Effect of Bra Style and Size on its Fit and Comfort

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It is extremely difficult to establish a good fit and comfort in bras. There is an emphasis on a bra sizing system that has not changed much since it was introduced in 1935 by the Warner's company (Lee and Hong, 2007). Bra sizing is complicated and problematic due to the way bra cup sizes are calculated. Bra cup size is decided by manual measurement; the difference between full bust and underbust girths. Breast geometries are 3D in nature which makes the measurements more critical. Within the sizing system, there is the widely adopted concept of "sister sizes". "Sister Size" refers to the size availability for a woman to fit into more than a single band and cup. By choosing a bigger band size, she has to pick a smaller cup size and vice versa. For example, a 34C could wear a 36B or 32D. "Sister sizing" confuses the consumer by insisting that the same breast volume can be congruent with multiple sizes. Getting a good fit and comfort within "sister sizes" is hardly an easy task. Two individuals' may be "sister sizes" but it does not mean that the fit will be the same for each of those individuals.

The goal of this investigation is to study bra fit and comfort according to different sizes, cup seaming techniques, and locations within the bra structure. Two participants were invited, whose breast sizes are linked together through sister sizes (34C and 32D). Based on common bra production methods (Mattews-Fairbanks, 2012), three basic style bra prototypes were developed with different cup seaming techniques; horizontal seam (H-bra), vertical seam (V-bra), and combined seam (HV-bra). These prototypes were used to assess bra fit and comfort on each participant at 8 different locations shown in Figure 1 (Makabe et al., 1991; Chen et al., 2001); center front gore (GCF), underwire at seam (UWS), underwire at armpit (UWA), top of cup (CTP), cup at breast apex (CBP), shoulder strap (STS), band at side seam (BSS), and band at center back (BCB). Fit and comfort were evaluated based on the pressure being exerted by the bra. The pressure data was collected using the Novel Pliance X Expert System (Munich, Germany).

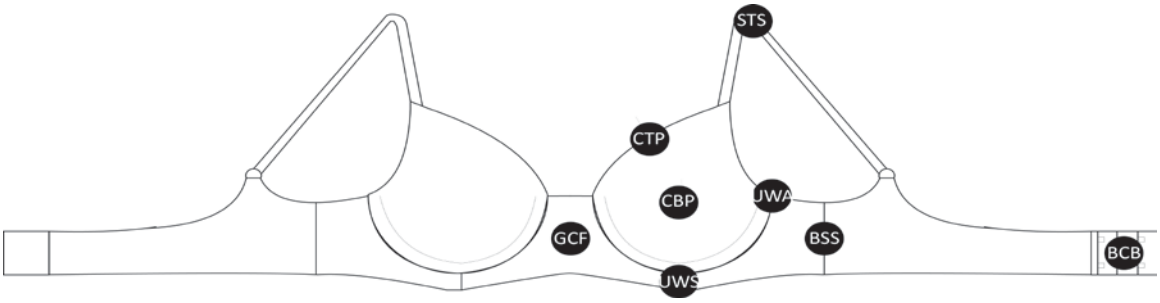

Figure 1. Pressure measurment locations on a bra prototype

Although the prototype patterns of both V- and HV-bras were derived from H-bra, the V-bra yielded an unreasonably larger cup than H- and HV-bras. Therefore, V-bra cups went through considerable size reduction based on the bra fit critera (Song, 2011). Overall, as shown in Figure 2, more pressure was

observed from 32D than 34C. There was no systematic difference between two participants, as well as between the different bra seam lines. Pressures on the certain bra were similar, while others were not correlated at all. Regarding the pressure at different measurement locations, it was found that the pressure was focused on certain locations regardless of the bra styles. Distinct amount of pressure was observed on underwire at seam (UWS) and shoulder strap (STS) for 32D, while it was underwire at armpit (UWA) for 34C. This indicates that 32D has wider breast base, especially to the lateral direction, and 34C has more verically-shaped breast base. The band at side seam (BSS) only showed a slight amout of pressure, compared to the shoulder strap (STS), which indicated that fitting was occuring at the strap rather than the band.

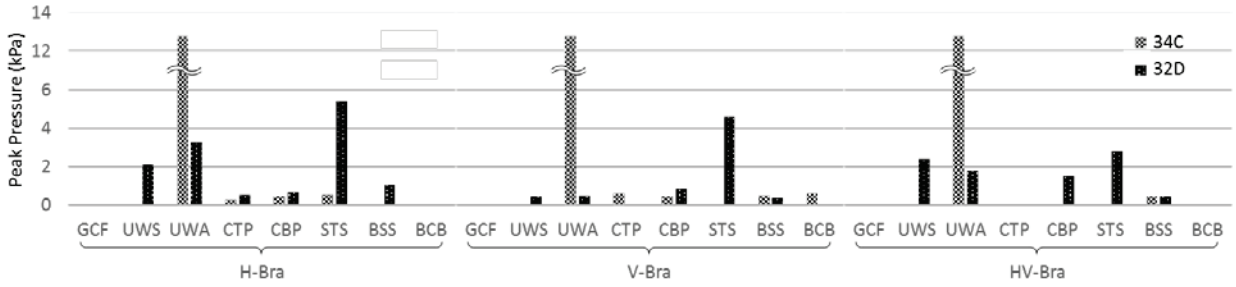

Figure 2. Bra pressure measured

Although the prototypes met the fit critera defined by Song (2011), the collected data showed that the bras were ill-fitting. This was evidenced by the inappropriate amount of pressure, such as too loose band, too tight straps and no pressure at the center front gore. As all bra components are related to one another, it is important to distribute the force properly in order to achieve a good fit and aid in the comfort of the wearer. In order to propose the ideal fit, bras might have to be tailored to individual consumers by mass customization.

Despite being sister sizes, the bra fit and pressure levels were found completely different. Due to the insufficient number of data points collected, statistical analysis was limited. This research needs to be expanded to observe more cases of various participants.

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