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THE PRESSURE CHARACTERISTICS OF ELASTIC WARP KNITTED FABRICS

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Medical textiles are an essential sub-group of technical textiles. With the use of textile products for medicinal purposes, diseases could be prevented or healed. As the life expectancy of humans extends and individuals become less active, medical conditions regarding the musculoskeletal system have become prevalent. For the treatment of these medical problems, elastic textile materials, such as corsets, bandages, posture correctors, wristbands, etc., are suggested by physicians. These elastic textile products must have various physical and mechanical properties to provide comfort for the user and fulfill their duty. Such properties are elongation, elasticity, air and relative water vapor permeability, thermal conductivity/resistance, and compression. Characteristics required to provide the necessary compression usually go against with the properties related to comfort. Therefore, an optimum balance between compression and comfort should be maintained.

In this study, elastic warp-knitted samples suitable for medicinal use were produced with different guide bar threading arrangements and weft yarn materials. The elastic warp-knitted fabrics were produced on a 15-gauge, T.C.H. crochet knitting machine with four guide bars. Yarn feeding tension, fabric takedown load, and the number of used needles were kept constant for all samples. The closed pillar stitches (Figure 1(a)) were knitted using 16.7 tex polyester threads which were fed from a fully threaded guide bar for the ground. The 0.8 mm diameter polyurethane thread was longitudinally fed into the knitting zone with a preliminary elongation of 270%. To determine the influence of the guide bar threading arrangement on the fabric structure and parameters, five different polyurethane threading options were used as given in Table 1. The other two guide bars (Figure 1(c) and (d)) were used to insert weft yarns in the transverse direction on both sides of the polyurethane threads. Four different yarns were used as weft yarns to create elastic fabrics with various raw material compositions (Table 2).

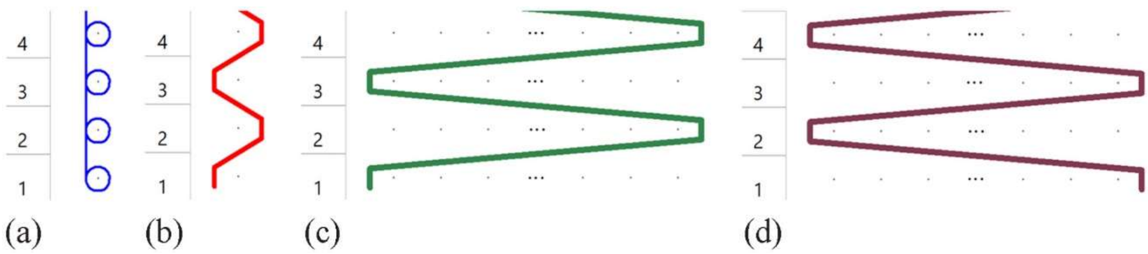

Figure 1. Lapping diagram: (a) first guide bar (pillar stitch), (b) third guide bar (elastomer thread), and (c) and (d) second and fourth guide bars (weft yarns).

Table 1. Threading of elastomer thread and type of weft yarn materials

Threading			Type of materials	
I	1 in, 1 out (50 %)		PET 2	33.4 tex polyester (96 filaments) 2 ply
II	2 in, 1 out (67 %)		PET 4	33.4 tex polyester (96 filaments) 4 ply
III	3 in, 1 out (75 %)		COT	29.0 tex cotton yarn 4 ply
IV	Full (100%)		LIN	29.0 tex linen yarn 4 ply

According to the experimental plan, 15 variants of elastic warp-knitted fabrics which have different threading arrangements for elastomer threads and different raw materials for weft yarn were manufactured. In our former study, the structural and elastic properties of the samples (mass per unit area, stitch density, thickness, and elastic behavior) were determined [1]. In the following research, the thermal comfort properties of the samples (fabric density, air permeability, thermal conductivity, thermal resistance, and water vapor resistance) were tested [2]. Investigating the effect of elastomer threading arrangement and weft yarn material on compression characteristics of the samples was aimed in this research. The pressure exerted by elastic textile materials depends on their structural properties such as raw material, fabric structure, elongation, elasticity, and additionally the diameter of the usage area. In order to obtain different extension values (8%, 20%, and 32%), three measurement disks have different diameters (8, 9, and 10 cm). The pressure measurements were taken with a Kikuhime pressure monitor.

The pressure results were evaluated according to weft yarn type, threading arrangement of elastane threading, and extension. It was revealed that pressure increased with the increment of elastane and extension ratios. Besides, cotton and linen samples exhibited higher pressure (Figure 2) due to their lower extensibility.

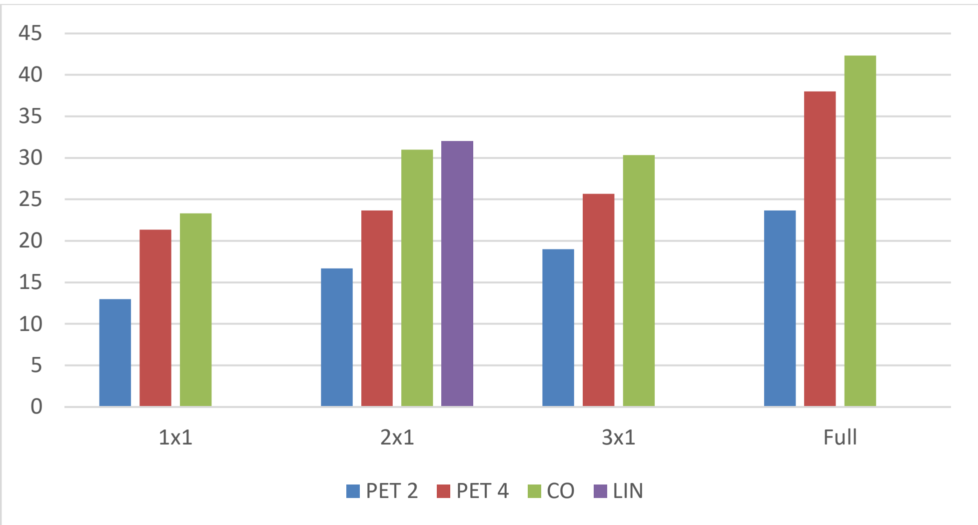

Figure 2. Pressure results at 8% extension

Keywords: Warp knitting, medical textiles, laid-in yarn, elastomer threading, compression

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