

Anthropometric Standards for Ready Made Garments of Pre-School Children

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KEY WORDS Static Anthropometry. Dress Designing. Standard Measurements.

ABSTRACT The data for the present study consist of 1000 normal pre-school children (504 girls and 496 boys) ranging in age from 2.750 to 5.249 years. Twenty five anthropometric measurements have been taken on each child selected from 14 government and recognised private schools and creches from Chandigarh. From the distribution of frequencies and the percentage of height and chest girth in relation to age, it has been concluded that chronological age does not have great significance for children's clothing. On the basis of overall consistency and strength of relationship with all the linear measurements, circumferences and width measurements, three measurements viz., height, chest girth and hip girth have emerged as important key dimensions. These form the basis for all the other measurements required for the bodice block and sleeve block. The Standard Measurement Chart for girls and boys from 3 to 5 years for the three sizes viz. small, medium and large has been developed. The standard measurements and variable proportions have been used to construct the standard drafting of basic bodice block and sleeve block which are capable of providing well fitted garments for pre-school children.

INTRODUCTION

In the recent years pre-school children's clothing has received a lot of attention throughout the world. The child has emerged as a potential consumer and is of prime concern to the manufacturers of readymade garments. According to Croney (1981) static anthropometry dealing with physical characteristic like length of body parts, girth dimensions and weight are of special concern for designers. Malik (1995) stated that interdisciplinary approach and co-operation between anthropologists, designers, manufacturers and users have helped a great deal in designing quality products. The future of anthropometry and its application is bright in the field of designing in the fast technologically developing world.

According to Kaur and Rajor (1993) surveys on readymade garments reveal that there are no

standard sizes. Due to the non-availability of Indian Standard Measurements for garments, the readymade garment industry in India is still depending on British and American standards, resulting in dissatisfaction to the consumers due to poor fitting and inconsistent sizing. Keeping in mind the urgent requirement of the readymade garment industry and the interest of the child, the present anthropometric study of pre-school children has been carried out for standardisation of measurements of bodice block and sleeve block for pre-school children from 3 to 5 years.

MATERIALS AND METHODS

The results are based on cross sectional data collected on 1000 normal pre-school children (504 girls and 496 boys) ranging in age from 2.750 to 5.249 years. The data were collected from Chandigarh. The pre-school children were selected from 14 government and recognised private schools and creches. The data of birth of the children was obtained from the school registers and the decimal age have been calculated by applying the formula given by Wiener and Lourie (1969). The data have been divided into five six monthly age groups.

An attempt was made to include all the measurements considered essential for designing the bodice block and the sleeve block. The technique was based on IS: 10015 Part 1 (1981), IS: 11621; (1986) and the method used by Singh (1975) designed by Justina A. Singh of the Department of Clothing and Textiles, Maharaja Sayajirao University of Baroda, Vadodara. For adequate interpretation the data have been subjected to various statistical tests viz. mean, standard deviation (S.D.), standard error of mean (S.E.M.), correlation coefficient (r) and test of significance

(t). The shoulder slope measurement taken in degree has been converted to centimetres.

RESULTS AND DISCUSSION

Age Alone is a Poor Indicator of Body Measurements: From the distribution of frequencies and percentages of height and chest girth in relation to age (Table 1 and 2) it is evident that all the three categories of height and chest girth are represented at each age from 3 to 5 years. It can be concluded that chronological age does not have great significance for children's clothing and has not been taken as the sole basis of standardisation. Fisher (1974) pointed out that children of the same age differ widely in height, weight and in shape. According to Crony (1981) for the designer, numerical age is less important than body size and the proportions achieved. It is not proper to fit every child into the garments meant for his respective

age. It needs to be emphasized that garments are made for children not vice versa.

Correlation Coefficients: Age has shown a positive correlation with body weight and most of the other body dimensions ranging from very weak to moderate. Body weight has not shown a consistent correlation with the measurements of girls and boys. Height has a moderate to very strong positive correlation with most of the linear measurements. Chest girth has a higher correlation than hip girth with the circumferences and widths of the head, back shoulder, waist, hip, arm and hand. The values vary from weak to strong (Marascuilo, 1971).

Control Dimensions: On the basis of overall consistency and strength of relationship with all the linear measurements, circumferences and width measurements, three measurements viz., height, chest girth and hip girth have emerged important.

A combination of height, chest girth and hip

Table 1: Mean, standard deviation, standard error of mean, frequency and percentage distribution of children according to age and height categories

Category	Height (cm)						
Age (years)	90-96	97-103	104-110	Total	Mean	S.D.	S.E.M.
Girls							
3.0	33 N 6.15 %	18 N .57 %	2 N 0.40 %	51 N 10.12 %	95.63	4.14	0.58
3.5	30 N 5.95 %	42 N 8.33 %	2 N 0.04 %	74 N 14.68 %	97.31	4.84	0.56
4.0	50 N 9.92 %	69 N 13.69 %	4 N 0.79 %	123 N 24.40 %	97.49	3.37	0.30
4.5	24 N 4.76 %	63 N 12.50 %	38 N 7.54 %	125 N 24.80 %	100.98	4.83	0.43
5.0	14 N 2.78 %	60 N 11.90 %	57 N 11.31 %	131 N 25.99 %	102.20	5.67	0.50
Total	148 N 29.56 %	252 n 50.00 %	103 N 20.44 %	504 N			
Boys							
3.0	36 N 7.26 %	17 N 3.43 %	2 N 0.40 %	55 N 11.09 %	94.73	4.77	0.64
3.5	20 N 4.03 %	34 N 6.85 %	0 N 0.00 %	54 N 10.89 %	97.17	3.60	0.49
4.0	44 N 8.87 %	61 N 12.30 %	19 N 3.83 %	124 N 25.00 %	98.80	4.71	0.42
4.5	18 N 3.63 %	55 N 11.09 %	39 N 7.86 %	112 N 22.58 %	101.27	5.02	0.47
5.0	7 N 1.41 %	62 N 12.50 %	82 N 16.53 %	151 N 30.44 %	104.09	4.80	0.39
Total	125 N 25.20 %	229 N 46.17 %	142 N 28.63 %	496 N			

N = Frequency

Table 1: Mean, standard deviation, standard error of mean, frequency and percentage distribution of children according to age and chest girth categories

Category	Chest girth (cm)						
Age (in years)	47-50	51-54	55-58	Total	Mean	S.D.	S.E.M.
Girls							
3.0	18 N 3.57 %	30 N 5.95 %	3 N 0.60 %	51 N 10.12 %	51.22	2.02	0.28
3.5	24 N 4.76 %	43 N 8.53 %	7 N 1.39 %	74 N 14.68 %	51.54	2.28	0.27
4.0	32 N 6.35 %	80 N 15.87 %	11 N 2.18 %	123 N 24.40 %	51.76	2.24	0.20
4.5	24 N 4.76 %	71 N 14.09 %	30 N 5.95 %	125 N 24.80 %	52.57	21.51	0.22
5.0	27 N 5.36 %	64 N 12.70 %	40 N 7.94 %	131 N 25.99 %	52.91	2.77	0.24
Total	125 N 24.80 %	288 n 57.14 %	91 N 18.06 %	504 N			
Boys							
3.0	22 N 4.44 %	29 N 5.85 %	4 N 0.81 %	55 N 11.09 %	51.09	2.35	0.32
3.5	19 N 3.83 %	30 N 6.05 %	5 N 1.01 %	54 N 10.89 %	51.70	2.36	0.32
4.0	24 N 4.84 %	82 N 16.53 %	18 N 3.63 %	124 N 25.00 %	52.44	2.26	0.20
4.5	13 N 2.62 %	71 N 14.31 %	28 N 5.65 %	112 N 22.58 %	53.05	2.39	0.23
5.0	16 N 3.23 %	73 N 14.72 %	62 N 12.50 %	151 N 30.44 %	53.78	2.63	0.21
Total	94 N 18.59 %	285 N 57.46 %	117 N 23.59 %	496 N			

N = Frequency

girth constitute the 'control dimensions' or the 'key dimensions' and form of the basis of analysis for all the other measurements required for the bodice block and the sleeve block.

- Height has been taken as the 'control dimension' for analysing all the linear measurements.
- Chest girth has been taken as the second 'control dimension' and forms the basis for analysing the circumferences and widths of the head, neck, shoulder, back, waist, hip, arm and hand.
- Hip girth is the third 'control dimension' and has been used to analyse the chest girth.

Nystrom (1937) also suggested that when a height is known than other lengths can be predicted and when a girth is known than other girths can be predicted. According to IS: 10015. Part IV (1982) 'control dimensions' for infant's garments are height and chest.

Selection of Size Interval for Sizing Gar-

ments: According to Hepworth (1960) there is no universal system of sizing. Malik (1995) opined that basic data on human variability and information in a sample manner, that is easy to understand and ready to apply is needed.

In the present study all the measurements have been grouped into three categories on the basis of similarities in the body dimensions viz., Height: Short, (90-96 cm), Medium, (97-103 cm) and Tall, (104-110 cm).

Weight: Light, (10-12 kg), Medium, (13-15 kg) and Heavy, (16-18 kg).

Chest Girth: Small, (47-50 cm), Medium, (51-54 cm) and Large, (55-58 cm).

Hip Girth: Small, (46-51 cm), Medium, (52-57 cm) and Large, 58-63 cm).

Likewise all the other measurements have also been divided into three categories.

Height is the main factor to be considered in the basic size chart. There is an increment of 6 cm between the consecutive classes viz., Short, Medium and Tall. In the chest girth there is an increment of 3 cm between the consecutive

classes viz., Small, Medium and Large. In the hip girth there is an increment of 5 cm between the consecutive classes viz., Small, Medium and Large. In body weight there is an increment of 2 kg in the consecutive classes viz., Light, Medium and Heavy. According to Taylor and Shoben (1990) a sizing system consisting of 5 or 6 cm between each size is considered ideal. However in some case 4 cm or alternative examples of non-consistant increments also exist.

Majority of the children have well proportioned bodies and possess medium height with a well matched medium weight, majority of the short children are light and majority of the tall children are heavy. However, extreme variation is also exhibited by a meagre percentage of girls and boys, in different measurements. The readymade garment industry rarely caters to the size demands of extreme cases.

Standard Measurement Chart: The 'Standard Measurement Chart' for girls and boys from 3 to 5 years for the three sizes viz., Small, Me-

dium and Large has been developed (Table 3). It contains the mean values of all the measurements for each size. The variable proportions for the small, medium and large sizes of girls and boys are presented in table 4.

Conversion of Summary Data into Design Value: This component of the size is decided by the designers and is known as tolerance, ease or average livability amount and is more than mere body size, depending on the action and movement of particular parts of the body and growth. According to Malik (1995) design value is that value of a given variable which is meaningful for designing a particular item. Doongaji and Deshpande (1962) recommended 5 cm of ease at the chest level and 10 cm at the hip level. The Hamlyn Publishing Group Limited (1984) suggested 5 cm at hip level. Pandit (1967) recommended 5 cm ease at the chest level. In the present study the amount of ease taken is given in the 'directions for making the draftings'.

Standard Draftings: A properly fitted dress

Table 3: Standard Measurement Chart, Age: 3-5 years

Size indicator/ Control dimension	Girls			Boys		
	Small size 'S'	Medium size 'M'	Large size 'L'	Small size 'S'	Medium size 'M'	Large size 'L'
Measurement (cm)	Range			Range		
Height	90-96	97-103	104-110	90-96	97-103	104-110
Chest girth	47-50	51-54	55-58	47-50	51-54	55-58
Hip girth	46-51	52-57	58-63	46-51	52-57	58-63
Measurements (cm)	Mean			Mean		
Head girth	48.1	49.1	49.8	48.8	49.8	50.5
Neck girth	24.0	24.3	25.0	24.3	24.7	25.3
Neck width	7.6	7.8	8.4	7.6	8.1	8.5
Neck depth	5.7	5.9	6.6	5.7	6.1	6.7
N.S.P. to waist level	22.8	23.8	25.5	23.4	24.2	25.7
N.S.P. to hip level	35.8	37.6	39.9	36.3	38.1	40.5
Shoulder depth	7.3	7.5	8.1	7.3	7.8	8.3
Shoulder slope	2.7	2.9	3.3	2.8	3.0	3.4
Back width	23.9	24.6	25.9	23.7	24.9	26.3
Scye depth	12.1	12.6	13.6	12.2	12.7	13.8
Chest girth	49.0	52.2	55.1	49.7	52.7	56.4
Hip girth	51.6	54.7	57.9	51.2	54.2	57.7
Waist to hip length	12.3	13.2	14.9	12.9	13.5	15.4
Waist to knee length	31.0	33.2	35.9	30.8	33.2	36.0
Waist height	55.1	59.6	63.9	54.8	59.5	64.2
Under arm length	28.3	29.5	31.6	28.2	29.7	31.5
Upper arm girth	15.7	16.4	17.4	15.6	16.7	17.5
Elbow girth	16.0	16.6	17.9	15.9	16.8	18.0
Wrist girth	11.1	11.5	12.1	11.1	11.7	12.3
Hand girth	14.3	14.9	15.8	14.6	15.2	15.7
Hand length	11.0	11.7	12.9	11.1	11.8	13.0

N.S.P. = Neck shoulder point

Table 4: Variable proportions in the draftings

Drafting	Girls			Boys		
	Small size	Medium size	Large size	Small size	Medium size	Large size
<i>Bodice Block</i>						
AB	29.5	31.1	32.6	29.9	31.4	33.2
AC	23.8	24.8	26.5	24.4	25.2	26.9
E	14.8	15.6	16.3	15.0	15.7	16.6
F	11.9	12.4	13.3	12.2	12.6	13.5
EQ	13.1	13.6	14.6	13.2	13.7	14.8
AK	4.8	4.9	5.2	4.8	5.1	5.3
BM	4.8	4.9	5.2	4.8	5.1	5.3
BN	6.7	6.9	7.6	6.7	7.1	7.7
OI	2.2	2.4	2.8	2.3	2.5	2.9
PJ	2.2	2.4	2.8	2.3	2.5	2.9
KO	8.3	8.5	9.1	8.3	8.8	9.3
MP	8.3	8.5	9.1	8.3	8.8	9.3
CR	14.3	15.0	15.8	14.3	14.9	15.8
DS	14.3	15.0	15.8	14.3	14.9	15.8
<i>Sleeve Block</i>						
AB	10.8	11.6	12.3	10.9	11.7	12.7
AD	34.0	35.3	37.4	34.0	35.6	37.6
AE	5.7	5.8	5.8	5.8	5.9	6.1
DM	7.1	7.3	7.6	7.1	7.4	7.7

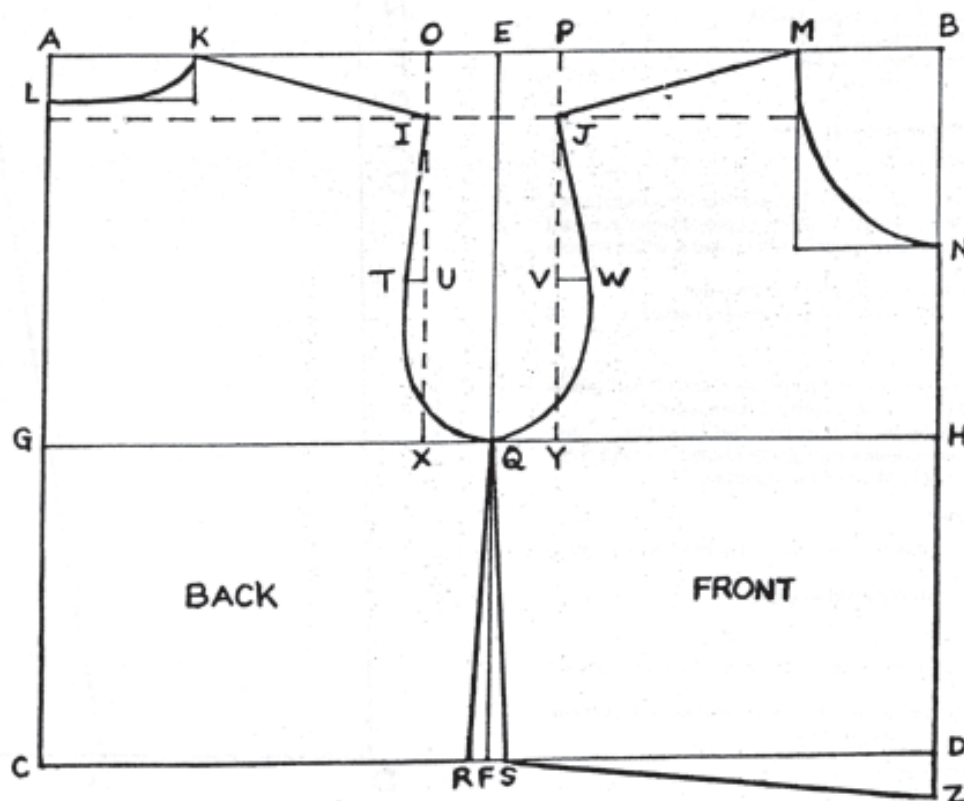


Fig. 1. Basic bodice block scale 1 cm = 1/2 cm

begins with a standard drafting or a basic block of the right size based on standard body measurements. According to Bray (1961, 1970) the basic block is a basic foundation that follows the natural lines and serves as a basis for developing other foundations. The Standard Measurements have been used to construct the standard draftings (Figs. 1 and 2) viz.,

- (i) Basic bodice block
- (ii) Sleeve block

Different types of garments can be constructed with the help of these standard draftings for pre-school children.

Directions for Making the Standard Draftings

i) Basic Bodice Block

From point A measure
 $AB = \frac{1}{2} \text{ chest girth} + 5.0 \text{ cm (ease)}$
 $AC = \text{length of the bodice block}$
 $= \text{length from highest shoulder point to waist level} + 1.0 \text{ cm (ease)}$
 $BD = \text{and parallel to } AC$
 $CD = \text{and parallel to } AB$
 Complete the rectangle ABCD
 AC is the centre back line
 BD is the centre front line
 $\text{Point } E = \frac{1}{2} \text{ of } AB$
 $\text{Point } F = \frac{1}{2} \text{ of } CD$
 Join EF with a straight line.

Neck Curve

Neck width $AK = BM = \frac{1}{2} \text{ neck width} + 1.0 \text{ cm (ease)}$.
 Back neck depth $AL = 1.5 \text{ cm}$ (a proportional constant and same for all the sizes). Join L and K with a smooth inward curve.
 $BN = \text{Front neck depth} + 1.0 \text{ cm (ease)}$
 Join M and N with a smooth inward curve.

Shoulder

From the highest shoulder points K and M mark points O and $P = \text{shoulder depth} + 1.0 \text{ cm (ease)}$
 For the shoulder slope mark points I and J on the perpendiculars dropped from points O and P = straight line.
 Similarly join M and J a straight line.

Armhole Curves

For the depth of the armhole mark $EQ = \text{Scye depth} + 1.0 \text{ cm (ease)}$
 Draw the armpit level as GQH .

Back Armhole Curve

Drop a perpendicular IX from point I on the armpit level.
 Mark U as the mid point of IX . From U mark $T = 0.5 \text{ cm}$.
 Join ITQ in a smooth curve.

Front Armhole Curve

Drop a perpendicular JY from point J on the armpit level.

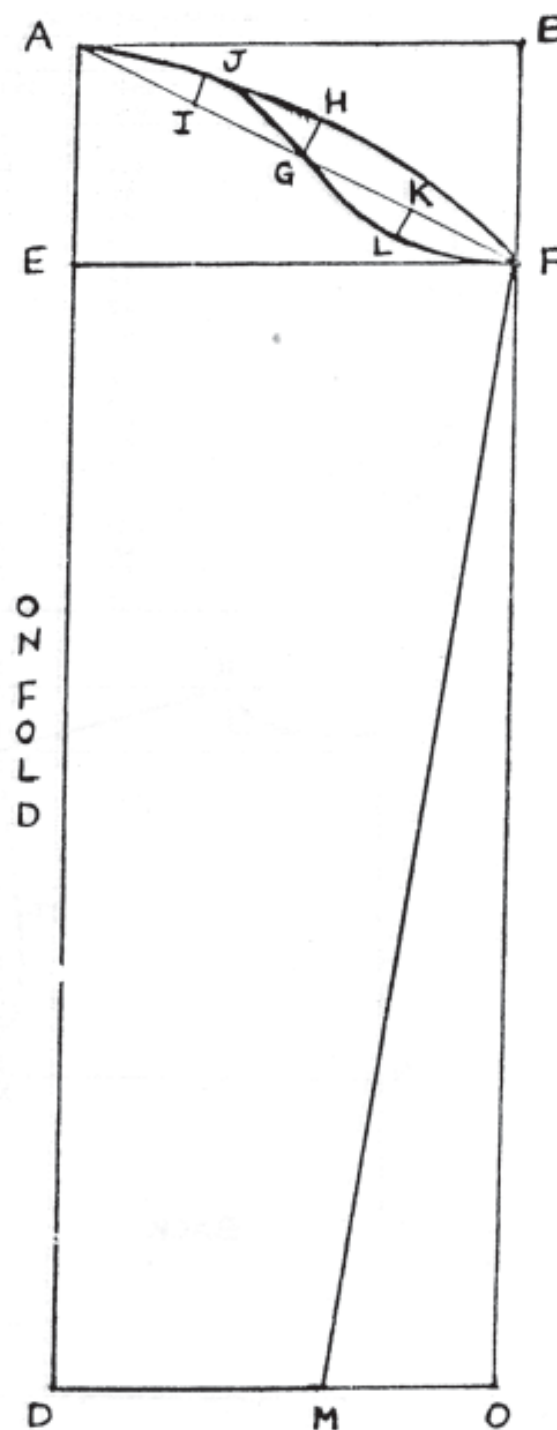


Fig. 2. Sleeve block scale 1 cm = $\frac{1}{2}$ cm

Mark V as the mid point of JY. From V mark W = 1.0 cm. Joint JWQ in a smooth curve.

Waist Line

Back Waist Line

Mark CR = $1/4$ waist girth + 2.5 cm (ease)

Front Waist Line

From D go down to S by 1.5 cm (ease for abdomen). Mark ZS = CR and joint with a straight line.

Under Arm Line

Back Underarm Line

Join Q and R with a straight line

Front Under Arm Line

Join Q and S with a straight line

ii) Sleeve Block

From point A measure sleeve width.
 AB = $1/4$ chest girth - 1.5 cm (a proportional constant and same for all sizes).
 Mark DO = and parallel to AB.
 AD is on fold = arm length + 3.0 cm (ease)
 Mark BO = and parallel to AD
 Complete the rectangle ABOD
 AE = BF = cap length of sleeve
 = arm length AD - under arm length
 Join A and F with a straight line (guide line) and divide it into four equal parts.
 Mark points, I, G and K
 Measures GH = 1.0 cm and IJ = KL = 0.8 cm

Armhole Curves

Back Armhole Curve

Join points AJH and F with a smooth outward curve

Front Armhole Curve

Join points A J G L and F with a smooth curve

Under Arm Line

Measure DM = $1/2$ wrist girth + 3.0 cm (ease) Joint F and M with a straight line.

CONCLUSION

The information explosion, opening of the economy and competition in the global arena had led to a sea change in the scenario. There seems to be a spurt in the manufacture of readymade garments for children in India. The attitude of the consumer is no longer callous.

Well fitted, comfortable and properly designed garments are in great demand. Hence it would be more appropriate to use Indian Standard Measurements for the readymade garment industry.

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