



Newton Sports Bra

Claudine Eckert Barner and Kristin Morris, University of Missouri

Functional Clothing, Ready-to-wear, Textile innovation

Beginning with the goal of improving the functionality of a sports bra for female tennis players ages 40-60 who wear a C-cup or higher, a survey was developed and distributed to females fitting this demographic. Participants ranged in age from 40 to 61 with an average age of 52 and a median age of 53. Average household income of participants is greater than \$100,000 per year. Band sizes ranged from 32 to 38 and cup sizes ranged from C to G with the mode being a C cup. Support, coverage, and heat transfer were found to be the top three features women desire in a sports bra with support through compression and/or encapsulation being more important as cup size increased. Participants noted that “It is hard to find attractive bras that fit.” and “I haven’t found a bra that works at all so I wear 2 bras – a minimizer bra with a sports bra on top.”

This research was conducted with User-Centered Design (UCD) as the framework. User-centered design is a multi-stage problem solving process that not only requires designers to analyze and foresee how users are likely to use a product but also to test the validity of their assumptions (Kanstrup, 2012; Sanders, 2002). Since the 1990s, users have been involved in the design process in an approach called User-Centered Design (Kanstrup, 2012; Sanders, 2002). This method improves credibility, improves performance, and reduces unknowns such as development time and costs, and re-design costs. User-centered design is the dominating ideology when designing functional apparel. Gender, age group and relevant human physiological concerns must be understood prior to commencing the design process in a user-centered functional design approach (Watkins, 1995).

People who lie beyond the “standard model” of users often come up against barriers when using consumer products, especially fashion and clothing products the design of which ought to give special attention to comfort, security and well-being (Martins & Martins, 2012). According to our survey results, the needs of active women aged 40-60 who wear a C-cup or higher are not currently being met with the sports bra designs that are on the market today. Zero of 17 respondents were completely satisfied with their current sports bra.

Compression and encapsulation bras are the two main styles of sports bras (Yip & Yu, 2006). Compression sports bras are designed to press the breasts tightly against the body to minimize movement, whereas encapsulation sports bras enclose each breast individually with separate fabric panels, but still provide a degree of compression. Recently, an innovative approach to sports bra design is to combine the features of encapsulation and compression in one bra. The encapsulation layer provides shape and structure typically with an underwire and molded cup. The compression layer reduces movement by compressing the breast tissue against the body. Most sports bras available on the market are constructed with only one design feature -encapsulation or compression, not a combination of both. A few companies such as Brooks Running are combining both encapsulation and compression into one product with 2 layers. According to the Brooks company website these bras are recommended for women with larger cup sizes who participate in high impact sports (Sports Bra Finder, 2016). Our survey respondents reported that support through compression and/or encapsulation was more important as cup size increased. As

noted by the participants in the survey, the number one feature they desired in a new sports bra concept was movement reduction and support.

The innovative feature of this bra is the wide, adjustable elastic band that is placed superior to the molded cup and allows the wearer to control the amount of compression applied to the superior aspect of the breast to reduce upward movement with high impact activities, thus also reducing downward movement and increasing overall comfort in the wearing experience while participating in high impact activities. When developing the design of the Newton Bra, low fidelity prototyping was conducted using 2 existing sports bras, one worn traditionally and one worn upside down with the lower band of the bra crossing the body just under the axillary area and across the superior line of the pectoralis muscle. This idea was conceived while riding a roller coaster and contemplating Newton's Law that for every action, there is an equal and opposite reaction. If the breast tissue did not rise up with upward movement, it certainly could not come down with the same force.

Survey data was used to inform additional design features of the bra. The prototype was constructed with molded cups with the added stability of the underwire in the inner encapsulation layer with an outer layer for compression and visual effect. The straps were designed to be wide so as to reduce pressure and increase comfort with wearing. Survey respondents indicated a dislike for obvious metal parts in their bras because they perceived the metal to be uncomfortable. The garment was constructed with the minimal use of metal parts – only the concealed underwire and the bra hooks. The prototype was constructed on a lockstitch machine with appropriate stitches to allow the active wear fabrics to stretch and move with the user. Future research will continue with wear trial testing to further inform the development and revision of the Newton Bra.

Citations

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