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ORIGINAL BRIEF

Comparative pilot study of anthropometric measurements in standing position between the grid template and the anthropometer Harpenden

Estudio piloto comparativo de medidas antropométricas en bipedestación entre Tablas antropométricas y un Antropómetro Harpenden

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ABSTRACT

Introduction: anthropometric dimensions allow the world of work to adapt the means and the workplace to the workers' characteristics and improve their jobs. It is necessary to have alternatives to carry out anthropometric measurements, given the costs of measuring instruments and the limited availability of such instruments in occupational health and safety services.
Aim: to compare standing anthropometric measurements using anthropometric tables versus the Harpenden anthropometer.
Methods: a descriptive cross-sectional study was carried out with a population of 26 workers (11 men and 15 women). The following measurements were taken in a standing position with the anthropometric tables and the Holtain Harpenden anthropometer: height, shoulder height, height at the middle finger, and length of the upper limb, using the Student's t-hypothesis test to compare both measurements.
Results: the values of the anthropometric variables measured by both the anthropometric tables and the Harpenden anthropometer did not present significant statistical differences, both in men and women.
Conclusions: the pilot test showed that using anthropometric tables in anthropometric studies constitutes a low-cost alternative.

Keywords: Anthropometry; Anthropometric Dimensions; Measuring Instruments; Anthropometer; The Grid Template.

RESUMEN

Introducción: las dimensiones antropométricas permiten en el mundo del trabajo adaptar los medios y el lugar de trabajo a las características de los trabajadores/ras y mejorar sus puestos de trabajo. Se hace necesario disponer de alterativas para efectuar las mediciones antropométricas, dado los costos de los instrumentos de medición y la poca disponibilidad de obtenerlos en los servicios de salud y seguridad en el trabajo.
Objetivo: comparar las mediciones antropométricas en bipedestación utilizando tablas antropométricas versus el uso del antropómetro Harpenden.

Metodos: se hizo un estudio transversal descriptivo, con una población de 26 trabajadores (11 hombres y 15 mujeres). Se tomaron las siguientes mediciones en bipedestación con las tablas antropométricas y el antropómetro Harpenden marca Holtain: Altura o Estatura, Altura del hombro, Altura al dedo medio y longitud del miembro superior.Se utilizó la prueba de hipótesis t de student para comparar ambas mediciones.
Resultados: los valores de las variables antropométricas medidas tanto por las tablas antropométricas como el antropómetro Harpenden no presentaron diferencias estadísticas significativas, tanto en hombres como en mujeres.
Conclusiones: la prueba piloto mostro que el uso de las tablas antropométricas en los estudios antropométricos constituye una alternativa de bajo costo.

Palabras clave: Antropometría; Dimensiones Antropométricas; Instrumentos de Medición; Antropómetro; Tablas Antropométricas.

INTRODUCTION

Anthropometry represents a fundamental technique within ergonomics, because from its epistemological assumptions it pursues the study of proportions and dimensions of the human being. Etymologically, the word comes from the Greek arthropod (man) and metrics (measure) which tells us about the measurements of the human body.[1] Likewise, anthropometry is the treaty of the proportions and measurements of the human body.[2]

From the ontological assumptions, the dimensions of the body will have relevance in public health; since anthropometry will be useful in the study of the etiology of chronic diseases and/or in the detrimental effects, which may occur either due to levels of malnutrition or obesity. It is also associated with childhood growth and development, adult chronic diseases; and the effect of the job on working conditions and environment.

In this sense, the measurements of anthropometric dimensions allow the world of work to be able to adapt the work environment to the characteristics of the workers and contribute to improving their workplace.

It should be noted that from the axiological assumptions anthropometry can be static or structural. The first measures the dimensions of the body in a fixed or static position; while the second is dynamic or functional related to movement to certain activities. Likewise, in an industrial environment to handle a machine and/or equipment, it requires certain movements that can be related to dynamic measurements; but the complexity where limbs and joints come into play makes it complicated; that is why for these studies on anthropometric measurements in the workplace, the most recommendable, except in specific cases, is to take static anthropometric data.[3]

Anthropometrics within its epistemological assumptions, in the framework of the measurements and calculations of the different measurements of the body, takes the different anatomical structures as a reference. This approach to the quantifiable and/or measurable sustains its ontological level; which is nothing more than adapting that environment or job in the industrial world to the human being or worker.

On the other hand, the measurement equipment represents the instruments that the anthropometrician requires in his research, they must meet the objectives of each anthropometric study that allows adequate data collection. In this order of ideas, the anthropometric study contemplates the use of sophisticated equipment, which allows measuring the dimensions of the human body in a correct way.[4]

Taking into account the above assumption, it is necessary to have adequate instruments that allow the recording of this anthropometric data. In this sense, if measurements are made manually, these can be addressed with instruments such as: stadiometer, anthropometer, anthropometric compass, tape measure, anthropometric chair, among others. Likewise, in anthropometric studies, there are other more sophisticated forms of measurement using digital technology such as photography, infrared thermography equipment, SYMCAD and its patented 3D acquisition technology.[5]

However, given the high cost (between $400-$2000) of acquiring both manual and digital instruments, it is important to take alternatives regarding other types of measurement instruments at lower costs and easy acquisition that allow the objective of obtaining anthropometric data in our ergonomic research in Venezuela.

In this regard, we can mention an experimental measurement instrument that is used in anthropometry laboratories that is easy to use, acquire and low cost ($50), such as anthropometric tables. This model was initially used by Morgan, Cook, Chapinis & Lunk,[6] it consists of two sheets of wood 2 meters high by 80 cm wide joined by an axis; In addition, each sheet contains a laminated grid sheet and each square measures 0,5cm (Figure 1-2).

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Figure 1. Anthropometric tables

Figure 2. Use of anthropometric tables

Given the above considerations, the objective of this study was to compare standing anthropometric measurements using anthropometric tables versus the use of the Holtain-brand Harpenden anthropometer.

METHODS

A descriptive cross-sectional study was carried out at the headquarters of the Fundación Centro de Estudios Sobre Crecimiento y Desarrollo Humano de la Población Venezolana (FUNDACREDESA). The proper institutional authorization was processed to access the working population of this organization. 26 workers (11 men and 15 women) participated in this study. The following measurements were taken: height or stature, shoulder height, height at the middle finger and length of the upper limb.

As reference for the informed consent of the participant or collaborator we used the letter from the Ministry of Health, Hospital General "Dr. Manuel Gea González", together with the Declaration of Helsinki of the World Medical Association - Ethical principles for medical research in human beings. Once the informed consent document was read, the subjects who agreed to participate voluntarily allowed themselves to be measured and collaborated in the study.[7,8]

RESULTS

The present study was carried out to observe if there are significant statistical differences related to the measurements between the anthropometric tables and the anthropometer. In this sense, for a sample of 26 people between the ages of 20-60+, the student's t test criterion was applied, which is considered for a small sample ≤ 30.[9,10,11,12]

Table 1 shows the averages of the measurements of the male population (n=11) and table 2 for the female population (n=15).

Table 1. Average of anthropometric measurements with the two instruments in men (n=11).

Age	Height (AT)	Acromion height (AT)	Height to finger (AT)	Arm length (AT)	Height (A)	Acromion height (A)	Height to finger (A)	Arm length (A)
23	168	139	63	76	168	139	63	76
52	172	138,1	63,1	75	172,1	138,8	63,2	75,6
35	170,8	141,8	64,7	77,1	170,3	142	65	77
43	165,9	135,3	59	76,3	166,9	136,4	59,2	77,2
19	167	136,5	59,9	76,6	166,9	136,9	60,8	76,1
40	186,1	159	71	88	187	159	71,9	87,1
53	170,6	142,2	64	78,2	171,6	143,1	65	78,1
46	174	143,2	66,5	76,7	175	143,5	67	76,5
24	179	147	69	78	179,7	148	69,4	78,6
58	169,2	140,3	64	76,3	170,2	140,9	64,8	76,1
71	176	145,2	65,7	79,5	176,4	146,2	66,7	79,5

Anthropometric Table (AT), Anthrophometer (A).

Table 2. Average of anthropometric measurements with the two instruments in women (n=15).

E	Height (AT)	Acromion height (AT)	Height to finger (AT)	Arm length (AT)	Height (A)	Acromion height (A)	Height to finger (A)	Arm length (A)
26	159	130	59	71	160,03	131	60	71
45	152	124	56	68	152,9	125	56	69
52	151	125	59,2	65,8	152,1	125	59,2	65,8
28	153	125,3	57,3	68	153,2	126	57,7	68,3
28	158	131	59	72	158,5	131,8	59,3	72,5
49	156,9	131,8	61,2	70,6	156,9	131,2	61,1	70,1
49	148,3	122,2	55,8	66,4	148,7	123,2	56,6	66,6
44	157	127,4	55,8	71,6	158	128,4	56,8	71,6
35	151	124,7	56,3	68,4	150,9	124,6	57,2	67,4
43	158,1	132,3	62,4	69,9	158	133	63,4	69,6
30	160	134,2	61,8	72,4	160,2	135	62,6	72,4
45	151,6	126	57,8	68,2	152,5	127	58,7	68,3
64	158	132,2	56	76,2	159,1	133,2	57,1	76,1
36	157,9	131,7	62,7	69	158,2	131,9	63,3	68,6
52	153,5	125,5	56,2	69,3	153,9	126	57,2	68,8

Note: Anthropometric Table (AT), Anthrophometer (A).

Hypothesis:

For this study, the Student t Hypothesis Test was used. In order to demonstrate whether the differences are significant, the following criterion is applied:

H_0= Medians do not have significant differences. (μ1= μ2).

H_1= Medians show significant differences (μ1≠ μ2) having a significance level α=0.05. Taking the criterion: P-Value›α, there are no significant differences in the measurements of the two teams and on the other hand, P -Valor‹α has significant differences between the two teams from the statistical point of view.

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Table 3. Statistical results for the measurements. Anthropometric tables versus Anthropometer. men (n=11).

Variable	Median	Standard deviation	Standard error of the median	P-Value	Decision making
Height (AT)	172,60	5,94	1,8	p=0,848	P›α= 0,05 accept
Height (A)	173,10	6,11	1,8		H_0: Medians do not have significant differences.
Acromion height (AT)	142,51	6,52	2,0	p=0,840	P›α= 0,05, accept
Acromion height (A)	143,07	6,41	1,9		H_0: Medians do not have significant differences

As can be seen in Table 3, the values of the anthropometric variables measured by both the anthropometric tables and the Harpenden anthropometer do not present significant differences from the statistical point of view that demonstrate the use of one or the other instrument.

Table 4 below shows the results of the sample for women (n=15), with the help of the minitab-17 package.

Table 4. Statistical results for the measurements. Anthropometric tables versus Anthropometer. women (n=15)

Variable	Median	Standard deviation	Standard error of the median	P-Value	Decision making
Height (AT)	155,02	3,67	0,95	p = 0,700	P›α= 0,05, accept
Height (A)	155,54	3,67	0,95		H_0: Medians do not have significant differences.
Acromion height (AT)	128,22	3,80	0,98	p = 0,669	P›α= 0,05, accept
Acromion height (A)	128,82	3,79	0,98		H_0: Medians do not have significant differences

Table 4 also shows that there are no significant differences in terms of the measurements of one of the other instruments. The median are very close, which allows us to demonstrate the use of anthropometric tables.

CONCLUSION

The pilot test showed that the use of anthropometric tables in anthropometric studies constitutes a low-cost alternative, following the protocol referred to by international standards for anthropometric assessment.

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CONFLICT OF INTEREST

None.

AUTHORSHIP CONTRIBUTION

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