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Methodological framework for the ergonomic design of children's playground equipment: A Serbian experience

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Abstract.
BACKGROUND: Adequate application of the static and dynamic anthropometric measures of pre-school children in ergonometric design of children's playground equipment should eliminate all dangers and difficulties in their use. Possibilities of injuries, insecure movements, discomfort able positions and some other dangerous actions may be minimized; and safety and health protection of pre-school children will be increased.
OBJECTIVE: Children's playground represents a significant space of activity for pre-school children. Therefore, it is necessary to apply ergonomic principles which contribute to the adjustment of the playground elements to children's anatomic features. Based on the results presented in this paper, new constructions were designed and new playgrounds were installed in Serbia.
PARTICIPANTS: Participants were children from three pre-school age groups: Junior age group (3–4 years of age, 17 children), Medium age group (4–5 years of age, 22 children), and Senior age group (5–6 years of age, 26 children).
METHODS: Thirty-one static anthropometric measures (12 in standing position, 11 in sitting position, 7 related to dimensions of hand, foot an head, with body weight and shoe size) and 15 dynamic anthropometric measures (7 in standing position, 6 in sitting position and 2 dimension of foot and hand) were defined for the study. Measurements were taken using an anthrop-meter, a flexible measuring tape. Equations for ergonomic design of children's playground elements were also defined.
RESULTS: Basic statistical data of static and dynamic anthropometric measurements of the pre-school children are presented in this paper, as well as the statistical calculation of the corrective anthropometric measurements. Measurements were performed in "Poletarac" kindergarten, part of the pre-school institution "Radost" in Cacak. Elements of playground equipment in "Bambi" kindergarten in Kragujevac (the Indian tent "wigwam", gate-house, swing and carousel) were designed and built using these parameters.
CONCLUSION: Based on the obtained results, several playgrounds were designed, manufactured and equipped with the appropriate items.

Keywords: Ergonomics for children, static anthropometric measures, dynamic anthropometric measures, pre-school children

1. Introduction

Modern toy manufacturers around the world apply the state-of-the-art scientific and technological advancements while designing their products. They strive to meet the safety, ergonomic, aesthetic, psychological, educational, and other requirements. Toy design involves numerous experts from various fields: designers, ergonomists, psychologists, and many others. Today, in most developed countries, the quality of toys is subject to approval of a number of institutions, since the toy is considered a highly important pedagogical and educational instrument. It is important to

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