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Data Article

Dataset on anthropometric measurements of the adult population in Slovakia

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ABSTRACT

This research on human body dimensions offers data for creating comfortable and efficient workplaces. Focusing on Slovak university students (2003–2023) as a representation of the adult population, the study measured 25 key anthropometric dimensions. 11355 respondents (5219 women and 6136 men) were selected for the analysis. This data, analyzed through descriptive statistics, empowers designers to tailor work environments and their elements to individual needs, minimizing worker fatigue and maximizing productivity. The findings are applicable across various design fields: Informing dimensions and functionalities of tools, workspaces, and controls in industrial design and guiding short- and long-term product development in consumer product design. By analyzing future workforce trends through university students, this research helps ensure workplace designs remain relevant and ergonomically sound.

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Specifications table

Subject	Social Sciences
Specific subject area	Anthropology, Human Factors and Ergonomics
Type of data	Table, Graph, Figure Raw, Processed
Data collection	Based on our study and analysis of the literature, we present a set of 25 dimensions and features that can be used in hygienic and ergonomic practice, especially when designing the optimal spatial arrangement of the workplace and creating an optimal working environment. The anthropometric dimensions of university students in Slovakia were measured. Dimensions were measured with a certified anthropometer and certified scales. Standard statistical parameters of descriptive statistics were evaluated: measure of central tendency (arithmetic mean, median, modus), dispersion (percentiles, standard deviation, variance, coefficient of variation), and shape of a probability distribution (skewness, kurtosis). Collectively analyzing these statistics offers a nuanced and comprehensive view of the anthropometric data.
Data source location	The data are stored: • Institution: Technical University in Zvolen, Faculty of Wooden Sciences and Technology • City: Zvolen • Country: Slovakia • GPS coordinates: 48.572528295432974, 19.117270285629747
Data accessibility	Repository name: Mendeley Data Data identification number: 10.17632/2kjkw962gd.3 Direct URL to data: https://data.mendeley.com/datasets/2kjkw962gd/3

1. Value of the Data

- The data represent value in terms of both the scope and period of collection.
- The data are valuable from the point of view of the possibility of creating statistical evaluations.
- Data in both raw and statistical form represent valuable information for various sectors of the manufacturing and design industries.
- The data are suitable for comparison in other countries or world regions and for evaluation of trends.

2. Background

Globally, lifestyles have changed, driven by factors like improved healthcare, population mixing, and psycho-social shifts. This "secular trend" is reshaping populations, with anthropometric characteristics evolving over time. These changes can affect various aspects of body size, including height, weight, body mass index (BMI), and specific body proportions. The secular trend exhibits similar patterns worldwide, though its pace and timing vary [3]. Measurements focused on key points on the limbs, head, and trunk offer valuable insights. Additionally, body mass index (BMI) helps assess weight-to-height ratios. These measurements are simple yet effective [1,2] and enable the description of changes in body dimensions.

These changes in human body sizes directly impact production and business, especially for companies seeking market success, striving to improve the working environment and better adapt the manufactured goods to the needs of modern people. Therefore, we aim to provide a database of key anthropometric features for the Slovak adult population. This resource assists consumer goods manufacturers in adapting product dimensions to current population needs, ultimately enhancing convenience and comfort.

3. Data Description

Based on our systematic measurements and analysis of the literature, we present a database of 25 dimensions and measures that can be used in hygienic and ergonomic practice, especially when designing the optimal spatial arrangement of the workplace and creating an optimal working environment. Since anthropometric measurements are essential in the production of ergonomically correct work aids, machines, and furniture, the creation of this data set is based on an effort to solve the gap in the anthropometric data of the adult population of Slovakia (18–25 years). 11355 respondents (5219 women and 6136 men) were selected for the analysis. Table 1 defines individual dimensions and how they are measured. Representativeness is ensured with a minimum of 322 respondents, covering all of Slovakia. In Table 2, there is a database of measurements of 25 anthropometric measurements on the entire population sample over the entire time period. The table also specifies the gender of the measured subjects and their age. Table 3 shows the basic characteristics of the descriptive statistics of the population measured by gender.

The list of dimensions of interest, along with the associated measurement units, is contained in Table 1, which is available in the dataset [4].

Table 2 in the dataset provides a complete database of measured data of selected anthropometric characteristics of Slovakia's adult population for 2003–2023.

Table 3 in the dataset provides summary data of the basic statistical analysis of descriptive statistics for the measured data of anthropometric dimensions in differentiation by gender.

4. Experimental Design, Materials and Methods

The data were measured over 20 years at various universities in Slovakia. 25 standardized anthropometric dimensions were selected for measurement based on professional literature, technical documentation, and standards that deal with the design and proposal of workspaces, work tools, and the work environment. Measurements were taken in the morning at points located on the upper and lower limbs, head, and trunk (see Table 1). Sampling was carried out using standardized calibrated anthropometric tools: personal scales, anthropometer, tetrameter, pelvimeter, and cephalometer, with a permissible measurement error of 0.5 cm and a precision of 0.1 cm. No participant was measured repeatedly over several years. The data were measured by multiple trained measurers (4–5 people) over the years. They performed the measurements independently as individuals. Measuring devices that did not have systematic errors were used. The correctness of the devices was always thoroughly checked before the measurement. When averaging over a large amount of data, the random errors from the measurements tend to zero out. The average determination error can be estimated as the individual measurement error divided by the number of measured values. If we measure the heights of 100 people with an individual error of $\pm$ 1 cm, then the average height will be burdened by a measurement error of only 1 mm. In our case, we had 11,355 respondents. Such an error cannot affect the results of our measurements. Table 1 and Fig. 1 defines individual dimensions and how they are measured. Not all dimensions were measured in all respondents by gender. For some anthropometric dimensions, the sample size is lower, which was influenced by the variability and gradual expansion of measurements of individual dimensions over time in years. Table 3 shows the sample sizes of measured respondents for individual anthropometric dimensions.

The measured sample data were collectively described by common measures of location and variability – arithmetic means $\bar{x}$ and standard deviations s_x characterizing the size and fluctuation of individual measured values. From descriptive statistics, we processed medians, quantiles for 5 % and 95 %, coefficients of variation, variances, skewness coefficients, and kurtosis coefficients. The calculation of these statistical parameters is generally known in the scientific community and generally accepted statistical procedures apply. The Statistica 12.0 (TIBCO Software Inc., Palo Alto, USA) software was used for the calculation.

Table 1
List of 25 anthropometric dimensions and measures that can be used in hygienic and ergonomic practice, especially when designing the optimal spatial arrangement of the workplace and creating an optimal working environment.

Nr.	Anthropometric measure	Description
1	Body weight	A measure of the amount of substance in the human body. It is determined using a personal scale
2	Stature height	Vertical distance of vertex[a] from the ground.
3	Eye height	The vertical distance of the glabella[b] from the ground
4	Shoulder height	Vertical distance radiale[c] from the floor
5	Elbow height	The distance of the olecranon[d] from the floor
6	The height of the fingertip, standing	The distance of the dactillion point[e] from the floor. The hand is attached and outstretched, fingers are together and outstretched.
7	Arm's reach, standing	The distance of a dactylion point [e] from the ground. The hand is straight and outstretched, the fingers are together and outstretched.
8	Shoulder (bideltoid) breadth	Direct distance between the two points of the acromiale[f].
9	Chest depth, standing	Diameter at the height of the center of the sternum[g] (mesosternum[h]).
10	Arm's reach, standing	Horizontal distance from the rear support to the most distal point of the middle finger of the right upper limb.
11	Arms spread, standing	Direct distance of the left and right dactylion points at maximum tension.
12	Sitting height	The vertical distance of the vertex from the surface on which the proband is sitting. The torso is upright, the thighs are supported along their entire length, the knees are bent at right angles.
13	Eye height, sitting	The vertical distance of the glabella from the seat surface.
14	Elbow height, sitting	Distance of the olecranon from the pad.
15	Shoulder-elbow length	Vertical distance from acromion to the bottom of the elbow bent at a right angle with the forearm horizontal.
16	Knee height, sitting	Vertical distance from the pad to the highest point of the right knee.
17	Arm's reach, sitting	Vertical distance from the seat surface to the most distal point of the right upper limb (dactylion)
18	Forearm-fingertip length	Distance from olecranon to dactylion.
19	Buttock-knee length	Horizontal distance from the seat surface to the most distal point of the right knee.
20	Leg length forward, sitting	Horizontal distance from the back support to the most distal point of the heel.
21	Arm's reach, sitting	The horizontal distance from the back support to the most distal point of the middle finger of the right upper limb.
22	Hand breadth including thumb	Direct distance measured along the back of the hand between the point of the metacarpale radiale[i] and metacarpale ulnare[j] on the outstretched right hand.
23	Palm length	The direct distance between the two stylion points[k] on the right upper limb from the dactylion point at the end of the middle finger.
24	Foot breadth	Direct distance between the metatarsale tibiale[l] and metatarsale fibulare[m] points on the loaded right leg.
25	Foot lenght	The direct distance of the pternion point[n] from the acropodion point[o].

[a] Vertex - the point on the top of the head, which is the highest when the head is positioned in the orientation straight.
[b] Glabella - the point lying above the root of the nose in the lower part of the forehead most anteriorly in the medial plane between the eyebrows.
[c] Radiale - the point on the upper edge of the head of the radius, which is the highest on the attached limb.
[d] Olecranon - the most lateral point of the part of the elbow joint where the trochlea of the humerus is received into the semilunar notch of the ulna.
[e] Dactylion - the point at the end of the finger that lies lowest on the attached upper limb.
[f] Acromial – the point most laterally located on the acromial process of the scapula in an upright position with the limb attached.
[g] Sternum - chest bone
[h] Mesosternum - transverse diameter of the chest (measured in the middle of the sternum)
[i] Metacarpale radiale - the point lying most radially on the head of the axis of metacarpale II.
[j] Metacarpale ulnare - the point lying most lunar on the head of the metacarpale axis V.
[k] Stylion - the point that is the lowest on the processus styloideus radii of the attached limb. We feel it on the thumb side of the forearm
[l] Metatarsale tibiale - the most protruding point on the inner side of the loaded leg (it lies on the head of the metacatarpal axis I.)
[m] Metatarsale fibulare - the most lateral point on the head of the axis of the metatarsale V. of the loaded leg.
[n] Pternion - the most posterior point on the heel.
[o] Acropodion - the most forward point of the loaded leg. It lies at the end of the 1st or 2nd finger.

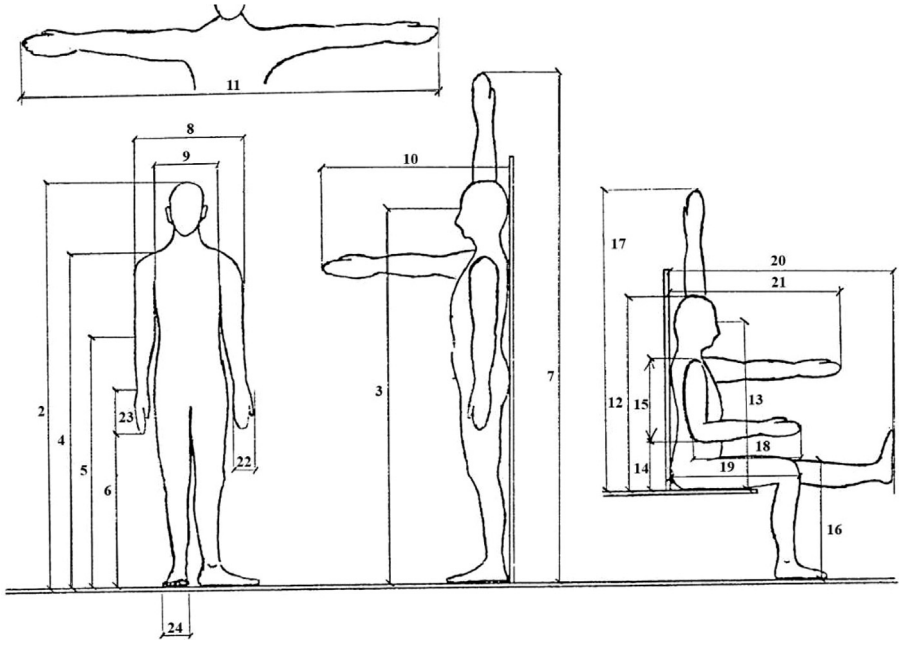

Fig. 1. List of 25 anthropometric dimensions and measures according to ISO 7250 [5].

Limitations

In some subjects, not all 25 analyzed dimensions were measured. For some anthropometric dimensions, the range of data is therefore smaller. This results from an extensive range of measurements carried out in different places by different workers over a long period, who were limited in terms of time, space, and equipment.

Some values may be extremely low or extremely high due to faulty digital transcription from analog recordings. When using data, it is necessary to filter out extreme values.

Ethics Statement

Our university does not have a standard ethics committee that would deal with the ethics of the given research and issue confirmations for its implementation. All students and employees undertake to comply with the principles of the code of ethics and academic integrity no. 8/2021. We have attached the link. https://www.tuzvo.sk/sites/default/files/organizacna_smernica_8_2021_1_0_0_0_0_0_0_0_0_0_1_0_0.pdf.

Data Availability

Dataset on anthropometric measurements of the adult population in Slovakia (Original data) (Mendeley Data).

CRediT Author Statement

Miloš Hitka: Conceptualization, Methodology, Software, Writing – original draft, Supervision; **Miloš Gejdoš:** Data curation, Writing – original draft, Visualization, Investigation, Writing – review & editing; **Maciej Sydor:** Software, Validation, Writing – review & editing.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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