

Custom-fit sports compression garment engineering integrating seamless/semi-seamless and scan technologies

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Abstract: Athletes lack post-workout recovery benefits due to poorly fitting garments designed using control dimensions from a size system. Contrarily, to achieve the essential fit-giving required compression all over the body utilising scan technology and fabric mechanical response/properties, producing custom-fit compression garments, which this study aimed to achieve. 3D body scanning technology using a size-Stream scanner, which is a non-contact method that precisely identifies the athlete's body position and anthropometric dimensions, is used in this study. It offers precise measurements of circumferences and height from the ground and between various circumferences/points for a body. It allows the extraction of dimensions easily, facilitating knitwear manufacturers through immediate input in knitting machine programs. Seams can cause unwanted compression; thus, seamless clothing is made with 3D weft circular knitting with no or fewer seams by utilising scan data to ensure a precise fit throughout the body. Main (Nylon) and inlay (Elastane double-covered with nylon) yarns were used to knit a 1*1 plain knitted structure. The results were assessed by creating customised lower-body clothing for the Male Alva-40 mannequin based on its scan data. The compression was verified using a Picopress pneumatic pressure measurement device, which verified the gradual compression at seven locations from the ankle to the thigh at the leg. The garments produced exhibited consistent progressive compression without deviation from the stated requirement. The author suggests inputting the fabric's mechanical properties along with 3D body scan data for each individual; necessary adjustments may be made at the knitting stage to obtain the required compression for custom-fit compression garments in fewer trials while enhancing the garments' effectiveness on the whole body.

Keywords: Knitting, 3D body scanning, graduated compression, seamless, custom-fit