure and the manifestations of the force. All of this was corroborated through the analysis of kinematic variables carried out using the procedure for biomechanical analysis proposed by Perdomo et al., (2021) and with the use of biomechanical software (Kinovea) for the analysis of movements.

It is extremely important to specify that with respect to the exercises to develop the muscles in the preparation of strength, the criteria of Verjoshanski (1990) coincide, who points out that the load is composed of three main indices: content, volume and organization related to the components of load scheduling. Going deeper into these main indices of the load, and referring to his criteria, we see that Verjoshanski (1990) considers that the content of the load is representative of its specialization and its potential. The volume has as criteria its magnitude, intensity and duration, while the organization includes the structures for its distribution over time as well as the succession and interconnection of loads.

RESULTS AND DISCUSSION

Auxiliary exercises with weights.

To select the exercises for strength preparation, the weaknesses in the most common techniques in the Greco-Roman wrestler, the muscles by muscular planes and their priority were assessed.

These exercises were aimed at developing the muscles involved in the execution of projection techniques, to plan them according to individual needs. From the process of selecting the exercises by the specialists, their structure and some methodological elements are described, which were divided into:

- The auxiliary exercises with weights proposed by Román (1998) for this sport. For the arms, standing strength and its variants, lying strength, sitting strength and its variants, standing, bent over and neck bridge rowing and the forearms. These exercises are essential when influencing shoulder and arm techniques, as well as forearm exercises for gripping the opponent and defensive movements.
- For the trunk, the exercises selected were: bows with and without flexion (c/f and s/f), take-off (c/f and s/f), trunk twists, lateral flexions, hyperextension (without and with weight), leg elevation (with weight), trunk elevation (with weight). Fighters must keep in mind that in these exercises coordination of movements is essential to obtain high results in the application of techniques in the four-point position.
- For the legs, the following exercises were selected: squat recovery (front and back), walking in scissors, scissors (pendulum), jumps with weights, push-ups (biceps femoris), extensions (quadriceps) and calves. In addition, coordination and balance must be worked on.
- The combinations to be used are: squats from behind and force push from behind, squats from the front and force push; brachialis and standing strength, standing rowing and standing strength, bowing (c/f) and pushing strength from behind, bowing (c/f) and twisting, bowing (c/f) and standing strength from behind. Emphasis should be placed on these exercises since in Greco-Roman Wrestling the combat takes place in a high posture, in addition the most used technical elements start from this position (Tackle, Flips and Pushes). The distribution of volume and intensity will be that applied in the preparation cycles according to the phases.

In the control and evaluation of strength preparation, the starting point is the location in the structure of the maximum strength tests (microcycles 3, 24 and 39), considering the controls of the other exercises and their location. The test with the maximum result carried out is the proposed standard exercises, although other auxiliary exercises with weights can be measured at the discretion of the trainers.

After evaluating the opinions, it is agreed that the training session in the maintenance phase (M) should not be eliminated, in this the exercises proposed for strength preparation should be performed. (tractions, planks and their variants, abdominals and their variants) seeking to maintain the strength achieved in the previous phases.

Complementary exercises to apply in the different phases

It was determined to classify the complementary exercises for the preparation of strength in wrestling into the following five groups:

1. Individual general exercises (GI).

2. General exercises with auxiliary means (GMA).
3. Special exercises with your partner (EC).
4. Specific exercises with your partner (ESPC).
5. Special force exercises in competition (FE).

1. Individual general exercises (GI): They must be used in the general phases of the integrated macrocycles I and II, they are, open, closed, underwater push-ups (planks), with claps and with a single arm; squats and front jumps, abdominal exercises and their variants, hyperextensions and neck exercises, fixed bar and parallel bars. Its dosage will be between 10-15 repetitions, the series between one and five and the rest between one and three minutes. Other exercises may be used depending on the needs of the fighters and the experience of the coach.

2. General exercises with auxiliary means (GMA): They will be used in the specific phase of macrocycle I combined with special exercises with the partner. For the general phase of the macrocycle II, this group of exercises will be combined with the individual general exercises (GI), while in the general phase of the integrated macrocycle III, they will be combined with the special ones with the partner (EC). These are rope climbs, jumps next to and over a partner and/or obstacles, exercises with pulleys, with gymnastic equipment (fixed bar and parallel bars), with medicine balls, rubber bands and dolls.

3. Special exercises with the partner (SC): They are proposed for the specific phases of the integrated macrocycles I and II and the general phase of the macrocycles III, IV and V, whose objective was to maintain the levels of resistance to force, strength rapid and resistance to rapid force with the specific efforts of Greco-Roman Wrestling. They were: flexion of the arms lying down with resistance from the partner, walking in wheelbarrows (prone and supine), flexion of the arms in handstand, walking with the partner held on the side, turning with the partner's Turkish grip on the place, take-off of the partner with arm and thigh grip, alternating arching with grip of the partner's waist, tackle entry through the partner's trunk, roll entry on both sides taking off the partner.

   Its dosage varies between eight and 12 repetitions, with series between one and three and rest between one and three minutes. Other exercises may be used according to the individual needs of the fighters, the experience of the coach and what is guided by Arística et al., (2021) in the PIPD.

4. Specific exercises with the partner (ESPC): They were determined for the specific phase of the integrated macrocycles III, IV and V, whose objective was to maintain strength levels in resistance to the rapid force of the specific efforts of Greco-Roman Wrestling.

   These were: substitute with partner (10 repetitions in 15 seconds), tackle to the trunk in 15 seconds (highest number of repetitions), 10-meter race with partner, moving projections and return in horizontal jump, abdominal exercises in four points above the partner, arches on the mattress, arches with a partner's grip until reaching a neck bridge, viola jump, passing between the legs and tackling another partner, wrestling match on the court. Your dosage will be between 8-10 repetitions, with series between one and two and rest between one and two minutes. Other exercises may be used according to the individual needs of the fighters, the experience of the coach and what is guided by Arística et al., (2021) in the PIPD.

5. Special force exercises in competition (FE): Destined for the maintenance phases (M) (microcycles eight, 16, 25, 34 and 41), where preparatory and fundamental skills are contemplated, technical preparation is accentuated, perfecting takedowns, turns, individual and pair exercises; while the strength exercises will have a special character, since they will be applied according to the distribution and competitive organization, using exercises with bands, dummies, dumbbells, rope traction (horizontal and vertical), planks, fixed bar, parallel bars, abdominals; with low volumes and intensities; Study limits and their corrections are carried out in the technical-tactical order to obtain the planned competitive results.

After grouping the exercises into these five groups, they were distributed into the different macrocycles and phases of the two cycles of preparation as shown in figures 1 and 2:

Cycle	**Cycle I**																								
Macrocycle	Macrocycle 1								Macrocycle II								Macrocycle III								
Phase	General			Specific				M	General			Specific				M	General				Specific			M	
Microcycle	G	G	G	S	S	S	S	C	G	G	G	S	S	S	S	C	G	G	G	G	E	E	E	E	C
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Type of Force	Adaptation			Force Resistance					Force Resistance			Fast force					Fast force				Fast Force Resistance				
Training Procedures	GI			GMA				FE	GMA			EC				FE	GMA				ESPC				FE
				EC					GI								EC								

Figure 1. Application of Exercises in Cycle 1
M-Maintenance; C-Competition; GI-Individual General Exercises; GMA-General Exercises with Auxiliary Means; EC-Special Exercises with a Partner; ESPC-Specific Exercises with a Partner; FE-Special Force Exercises in Competition

Cycle	Cycle II														
Macrocycle	Macrocycle IV									Macrocycle V					
Phase	General				Specific				M	General			Specific			M
Microcycle	G	G	G	G	E	E	E	E	C	G	G	G	E	E	E	C
Week	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Type of Force	Fast Force				Fast Force Resistance					Force Resistance			Fast Force Resistance			
Training Procedures	EC				ESPC				FE	EC			ESPC			FE
	GMA									ESPC						

Figure 2. Application of Exercises in Cycle II

Regarding the methods, they were considered the predominant ones for this level, and in the adaptation phase the method of weight change should be used according to individual needs and after the first maximum strength test, the method of maximum results or by types of strength proposed by Román should be used (1998), always with strict control and according to the needs of the fighters.

According to Noriega et al., (2020), considering that the application of the weight change method should be carried out only in the initial adaptation phase, with a view to achieving better recovery and assimilation of the execution technique of the auxiliary exercises with weights, working as seen in table 1.

Table 1: Weight change method (Variation in application)

	Procedures	Reps	Advantages	Application
1st	Little weight and many repetitions	*8-12*	- Adaptation of the body to strength work Correct assimilation of technical habits	1-2 microcycles
2nd	Weights and average repetitions	*4-6*	- Increase in muscle strength	1-2 microcycles
3rd	A lot of weight and few repetitions	*1-2*	- Greater increase in muscle strength	1-2 microcycles

It was determined that the appropriate selection of methods according to the phase of preparation and individual and collective needs is very important for the preparation of the force, a generalized criterion was that the method of maximum results proposed by Román (1998), It is the fundamental one due to its easy application. The means to be used in preparation will be the essential ones available in the training rooms, as well as the auxiliary exercises with selected weights.

Features of programming loads of strength preparation of macrocycles integrated into cycles

Cycle I
Integrated macrocycle I
Objective: Strengthen the muscles of the youth Greco-Roman wrestler, as a basis to face the first training cycle.
Consisting of eight weeks of duration, three for the general phase, four for the specific phase and one for the maintenance phase. The general phase begins with three microcycles to achieve anatomical adaptation, which would prepare the fighter for the demands of both general strength loads through auxiliary exercises and combined with weights, integrated with technical exercises according to individual characteristics.
In the specific phase, the method begins to be used according to the type of force according to the maximum result (MR), starting with force resistance general exercises with auxiliary means combined with special exercises with the partner and auxiliary exercises with weights.
In the maintenance phase (microcycle eight), the volume and intensity of the loads will be low, using the specific rhythm of the competition and its speed to obtain the planned competitive results, in the first preparatory competition, the Team Tournament.

Integrated Macrocycle II
Objective: Relate the development of resistance to force with the special efforts of the youth Greco-Roman wrestler.
Made up of eight weeks, three for the general phase, four for the specific phase and one for the maintenance phase.
In the general phase, strength preparation continues with strength resistance work, combined with general exercises with auxiliary means and individual general exercises, as well as auxiliary and combined exercises with weights using an intensity between 50-60% of the RM.

The specific phase begins work with special exercises with the partner, integrated with technical actions for the development of rapid strength with intensities of 65-75% of RM.
In the maintenance phase, in microcycle 16, it is combined with competitive modeling, maintaining the work acquired on rapid strength and strength resistance to achieve the objectives with a view to the Villa Clara Cup preparatory competition.

Integrated Macrocycle III
Objective: Develop resistance to rapid force as a determining capacity for performance and its transfer to specific Wrestling exercises.
Made up of nine weeks, three for the general phase, five for the specific phase and one for the maintenance phase.
In the general phase, the work emphasis focuses on rapid strength between microcycles 17, 18 and 19, combining work with general individual exercises and special exercises with the partner, as well as auxiliary exercises with weights with percentages by planes of 20 % for the arms, 35% for the trunk and 45% for the legs. The maximum values for the intensity will range between 75-85%.

In the specific phase, which includes microcycles 20, 21, 22, 23 and 24, work on rapid force resistance is accentuated, with an intensity between 55-65% of the RM, specific exercises with the partner and auxiliary exercises. In the maintenance phase (microcycle 24) the maximum strength test is carried out, which will allow the comparison of the results in relation to the previous macrocycles. In this phase, competitive modeling is carried out with a view to the Santi Spíritus Cup preparatory competition.

Cycle II
Integrated Macrocycle IV
Objective: Maintain the strength levels acquired in the determining capacities by increasing the specific work in the cycle.
Made up of nine weeks, four for the general phase, four for the specific phase and one for the maintenance phase.
The general phase made up of microcycles 26, 27, 28 and 29, in which the work emphasis is focused on rapid strength through general exercises with auxiliary means in succession with special exercises with the partner, increasing the intensity to 70-80% of the RM, the repetitions will be between six and 10 per series (Román, 1998).
This will allow you to continue with the resistance to rapid force in the specific phase and the specific exercises with the partner, the percentages by planes that will be applied are 25% for the arms, 35% for the trunk and 40% for the legs.

This phase includes microcycles 30, 31, 32 and 33, the fast force resistance work is performed with intensities between 55-65% of the RM.

In the maintenance phase (microcycle 34), competitive modeling is carried out, the objective of which is to create different forms of stops to maintain the rapid strength acquired in the previous phase to obtain the competitive results that were planned with a view to the preparatory competition. 1st Category.

Integrated macrocycle V
Objective: Apply the strength levels acquired in the determining capabilities to specific technical-tactical actions.
Consisting of seven weeks in duration, three for the general phase, three for the specific phase and one in the maintenance phase. In the general phase, exercises with the partner are applied combined with specific exercises with the partner in microcycles 35, 36 and 37, exercises will be performed for the development of strength resistance with values between 45-55% of the RM, For the auxiliary exercises, the percentages by planes that will be applied are 20% for the arms, 30% for the trunk and 50% for the legs, three sessions are maintained per microcycles and the rest time between sets between one and three minutes.

In the specific phase, specific exercises are applied with the partner, in microcycle 39 the final maximum strength test is carried out, so as to allow the planned objectives in the cycle to be assessed and thus quantify the strength levels achieved during the planned cycles. will accentuate resistance to rapid force for auxiliary exercises with intensities between 55-65% of the RM, the percentages by planes that will be applied are, 25% for the arms, 30% for the trunk and 45% for the legs per its proximity to core competence.

The maintenance phase in microcycle 41 leads to the fundamental competition, the National High Performance Youth Olympiad, whose objective is to compete at the highest level. It is advisable to maintain general strength levels but not develop it.

From the presentation of the results obtained in the study, it is understood that the exercises to develop the muscles in the execution of projection techniques in fighters improve the methodological procedures of the coaches for the control and evaluation of the technical-tactical elements, it also facilitates training intelligent, analytical, independent, creative fighters with a high technical-tactical level.
Table 2 shows the increase in competitive results in terms of medals and places obtained in the different preparatory competitions and the National Youth Olympiad.

Table 2. Competitive results in the preparatory competitions and National Youth Olympiad.

Competencies Preparatory		**Tournament U-20**	**Villa Clara**	**Sancti Spíritus**	**1st Category**	National Olympiad Category
Medals obtained	Before	9th	1 Gold 1 Siver 2 Bronze	1 Gold 2 Bronze	1 Bronze	1 Silver
	After	5th	2 Gold 3 Silver 5 Bronze	1 Gold 2 Silver 2 Bronze	1 Bronze	1 Gold 1 Silver 2 Bronze
Place Obtained	*Before*	*9th*	*3rd*	*4th*	*10th*	*8th*
	After	*5th*	*2nd*	*3rd*	*9th*	*4th*

CONCLUSIONS
Evidenced the need to modify the conception of programming in the preparation of the force, through a structure capable of guaranteeing greater specialization and the correct succession and interconnection of the different manifestations of the force, in such a way that allows the application of the acquired potential in the preparatory competitions that are held.
The model of integrated macrocycles that respects the dynamics of the loads of traditional planning through general and special work, organizing the season in various macrocycles of 6 to 12 weeks, allows organizing the succession of the different manifestations of strength in youth wrestlers.
The criteria of the magnitude and relative average intensity of the volume of the load proposed for the macrocycles and phases, as well as the auxiliary and complementary exercises determined, facilitate the distribution of the loads in the preparation of the strength of the exercises to develop the muscles in the execution of projection techniques in youth wrestlers in the integrated macrocycle structure.

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ON THE PROBLEM OF THE USE OF COMBAT MEANS IN THE DEVELOPMENT AND SOCIALIZATION OF CHILDREN WITH AUTISTIC SPECTRUM DISORDER

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INTRODUCTION

Numerous studies show that children with autism have reduced motor skills [5,6,7]. However, recently we can observe the participation of people with special needs in various recreational, physical education and sports activities, including sports achievements [1,2]. Consequently, the therapeutic programs must be oriented towards the formation of basic motor skills, movement patterns and motor activity that increases physical competence, in day-by-day life by use of different types of sports [3]. The system of martial arts is no exception, which can be considered as one of the forms of psychosocial adaptation [4].

For a more complex analysis of the role played by sport in this issue we asked the following question: "What types of sports, in your opinion, can be used for the development and socialization of autistic children. As we can see in figure 1., the majority of respondents preferred "Swimming" – 46.02%, the second choice was "Team sports" – 40.708%, and the third place was offered to "Gymnastics", "Combat sports" took the fourth place out of seven presented (36.28%). The following sports have not been overlooked as well, "Horseback riding" – 21.24%, "Athletics" – 17.70% and "Table tennis" – 0.88%.

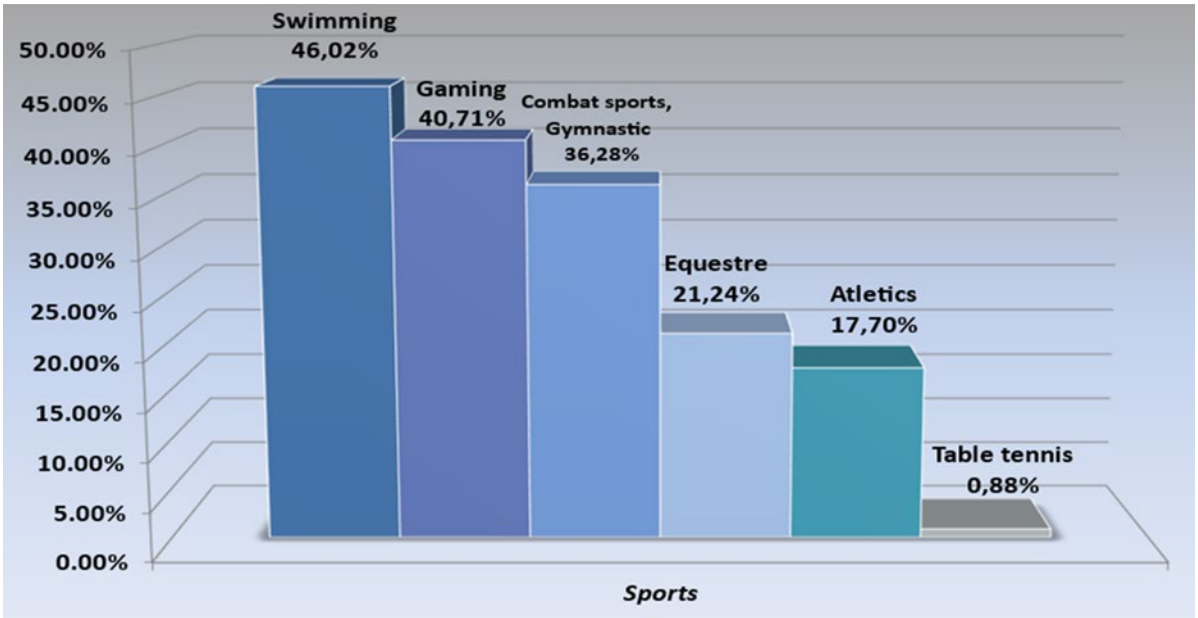


Fig. 1. Types of sports which, according to respondents, can be used in the development and socialization of children with autism

This suggests that combat sports can play an important role in the development and socialization of special needs children. Continuing the analysis of the sociological survey, it was important for us to know "Can combat sports be used as rehabilitation and motor development means for people with ASD". Based on data in next question, it is worth mentioning that the majority of respondents, 77% consider that the combat sports means can be included in

the rehabilitation and motor development program for people with ASD. In this regard, 17.69% respondents had difficulty answering and only 5.31% respondents answered “No”. This enhances the further researches in this direction and we had decided to propose the respondents to choose the types of combat that could be recommended to people with autistic spectrum disorder. That is why the respondents were offered the answer options presented in figure 2.

The respondent’s opinions were distributed the following way: Judo occupied a priority place – 59/29%, Aikido – 35.40%, followed by Wushu -31.86, Box went to the fourth place- 16.81%, the fifth place was divided between, Trinta, national combat and Kickboxing, the sixth place was occupied by Freestyle wrestling- 7.96% and the next place was occupied by Karate – 1.77, the other combat sport that was not ignored is Taekwondo – 0.88%. Only 0.88% respondents had difficulty answering this question.

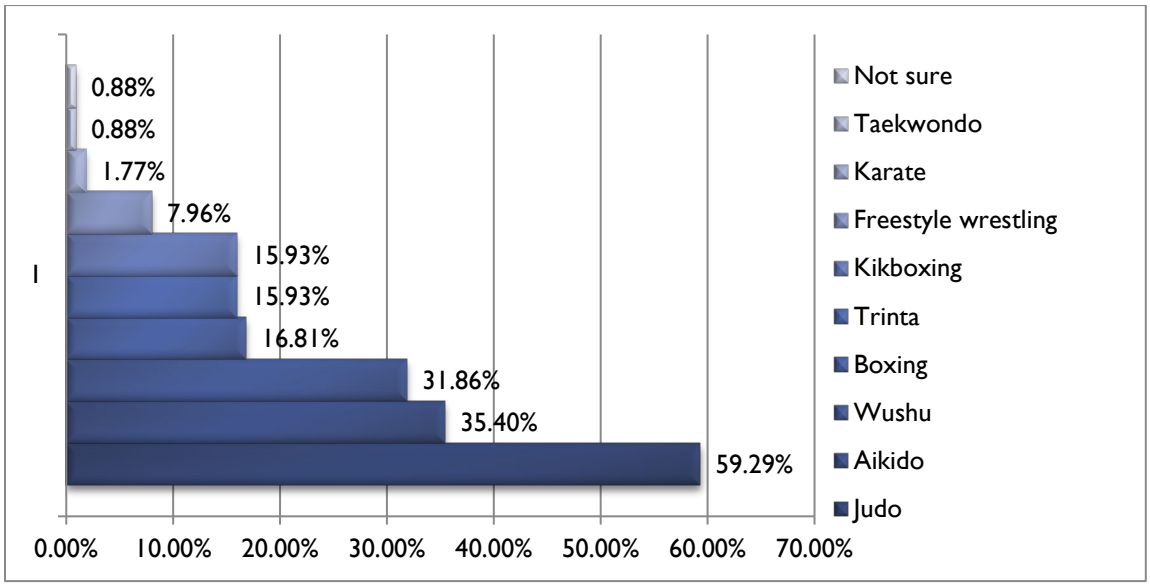


Fig. 2. Types of martial arts that may be recommended for people with an autism spectrum disorder

Research Results.

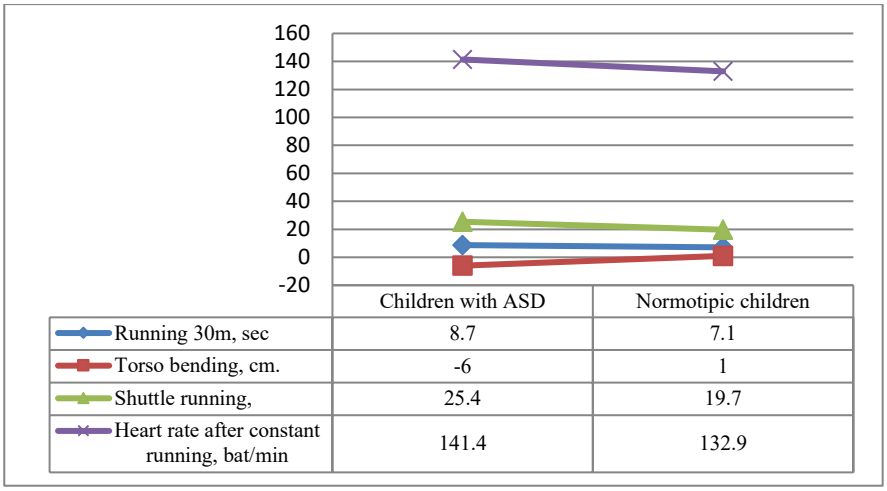
The training in martial arts is based, at the first stage, on the personal imitation capacity. From this it follows that only people with mild or high function autism could approach martial arts. A child with autism must be able to imitate, to have an average capacity of psycho-physical effort and between 70%-80% of psycho-motor acquisitions corresponding to his age. The martial arts that aim only at combat cannot help the development of a child with autism, this way are recommended the traditional arts that have exclusively technical tests. In this context judo is a sport that could help increase the level of physical activity in children with autistic spectrum disorder (ASD). This activity reduces sedentary behavior; hence it reduces the risk of obesity and diabetes mellitus.

One of the major problems for the specialists, that work with children that have special development needs, is the choice of a methodology that would allow for a detailed appreciation of all basic functional spheres. This way of approaching the problem represents a necessary condition for the elaboration for every child of an individual correctional training program.

At the same time, it is worth mentioning that the problem of motility restoration in autistic children is particularly urgent not only by practicing adaptive physical training but also different special sport and motor activities. The methods used for this purpose, as a rule, evaluate a certain development area or a limited group of motor skills. In this context, our work attempted to systemize and evaluate as a complex the motor abilities and the development of physical qualities in elementary school age children with autistic spectrum disorders.

The research was conducted at the State University of Physical Education and Sport and the Sport Wrestling Club "ANGELUS" in Chisinau. In the study were included 2 groups of elementary school age children, 6 children in each group. One group consisted of children without autistic pathology, normotipic, the other group consisted of children with autistic spectrum disorders. All of them took lessons in judo. For the purpose of establishing the level of physical capabilities of normotipic children and those with autistic spectrum disabilities we used the motility diagnostic testing not only directly at the locomotive system level, but also at the level of neuropsychiatric testing, which was an addition factor of evaluation. The motor abilities were estimated with the help of a test on force, endurance, coordination, flexibility and speed. For force evaluation it was used the test that consisted of raising the torso from lying position on the back. Endurance was measured by constant running with the fixation of the pulse after the endured test. Shuttle running was used as a method of evaluation of coordination abilities. Flexibility, as a quality, was evaluated on the basis of the results of the exercise consisting of forward torso bending in sitting position, and the speed capacity was appreciated on the basis of running 30-meter distance. After that a freely chosen form of different types of praxis was selected. By praxis is meant the capacity to execute motor acts with a previously established aim. We analyzed the position, dynamic and space praxis. All the test were executed by demonstration and imitation. They were accompanied by verbal explanation and indication of the correct arm movement. In some cases, the teacher himself demonstrated the correct arm movement. In some situations, an additional test was used, with the aim to simplify, or on the contrary, to make the test execution more difficult, and this fact allowed for the identification of the disorder mechanisms and establishing of the corresponding development level of the child.

The evaluation of motor abilities in children with limited possibilities at the lessons of adaptive training with the use of judo resources is the fundamental factor for the elaboration of the entire didactic (instructive) process. The use of motor tests with a vast variety and functionality that are adapted to the tasks that are to be solved, allows for the complex evaluation of the effective state of the pupil motor sphere. In our opinion, out of a wide variety of motor tests used in practice, the most attention must be paid only to the tests that allow for the highlighting (identification) of capacities of children to learn two types of motor activities. It refers to the motor abilities that require the completion of locomotor and object manipulation oriented acts, which require actions as accurate as possible. For the evaluation of the motor abilities are used test that allow for the estimation of the development of the basic motor abilities in pupils – endurance, force, speed, flexibility and dexterity. The conducted investigations allow to bring forward (outline) some considerable differences in the effective state of the motor sphere of the children included in the experiment (Picture 3.9.). As evidenced by the presented results, the defining factor that influences the state of motor abilities is diagnosis. The lowest results of the motor tests were obtained by children with autistic spectrum disorder, since autism is characterized by more profound pathological and morpho-functional changes of the nervous system, which takes a tall in all vital activity spheres.



	Children with ASD	Normotipic children
Running 30m, sec	8.7	7.1
Torso bending, cm.	-6	1
Shuttle running,	25.4	19.7
Heart rate after constant running, bat/min	141.4	132.9

Figure 3. Motor quality indices for normotipic and autistic children

The most difficult part for autistic children is the realization of test that requires maximal level of attention on the actual execution, which include shuttle running and 30 m. running. The afore-mentioned method of evaluation of some concrete motor abilities allows for the highlight of particularities of child's psychological state. An important characteristic of motor abilities in children is the muscle force characteristics. The dynamic force indices, determined

by the number of torso lifting repetitions, in normotipic children was 29,5±2,1, which is 26.0% ($p<0.05$) above the figures registered for the group of children with autistic spectrum disorder. The insufficient development of skeletal muscles might have a negative impact on the functional state of the nervous system which does not fully receive the vitally important, proprioceptive stimuli. In the case of performing the task with emphasis on endurance there were registered higher values of the heart rate in the group of children with the autistic spectrum disorder. The increase of pulsation as a result of the performed activity, on one hand could be related to the insufficient level of physical fitness, and on the other hand by the increase of tension and anxiety (fear) experienced by autistic children. As regards flexibility, this quality is less developed in autistic children as well. By the level of flexibility development, it is possible to appreciate the state of the nervous system. It refers to movement stereotype. The children with autistic spectrum disorder have a reduced mental flexibility, an insignificant ability. Any change of the obtained circumstances brings them out of balance. And for this very reason they try at all costs to avoid anything that is new to them. Besides this, flexibility presupposes the amplification of movement amplitude, but the autistic nervous system opposes to this variety range and creates a movement model that ensures the avoidance of changes and extension of possibilities, which fact is reflected in their ability to develop flexibility. Furthermore, according to the results of the neuropsychological motility research, we evaluated the state of the object manipulation abilities in children. The obtained results indicate visible disorders (more severe disorders of the motor sphere in autistic children in comparison with children that do not have the same pathology). The inability to perform different movements is marked with a plus. The number of pluses indicates the lack of the ability to perform a variety of movements. For healthy children the execution of test with different types of praxis was followed by some insignificant mistakes such as delayed task execution, weak coordination and consistency errors. In some cases, there was an inertia at the task execution. The autistic children accumulated, according to test results, a significant number of pluses. During the task execution they faced problems related to the fixation of their extremities position or their segments in relation to each other. It was identified a perseverance (stubborn repetition) of movements and a certain difficulty in transition to a different movement, as well as complications related to optical (visual) information processing and perception. There were mistakes at hand (arm) positioning, confounding of sides, and changing of hands.

Conclusions. It can be noted the indisputable truth that the essential factors in the development of the brain are movement and physical well-being. Numerous investigations indicate that the development of motor skills is closely related to the development of speech, mental processes, social and emotional skills that allow the individual to adapt to the surrounding world. In the given context, we can mark that the training of motor skills is logically included in the education of the ordinary child, who directly or indirectly, through communication with close people, including through motor activities, games build their own representation of how their own life is arranged, begins to understands why he/she has to collect toys by himself, express his wishes clearly, greet others, including the elderly, say goodbye, when parting, etc.

The evaluation of motor abilities in children with limited possibilities at the judo lessons is a fundamental (determining) factor for the conception and edification of the entire instructive. Or, the execution of different motor tests that are systematized and functionally adapted in conformity with the tasks that are to be solved, allows for the complex evaluation of the effective state of the child's motor sphere. In our opinion, out of a wide variety of motor tests used in practice, special attention must be paid primarily to the test that allow for the highlighting the ability of children to learn 2 types of motor skills. This refers to motor actions that require the execution of locomotor and object manipulation oriented acts as precisely as possible. As it follows from the research results, at the creation of the motility restoration program it is necessary to take into consideration the development particularities of the qualities and abilities of children, a principle that should provide the basis for the elaborated programs.

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