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Differences in Clothing Pressure between Bandages and Stockings ⋆

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Abstract

Bandages and stockings are used in a wide variety of ways to provide pressure in medical application; bandages are used to compress part of the leg while a stocking is used to compress the whole leg. The proper use of a bandage or stocking depends on the healthcare setting. To understand the compression effects of bandages and stockings, the pressure of a bandage was compared with that of a stocking made under the same design conditions using Lycra yarn (4.4 Tex, type: T-127c). Multiple-regression analysis was carried out to clarify the factors affecting clothing pressure. The bandage/stocking clothing pressures were explained by the same three factors (i.e., the stretching rates across the width and along circumference and the radius curvature). The relation between stocking pressure (Y) and bandage pressure (x) was linear; Y = 0.89x (R^2= 0.984). The pressure of a stocking needs to be 11% greater than that of a bandage to achieve the same effect.

Keywords: Clothing pressure; Bandage; Stocking; Radius curvature; Loop tension; Multiple correlation

1 Introduction

Compression wear has become popular for controlling body shape and for reducing swelling in daily life. The pressure applied by clothing has advantages and disadvantages [1]. Moderate pressure is needed to achieve an aesthetic silhouette while excessive pressure may have adverse effects [2]. According to Kikufuji et al., menstrual cycles were significantly delayed by 14 days when participants wore a tight foundation layer of clothing compared with when they wore no foundation layer [3]. Meanwhile, Sugimoto reported an increase in urinary noradrenaline excretion when participants wore a girdle. It is possible that the pressure may cause the alternation of the autonomic nervous system [4]. It is therefore important to pay careful attention to the level, duration and frequency of pressure being applied to a particular body part [5, 6]. Among body parts, the legs are most insensitive to pressure and commercial compression wear products that reduce swelling of the legs [7] are widely available. Meanwhile, compression wear has been used for

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the treatment of burn injuries and venous and lymphatic disease; e.g., the treatment of varices by pressure has been reported [8, 9]. However, the pressure level can be a problem depending on the body part [10]. For example, the preferred elastic band pressures for the leg and arm should be higher than those for the neck and abdomen, due to the large presence of the autonomic nervous system at the surfaces of the neck and abdomen. The leg is thus an appropriate body part for applying high clothing pressure [11]. Bandages and stockings are used in a wide variety of ways to provide pressure in medical application; bandages are used to compress part of the leg while a stocking is used to compress the whole leg. The proper use of a bandage or stocking depends on the healthcare setting. We must consider these practical aspects when producing and using bandages and stockings. To understand the compression effect of bandages and stockings, the present paper compares the pressure of a bandage with that of stockings under the same design conditions [12].

2 Experimental Method

2.1 Samples and measurements of physical characteristics [12]

The two samples used in this study are shown in Fig. 1. Sample A comprises six bandages having a width of 5 cm (wale: 37/inch, course: 22/inch) that correspond to the six sensor positions of the device used to measure clothing pressure. Sample B is a stocking made from six bandages identical to those of Sample A stitched together using a flat-knitting machine. The circumferences of the bandages are given in Table 1, with the lengths corresponding to size 6 of Australian womenswear [11]. The connecting parts of the knit were made of a nylon yarn comprising 90 filaments. The knitted structure has a plain stitch. Figure 2 shows measuring points a–f of a wooden leg model. When the samples were placed on the wooden leg model, the circumferential stretch increased approximately 10% to 60%. The sample stretch and recovery properties were obtained using an Instron device (5565A) at 10% and 60% strain. The stress-versus-strain curves of the samples were obtained three times under the same conditions. Each sample was preloaded by 50 kPa (as decided in a preliminary experiment to flatten both curled ends of the bandage) in the first trial and extended by 60%. All experiments were carried out in a climate-controlled room (environmental temperature, 20 °C; relative humidity, 60%).

Fig. 1: Sample A (bandage) and Sample B (stocking)