

## Sports Bras for Young Arthritic Women: Required Features and Functions

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**Background & Significance.** Sports bras were invented in 1977 when three co-designers Lisa Lindahl, Hinda Miller, and Polly Smith realized that women had no suitable, supportive chest garments for recreational sports and activities such as jogging. These women saw an audience whose needs were not being met and addressed this gap in the apparel market (Keyes, 2020). Currently, one of those overlooked user groups is young arthritic women who have difficulty finding sports bras that they can utilize. This disease affects millions of people across the globe of all varying ages and races every single day (Charleson, 2020). In the U.S., it affects nearly 23% of the population, which is roughly 54 million people (Centers for Disease Control and Prevention, 2019). In 2019, arthritis affected 23.7% of the total adult population, in which 26.5% of them were women (Centers for Disease Control and Prevention, n.d.). Even so, the apparel industry has been slow to respond and most retailers do not carry arthritic friendly apparel, especially sports bras and undergarments. This is problematic, specifically for young arthritic women who want to stay active, healthy, and perform exercises that will relieve joint and muscle pain. While there are many studies which have explored the relationships among clothing and disabilities, arthritis, or age, there is only a handful which specifically examined design requirements for women with arthritis such as therapeutic gloves (Nasir & Troynikov, 2019) or arthritic inclusive footwear (Goodacre & Candy, 2010).

**Purpose & Objectives.** The purpose of the study was to explore and develop design requirements for functional sports bras for young arthritic women. Using the Lamb and Kallal (1992) functional, expressive, and aesthetic (FEA) model, clothing attributes were collected from Gen Z and Millennial women with arthritis. The results of this study would help academia and retailers understand the design requirements for more accessible sports bras. The results of this research would also lead towards a greater understanding of consumer needs regarding young arthritic women and sports bras. Three research objectives guided this study: a) Examine the satisfactions and dissatisfactions of young Millennial and Gen Z arthritic women wearing regular sports bras (compared to an average woman), b) explore users' functional, expressive, and aesthetic needs for a sports bra, specifically for young Millennial and Gen Z women with arthritis/upper arm mobility issues, and c) propose design specifics and strategies for designing sports bras for young Millennial and Gen Z arthritic women.

**Method & Theoretical Framework.** A sequential mixed methods research design with a user-centered design framework was used for this study. This framework was ideal because it provided a five step, design-based approach to understanding the desires, limitations, and needs of the end user during each stage of the design process (Usability.gov, 2019). To identify the required features and functions needed for a sports bra, stages 1 through 3 of the user-centered design framework were used. In *Stage 1*, market research of currently existing bras was collected and analyzed to determine current features, design specifics, aesthetics, and functions. A quantitative survey and a qualitative virtual focus group interview were conducted among U.S.

based Gen Z and Millennial women with arthritis that affects the upper body. These methods were used to determine current sports bra wearing experiences, user needs, physical posture descriptions regarding mobility, and demographic information. The survey was conducted first, in which about 50 participants were recruited on social media, arthritis related web forums, and through arthritis medical center advertisements using a snowball sampling method. Following the online survey, three participants were recruited for an in depth virtual focus-group interview using Zoom. The interview was recorded and transcribed verbatim for thematic content analysis (Corbin & Strauss, 2008). In *Stage 2*, the satisfactions, dissatisfactions, physical postures, needs, and demographic data were analyzed using the FEA model to determine user needs. In *Stage 3*, design specifics, features, and strategies for sports bras for young arthritic women were proposed.

**Results & Discussions.** The results of the market research revealed that most sports bras have front fastening mechanisms, have fabric blends such as polyester and spandex or Lycra and nylon, most do not have adjustable straps, and most provided adequate sweat wicking functions. Arthritic and elderly bras were also examined; all fastened in the front using Velcro or large, flat hook and eyes, and none had adjustable straps. Based on the survey and focus-group interview, a total of 11 themes were identified. Under the functional category, it was found that sports bras could use improvement with body temperature control, support (especially for larger chested women), comfort, fit, donning and doffing, material flexibility, strap designs, fastening systems (or lack of), and strap adjustments. Under the expressive category, users explained that they do not come in a large enough selection of designs that satisfy “*modesty, self-esteem, desired aesthetics, and privacy*”. Regarding socioeconomics, sports bras are not affordable or easy enough to locate. Under the aesthetics category, most participants expressed that sports bras are not very attractive and they “*do not come in many colors or styles for someone my age*” [P#43]. The participants believed that appealing designs would improve their self-esteem and body image.

Based on the analysis, it was determined that accessible sports bras for young arthritic women must have large, front fastening systems (such as Velcro or large zippers) for easy donning and doffing. In addition, they must have adjustable straps with easy mechanisms in the front and must be made of flexible materials that mold to the chest to provide support without using boning or wiring, especially for larger chests. They should also adequately control body temperature, wick away sweat, and must be breathable. To optimize comfort, materials should not be itchy or too heavy, seams should be minimal, and the under band should not be too tight and should sit lower under the chest to prevent chafing. Design styles should also include a wider range of modesty and trendy aesthetics to appeal to more and different types of consumers with built-in cup padding to hide nipping. In terms of size, sports bras for arthritic women should be made for a variety of body shapes and sizes with easy adjustability to account for occasional body swelling. The proposed designs of sports bras would meet the user requirements and be inclusive to young women with arthritis.

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