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JORPRES (Jurnal Olahraga Prestasi), 21 (1), 2025, 14-19

The relationship between anthropometry and biomotor ability on gymnastics potential at SD Negeri 1 Gentan

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Abstract

This study aims to analyze the relationship between anthropometric variables and biomotor abilities with gymnastics potential in elementary school students. The research method used a correlational quantitative approach involving 106 fourth and fifth grade students aged 9–11 years at SD Negeri 1 Gentan. Data were collected through anthropometric measurements (height, weight, arm span, sitting height) and biomotor ability tests (flexibility, core muscle strength, coordination). Data analysis was performed using Pearson's correlation test and multiple regression using SPSS. The results of the study showed that: (1) Height was significantly correlated with arm span ($r = 0.687$; $p < 0.01$) and sitting height ($r = 0.434$; $p < 0.01$), but not with biomotor ability; (2) Sit height has a positive relationship with core muscle strength (plank) ($r = 0.346$; $p < 0.01$), while arm span has a negative correlation ($r = -0.209$; $p < 0.05$); (3) Biomechanical abilities such as flexibility (split) and body rotation (air turn) are significantly correlated ($r = 0.775$ and $r = 0.676$; $p < 0.01$), but are not directly influenced by anthropometric variables. The conclusions of this study indicate that gymnastics potential is more influenced by technical training and flexibility than by body structure, although certain anthropometric variables such as sitting height and arm span play a role in core muscle stability. The implications of this study highlight the importance of combining anthropometric monitoring with structured biomotor training programs for the development of gymnastics potential in elementary school students.
Keywords: Anthropometry, Biomotor, Gymnastics, Elementary School, Talent Guidance.

INTRODUCTION

Sports play a central role in developing the physical skills and character of elementary school children. Among the various sports, gymnastics occupies a strategic position because it requires coordination, agility, strength, and flexibility, and is able to form the foundation of children's basic motor skills (Saharullah, 2020). Gymnastics is not only a physical activity, but also a means of guiding talent and coaching young athletes in a targeted manner.

Two important factors that determine success in gymnastics are anthropometric characteristics and biomotor abilities. Anthropometry refers to measurements of body dimensions such as height, weight, leg length, and arm length, which can influence movement efficiency and performance in gymnastics (Dlis et al., 2021). Certain body proportions can support biomechanical advantages in gymnastics movements that require precision and stability.

Meanwhile, biomotor abilities include strength, speed, agility, endurance, and flexibility, which play a major physiological role in supporting children's athletic performance (Kurniawan & Marsanda, 2023). Children with superior biomotor capacities have a higher chance of excelling in gymnastics,

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

especially during the basic training stage at school. However, despite extensive research on the relationship between anthropometric parameters and biomotor abilities in young children, adolescents, and professional athletes, there remains a lack of integrated studies examining both in the context of gymnastics for school-age children, particularly in local settings such as SD Negeri 1 Gentan. This study aims to address this gap to support the selection and development of athletic potential from a young age.

SD Negeri 1 Gentan, as one of the elementary schools actively developing students' athletic potential, needs to understand the extent of the relationship between anthropometry and biomotor abilities on children's potential in gymnastics. This research is important to determine the relationship between anthropometry and biomotor abilities in gymnastics and to identify students with talent in gymnastics while designing training programs tailored to their physical and motor characteristics.

Through this analysis, it is hoped that an objective picture can be obtained of how anthropometric parameters (such as height, weight, and leg length) and biomotor abilities (such as strength, flexibility, and coordination) play a role in determining children's potential in gymnastics. These findings can serve as a basis for physical education teachers and coaches in developing more targeted and effective strategies for developing students' athletic talents.

METHOD

This study uses a correlational quantitative approach to determine the relationship between independent variables in the form of anthropometry and biomotor skills with gymnastics potential in elementary school children. This approach was chosen because it is able to measure the strength of the relationship between numerical variables objectively and measurably (Abrori, 2021).

The population in this study consisted of all fourth and fifth grade students at Gentan Public Elementary School aged 9–11 years. The sampling technique used total sampling, with a total of 109 respondents who met the inclusion criteria, namely: (1) aged 9–11 years, (2) had no motor movement disorders, and (3) actively participated in physical education classes and school gymnastics activities.

The first independent variable (X1) is anthropometry, which includes height, weight, arm length, and sitting height. This parameter refers to previous research linking body posture suitability to gymnastics (Wijana & Rusiawati, 2021). The second independent variable (X2) is biomotor ability, which includes three aspects: vertical split to measure hip and hamstring flexibility (measured in degrees using a goniometer), air turn to assess coordination and explosive movement (assessed observationally based on 180° or 360° rotation by the coach), and plank hold to measure core muscle stability (measured in seconds). These biomotor components have an important influence on the effectiveness of techniques in floor gymnastics (Kurniawan & Marsanda, 2023).

The dependent variable (Y) is gymnastics potential, measured through the practice of basic floor gymnastics techniques such as the candle position, forward roll, and static balance. The assessment was conducted by physical education teachers and coaches using a structured rubric that had been validated based on early childhood gymnastics training standards (Hasyim, 2024). All measurements were conducted individually in the school hall using standard measuring tools such as a tape measure, digital scale, high chair, and stopwatch.

Content validity testing was conducted through expert assessment by physical education teachers and gymnastics coaches. Meanwhile, reliability testing was conducted through a pilot test on 10 students and calculated using Cronbach’s Alpha coefficient. The data obtained were analyzed using SPSS statistical software. The analysis stages included a Kolmogorov–Smirnov test for data normality, a Pearson correlation test to measure the relationship between variables, and a multiple regression test to determine the simultaneous contribution of variables X1 and X2 to Y. This analysis technique aims to provide a comprehensive understanding of the extent to which anthropometric and biomotor factors influence children's overall gymnastics performance (Atiq et al., 2022).

RESULT AND DISCUSSION

Table 1. Descriptive Statistic

	N	Minimum	Maximum	Mean	Std. Deviation
Height	106	127	159	141.29	7.513

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

Wieght	106	20	344	39.34	31.845
Arm Span	106	76	167	141.39	11.069
Sitting Height	106	62	145	72.54	8.263
Right Vertical Split	106	90	180	123.33	20.553
Left Air Turn	106	160	360	272.78	56.796
Right Air Turn	106	135	380	268.40	53.704
Plank	106	9	52	21.25	7.039
Valid N (Listwise)	106				

Table 2. Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Height	.053	106	.200*	.986	106	.345
Wieght	.281	106	.000	.321	106	.000
Arm Span	.076	106	.148	.880	106	.000
Sitting Height	.215	106	.000	.515	106	.000
Right Vertical Split	.124	106	.000	.963	106	.005
Left Vertical Split	.081	106	.085	.970	106	.017
Left Air Turn	.141	106	.000	.924	106	.000
Right Air Turn	.144	106	.000	.967	106	.010
Plank	.123	106	.000	.882	106	.000

Table 3. Correlation Test

		Height	Wieght	Arm Span	Sitting Height	Right Vertical Split	Left Vertical Split	Left Air Turn	Right Air Turn	Plank	Gender
Height	Pearson Correlation	1	.325**	.687**	.434**	-.005	.029	-.038	.092	-.016	.096
	Sig. (2-tailed)		.001	.000	.000	.958	.764	.698	.346	.867	.328
	N	106	106	106	106	106	106	106	106	106	106
Wieght	Pearson Correlation	.325**	1	.264**	.169	-.016	-.059	-.022	-.050	.000	-.076
	Sig. (2-tailed)	.001		.006	.084	.869	.548	.826	.607	.996	.441
	N	106	106	106	106	106	106	106	106	106	106
Arm Span	Pearson Correlation	.687**	.264**	1	-.189	.012	.045	-.007	.026	-.209*	.046
	Sig. (2-tailed)	.000	.006		.053	.904	.648	.941	.792	.032	.638
	N	106	106	106	106	106	106	106	106	106	106
Sitting Height	Pearson Correlation	.434**	.169	-.189	1	.037	.009	.116	.113	.346**	-.054
	Sig. (2-tailed)	.000	.084	.053		.704	.924	.235	.250	.000	.584
	N	106	106	106	106	106	106	106	106	106	106

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

Right Vertical Split	Pearson Correlation	-.005	-.016	.012	.037	1	.775**	.281**	.251**	.094	-.001
	Sig. (2-tailed)	.958	.869	.904	.704		.000	.004	.010	.340	.988
	N	106	106	106	106	106	106	106	106	106	106
Left Vertical Split	Pearson Correlation	.029	-.059	.045	.009	.775**	1	.192*	.219*	.093	-.015
	Sig. (2-tailed)	.764	.548	.648	.924	.000		.049	.024	.345	.876
	N	106	106	106	106	106	106	106	106	106	106

Table 4. Regression Test With ANOVA of Left Air Turn

Model		Sum of	df	Mean Square	F	Sig.
1	Regression	41241.256	5	8248.251	2.773	.022[b]
	Residual	297462.753	100	2974.628		
	Total	338704.009	105			

Table 5. Regression Test With ANOVA of Right Air Turn

Model		Sum of	df	Mean Square	F	Sig.
1	Regression	17270.616	5	3454.123	1.210	.310[b]
	Residual	285556.743	100	2855.567		
	Total	302827.358	105			

The results of the Pearson correlation analysis revealed significant relationships among several anthropometric variables. Height demonstrated strong positive correlations with arm span ($r = 0.687$, $p < 0.01$), seated height ($r = 0.434$, $p < 0.01$), and body weight ($r = 0.325$, $p < 0.01$). The highest correlation was observed between height and arm span, indicating that taller individuals tend to have proportionally longer arms. However, height did not exhibit any significant association with motor performance variables such as plank, vertical split, or air turn. In contrast, arm span was not only positively correlated with height and weight but also showed a weak negative correlation with plank performance ($r = –0.209$, $p < 0.05$), suggesting that individuals with longer arms may experience greater difficulty in maintaining isometric plank positions. Conversely, seated height showed a significant positive correlation with plank performance ($r = 0.347$, $p < 0.01$), indicating that a taller seated posture is associated with better core muscular endurance.

Relationships among motor performance variables revealed a more consistent and robust pattern. Right and left vertical splits exhibited a very strong correlation ($r = 0.775$, $p < 0.01$), reflecting symmetry in lower-body flexibility. Similarly, left and right air turns were strongly correlated ($r = 0.676$, $p < 0.01$), suggesting bilateral integration in rotational movement ability. Additionally, the right vertical split was significantly associated with both left air turn ($r = 0.281$, $p < 0.01$) and right air turn ($r = 0.251$, $p < 0.01$), while the left vertical split also correlated with left air turn ($r = 0.192$, $p < 0.05$) and right air turn ($r = 0.219$, $p < 0.05$). These findings highlight the interdependence between lower-body flexibility and rotational movement capacity, which are both critical in gymnastics performance. Notably, there were no significant correlations between plank performance and air turns, nor between anthropometric dimensions and air turn performance, except for a weak relationship between left split and arm span ($r = 0.219$, $p < 0.05$). Collectively, these results suggest that while anthropometric characteristics are

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

moderately interrelated, their direct influence on motor performance is limited—except in the case of seated height and core strength—whereas flexibility and rotational coordination appear to be intrinsically linked within motor skill domains.

CONCLUSION

Based on the results of the study, it can be concluded that the relationship between anthropometric variables and biomotor abilities on gymnastics potential is partial and complex. Height shows a significant correlation with arm span ($r = 0.687$; $p < 0.01$) and sitting height ($r = 0.434$; $p < 0.01$), but it does not directly influence biomotor abilities such as flexibility (split) or body rotation (air turn). Seated height positively correlates with core muscle strength (plank) ($r = 0.346$; $p < 0.01$), while arm span has a negative relationship ($r = -0.209$; $p < 0.05$), indicating that certain body proportions influence postural stability. On the other hand, biomotor abilities such as flexibility and coordination (split and air turn) are more determined by training factors and movement habits, as evidenced by strong correlations between bilateral motor components (right-left split: $r = 0.775$; right-left air turn: $r = 0.676$; $p < 0.01$). These findings emphasize that developing gymnastics potential at the elementary school level requires a holistic approach that integrates monitoring of anthropometric characteristics (particularly sitting height and arm span) with structured training programs to enhance flexibility, core strength, and coordination. The practical implications of this study are the need for collaboration between physical education teachers and coaches in designing evidence-based training strategies, considering both physical and technical aspects.

REFERENCES

Budiarti, R. (2023). PENGEMBANGAN TES IDENTIFIKASI BAKAT AEROBIC GYMNASTICS KATEGORI NATIONAL DEVELOPMENT. *Universitas Negeri Yogyakarta*.

Chaniago, H. (2022). Measurement of Anthropometry, Biomotor and Fundamental Skills for Identification of Future Athletes' Talents at the Age of 11-15 Years. *International Journal of Human Movement and Sports Sciences*, *10*(2), 179-186.

Budiarti, R., Siswantoyo, E. R. S., & Miftachurochmah, Y. (2023). NEEDS ANALYSIS OF PHYSICAL AND TECHNICAL TEST MODELS TO IDENTIFY CHILDREN TALENTS IN IN NATIONAL DEVELOPMENT CATEGORY IN GYMNASTIC AEROBIC SPORTS. *Neuropsychopharmacologia Hungarica*, *21*(4), 49-60.

Sukamti, E. R., Pamungkas, O. I., & Pranatahadi, S. (2020, November). Identify the Talent of Artistic Gymnastics in Special Region of Yogyakarta With Application. In *The 3rd International Conference on Sports Sciences and Health 2019 (ICSSH 2019)* (pp. 41- 44). Atlantis Press.

Siatras, T., Skaperda, M., & Mameletzi, D. (2010). Reliability of anthropometric measurements in young male and female artistic gymnasts. *Medical Problems of Performing Artists*, *25*(4), 162-166.

Kaur, K., & Koley, S. (2019). Anthropometric determinants of competitive performance in gymnastics: a systematic review. *Int J Health Sci Res*, *9*(7), 249-256.

Genc, H., & Cigerci, A. E. (2020). The effect of gymnastics training on anthropometric, somatotype and some performance characteristics in pre-school girls. *Progress in Nutrition*, *22*(2), 547-554.

Sukamti, E. R., & Pranatahadi, S. (2018, December). The Effect of Artistic Gymnastics Talent Scouting Application to Artistic Gymnastic Basic Skills. In *2nd Yogyakarta International Seminar on Health, Physical Education, and Sport Science (YISHPESS 2018) and 1st Conference on Interdisciplinary Approach in Sports (CoIS 2018)* (pp. 319-321). Atlantis Press.

Sukamti, E. R., Primasoni, N., & Budiarti, R. (2019, February). The Effectiveness Test of Artistic Gymnastic Talent Scouting Selection Model–Based Application. In *2nd International Conference on Sports Sciences and Health 2018 (2nd ICSSH 2018)* (pp. 68-70). Atlantis Press.

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

Suryadia, L. E. (2020, May). Identification of sport talents with the sport search methods. In *Journal of Physics: Conference Series* (Vol. 1539, No. 1, p. 012043). IOP Publishing.

Soenyoto, T., Darmawan, A., Anjally, C. N., Amara, D. A., & Kurniawan, W. S. (2023, November). Gymnastics Talent Identification Test in Semarang City. In *Proceedings of International Conference on Physical Education, Health, and Sports* (Vol. 3, pp. 418-428).

Nugraheningsih, G., Admaja, A. T., Bintoro, Y., & Purilawa, A. F. (2022). IDENTIFICATION OF SPORT TALENT FOR SCIENCE STUDENTS. *Slovak Journal of Sport Science*, *8*(1).

Afrian, H., Daniyantara, D., & Dinata, K. (2021, June). Identification of Sports Talent (Using Sport Search) in Students of State Middle School. In *2nd Progress in Social Science, Humanities and Education Research Symposium (PSSHERS 2020)* (pp. 178-182). Atlantis Press.

Utamayasa, I. G. D. (2021). Talent Identification of Future Sportsmen Using Sport Search Application. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *4*(1), 690-695.

Masruroh, A. D., Puspodari, P., & Herpandika, R. P. (2022). Survey of Interest and Talent in Participating in Aerobic Gymnastics on the Nusantara Aerobic Gymnastics Team in 2021. *Physical Education and Sports: Studies and Research*, *1*(1), 29-37.

Till, K., Emmonds, S., & Jones, B. (2019). Talent identification. *Strength and Conditioning for Young Athletes*, 21-44.

Valencia, M. J. D., Maming, J. B., Medina, J. H., & Macasarte, G. D. (2021). The making of the champions: a case study of the development of the young aerobic gymnasts in Malay, Aklan. *International Journal of Multidisciplinary: Applied Business and Education Research*, *2*(4), 327-336.

ISSN 0216-4493 (print), ISSN 2597-6109 (online)