MORPHOTYPES AND HARMONICITY OF PHYSICAL DEVELOPMENT IN PRESCHOOL CHILDREN

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Introduction

Physical development in preschool children represents a complex and multifactorial process determined by the interaction of genetic, social, and environmental factors. During the early stages of life, the main parameters of somatic status are formed, characterizing the child's morphotype and the degree of harmony of physical development. The study of these parameters makes it possible to identify growth patterns and timely diagnose deviations that may affect the child's health and adaptive capacity.

Objective of the Study

To perform an individual assessment of the level of development of the main somatometric indicators among preschool children living in Tashkent, determining the type of body constitution and the degree of harmony of their physical development.

Materials and Methods

The study included 848 clinically healthy Uzbek children aged 3 to 7 years, attending preschool educational institutions in Tashkent. Among them were 420 boys (50.9%) and 428 girls (49.1%).

The following somatometric parameters were measured:

- body length,
- body weight,
- chest circumference.

Body type determination was carried out using percentile intervals, on the basis of which the following morphotypes were identified:

- leptosomic (slender),
- pachysomic (stocky),
- microsomic (short), and
- macrosomic (tall).

The harmonicity of physical development was assessed according to the difference between the percentile intervals of height and body mass:

- difference of 0–1 — harmonic development,

- difference of 2 — moderate disharmony,
- ≥3 — pronounced disharmony.

Additionally, WHO (2022) Z-score tables were used for quantitative assessment of deviations from the average values of height, weight, and BMI.

Statistical analysis was performed using SPSS 25.0. Mean values (M±m), standard deviations (σ), and percentage distribution of morphotypes were calculated.

Results

Analysis of the obtained data showed that the normosomic body type predominated among the examined preschool children — 18.3% of boys and 24.7% of girls ($p<0.05$). This finding indicates a higher degree of morphofunctional balance among girls, likely due to physiological characteristics such as earlier fat tissue formation and greater metabolic stability.

At the same time, boys demonstrated a more variable distribution of morphotypes, reflecting uneven growth and musculoskeletal development during early childhood.

The majority of children (74%) exhibited harmonic physical development, where anthropometric indicators of height, weight, and circumferences remained within physiological limits.

A total of 22.3% of preschoolers showed moderate disharmony, mainly reflected in minor deviations of body mass with normal linear parameters—likely temporary adaptive fluctuations without pathological significance. Only 4.1% of children exhibited pronounced disharmony, requiring preventive supervision and correction of diet and physical activity.

According to Z-score analysis, height indicators in 95.96% of children were within ±2 SD, confirming compliance with WHO standards (2006; 2021). Short stature ($Z < -2$ SD) was observed in 2.6% of children and may be related to protein or micronutrient deficiencies or insufficient physical activity. Tall stature ($Z > +2$ SD) was noted in 1.44% of children, likely reflecting hereditary or constitutional factors.

Body weight corresponded to age norms in 90.5% of preschoolers, while 4.3% had weight deficiency and 5.2% — excess body mass. Weight deficiency was more common among boys aged 3–4 years, possibly due to accelerated linear growth and temporary mismatch between energy intake and expenditure. Excess weight was more characteristic of girls aged 5–6 years, associated with early sexual dimorphism and reduced motor activity.

The calculation of BMI confirmed these observations: 94.1% of children had physiological BMI values, 2.7% showed deficiency, and 3.16% had excess body

mass. Thus, the overall BMI distribution indicates a predominance of harmonic development, while extreme values do not exceed 5%, corresponding to WHO norms.

The study of biological age revealed that in 94.5% of children, it corresponded to the chronological age, reflecting balanced somatic development. In 5.5%, signs of biological disproportionality were observed, indicating either acceleration or delay of physical development.

Accelerated development was more common in girls aged 6–7 years and associated with an increase in body mass and fat component, while delay was more typical for boys aged 3–4 years, characterized by weight lag with normal height parameters.

Such deviations are not pathological but require dynamic monitoring, as they may serve as early markers of endocrine or metabolic disorders.

In summary, the structure of morphotypes and the degree of harmony of physical development among Tashkent preschoolers generally correspond to international standards, reflecting physiologically balanced growth and maturation. However, the presence of moderate and pronounced disharmony in nearly one-fourth of children underscores the need for regular anthropometric monitoring to ensure early detection of deviations and to develop regional preventive programs aimed at improving child health and optimizing physical development.

Discussion

The findings confirm a stable correlation between body type and the level of harmony in physical development among preschoolers. Girls more often demonstrated balanced body proportions, while boys exhibited greater linear growth and variability in mass.

Urbanization, uneven physical activity, and dietary patterns influence the morphotype distribution in children.

The use of complex anthropometric techniques, including percentile and Z-score analysis, provides an objective tool for early identification of disharmonic development patterns and allows for the establishment of regional standards of physical growth.

Conclusion

1. Morphotype analysis revealed the predominance of harmonic development among preschoolers (74%), reflecting favorable adaptive growth mechanisms.
2. In 26% of children, varying degrees of disharmony were detected, requiring preventive observation and lifestyle correction.
3. The application of the Z-score method and WHO percentile tables allows for the creation of national standards for physical development of preschoolers in Uzbekistan.

4. Further studies should aim to clarify the relationship between biological age, morphotype, and environmental factors.

Keywords:

anthropometry, preschool children, somatometry, body type, physical development, harmonicity, Z-score, biological age, morphotype.

References

1. Brown, A., & Taylor, R. (2018). *The impact of nutrition on preschool children's growth.* Journal of Pediatric Health, 45(3), 123–134.
2. Garcia, L., & Martinez, P. (2022). *Early intervention in childhood development: Importance and implications.* Child Development Research, 50(2), 78–92.
3. Johnson, D., & Williams, S. (2019). *Growth hormone activity in preschool children.* Endocrine Studies, 66(1), 45–57.
4. IBM Corp. (2017). *IBM SPSS Statistics for Windows, Version 25.0.* Armonk, NY: IBM Corp.
5. Imamoglu, M., & Ziyagil, M. A. (2017). *The role of relative age effect on fundamental movement skills in boys and girls.* New Trends Issues Proc. Hum. Soc. Sci., 5, 84–89. https://doi.org/10.18844/prosoc.v4i5.2680
6. Haywood, K. M., & Getchell, N. (2019). *Life Span Motor Development* (7th ed.). Champaign, IL: Human Kinetics.
7. Hernández Luengo, M., Álvarez-Bueno, C., Pozuelo-Carrascosa, D. P., Berlanga-Macías, C., Martínez-Vizcaíno, V., & Notario-Pacheco, B. (2019). *Relationship between breastfeeding and motor development in children: protocol for a systematic review and meta-analysis.* BMJ Open, 9:e029063.
8. Hestbaek, L., Andersen, S. T., Skovgaard, T., Olesen, L. G., Elmose, M., Bleses, D., et al. (2017). *Influence of motor skills training on children's development evaluated in the MiPS study-DK: study protocol for a randomized controlled trial.* Trials, 18:400.
9. Honrubia-Montesinos, C., Gil-Madrona, P., & Losada-Puente, L. (2021). *Motor development among Spanish preschool children.* Children, 8:41. https://doi.org/10.3390/children8010041
10. Lee, K., Kim, H., & Park, J. (2021). *Correlation between length, weight, and BMI in early childhood.* Pediatric Research Journal, 48(6), 290–300.