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ANTHROPOMETRIC PROFILE OF BRAZILIAN TRUCK DRIVERS

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Abstract

In Brazil, the road freight has a great importance in the economy. The objective of this work is to define the anthropometric profile of the Brazilian truck drivers and to develop an anthropometric table, based on ABNT (Brazilian Association of Technical Standards). Anthropometric data were collected from 719 Brazilian truck drivers from all over the country. Through the statistical treatment, the average, standard deviation and the percentiles 5%, 20%, 80% and 95% of each body dimension were obtained. The values found were compared with those described in the literature and is the reference for future studies.

Keywords: anthropometry; truck drivers; ergonomics; anthropometric profile.

1. INTRODUCTION

In Brazil, the transport of products is carried out largely by road. According to the National Transport Confederation, in its "CNT Road Survey 2005", there are 1,940,751 trucks in circulation. Although there is no accuracy in these numbers, it is possible through them to be aware of the number of truck drivers in Brazil, assuming that there is at least one driver for each truck. With this, the quantitative importance that the profession has come to have for the country's economy is emphasized (KAPRON, 2012).

Characteristics of this professional activity, such as the intense pace, few breaks, staying in a sitting position for long periods, constant demand for attention, external factors that influence the worker's well-being, such as traffic jams, pollution and the condition of the roads, in addition to socioeconomic issues, make the driver's routine stressful and exhausting (KILESSE, 2005; KAPRON, 2012).

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The restricted space to carry out their tasks, the sitting position and the attention to the dashboard controls, the roof or another place require the driver to repeat fundamental actions to drive the vehicle properly. The motor demands of the profession are specific, as they demand that the head, trunk, upper and lower limbs be used in a coordinated manner during the execution of activities (KILESSE, 2005).

Ergonomic studies aim to adapt work to man, through the analysis of the task, posture and actions of the worker, his physical and psychological demands, aiming to reduce physical and mental fatigue, adjusting a comfortable and safe workstation and thus increasing work efficiency (KILESSE, et al; 2006).

Considering that natural body postures and natural movements are conditions for efficient work, it is essential to adapt the workplace to the measurements of the human body. To this end, anthropometric measurements must be taken (GRANDJEAN, 1998).

As mentioned by Lopes (1996), knowing the characteristics of the worker through a survey of his profile is essential to develop new projects. For this reason, the general objective of this article was to define the anthropometric profile of truck drivers in Brazil, based on the ABNT.

2. DEVELOPMENT

The present research was descriptive and quantitative, where anthropometric data related to the mean, standard deviation and percentiles of the sample were collected, characterizing it as a quantitative study.

The measurements were carried out in the city of Curitiba-PR and metropolitan region, by physiotherapists, considering the right side of the drivers. These were wearing light clothing and without shoes and received guidance on the study and its objective at the measurement site.

The equipment used was a digital scale to verify weight in kilograms and a stadiometer graduated in millimeters to obtain anthropometric measurements in standing and sitting posture. After the end of the collection, the data were tabulated and treated.

The study included 719 truck drivers, employed or self-employed. The number of individuals was established in accordance with the ISO 15535:2012 standard, which recommends that the minimum sample size for an anthropometric study be calculated using the body measurement that presents the highest coefficient of variation from a previous study of the same population and, in this case, the study entitled: "Evaluation of ergonomic factors in

workstations of truck drivers used in the agricultural environment" was used. de Kilesse et al (2006).

Considering a sample with a 95% confidence level and 1.5% percentage error, this was established through the equation (ISO 15535:2012):

$$N = \left(\frac{1{,}96.\ CV^2}{1{,}5}\right).1{,}534^2$$

where:

N = number of samples needed;

1.96 = critical value of z, representing 95% confidence;

CV = coefficient of variation.

The coefficient of variation used as the basis for the calculation was related to the "arm length" of the study mentioned above, which had a value of 9.1, resulting in N = 333, as shown below:

$$N = \left(\frac{1{,}96.\ 9{,}1^2}{1{,}5}\right).1{,}534^2$$

$N = 333$

3. RESULTS AND DISCUSSIONS

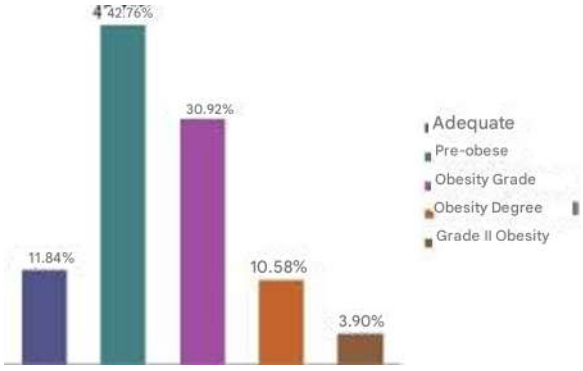
All the individuals studied were male. The age of the drivers ranged from 20 to 81 years, the mean was 46 years (SD = 12), and the age groups of 40 – 49 and 30 – 39 years had the highest number of individuals, with 29.01% and 27.18% respectively. Among the drivers in the sample, there is a lower proportion of young people (6.48%) and elderly (14.3%). It was observed that the predominant age group is between 40 and 49 years old (29.01%) followed by ages between 30 and 39 years old (27.18%), corroborating the study by Penteado et al. (2008), who analyzed the data of 400 truck drivers and found that a large number (40%) were between 40 and 49 years old, and 21% were between 30 and 39 years old. Accordingly, Palácio et al. (2015) analyzed drivers injured by cargo transport, where the predominance was of individuals aged 40 to 44 years (15.3%). Notes similar to other studies are present in the literature (SILVEIRA et al., 2005; MASSON, MONTEIRO, 2010).

Regarding the place of birth of the drivers, taking into account the place of birth, 46.71% were from Paraná, followed by São Paulo with 12.45%, Santa Catarina and Rio Grande do Sul with 11.33% and 8.67%, respectively.

The time in the profession of the drivers ranged from 3 months to 61 years, with 29.84% working in this area between 10 and 20 years and 22.45% between 5 and 10 years.

With regard to education, according to the data collected, 33.62% completed high school; 31.77% have completed elementary school and 25.39% have not finished elementary school. Compared to the survey carried out by Kilesse et al. (2006), this number was 50%, which demonstrates that a significant increase in the schooling of this profession.

The body mass index (BMI) was also evaluated, which is used to relate whether the body weight is adequate to the individual's height, through the formula: BMI = Weight (in kg) divided by the square of height (in meters). The result is then classified as normal BMI (between 18.5 and 24.9kg/m2), overweight (25.0 to 29.9kg/m2) or obesity ($\geq$ 30kg/m²) (REZENDE, 2010). Kilesse (2005) observed that 36% of the drivers who participated in his research were diagnosed with overweight, which in the current classification is comparable to pre-obesity, and 19% had obesity. Compared to the present study, based on the calculation of BMI, about 43% of the individuals had pre-obesity and 30.92% could be considered as class I obese, as shown in Graph 1. Graph 1 - Sample distribution related to BMI classification.



According to a survey conducted by the Getúlio Vargas Foundation (FGV) in 2001, pain in the spine, tendons and joints affects 35% of drivers while 80.5% of drivers have experienced back or spine pain. As Penteado et al. (2008) mentions that 67.75% of the drivers reported constant or occasional posture problems.

Prolonged permanence in the same position, the increase in working hours and the impossibility of spontaneous breaks, associated with furniture and equipment that do not allow comfort, are determining factors for the occurrence of occupational diseases (TODESCHINI,

2008). In order to reduce these discomforts, anthropometry can be considered one of the basic tools for the analysis and design of the entire physical environment related to human beings (PHEASANT and HALESGRAVE, 2006).

These studies reinforced the motivation to know the anthropometric profile of the population in question.

Regarding anthropometric variables, the value in the study by Kilesse et al. (2006) for the height of the 95% percentile was 181.0 cm, while by Fragoso et al. (2015) it was 185.5 cm, which was similar to that of the present study (184.01 cm). Regarding the height of the 5% percentile, the results between this study and that of Kilesse et al. (2006) were similar, obtaining values of 160.43 and 159.0 cm, respectively.

Table 1 shows the mean and standard deviation of the body dimensions studied, as well as the value of the 5%, 20%, 80% and 95% percentiles of the sample in question. The results show that 5% of the drivers have a height below 160.43 cm, as indicated in the calculation of the 5% percentile for this variable, while 5% had a height above 184.01 cm, according to the 95% percentile. Thus, 90% of the workers would be between 160.00 and 184.01 cm tall. The same analysis is considered for the other variables described in Table 1.

Table 1 – Mean, Standard Deviation and Value of the 5%, 20%, 80% and 95% percentiles of the anthropometric variables analyzed in the standing and sitting positions.

			Percentiles (cm)			
Body measurements	Average (cm)	Desv. Standard (cm)	5 %	20%	80%	95%
Weight (in KG)	89,25	16,49	62,04	75,4	103,1	116,46
Stature	172,22	7,15	160,43	166,22	178,22	184,01
Eye-to-floor height	159,37	7	147,83	153,5	165,25	170,92
Shoulder-to-floor height	143,81	6,97	132,31	137,96	149,67	155,31
Nipple line height	125,76	6,06	115,76	120,67	130,85	135,76
Xiphoid appendix height	121,51	5,91	111,76	116,55	126,48	131,27
Elbow-to-floor height	107,6	5,63	98,32	102,88	112,33	116,89
Height Handle-floor	84,77	4,78	76,89	80,76	88,78	92,65
Height Thumb-floor fold	80,34	4,7	72,59	76,39	84,28	88,08
Pubic height	82,76	5,19	74,2	78,4	87,11	91,31
Knee height	44,75	5,56	35,58	40,09	49,42	53,92
Arm length	37,96	2,72	33,48	35,68	40,24	42,44

Elbow-end of index finger	47,9	3,08	42,82	45,31	50,49	52,98
Elbow-fold thumb	35,91	2,22	32,25	34,05	37,77	39,56
Shoulder width	49,9	4,39	42,66	46,22	53,59	57,14
Torso width	35,76	3,01	30,79	33,23	38,29	40,72
Standing Hip Width	36,77	2,82	32,12	34,4	39,14	41,42
Seat - Head	84,56	4,22	77,59	81,01	88,11	91,53
Seat - eye	72,3	4,63	64,65	68,41	76,19	79,94
Seat - Shoulder	57,68	3,84	51,35	54,46	60,91	64,02
Nipple seat-height	39,53	3,58	33,62	36,52	42,54	45,45
Xiphoid appendix seat	35,69	3,24	30,34	32,97	38,41	41,04
Seat-elbow	21,39	3,33	15,89	18,59	24,18	26,88
Seat-Thigh Height	15,83	2,62	11,51	13,63	18,02	20,14
Foot-popliteal fossa height	44,14	2,44	40,12	42,09	46,19	48,16
Sacrum - popliteal	48,02	4,15	41,18	44,53	51,5	54,86
Popliteal-Knee End	15,45	2,56	11,22	13,3	17,61	19,68
Foot Length	26,17	1,5	23,7	24,91	27,43	28,65
Foot Width	10,48	0,93	8,94	9,7	11,27	12,02
Hip width (sitting)	40,15	3,71	34,02	37,03	43,26	46,27
Depth of abdomen (sitting)	29,29	4,85	21,29	25,22	33,36	37,29
Waist circumference	101,92	12,36	81,53	91,54	112,31	122,32

Comparing the other measurements of the 95% percentile found in the study by Fragoso et al. (2015), the findings that most closely resemble those of this study are hip width (37.1 and 41.42 cm, respectively); foot length (26.4 and 28.6 cm) and foot width (10.2 and 12.2 cm). Regarding the 5% percentile, the values found in this study are more similar to those of the study by Kilesse (2005), where the results were similar for the measurement of shoulder height (132.31 cm in the present study and 130 cm for Kilesse (2005)) and arm length (33.48 cm and 32 cm, in that order).

4. CONCLUSIONS

In addition to outlining a profile of truck drivers and the elaboration of a table with the values of the 5%, 20%, 80% and 95% percentiles for the various body dimensions analyzed of truck drivers in Brazil, this study allowed us to conclude that the data found corroborate, for

the most part, with the others found in the existing literature. This article serves as a basis for reference of a Brazilian anthropometric table in future ergonomic studies.

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