Viref Revista de Educación Física
Instituto Universitario de Educación Física y Deporte
ISSN 2322-9411 • Julio-Septiembre 2021 • Volumen 10 Número 3
UNIVERSIDAD DE ANTIOQUIA 1803

Determining the norm values of table tennis in motor and technical tests in male students aged between 7-9 and analyzing differences

Kosovo table tennis norm values for physical fitness and technical characteristics

Milaim Berisha[1]
Blerta Abazi[2]

[1] Istanbul Gelisim University, School of Physical Education and Sport. mberisha@gelisim.edu.tr
[2] AAB University, Physical Education and Sport. blerta1.abazi@universitetiaab.com

Abstract

Objective: the study aimed to norm the physical and technical characteristics of table tennis in male students aged 7-8-9 years old. Besides this, the study also aimed to analyze the differences between motor and technical characteristics of male students between the ages of 7-8-9 living in Kosovo in table tennis.

Methods: the study included 56 non-athlete boys aged 7, and 25 non-athlete boys aged 8, and 31 non-athlete boys aged 7. The Sprint (S), Vertical jump (VJ), Throwing ball (THB), Speed While Dribbling (SWD), Aiming At Target (AT), Ball Skills (BS), Eye Hand Coordination from 1 meter (EHC_1m), and Eye Hand Coordination from 2 meters (ECH_2m) were used as the measurement tools. Based on the skewness and kurtosis values, and sample groups (N), Kruskal-Wallis and One-Way ANOVA, Post-hoc (Tamhane's T2) analyses were used to determine the differences between age groups in the motor and technical tests. Determination of the normative values was made by using the frequency and percentile values divided into 20 portions (percentiles).

Results: based on the results of the data analyses of the study, there are significant differences in motor and technical abilities related to table tennis between 7-8-9 years old children.

Conclusion: the norm values related to the table tennis branch for motor tests (sprint, vertical jump, ball throwing), technical tests (speed while dribbling, aiming to target, ball skills), and motoric (reactional) tests (eye-hand coordination from 1 meter and eye-hand coordination form 2 meters) were determined. The norm values were determined in 4 groups, for which separate data in 20% piece represented the percentiles for each test.

Keywords: normative values, performance improvements, table tennis, technique, motor skills, reaction time, talent identification.

Introduction

The tennis table is a sports branch where motor and technical abilities play a key role in performance success. Especially when motor and technical abilities work together in order to increase performance, the complexity of the branch increases significantly. This complexity increases more when the age and gender factors are included as a variable. According to many pieces of research evaluating the motor skills such as a perceptuomotor resulted to be valuable in table tennis talent selection (Faber et al., 2017). However, the complexity of the motor and technical abilities makes it more difficult to determine the differences between the age, gender, and competition categories. Besides this, it is believed that motor tests can only partly explain future performance, probably by reflecting a preposition or necessity for a certain skill. Longitudinal studies are needed to find answers on this matter (Faber et al., 2014).

Therefore, one of the best ways to determine the differences and requirements of the age groups of table tennis is norming the motor and technical abilities for each age group and gender. In the Netherlands, a study made by Faber et al. (2016) focused on the capacity of the perceptuomotor skills assessment in young table tennis players to predict future competition participation and competition performance over a period of two and a half years.

The determination of the norm values for motor and technical tests of table tennis may help in talent identification. Besides this, knowledge about motor and technical abilities requirements per age and gender may be beneficial to develop a better training program for each age group and gender in table tennis. It is also important for the selected motor and technical test to measure and evaluate performance of children to create standard/norm values for the talent selection in table tennis. In this case, the tests used in our study were in use by the Netherlands Talent Identification Assessment (TIDA) program (Faber et al., 2014). Also, many studies made about the determination of the factors for talent selection in table tennis includes a test which is part of the study (Faber et al., 2014). However, the norm values determined in certain students or athletes cannot be a measurement tool for another group of students or athletes and cannot be used for another country.

In Kosovo, the norm values in different age groups and gender for motor abilities, physical fitness, and body composition were determined with around 30 variables, and they covered the country (Berisha, 2018; Berisha & Çilli, 2018, 2020). However, these norm values target the motor abilities and body compositional characteristics which are related to health and wellness. There is no table tennis-specific motor or technical test normed in Kosovo.

According to the data, it can be seen a lack of literature that determining norm values for motor and technical tests which cover entire table tennis athletes. Also, there are no norm values about table tennis that cover Kosovo or Europe. Therefore, to use the criteria for each age group and gender in talent selection in table tennis, prepare training program according to the level of motor

and technical abilities, and compare values of the motor and technical abilities of different categories of table tennis athletes, we need to determine the standards/norm values for each age group and gender in table tennis branch. Determination of the norm values contribute to an evidence-based talent identification program and will help talent development in future (Faber et al., 2014). For more, obtaining normative data and learning more about the predictive value and reproducibility in a larger sample in longitudinal studies are essential for correct interpretation of individual test scores of the TIDA (Faber et al., 2012; Vaeyens et al., 2008; Vandorpe et al., 2012).

In the light of the above data, the study aimed to norm the physical and technical characteristics of table tennis in male students aged 7-8-9 years old. Besides this, the study also aimed to analyze the differences between motor and technical characteristics of table tennis players aged 7-8-9 years old living in Kosovo.

Methodology

Study sample

The study included 56 non-athlete boys aged 7, 25 non-athlete boys aged 8, and 31 non-athlete boys aged 7. The participants included in the study and their parents were informed about the benefits and risks (even no risks were detected) of the study. The study was conducted according to the Helsinki Declaration which protects the privacy of the volunteers. The study was approved by the ethics commission of the "Istanbul Gelisim University".

Performance measure and evaluation tests

Determination of the standards/norm values of the motor and technical tests were made based on the tests which are in use by TIDA for talent selection in table tennis branch (Faber et al., 2016). The tests, according to Faber et al. (2014), were as follows:

Sprint (S): involved a pyramid-shape circuit in which players need to gather and return five table tennis balls one by one as fast as possible from five different baskets starting at the basis of the pyramid-shaped circuit. Time was measured in seconds, and the best of two attempts was used as the final score.

Vertical jump (VJ): players were instructed to stand next to a wall and jump and touch the wall with their fingertips as high as possible. The difference between the jumping height and standing height with one arm up along the wall was measured in centimeters. The best of three attempts was used as the final score.

Throwing Ball (THB): players threw a table tennis ball as far away as possible with their preferred hand. The distance from the starting-point at the marked line to the point of the ball's first bounce was measured in meters. The best of three attempts was used as final score. In the 'eye-hand coordination' test players were instructed to throw a ball at a vertical

table tennis table at 1-meter distance with one hand and to catch the ball correctly with the other hand as frequently as possible in 30 seconds.

Speed While Dribbling (SWD): a zigzag circuit was used in which the players needed to move sideways as fast as possible while dribbling with a basketball using one hand. Players had one attempt in which time was measured in seconds.

Aiming at Target (AT): players needed to hit a round target (Ø 60 cm) on the floor at 2.5 meter distance with a table tennis ball using a standard bat with their preferred hand. Forehand and backhand had to be used alternately during the attempts. A hit in the target' center (Ø 0.20 m) or the outer ring yielded 6 and 4 points, respectively. The total score of ten attempts was registered as the final score.

Ball Skills (BS): players were required to hit a round target on the floor (Ø 75 cm), to throw a table tennis ball with their preferred hand via a vertical table tennis table from two different positions (1 and 2-meter distance away from the target). Each player had a total of twenty attempts. A hit in the center (Ø 0.335 m) or the outer ring of the target yielded 2 and 1 points, respectively. The total score of the twenty attempts was registered as the final score.

Eye Hand Coordination from 1 meter (EHC_1m) and Eye Hand Coordination from 2 meters (ECH_2m): players were instructed to throw a ball at a vertical table tennis table at 1-meter distance with one hand and to catch the ball correctly with the other hand as frequently as possible in 30 seconds. The number of correct catches was scored.

Data analysis

The calculation of the data was made by using the SPSS 26 program. To analyze general values and normality (skewness and kurtosis) of the test, descriptive statistics were used. Based on the skewness and kurtosis values, and sample groups (N) Kruskal-Wallis and One-Way ANOVA, Post-hoc (Tamhane's T2) analysis were used to determine the differences between age groups in the motor and technical tests. The determination of the normative values was made by using the frequency and percentile values divided into 20 portions (percentiles).

Findings

Table 1. Differences between ages (7, 8, 9) in motor tests (S, VJ, THB) characteristics.

Ability	V	N	Ages	Skew.	Kur.	Mean rank	df	Sig.	PH
Acceleration	S	56	7	-.321	-1.007	66.86	2	.000	7>9
		25	8	1.269	1.989	56.80			
		31	9	-.089	-.664	37.55			
Explosive force	VJ	56	7	.318	.168	47.54	2	.002	7<9
		25	8	3.936	17.858	55.82			
		31	9	.701	1.557	73.23			
	THB	56	7	.690	1.999	44.19	2	.000	7<9
		25	8	-.014	-.960	53.40			8<9
		31	9	-.357	-.537	81.24			

V: variables, S: Sprint, VJ: Vertical jump, THB: Throwing ball.
PH: Post-hoc Tamhane's T2.
Skewness: > 1 - positive skew, ± 0 - normal, < - 1 - negative skew.
Kurtosis: > +2 leptokurtic distribution, ± 2 normal (mesokurtic) distribution, < -2 platokurtic distribution.

The results given in Table 1 show that increases in age were accompanied by performance improvement in S, VJ and THB tests ($p<0.05$). While the differences in S and VJ tests seem to be between 7 and 9 years old, THB test resulted in significant differences in every age.

Table 2. Differences between ages (7, 8, 9) in technical tests characteristics (SWD, AT, BS).

Ability	Variables	N	Ages	Skew.	Kur.	Mean rank	df	Sig.	PH
Technique	SWD	56	7	-1.761	3.943	81.47	2	.000	7>8
		25	8	.567	-.036	43.18			7>9
		31	9	.646	.180	22.13			8>9
	AT	56	7	1.395	2.138	42.06	2	.000	7<8
		25	8	.550	-.168	53.32			7<9
		31	9	1.426	4.483	85.15			8<9
	BS	56	7	.788	.789	43.49	2	.000	7<8
		25	8	-.569	-.067	67.86			7<9
		31	9	.309	-.1.329	70.84			8<9

V: variables, SWD: Speed while dribbling, AT: Aiming at target, BS: Ball skills.
PH: Post-hoc Tamhane's T2.

Skewness: > 1 - positive skew, ± 0 - normal, < - 1 - negative skew.
Kurtosis: > +2 leptokurtic distribution, ± 2 normal (mesokurtic) distribution, < -2 platokurtic distribution.

The results given in Table 2 show that increases in age were accompanied by performance improvement in SWD, AT and BS techniques ($p<0.05$). As it can be seen in table 2, SWD, AT and BS techniques resulted in significant differences in every age.

Table 3. Differences between ages (7, 8, 9) in reactional tests characteristics (ECH_1m, ECH_2m).

Ability	Variables	N	Ages	Skew.	Kur.	Mean rank	df	Sig.	PH
Reaction	ECH_1m	56	7	.796	.039	42.25	2	.000	7<9
		25	8	1.142	.091	54.34			8<9
		31	9	1.000	.433	83.98			
	ECH_2m	56	7	.681	.244	42.46	2	.000	7<9
		25	8	.934	-.416	48.40			8<9
		31	9	1.237	2.044	88.39			

V: variables, EHC_1m: Eye hand coordination from 1 meter, ECH_2m: Eye hand coordination from 2 meters.
PH: Post-hoc Tamhane's T2.
Skewness: > 1 - positive skew, ± 0 - normal, < - 1 - negative skew.
Kurtosis: > +2 leptokurtic distribution, ± 2 normal (mesokurtic) distribution, < -2 platokurtic distribution.

The results given in Table 3 show that increases in age were accompanied by performance improvement in ECH_1m and ECH_2m tests ($p<0.05$). As it can be seen in the same table, these tests resulted in significant differences in every age.

Table 4. Normative values for the motor tests (S, VJ, THB) in male students aged 7, 8, 9 years old.

V	Age 7					Age 8					Age 9				
	Percentiles (%)					Percentiles (%)					Percentiles (%)				
	<20th	40th	50th *	60th	>80th	<20th	40th	50th *	60th	>80th	<20th	40th	50th *	60th	>80th
S	36.32	39.20	40.35	41.30	42.30	35.95	37.13	38.52	39.76	42.15	34.94	35.36	36.02	37.80	39.51
VJ	15.0	17.0	19.0	19.0	22.0	15.0	18.0	20.0	21.2	25.0	16.0	22.0	24.0	27.0	30.0
THB	6.05	6.87	7.10	7.30	8.00	6.22	7.20	7.40	7.88	8.30	7.54	8.58	8.80	9.28	10.00

V: variables, S: Sprint, VJ: Vertical jump, THB: Throwing ball, *: middle fifty.

Table 4 gives the normative values for the S, VJ, and THB tests. Normative values show that children's performance in SWD, AT, and BS significantly improves every year.

Table 5. Normative values for the technical tests (SWD, AT, BS) in male students aged 7, 8, 9 years old.

V	Age 7					Age 8					Age 9				
	Percentiles (%)					Percentiles (%)					Percentiles (%)				
	<20th	40th	50th*	60th	>80th	<20th	40th	50th *	60th	>80th	<20th	40th	50th *	60th	>80th
SWD	34.38	36.28	38.00	38.05	40.00	18.52	22.18	24.00	27.06	29.25	14.04	16.59	18.50	18.94	22.06
AT	8.0	11.6	12.0	14.0	18.0	8.0	12.0	18.0	21.2	27.2	20.8	24.0	30.0	30.4	36.0
BS	9.4	12.0	13.0	14.0	16.0	12.4	16.4	18.0	18.0	19.8	12.0	15.0	18.0	18.0	22.0

V: variables, SWD: Speed while dribbling, AT: Aiming at target, BS: Ball skills, *: middle fifty.

Table 5 gives the normative values for the SWD, AT and BS tests. Normative values show that children's performance in SWD, AT, and BS significantly improves every year.

Table 6. Normative values for the reaction time tests (ECH_1m, ECH_2m) in male students aged 7, 8, 9 years old.

V	Age 7					Age 8					Age 9				
	Percentiles (%)					Percentiles (%)					Percentiles (%)				
	<20th	40th	50th *	60th	>80th	<20th	40th	50th *	60th	>80th	<20th	40th	50th *	60th	>80th
EHC_1m	2.0	3.0	3.5	4.0	5.6	2.0	3.0	3.0	5.0	8.8	5.0	7.0	8.0	9.0	12.8
EHC_2m	0.9	1.0	1.0	1.9	2.0	0.9	1.0	1.0	2.0	4.6	2.4	4.0	6.0	6.0	8.0

EHC_1m: Eye hand coordination from 1 meter, ECH_2m: Eye hand coordination from 2 meters, *: middle fifty.

Table 6 gives the normative values for the ECH_1m and ECH_2m tests. Normative values show that children's performance in these tests improves every year.

Discussion

The study provides standards/normative values for the motor and technical test related to the table tennis branch. The fundamental movement skills play an important and necessary role in the proper and comprehensive development of a child (Berisha, 2021). Besides this, determination of the normative values for the motor and technical test related to table tennis branch may improve the training program as well as it may help in the talent election in table tennis branch.

Motor performance which is measured by the sprint, vertical jump, and ball throwing tests resulted to have a significant difference between male students aged 7, 8 and 9 years old. While the differences in sprint and vertical jump seem to be between 7 and 9 years old, the throwing ball test resulted in significant differences in every age. Since sprint performance increases by age especially between the ages of 5-7 (Muratlı et al., 2005) norm values should be separated for each age group.

When the primary school 8 and 9 years old children are compared to the same age group of another country, results seem to be similar or a little bit lower in sprint performance, which means that Kosovar children performed similarly or better than children of another country such as the Netherlands. On the other hand, in the vertical jump performance and throwing ball test Kosovar children resulted to have lower results, which means that children living in the Netherlands performed better in this parameter (Faber et al., 2017).

Similarly, speed while dribbling, aiming at the target, and ball skills techniques resulted in significant differences between male students aged 7, 8 and 9 years old. Speed while dribbling, aiming at the target, and ball skills techniques resulted in significant differences in every age. When the results of the primary school student of children aged 8 and 9 years old were compared to the same age and gender of children living in the Netherlands, results showed that Kosovar children registered better norm values for the speed while dribbling, aiming target, and ball skills test (Faber et al., 2017).

Also, eye hand coordination (1 meter, 2 meters) results seem to be significantly different between male students aged 7, 8, and 9 years old. Similarly, previous test results in eye hand coordination (1 meter, 2 meters) resulted in significant differences in every age. These tests' norm values hold importance in first stage of the talent selection program in Kosovo. Comparison of the norm values and averages of the test results showed that Kosovar children aged 8 and 9 had lower performance in eye-hand coordination test compared to the same age and gender students living in the Netherlands (Faber et al., 2017). The 1-meter distance eye-hand coordination test demonstrated the smallest random measurement error between the initial and the retest. These tests also suggested to fit best in the provisional TIDA of the Netherlands Table Tennis Association (NTTA) as part of talent identification in table tennis due to the best combination of psychometric characteristics examined in this study (Faber et al., 2014). While the inclusion of these tests in the TIDA program started in 2014 by the research made by Faber et al. (2014) our study aimed to make this part of the talent selection program in Kosovar children.

Based on the study results, normative values given in percentiles resulted to be significantly different between male students aged 7, 8, and 9 years old. Therefore, table tennis-related normative values for the motor test and technical characteristics may be beneficial for designing a new training program based on the motor and technical skills of the children. Based on the determined norm values, classification of children in a different group to detect and select talents for the table tennis branch will be possible (Berisha & Çilli, 2018; Tomkinson et al., 2018;). Besides this, the existence of the normative values for physical and technical characteristics for each age group and gender may avoid the possible risks of early specialization and selection at such a young age (e.g., injuries, mental exhaustion, and dropouts) (Baker et al., 2005; Wall & Côté, 2007). The absence of the standards/norm values for motor and technical tests related to the table tennis branch may result in a non-adequate training program, non-adequate talent determination, early

specialization, etc. Although the number of normative studies is large, many countries have not a standard for talent selection or normative data that make differences in age groups (biological, chronological), gender, competition category, etc. Besides this, sports teams, sport schools, physical education at school, wellness centers have no evaluation criteria, norm values, or mechanism that define the status of athletes. It is likely that many countries (and corporations) around the world are currently not selecting their most potentially talented performers due to poorly defined and theoretically weak selection tools (Abbott et al., 2005). In order to address the issue, we determined the norm values for motor tests and technical characteristics related to table tennis in 7-8-9 male students in Kosovo.

Conclusion

Based on the study, which aimed to determine the normative values for the physical and technical characteristics of table tennis in male students aged 7-8-9 years old, the norm values were determined related to the table tennis branch for motor tests (sprint, vertical jump, ball throwing), technical tests (speed while dribbling, aiming to target, ball skills), and motoric (reactional) tests (eye-hand coordination from 1 meter and eye-hand coordination form 2 meters). Norm values were determined in 4 groups with separate data in 20% which represented the percentiles for each test. Based on the fact that the analyses made before norm determination showed that differences between age groups were statistically significant, and the norm values standards were terminated separately for each group age.

These norm values may help in the development of new training programs for the table tennis branch, detect and identify talents by making classification of children in categories based on their abilities, and provide the comparison of the motor and technical abilities in different countries at different levels of athletes and age groups.

This study may also be the first in the determination of the normative values for motor and technical tests related to table tennis in Kosovo. Because the study sample was primary school students, these norm values may be useful just for the first stage (detection) of talent identification and talent in table tennis. In order to use these norm values of the table tennis tests, they will be shared with the Table Tennis Federation of Kosovo and the Education Ministry of Kosovo.

Even there are significant literature data that determine the norm values of motor and technical tests in athletes and non-athletes, there is a lack of literature data that determine the norm values for motor end technical test related to table tennis branch. For this reason, our study used a lot of literature data from the same authors.

Suggestions

In order to be more beneficial, we will make some suggestions about the future studies on these topics based on the experiences that have been tried during this study:

- Increase the study sample.
- Determination of the norm values in athletes and non-athletes.
- Compare results with other sample groups.
- Create norm values for motor and technical tests related to table tennis to cover country and entire children separated into needed categories.
- Put the "middle fifty" to make a possible comparison between norm values.
- When appropriate, make more percentile categories (needed to increase the study sample).
- Use the updated motor, compositional and technical tests for norming and using in the talent selection process, develop a training program, etc.

References

Note: some references were translated from the original to English language. To verify the reference, consult the URL or DOI.

Abbott, A., Button, C., Pepping, G.J., & Collins, D. (2005). Unnatural selection: talent identification and development in sport. *Nonlinear Dynamics, Psychology, and Life Sciences, 9*(1), 61-88. https://bit.ly/3krJTMi

Baker, J., Côté, J., & Deakin, J. (2005) Expertise in ultraendurance triathletes early sport involvement, training structure, and the theory of deliberate practice, *Journal of Applied Sport Psychology*, *17*(1), 64-78. https://doi.org/10.1080/10413200590907577

Berisha, M. (2018). *Determination of norm values in evaluation of physical and bio-motoric developments in 11-17 years children in Kosovo* (Doctoral thesis). Sakarya University, Turkey. https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Berisha, M. (2021). Normative values for physical and psychomotor characteristics in children aged 4-7 in Turkey (Sakarya). *Human. Sport. Medicine*, *21*(1), 94-101. https://doi.org/10.14529/hsm210112

Berisha, M., & Çilli, M. (2018). Normative values for physical fitness in children aged 11-17 in Kosovo. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, *22*(1), 11-27. https://doi.org/10.15561/18189172.2018.0103

Berisha, M., & Çilli, M. (2020). *Physical fitness norms in student aged 8-17 in Kosovo*. Latvia: LAP LAMBERT Academic Publishing. https://bit.ly/2Z97CZb

Faber, I.R., Oosterveld, F., & Sanden, R.N. (2012). A first step to an evidence-based talent identification program in the Netherlands; a research proposal. *International Journal of Table Tennis Sciences 7*, 15-18. https://bit.ly/3hNFJwc

Faber, I.R, Oosterveld, F., & Nijhuis-Van der Sanden, M.W. (2014). Does an eye-hand coordination test have added value as part of talent identification in table tennis? A validity and reproducibility study*, PLOS ONE*, *9*(1), e85657. https://doi.org/10.1371/journal.pone.0085657

Faber, I.R., Elferink, M.T., Faber, N.R., Oosterveld, F.G., & Nijhuis-Van der Sanden, M.W. (2016). Can perceptuo-motor skills assessment outcomes in young table tennis players (7–11 years) predict future competition participation and performance? An observational prospective study. *PLOS ONE, 11*(2), e0149037. https://doi.org/10.1371/journal.pone.0149037

Faber, I.R., Pion, J., Munivrana, G., Faber, N.R., & Nijhuis-Van der Sanden, M.W. (2017): Does a perceptuomotor skills assessment have added value to detect talent for table tennis in primary school children?. *Journal of Sports* Sciences, *36*(23), 2716-2723. https://doi.org/10.1080/02640414.2017.1316865

Muratlı, S., Sahin, G., & Kalyoncu, O. (2005). *Training and competition*. Istanbul: Yaylım Publishing. https://www.researchgate.net/publication/341774995_Antrenman_ve_Musabaka

Tomkinson, G.R., Carver, K.D., Atkinson, F., Daniell, N.D., Lewis, L.K., Fitzgerald, J.S., Lang, J.J., & Ortega, F.B. (2018). European normative values for physical fitness in children and adolescents aged 9-17 years: results from 2 779 165 Eurofit performances representing 30 countries*. British Journal of Sports Medicine*, *52*(22), 1445-14563. https://doi.org/10.1136/bjsports-2017-098253

Vaeyens, R., Lenoir, M., Williams, A.M., & Philippaerts, R.M. (2008). Talent identification and development programmes in sport. Current models and future directions*. Sports Med*icine, *38*, 703-714. https://doi.org/10.2165/00007256-200838090-01

Vandorpe, B., Vandendriessche, J.B., Vaeyens, R., Pion, J., Lefevre, J., Philippaerts, R.M., & Lenoir, M. (2012). The value of a non-sport-specific motor test battery in predicting performance in young female gymnasts. *Journal Sports Science, 30*, 497-505. https://doi.org/10.1080/02640414.2012.654399

Wall, M., & Côté, J. (2007) Developmental activities that lead to dropout and investment in sport, *Physical Education and Sport Pedagogy*, *12*(1), 77-87. https://doi.org/10.1080/17408980601060358