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Memorandum for Record

Anthropology Team, Physical Performance Branch, Soldier Performance Optimization
Directorate, Combat Capabilities Development Command Soldier Center

Subject: New Standard Army Anthropometric Sizing System for Clothing and Equipment

1. Introduction

The U.S. Army completed its most recent anthropometric survey (ANSUR II) in 2012 (Gordon, et al., 2014). The survey includes body measurement data for 93 directly measured dimensions of 1,986 females and 4,082 males from active duty, Army Reserve, and National Guard units. This data is intended to be applied to the design, development, testing, and tariffing of Army clothing and equipment items. Sizing system development was part of the transition agreement with PEO Soldier for ANSUR II.

A comparison of the ANSUR II data to the previous Army anthropometric survey (ANSUR), conducted in 1988 (Gordon, et al., 1989), showed substantial changes in the variation and distribution of the data. While skeletal length dimensions have remained relatively unchanged, the upper ranges of weight and body circumference values have expanded beyond previous 95th percentile values. This increased range of circumference values results in greater variability of important design dimension values within a given size. It also changes the center of the distribution for those dimensions. These changes indicate a need for a new standard sizing system for Army clothing and equipment (Choi, et al., 2016). A surveillance study conducted in 2018 suggests that ANSUR II remains valid as the reference database for Army anthropometry (Choi, personal communication, June 20, 2019).

2. Methods

An analysis of the ANSUR II data was conducted by the Combat Capabilities Development Command Soldier Center (CCDC SC) Anthropology Team to develop a new sizing system. Males and females were considered separately. Sizing for upper body items (shirts, coats) and lower body items (pants) was done independently. The dimensions used for both males and females for upper body sizing were Chest Circumference and Stature, with three inch intervals for each. For males, Waist Circumference and Inseam were used for lower body sizing, and for females Buttock (Hip) Circumference and Inseam were used. The interval for Waist and Buttock Circumferences was three inches, while the interval for Inseam was two inches. Inseam was derived from the dimension Crotch Height ($I = CH - 2''$). The base size, Medium – Regular, was determined by the center of the distribution of the sizing variables.

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3. Results

Four sizing charts were developed; male upper body (coat/shirt), male lower body (pants), female upper body (coat/shirt), and female lower body (pants) (Table 1 and Table 2). Additional frequency tables indicating the sizes needed for at least 90% population accommodation are included as Attachments 1 through 4.

Table 1. Male Sizing (Inches)

MALE Coat / Shirt										
	X-Small		Small		Medium		Large		X-Large	
Chest	34 - 37		37 - 40		40 - 43		43 - 46		46 - 49	
Stature	62 - 65		62 - 65		62 - 65		62 - 65		62 - 65	X-Short
Chest	34 - 37		37 - 40		40 - 43		43 - 46		46 - 49	
Stature	65 - 68		65 - 68		65 - 68		65 - 68		65 - 68	Short
Chest	34 - 37		37 - 40		40 - 43		43 - 46		46 - 49	
Stature	68 - 71		68 - 71		68 - 71		68 - 71		68 - 71	Regular
Chest	34 - 37		37 - 40		40 - 43		43 - 46		46 - 49	
Stature	71 - 74		71 - 74		71 - 74		71 - 74		71 - 74	Long
Chest	34 - 37		37 - 40		40 - 43		43 - 46		46 - 49	
Stature	74 - 77		74 - 77		74 - 77		74 - 77		74 - 77	X-Long
MALE Pants										
	X-Small		Small		Medium		Large		X-Large	
Waist	30 - 33		33 - 36		36 - 39		39 – 42		42 - 45	
Inseam	26 - 28		26 - 28		26 - 28		26 - 28		26 - 28	X-Short
Waist	30 - 33		33 - 36		36 - 39		39 – 42		42 - 45	
Inseam	28 - 30		28 - 30		28 - 30		28 - 30		28 - 30	Short
Waist	30 - 33		33 - 36		36 - 39		39 – 42		42 - 45	
Inseam	30 – 32		30 – 32		30 – 32		30 – 32		30 – 32	Regular
Waist	30 - 33		33 - 36		36 - 39		39 – 42		42 - 45	
Inseam	32 - 34		32 - 34		32 - 34		32 - 34		32 - 34	Long
Waist	30 - 33		33 - 36		36 - 39		39 – 42		42 - 45	
Inseam	34 - 36		34 - 36		34 - 36		34 - 36		34 - 36	X-Long

Table 2. Female Sizing (Inches)

FEMALE Coat / Shirt										
	X-Small		Small		Medium		Large		X-Large	
Chest/Bust	30 - 33		33 - 36		36 - 39		39 - 42		42 - 45	
Stature	57 - 60		57 - 60		57 - 60		57 - 60		57 - 60	X-Short
Chest/Bust	30 - 33		33 - 36		36 - 39		39 - 42		42 - 45	
Stature	60 - 63		60 - 63		60 - 63		60 - 63		60 - 63	Short
Chest/Bust	30 - 33		33 - 36		36 - 39		39 - 42		42 - 45	
Stature	63 - 66		63 - 66		63 - 66		63 - 66		63 - 66	Regular
Chest/Bust	30 - 33		33 - 36		36 - 39		39 - 42		42 - 45	
Stature	66 - 69		66 - 69		66 - 69		66 - 69		66 - 69	Long
Chest/Bust	30 - 33		33 - 36		36 - 39		39 - 42		42 - 45	
Stature	69 - 72		69 - 72		69 - 72		69 - 72		69 - 72	X-Long
FEMALE Pants										
	X-Small		Small		Medium		Large		X-Large	
Buttock / Hip	33 - 36		36 - 39		39 - 42		42 - 45		45 - 48	
Inseam	24 - 26		24 - 26		24 - 26		24 - 26		24 - 26	X-Short
Buttock / Hip	33 - 36		36 - 39		39 - 42		42 - 45		45 - 48	
Inseam	26 - 28		26 - 28		26 - 28		26 - 28		26 - 28	Short
Buttock / Hip	33 - 36		36 - 39		39 - 42		42 - 45		45 - 48	
Inseam	28 - 30		28 - 30		28 - 30		28 - 30		28 - 30	Regular
Buttock / Hip	33 - 36		36 - 39		39 - 42		42 - 45		45 - 48	
Inseam	30 - 32		30 - 32		30 - 32		30 - 32		30 - 32	Long
Buttock / Hip	33 - 36		36 - 39		39 - 42		42 - 45		45 - 48	
Inseam	32 - 34		32 - 34		32 - 34		32 - 34		32 - 34	X-Long

4. Discussion and Recommendations

These size charts are intended to provide a standard sizing system, based on the most recent U.S Army anthropometric data, for Army individual clothing and equipment items. The sizing intervals have been reduced, as compared to the current four inch interval field clothing sizing system, for two main reasons. The primary reason is to control for the additional variability in design dimension values of the ANSUR II data for a given size. Also, a smaller sizing interval is expected to provide a better fit to a wider range of individuals. The methods applied in this analysis were developed in close consultation with the CCDC-SC Design, Pattern & Prototype Team. Values for select design dimensions have been calculated for each size and have been provided to CCDC-SC clothing designers for use as appropriate.

These size charts are best applied to duty uniforms and field clothing, and may be appropriate for some types of body worn protective or load carriage equipment. Other specialty items, e.g., bomb suits, may still require unique sizing systems or some modification of these charts. Not all sizes shown on the charts may be needed, and additional sizes may be created by continuing the sizing intervals up or down. To date, several proposals to test and implement this sizing system have gone unfunded.

The sizing charts presented here are not intended for dress clothing. However, a similar approach could be used to develop dress clothing sizing based on ANSUR II data.

5. References

- Choi, H., Garlie, T., and Mitchell, K. (2016). *Effects of Anthropometrics and Body Size Changes on the Development of Personal Protective Equipment (PPE) Sizing Systems in the US Army*. US Army Natick Soldier Research, Development and Engineering Center, Natick, MA.
- Gordon, C., Blackwell, C., Bradtmiller, B., Parham, J., Barrientos, P., Paquette, S., Corner, B., Carson, J., Venezia, J., Rockwell, B., Mucher, M., and Kristensen, S. (2014). *2012 Anthropometric Survey of US Army Personnel: Methods and Summary Statistics* (Technical Report NATICK/TR-15/007). Army Natick Soldier Research Development And Engineering Center, Natick, MA.
- Gordon, C. C., Churchill, T., Clauser, C. E., Bradtmiller, B., & McConville, J. T. (1989). *Anthropometric Survey of US Army Personnel: Methods and Summary Statistics 1988*. Anthropology Research Project Inc., Yellow Springs OH.

6. Anthropology Team POC

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Attachment 1. Male Coat Size Frequencies

Coat Size	Percent	Cumulative %	...	Coat Size	Percent	Cumulative %
Medium-Regular	14.3	14.3		3XLarge-Long	.1	99.8
Medium-Short	10.2	24.4		3XLarge-Regular	.1	99.8
Large-Regular	10.1	34.6		2XSmall-2XShort	.0	99.9
Small-Regular	9.6	44.2		2XSmall-Long	.0	99.9
Small-Short	8.3	52.4		2XSmall-XLong	.0	100.0
Medium-Long	6.4	58.9		3XLarge-Short	.0	100.0
Large-Long	6.0	64.8		4XLarge-Long	.0	100.0
Large-Short	5.5	70.4		Total	100.0	
XLarge-Regular	3.7	74.1				
Small-Long	3.7	77.8				
XSmall-Regular	3.0	80.8				
XSmall-Short	2.7	83.5				
XLarge-Long	2.3	85.8				
Small-XShort	1.9	87.7				
Medium-XShort	1.6	89.3				
XLarge-Short	1.5	90.8				
Large-XLong	1.1	91.9				
Medium-XLong	1.0	92.9				
XSmall-Long	.9	93.8				
XSmall-XShort	.7	94.5				
2XLarge-Long	.7	95.2				
Large-XShort	.7	95.9				
2XLarge-Regular	.7	96.6				
XLarge-XLong	.6	97.2				
Small-XLong	.5	97.6				
2XLarge-XLong	.4	98.0				
2XSmall-Short	.3	98.3				
XLarge-XShort	.3	98.6				
2XLarge-Short	.2	98.8				
Small-2XShort	.2	99.0				
2XSmall-Regular	.1	99.2				
XSmall-XLong	.1	99.3				
Small-2XLong	.1	99.5				
2XSmall-XShort	.1	99.6				
Medium-2XLong	.1	99.7				

Attachment 2. Male Pants Size Frequencies

Male Pants Size	Percent	Cumulative %	...	Male Pants Size	Percent	Cumulative %
Medium-Regular	10.9	10.9		2XLarge-XLong	.2	98.8
Small-Regular	9.1	20.0		4XLarge-Long	.2	98.9
Large-Regular	8.2	28.1		2XSmall-XLong	.1	99.1
XSmall-Regular	6.8	34.9		3XLarge-Short	.1	99.2
Small-Long	6.2	41.1		2XSmall-XShort	.1	99.3
Medium-Long	6.1	47.2		XSmall-2XLong	.1	99.4
Large-Long	5.2	52.4		Small-2XLong	.1	99.5
Small-Short	5.1	57.5		2XSmall-2XLong	.1	99.6
Medium-Short	5.0	62.5		4XLarge-XLong	.1	99.7
Large-Short	4.4	66.9		Small-2XShort	.0	99.7
XSmall-Long	3.9	70.8		Large-2XShort	.0	99.8
XLarge-Regular	3.6	74.4		2XLarge-XShort	.0	99.8
XSmall-Short	3.5	77.9		3XLarge-XLong	.0	99.9
XLarge-Long	3.2	81.1		3XSmall-XShort	.0	99.9
Small-XLong	1.9	82.9		3XSmall-Short	.0	99.9
2XSmall-Regular	1.6	84.6		3XSmall-XLong	.0	99.9
XLarge-Short	1.5	86.1		Small-3XLong	.0	100.0
Medium-XLong	1.4	87.5		4XLarge-Short	.0	100.0
2XLarge-Regular	1.3	88.8		4XLarge-Regular	.0	100.0
2XSmall-Short	1.2	90.0		Total	100.0	
2XSmall-Long	1.0	91.1				
2XLarge-Long	1.0	92.0				
XSmall-XLong	1.0	93.0				
Large-XLong	1.0	93.9				
XLarge-XLong	.9	94.9				
XSmall-XShort	.7	95.5				
2XLarge-Short	.6	96.2				
Large-XShort	.6	96.7				
Medium_XShort	.4	97.2				
Small-XShort	.4	97.6				
3XLarge-Regular	.3	97.8				
Medium-2XLong	.2	98.1				
3XLarge-Long	.2	98.3				
Large-2XLong	.2	98.4				
XLarge-XShort	.2	98.6				

Attachment 3. Female Coat Size Frequencies

Female Coat Size	Percent	Cumulative Percent
Medium - Regular	15.5	15.5
Small - Regular	13.1	28.7
Small - Short	10.0	38.6
Medium - Short	9.2	47.8
Large - Regular	8.5	56.3
Medium - Long	6.9	63.2
Large - Short	5.1	68.3
Large - Long	4.7	73.0
Small - Long	4.4	77.4
XSmall - Short	3.5	80.9
XSmall - Regular	3.2	84.1
XLarge - Regular	3.0	87.1
XLarge - Long	1.9	88.9
Small - XShort	1.7	90.6
XLarge - Short	1.2	91.8
Large - XLong	1.1	92.9
Medium - XShort	1.0	93.9
Medium - XLong	1.0	94.9
XSmall - XShort	0.8	95.7
2XLarge - Regular	0.8	96.4
Large - XShort	0.6	97.0
2XLarge - Long	0.6	97.6
XSmall - Long	0.5	98.1
XLarge - XLong	0.4	98.5
Small - XLong	0.4	98.8
2XLarge - Short	0.2	99.0
XSmall - 2XShort	0.2	99.2
2XSmall - XShort	0.1	99.3
2XSmall - Short	0.1	99.4
Large - 2XShort	0.1	99.5
XLarge - XShort	0.1	99.6
2XLarge - XLong	0.1	99.7
3XLarge - Long	0.1	99.8
Small - 2XShort	0.1	99.8
Medium - 2XShort	0.1	99.9
Medium - 2XLong	0.1	99.9
3XLarge - Short	0.1	100.0
Total	100.0	

Attachment 4. Female Pants Size Frequencies

Female Pants Size	Percent	Cumulative Percent	Female Pants Size	Percent	Cumulative Percent
Medium - Regular	16.9	16.9	Medium - 2XLong	0.1	99.7
Small - Regular	13.8	30.7	XLarge - 2XShort	0.1	99.8
Medium - Short	11.1	41.7	XLarge - 2XLong	0.1	99.8
Small - Short	8.5	50.2	2XLarge - Short	0.1	99.9
Medium - Long	7.9	58.1	2XLarge - XLong	0.1	99.9
Large - Regular	7.8	65.9	3XLarge - Regular	0.1	100.0
Large - Long	5.2	71.0	Total	100.0	
Small - Long	4.4	75.4			
Large - Short	4.3	79.8			
XSmall - Short	2.6	82.3			
XLarge - Regular	2.2	84.5			
XSmall - Regular	2.0	86.5			
XLarge - Long	1.9	88.4			
Small - XShort	1.6	89.9			
Large - XLong	1.3	91.2			
Medium - XLong	1.3	92.5			
XSmall - XShort	1.2	93.7			
Medium - XShort	1.1	94.8			
XLarge - Short	1.0	95.8			
XSmall - Long	0.7	96.5			
Small - XLong	0.6	97.0			
XLarge - XLong	0.5	97.5			
Large - XShort	0.5	98.0			
2XLarge - Regular	0.3	98.3			
2XLarge - Long	0.3	98.5			
2XSmall - Short	0.2	98.7			
XSmall - XLong	0.2	98.8			
XLarge - XShort	0.2	99.0			
2XSmall - XShort	0.1	99.1			
Small - 2XShort	0.1	99.2			
Large - 2XLong	0.1	99.3			
3XLarge - Long	0.1	99.4			
2XSmall - 2XShort	0.1	99.4			
2XSmall - Regular	0.1	99.5			
2XSmall - Long	0.1	99.5			
XSmall - 2XShort	0.1	99.6			
Small - 2XLong	0.1	99.6			
Medium - 2XShort	0.1	99.7			