

Novel Seamless Sports Bra Designs For Adolescent Girls

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BACKGROUND

- Current sports bra designs often overlook the evolving breast development of adolescent girls during puberty.
- Sports bras can cause excessive compression.
- Seamless knitted structures for extensibility and breast protection was explored.

METHODS

- Surveys were distributed to 25 adolescent girls in Hong Kong to understand their bra preferences.
- Various stretchable knitted structures were developed using a 15L Shima Seiki SWG-XS WholeGarment knitting machine.
- Fabric shape conformity and stretchability are systematically analyzed and compared to conventional foam and spacer fabrics.

RESULTS

- Survey results indicate that comfort and fit are the top priorities for adolescent girls in bra selection (**Figure 1**).
- A weft-knitted inlay spacer structure was developed that exhibits outstanding shape conformity, providing a snug and supportive fit to the breasts (**Figures 2 & 3**).
- To accommodate the dynamically changing breasts of adolescent girls, stretchable knitted structures, including pointelle and links, were strategically incorporated in the seamless sports bras (**Table 1**).

Table 1 Elongation (%) of knitted structures

Fabric structure	Course direction	Wale direction
1x1 Rib	23.78	33.41
2x2 Links	32.43	32.81
1x1 Links	33.07	33.15
Single Jersey	32.06	33.41
2x2 Purl	32.39	30.82
1x1 Purl	32.14	32.14
Tubular	31.29	31.92
Pointelle	33.33	32.99

- A novel seamless sports bras that fits cup sizes AA to B was specifically designed to cope with the changes in breast size, providing a comfortable fit (**Figure 4**).

DISCUSSION

- A series of seamless knitted structures and sport bra designs has been developed to meet the specific requirements of adolescent girls (**Figure 5**).
- Future research should involve larger, more diverse samples to better understand the needs of adolescent girls.

IMPACT STATEMENT

- The findings will have a positive impact on adolescent girls pursuing a healthy and active lifestyle through physical activity by wearing comfortable and well-fitting sports bras.
- The bra accommodates a wide range of sizes and promotes sustainable consumption patterns.

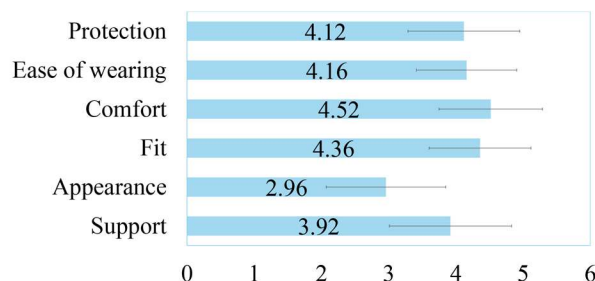


Figure 1 Sports bra preference of adolescent girls (n = 25)

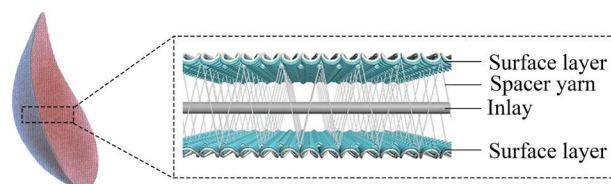


Figure 2 Visualization of inlay spacer fabric

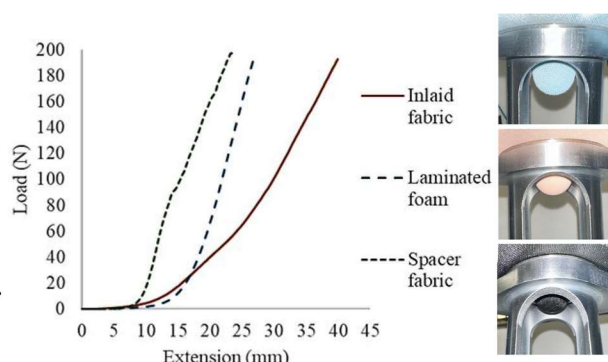


Figure 3 Shape conformity for inlaid fabrics versus laminated foam and spacer fabrics

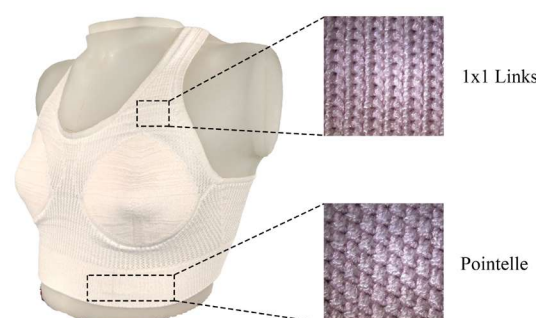


Figure 4 3D scanned seamless sports bra prototype



Figure 5 Proposed seamless sports bra designs

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