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THE INFLUENCE OF ELASTICITY OF MATERIALS ON COMFORT AND DESIGN OF SPORTS COMPRESSION UNDERWEAR

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Abstract
The comfort of clothing has become one of the leading characteristics of the modern range of clothing, be it special, household, protective, sports or corporate. More and more attention is paid to modern men's underwear for sports and exercise because when wearing underwear, it will inevitably produce pressure. The comfort of underwear is determined by several indicators: warmth by sensation, elasticity, and breathability, the convenience of construction in statics and dynamics, design.

Keywords: knitted underwear, T-shirts, comfort of underwear, elongation, adaptability.

Introduction
The processes of deformation of the linen material will cause pressure on the figure. If the material can adapt to deformations of the skin, then a feeling of comfort will arise; on the other hand, if the material interferes with movement, the sensation will be

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uncomfortable. Therefore, the stretching properties of knitted garments play an essential role in the functionality and comfort of underwear.

Material properties and clothing design are two factors that promote or hinder the comfort of the garment. Materials for men's underwear (including military personnel) are now made from Lycra, which give them elasticity and excellent adaptability to the shape of the figure and are a "second skin" due to the stretching properties of the knitted fabric [1]. Materials with an elongation of more than 15% are classified as elastic, and materials with an elongation of less than 15% are classified as inelastic [2]. Fitted garments made from stretchy materials offer minimal resistance to body movement, especially around the elbows, knees, back and buttocks.

The operating conditions of knitted underwear and other types of uniforms for military personnel differ significantly. Knitted products (underwear, T-shirts, underpants, tights, etc.) exposed to deformation loads that are large in magnitude and duration, which is reflected in the proportion of residual deformations in knitwear. Repeated abrasive effects cause increased wear of the fabric at the contact points of clothing parts. Significant energy consumption inherent in physical activity is accompanied by intense sweating, heat, moisture, carbon dioxide, which must be removed from the underwear space.

Material and Method

Modern manufacturers are constantly improving the technology of manufacturing products to improve the quality of manufactured goods. For example, Olivier Lapidus manufactures sportswear from double-sided knitted fabric using Santoni's seamless technology. To ensure high softness and elasticity of the products, a Thermolite thermo-regulating coating is applied to the inner side of the fabric made of elastomeric Lycra threads, and a metallic (silver) coating is applied to the outer side.

To assess the elasticity of indicators of new knitted fabrics produced at domestic knitwear enterprises, in Tashkent Institute of Textile and Light Industry (TITLI) at the Department of Design and Technology of Sewing Production, studies were carried out to establish the extensibility of elastic fabrics used in the production of knitted underwear.

For testing, samples of elastic knitted fabrics with circular knitted weaves were selected with an attachment of polyurethane Lycra yarn, which is currently most widely used for

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the manufacture of men's underwear. The characteristics of the investigated fabrics are presented in table 1.

Table-1. The characteristics of the investigated fabrics

Number of sample	Interweaving	Raw material composition of fabrics (%)	Surface density, g/m^2	Thickness, mm	Product group
1	Supreme	100% CO – 95, PU - 5	201,5	0,55	sports underwear
2	Ribana	100% CO – 95, PU - 5	232,2	0,8	Udershirts and T-shirts
3	Supreme	100% CO – 97, PU - 3	179,9	0,5	Undershirts and T-shirts
4	Interlock	100% CO – 90, PU - 10	227,7	0,85	sports underwear
5	Supreme	Cotton – 95, PU - 5	185,3	0,6	shirts and T-shirts
6	Supreme	100% CO – 92, PU - 8	192,9	0,7	shirts and T-shirts
7	Supreme	100% CO – 95, PU - 5	181,1	0,5	sports underwear
8	Ribana	100% CO – 92, PU - 8	251,6	0,6	sports underwear
9	Ribana (China)	PE- 92, PU- 8	205,2	0,5	sports underwear
10	Supreme (China)	PE – 95, PU - 5	190,4	0,4	sports underwear

Note: Conventional designations adopted in the table: 100% CO - cotton yarn, PE - polyester fiber, PU - polyurethane fiber.

The analysis of the extensibility of experimental samples of elastic fabrics was carried out at a load of 6N [3, 4].

Table-2. Indicators of physical and mechanical properties of highly elastic fabrics

№ Samples.	Breaking force (cN)		Elongation (%)		Extensibility or elongation of the specimen when 6 N (%)		Shrinkage (%)		Abrasion resistance, number of cycles
	By warp	By weft	By warp	By weft	By warp	By weft	By warp	By weft	
1	198,3	224,8	62	67	28	31,2	4	3	20000
2	186	193,1	111	123	51	54	3	4	16500
3	190	236	93	109	49	52	3	2	18000
4	181,7	176,6	25	32	10	9	4	4	14500
5	201,3	178,9	36	41	16	14	3	5	18000
6	322,6	345	14	12	23	21	5	3	16500
7	316	367	15	12	54	51	2	3	25000
8	204,3	201,8	54	63	31	36	4	5	18000
9	196,6	213	26	24	11	14	2	3	18000
10	194	237,6	82	97	58	61	3	4	14500
11	130	118,2	226	221	32	60	2	2	17400
12	734	284	284	151	11	47,4	2	3	21000
13	281	330,3	126	244	17	38	2	2	15500
14	404	524	208	347	13	34	3	2	27500
15	393	456	199	306	15	32	2	2	24000

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Result

The results of tests to determine the extensibility of knitted fabrics in width and length at loads less than breaking (6N) showed that the addition of Lycra does not always increase the elastic properties of the fabrics. The extensibility of the canvases ranges from 20-60%, which corresponds to the 1st and 2nd extensibility groups [5,6].

Conclusion

This kind of knitwear is elastic. Sewn samples of shirts and T-shirts from experimental fabrics also showed that they could recommend for products that occupy an intermediate position between sports and household clothing.

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