



Dreng: Women's Compression Performance Apparel

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A collaborative partnership commenced to investigate the increase usage of compression garments with women collegiate athletes. Limited to no studies have investigated how women psychologically feel about wearing compression garments. Prior research has shown female athletes psychologically adopt new garments to display physical-performance enhancement and to symbolically strengthen their identity and role as an athlete (Casselman-Dickson & Damhorst, 1993; Dickson & Pollack, 2000; Feather, Ford, & Herr, 1996; Schultz, 2004). For years, women athletes have been challenging hegemonic femininity by embracing their muscular bodies while psychologically maintaining their femininity (Krane, 2001; Krane, Choi, Baird, Aimar, & Kauer, 2004). Yet, garment fit dissatisfaction is still reported by woman athletes, mainly due to their muscular physique not fitting properly into garments made for the public (Feather et al., 1996; Schultz, 2004). The project was three phases; 1) investigate women collegiate athletes' perceptions of compression garments by looking at gender and athletic identity and garment satisfaction levels, 2) develop a compression top to fulfill their needs, and 3) test for any performance enhancing factors.

Phase 1 involved a survey of one hundred and eleven NCAA women athletes claiming prior experience wearing compression garments completed the survey. The main reasons for wearing compression garments were thermal properties, to prevent chafing and rashes, and due to it being a required sport garment. The top attributes needed in compression apparel were fit, comfort, mobility, style/design, and durability. The researchers found women athletes perceived compression garments as gender neutral and lacking in femininity and athletic identity. Women athletes reported fit issues at the neck, crotch, waist, and midriff, along with feelings of the garment being clingy, heavy, and hot.

Phase II was prototype development. The researchers deemed a compression top with postural cueing components would be developed. This decision was based on availability of women athletes to participate in the study which resulted in athletes using upper body movements, such as basketball, volleyball, and softball. Phase I athletes were invited to be body scanned to aid in the prototype development. While body scanning commenced an athletic fit model to articulate prototype fit was identified and a 3D body scan was obtained to draft initial compression garment patterns. Compression fabrics samples were ordered and chosen based on compression, thermal properties, and weight. Black was chosen for uniformity as there were limited colors options for compression fabrics. Garment designs were sketched collaboratively, and an initial design was chosen. Initially, four fabrics were chosen but the final garments used a super stretch compression tricot with MaxDri™ and MicroBlok™ finishes, stretch compression bonded with macro mesh, and a stretch lining with wicking properties. The compression top was drafted and draped due to the different stretch fabrics (Armstrong, 2010; Cole, 2016). Prototype #1 was tested on the fit model and deemed it achieved a feminine design, comfort, and movement but improvements were still needed for torso and bust fit due to the athletic build. Prototypes #2 through #4 worked extensively on improving fit in the neck, shoulders, and armseye. Flatlock stitching, in a contrasting light blue color, was used to improve durability and comfort, especially with rubbing or chafing. One fabric was eliminated due to a reported "heaviness after a workout". The super stretch compression provided better wicking giving "a feeling of being cool". A built-in sports bra was recommended to improve thermal comfort as the athletes wore a compression sports bra under the compression tops. Some athletes felt that a front closure may cause injury if they fell

during a competition, so the researchers installed a side closure. The fit model reported excessive heat under the arms and also recommended a wider elastic under the bust to prevent garment movement. The pattern was adjusted to accommodate these requests. The final prototype, as shown, integrated a sports bra with a formed foam bra cup and postural shoulder straps. The sports bra was made with the wicking mesh liner fabric to avoid excess heat during workouts or competitions. The fit model and two other female athletes then wore the final prototype during workouts and provided positive feedback on the fit, mobility, and comfort of the performance compression top. Lastly, compression pants were drafted as Capri length based on body scan measurements and survey comments about crotch depth were considered. Fit model feedback was positive after initial workout. Patterns were then graded to various sizes in regular and tall proportions along with B, C, and D cups sizes for Phase III testing. Pattern grading was based on 3D body scans of women athletes collected during Phase II.

Phase III involved twenty women athletes completing an overhead throwing regiment, Figure 1a, while kinematic data was being collected using a TrackSTAR™ electromagnetic tracking system synchronized with Motion Monitor, Figure 1b. Results indicated there was a significant performance enhancement in the throwing regiment when wearing the postural compression garment when compared to the control garment ($F=5.23$, $p=0.02$). A wear trial survey was completed by all Phase III participants. Participants reported feeling “powerful”, “like a superhero”, and “badass” while wearing the performance compression garment. These responses lead to the naming of the performance compression apparel. Dreng is an Old Norse word meaning warrior which translates into today’s meaning of “badass” – applicable to a male or female.



Figure 1. a (left picture): Throwing regiment, b (right picture): Kinematic test participant.

Dreng represents a new performance enhancing compression garment which can be produced for a niche market. Dreng also expands on the limited research in performance enhancing apparel for women athletes. There are limited brands producing athletic apparel for the professional athletic body. This study shows the need to have better functioning athletic apparel not only to fulfil the athletes apparel needs but also their performance. This collaborative project produced a symbolically improved compression garment with research-backed performance enhancing benefits. Collaborative design allowed for the innovation of the integrated postural strapped sports bra, improving overall compression garment functionality and also enhancing athletic performance.

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