

An Anthropometric Study on Sri Lankan School Children for Developing Clothing Sizes

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ABSTRACT To produce a garment, the manufacturers should have a set of necessary body measurements. For this purpose size charts that contain the required body measurements have been developed. These size charts are produced based on average measurements of human bodies and they can be used to make the basic block pattern to construct a garment. As every human being is different to each other, size charts are categorized based on sex, age group, figure type and geographical location. Thus each country may have its own size chart or even charts. This paper presents a size chart that has been developed based on measurements taken from 160 Sri Lankan children between the ages of 5 and 12. In this study, the height of the child is taken as the base measurement, and a size chart has been developed for seven size groups. The results obtained reveals that in general the body measurements of Sri Lankan boys and girls follow the trends of their counterparts in the rest of the world. However, though at the higher sizes the body measurements of Sri Lankan children are comparable with those of the Western children, the measurements at the lower height categories are considerably smaller.

INTRODUCTION

Ever since the advent of ready made garments that are produced in mass-scale, the age-old practice of tailors and fashion designers using measuring tapes to obtain physical measurements of the bodies for which they were manufacturing garments has become irrelevant and impractical. Thus mass production strategies of the past fifty years have encouraged the move from garments made to fit to garments made to size (Istook 2000).

Since ready-made clothing is intended to provide a reasonable fit to the body of the wearer, it is inevitable that attention be directed to the body shape, to differences in body shape within a population, and to differences which exist among different population groups (Winks 1997). As a result of this, much research has been directed towards anthropometric studies on various groups of people in different parts of the world. In recent years with the garment trade becoming global, problems associated with inter-and intra-population variations have emerged, and these

have become the subject of close study by many researchers.

This paper presents the results of an anthropometric study done on one hundred and sixty Sri Lankan school children in order to devise a size chart for them.

Clothing Sizes for Children

According to Gautam (2005), clothing plays an important role in childhood. Careful selection of clothes for a young child can satisfy some of his/her important needs, help get more attention from peer group and identification of sex. Proper fit is particularly important in childhood because it is the period of greatest potential growth and body development. Children require the most flexible and comfortable attire possible. When a garment is properly styled and sized, it is reflecting the children's growth and also does not disturb body movements (Kang et al. 2001). However, research indicates that when it comes to children many garment manufacturers use their own different designations and body measurements for the same size products (Kang et al. 2001). Thus the sizing of children's garments found in shops has been rather chaotic and inconsistent. In order to address this issue the British Standards Institution introduced BS 3728 in 1982 where it was recommended to designate children clothing

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sizes by height dimensions (British Standards Institute 1982). According to this standardisation, the basic control measurement for children's garments, which is the dimension of the body that is given on the label to enable consumers to buy clothes that fit, is the height of the child. However, this size designation is considered acceptable only up to about eleven years, after which the correlations of girth and limb length to height are found to vary considerably (Aldrich 1991).

With the aim of establishing a size designation system that indicates the body size of the child that a garment is intended to fit, British Standards Institution published the BS7231 in 1990 (British Standards Institute 1990). This standard gives specification for children's wear and recommendations of body dimensions for children.

One of the most important factors that should be considered when making garments to accommodate the growth of children is the development of size charts that fit each age group. In children's wear, there is a wide range of body sizes based on several lengths related to height (Park and Suh 1999) and several girths indicating body shape. From ages 6 to 11, children show a remarkable increase in length related to height (Jang and Kwon 1999), and a statistically significant difference of height between age groups is reported (Park and Suh 1999).

According to Winks (1997), for purposes of sizing of clothes, all children are grouped into infants, boys and girls. He arbitrarily suggests that the dividing line between the infants and the boys and girls to be at the height value of 104 cm. His reasoning for this tri-partite division is partly for the purposes of simplicity and partly due to the fact that the members of each group have different growth rates and growth features. In his size chart the infants height are between 50cm to 104cm and the boys' size chart is between 110cm to 176cm and the girls' size range is from 110cm to 164cm.

Aldrich (1991) presents number of size charts, where the infant chart is from 92cm to 116cm, corresponding to 2 to 6 years of children. The boys' size chart is from 122cm to 170cm

(corresponding to 7 to 14 years) and the size chart for girls of undeveloped figures is 122cm to 152cm (corresponding to 7 to 12 years). She presents a different size chart for girls of developing figure between 146cm to 164cm height figures, corresponding to 11 to 14 years. It is usual to give the children's size charts at 6cm height intervals as this approximates to the yearly average growth of children of this age group.

In this paper the size charts for boys and girls of ages between 5 and 12 are presented separately based on the anthropometric study done among this group of children.

METHODOLOGY

For the purpose of this study, body measurements of 160 Sri Lankan school children, 76 boys and 84 girls, between the ages of 5 and 12 were taken. Their height and the three primary body measurements, namely chest girth, waist girth, and hip girth were measured and recorded as per the standard guidelines of taking measurements. The average height of the boys and girls within each of the age group is shown in Table 1.

The chest, waist and hip measurements with reference to the height of the child are given as a scatter diagram in Figure 1.

The body measurement ranges for both the boys and girls surveyed are given in Table 2.

Once the individual measurements are available then they need to be put in a dimensional scale with fixed or variable inter-size intervals and matching them so as to obtain a full set of dimensional values for a body. In order to arrive at this existing size charts, such as the ones proposed by Winks (1997) and Aldrich (1991) were taken into consideration. Accordingly, the population was divided into eight equal class intervals based on the heights ranging between 113.8cm to 153.7cm disregarding the age of the child. The class intervals were 113.8-118.7, 118.8-123.7, 123.8-128.7, 128.8-133.7, 133.8-138.7, 138.8-143.7, 143.8-148.7, and 148.8-153.7. Based on these class intervals the mean values of height, chest waist and hip measurements for the boys and the

Table 1: Average height of children in cm

Age, years	5	6	7	8	9	10	11	12
Boys	119.8	124.8	132.0	136.4	139.9	140.7	138.6	142.8
Girls	121.0	127.9	130.5	133.1	141.8	137.1	138.3	143.0

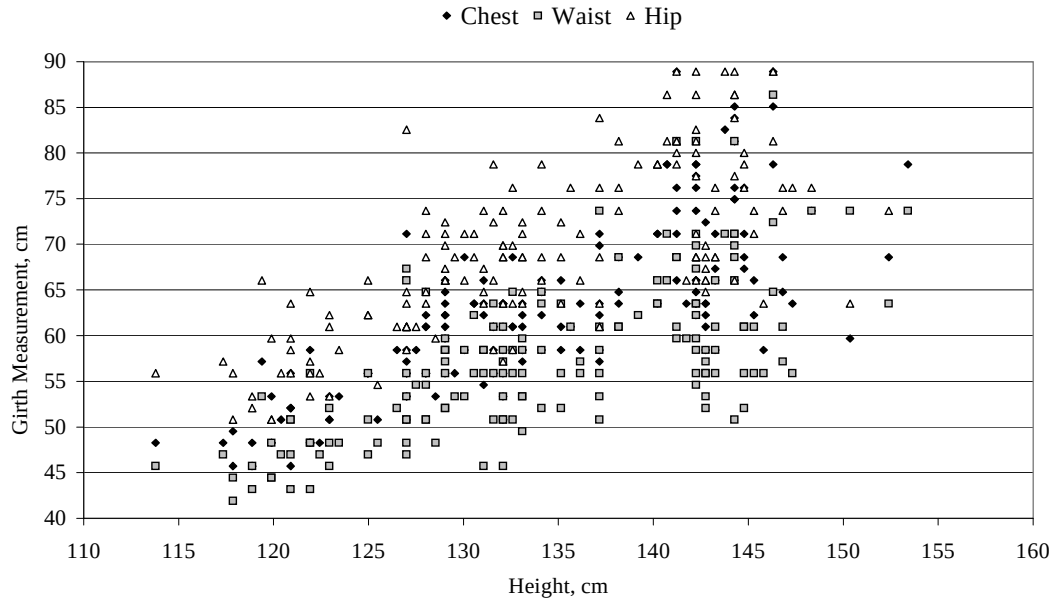


Fig. 1. Chest, Waist and Hip Girth measurements of Children (against their Height)

girls were separately calculated. Table 3 gives the results obtained. However, in the last class range of 148.8-153.7 there were only two boys and one girl and thus this class was not included for further study.

Based on the average measurements obtained and presented in Table 3, two graphs for girls and boys were constructed for the three measurements, viz. chest, waist, and hip against the height measurements. Based on these graphs the three body measurements at height measurements of 116, 122, 128, 134, 140, 146 and 152cm were determined and basic measurement charts were developed. The reason for selecting these height measurements is that one of the intentions of this paper is to compare the size measurements obtained with that of other available general size scales, and these size charts give body measurements corresponding to these height measurements. The resultant size chart is given in Table 4.

Table 2: Body measurement ranges for Boys and Girls

	Boys	Girls
Height	113.8 – 153.4 cm	117.9 – 150.4 cm
Chest girth	45.7 – 88.9 cm	45.7 – 88.9 cm
Waist girth	41.9 – 86.4 cm	43.2 – 81.3 cm
Hip girth	50.8 – 91.4 cm	50.8 – 88.9 cm

Table 3: Body measurements of 160 children surveyed (all measurements in cm)

	Boys' Measurements			Girls' Measurements		
	Mean	Median	SD	Mean	Median	SD
Height	116.3	117.3	2.2	117.9	117.9	0
	121.3	122.9	1.7	120.9	120.9	1.10
	126.3	127.0	0.9	127.2	127.5	1.20
	131.3	131.8	1.3	131.2	131.6	1.60
	136.0	135.4	1.7	136.2	136.7	1.40
Chest	141.7	142.2	1.0	142.1	142.2	1.10
	145.5	144.8	1.4	145.3	145.0	1.20
	47.4	48.3	1.5	49.5	49.5	0
	51.4	53.3	2.9	50.5	50.6	3.0
	55.0	55.9	2.6	56.3	55.9	3.3
Waist	61.1	61.6	4.9	60.4	61.0	3.2
	63.5	64.8	3.8	62.0	62.2	3.6
	69.1	71.1	5.7	67.7	66.0	6.8
	72.7	73.7	7.6	68.4	65.4	7.4
	44.9	45.7	2.6	44.5	44.5	0
Hip	49.1	48.3	2.2	46.8	46.9	3.0
	52.7	55.9	3.0	50.8	50.8	3.1
	56.0	55.9	4.6	55.8	57.2	4.3
	60.0	61.0	6.1	57.4	56.5	3.6
	62.5	63.5	5.5	60.8	60.3	5.2
	64.2	64.8	7.0	62.2	61.0	9.7
	54.6	55.9	3.4	55.9	55.9	0
	57.5	58.4	3.9	56.9	55.9	4.6
	61.2	64.8	3.5	63.4	62.2	3.9
	67.9	68.6	5.1	67.8	67.3	4.4
	71.0	73.0	6.9	69.9	68.6	5.8
	74.3	77.5	7.1	74.8	73.7	6.6
	77.9	78.7	6.6	78.7	76.2	11.8

Table 4: Children's wear Size scale for Sri Lankan Children (all measurements in cm)

Height	Boys			Girls		
	Chest	Waist	Hip	Chest	Waist	Hip
116	47.2	44.7	54.5	46.9	43.1	51.9
122	52.1	49.5	58.1	51.4	47.5	57.8
128	57.1	53.8	63.4	57.3	51.7	64.2
134	62.5	58.2	69.7	61.2	56.6	68.5
140	67.5	61.7	73.3	65.6	59.6	73.0
146	73.1	64.4	78.3	68.9	62.8	77.9
152	79.0	68.0	82.6	75.0	65.0	81.0

Finally, considering the standard deviation values within each class of measurements and the need to adjust the measurements to the nearest centimetre, the values were corrected accordingly, to obtain the final size chart for Sri Lankan school children, between the heights 116cm and 152cm. These results are presented in the next section.

RESULTS AND DISCUSSION

Following the methodology described in the earlier section, the final size chart for the Sri Lankan school children comprising the three primary measurements of chest girth, waist girth and hip girth were developed. The boys' and girls' size charts are given in Table 5 and 6 respectively.

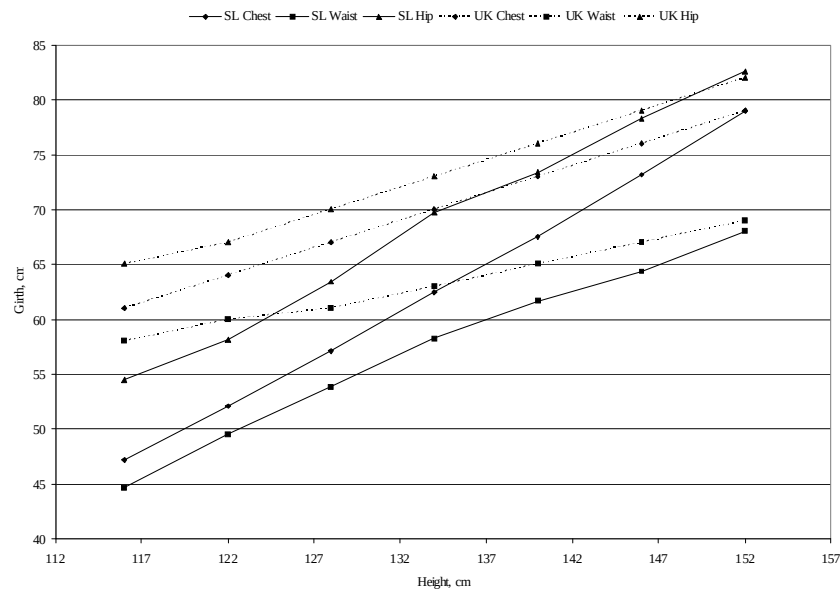
The study reveals that in general the chest, waist and hip girth measurements of boys are higher than that of the girls. However, though the chest measurements of both the boys and girls at 116cm height is the same at 152cm height the chest measurement of boys is 6cm higher than that of the girls. This trend is also seen with the waist measurement where the difference of 1cm at 116cm has become 3cm at 152cm height. However, in the case of hip measurements, the difference of 3cm at 116cm has come down to 1cm at 152cm height. This is in consistent with the body measurements presented by Aldrich (1991), where similar trends in the chest and waist

Table 5: Boy's Wear: Size Chart for Sri Lankan Children

Height	116	122	128	134	140	146	152
Chest	47	52	57	62	67	73	79
Waist	45	50	54	58	62	65	68
Hip	55	60	65	70	74	78	82

Table 6: Girl's Wear: Size Chart for Sri Lankan Children

Height	116	122	128	134	140	146	152
Chest	47	52	57	61	65	69	73
Waist	44	48	52	56	59	62	65
Hip	52	58	64	69	73	77	81

**Fig. 2. Body measurements Sri Lanka and Britain - Boys**

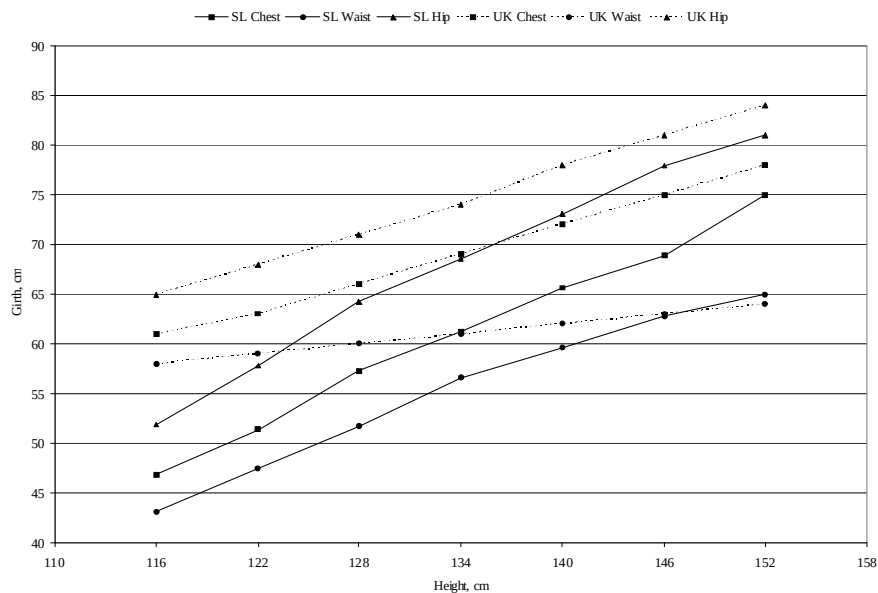


Fig. 3. Body measurements Sri Lanka and Britain - Girls

measurements of boys as against the girls of the same height range are seen. However, in Aldrich's size chart the hip measurement of girls is seen to overtake that of the boys at 122cm. The reason for this must be that with the onset of puberty, the waist to hip ratio in girls, drops down while in boys it remains almost the same (Fredriks et al. 2003). Further, earliest mean age of puberty is reported for African-American girls and the oldest for populations in Asia, with an example of 13 years for Swedish girls and 14.4 years for Indian girls (Rush. 2000). Thus though in the measurement chart British girls, the hip measurement of girls overtakes that of the boys, this phenomenon is not seen among the Sri Lankan children of similar age.

One of the significant differences between the British size charts and the results obtained through this study is that the body measurements of the children at the lower end are considerably smaller in the case of Sri Lankan children. However, as they grow up they seem to develop measurements that are comparable to that of the British children. Figures 2 and 3 illustrate this phenomenon.

CONCLUSION

Currently, in Sri Lanka, there are no size charts

for any categories of people. For all practical purposes, it is customary in Sri Lanka, to use the British Size chart. This applies for the children's wear as well. Through this work it has been possible to develop size charts for Sri Lankan school going boys and girls. Based on the results obtained it can be seen that when foreign size charts are used for manufacturing garments for Sri Lankan children, it leads to fitting problems and measurement variations. The results of the study reveals this is particularly so at the lower height categories. This study thus reiterates the need to have a separate size chart for Sri Lankan children, developed based on the data taken from the relevant population. Though the sample size in the current study was restricted to one hundred and sixty children, as the next step it is expected to expand the sample size to cover a larger population. Further, in this study the measurements were restricted to the three primary body measurements, namely, chest girth, waist girth and hip girth. The next step of this work would be to expand the scope of the study to include all the relevant measurements that are required for a complete size chart for boys' wear and girls' wear.

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