

## Functional Assessment of Exercise Apparel for Overweight and Obese Adults

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**Background and Significance.** Obesity and problems associated with being overweight are increasing among Americans, and approximately 73.7% of adults today are overweight (31.1%) and obese (42.5%) (Centers for Disease Control and Prevention, 2016). Being overweight or obese causes significant body changes that differ from those with normal Body Mass Index (BMI) values because of fat deposits, which may increase fit and support difficulties. Apparel for overweight and obese customers may need to include several additional features to support areas of accumulated fat to reduce pain in the neck, lower back, and other areas. Given the significantly large number of overweight and obese adults in the United States, exploring fit and support issues is important to develop new exercise apparel lines that may help overweight and obese adults engage in physical activities to improve their health.

This study conducted functional assessment (i.e., fit and support issues) of exercise apparel for overweight and obese adults. Functional aspects of exercise apparel are important to evaluate whether it allows consumers to engage in physical activity. According to Lamb and Kallal (1992), functional considerations in evaluating a garment include fit, comfort, and mobility. A recent study on exercise apparel for large women (Greenleaf et al., 2020) found that plus-size exercise apparel was not fully functional and it did not "...allow [a person] to move and engage in activity without restriction" (p. 78), which caused them to feel bad when shopping both in-store and online. Further, larger women had problems with inaccurate sizing in tops and bottoms in both shopping channels (Greenleaf et al., 2020). However, studies on functional assessment of exercise apparel for overweight and obese adults are still scarce. Thus, the purpose of this study was to explore fit problems, satisfaction, and fit preference for each category of exercise apparel and the need for support in each body site. In addition, gender differences in their functional assessment of exercise apparel were examined as well.

**Methods.** A sample of male and female adults in the U.S. with BMIs of 25 or higher was recruited through Amazon Mechanical Turk. The participants completed a survey that consisted of three sections: (1) Questions on fit problems; fit satisfaction, and fit preferences; (2) questions about support in ideal exercise apparel for each body site, and (3) questions on demographics. Measures were adopted based on previous studies: Fit problems (Shin et al., 2018), fit satisfaction on 20 body sites (LaBat & DeLong, 1990), and fit preferences for loose, semi-fitted, and fitted exercise apparel (Newcomb & Istook, 2011). Measures of support for ideal exercise apparel were created based on the body sites with the body cathexis measure (LaBat & DeLong, 1990). Items on fit problems (1, Strongly disagree-7, strongly agree), fit satisfaction (1, Very dissatisfied-7, Very satisfied), and support for ideal exercise apparel (1, Much less-7, Much greater) were measured using a 7-point Likert scale. Items on fit preference regarding 8 exercise

apparel categories were measured based on three fit levels (i.e., loose, semi-fitted, and fitted). SPSS was used to perform a descriptive analysis and analysis of variance (ANOVA).

**Results.** Among 700 participants who completed the survey, a total of 515 surveys were usable based on eligibility criteria: 18-years old or above, BMIs of 25 or higher, spent 3 minutes or more to answer the survey, and answered two screening questions correctly. The participants' mean age was 40 and the majority was between 19 and 55 (83.9%). The participants' mean BMI was 31.2, mean height was 5'6", and mean weight was 195.22 lb. The majority was White or European American (72.8%), followed by Black or African American (10.3%), Asian or Asian American (5.0%), and Hispanic or Latino (4.3%). Approximately, 40% (n = 209) were male and 60% (n = 306) were female.

The results showed that overweight and obese adults had moderate fit problems in exercise apparel in three sub-dimensions: Physical ( $M = 4.40$ ,  $SD = 1.37$ ); aesthetic ( $M = 4.70$ ,  $SD = 1.45$ ), and functional ( $M = 4.28$ ,  $SD = 1.62$ ). Gender differences in fit problems were found in only two sub-dimensions, physical fit ( $M_{\text{male}} = 3.99$ ,  $M_{\text{female}} = 4.68$ ,  $F = 24.94$ ,  $p < .001$ ,  $\eta^2 = .22$ ), and aesthetic fit ( $M_{\text{male}} = 4.31$ ,  $M_{\text{female}} = 4.97$ ,  $F = 26.47$ ,  $p < .001$ ,  $\eta^2 = .22$ ), while there was no gender difference in functional fit ( $M_{\text{male}} = 4.14$ ,  $M_{\text{female}} = 4.37$ ,  $F = 2.49$ ,  $p = .12$ ,  $\eta^2 = .07$ ).

The results for satisfaction with exercise apparel's fit showed that overweight and obese adults were slightly satisfied with the fit overall ( $M = 4.76$ ,  $SD = 1.10$ ), while there were gender differences in this measure ( $M_{\text{male}} = 4.99$ ,  $M_{\text{female}} = 4.61$ ,  $F = 13.72$ ,  $p < .001$ ,  $\eta^2 = .17$ ). For male respondents, the body sites that received the lowest satisfaction scores included abdomen ( $M = 4.69$ ,  $SD = 1.57$ ), armscye ( $M = 4.78$ ,  $SD = 1.27$ ), pants length ( $M = 4.81$ ,  $SD = 1.65$ ), and waist ( $M = 4.83$ ,  $SD = 1.59$ ). For female respondents, the body sites receiving the lowest satisfaction scores included abdomen ( $M = 3.96$ ,  $SD = 1.18$ ), midriff ( $M = 4.17$ ,  $SD = 1.77$ ), waist ( $M = 4.23$ ,  $SD = 1.76$ ), bust ( $M = 4.28$ ,  $SD = 1.91$ ), and waist length ( $M = 4.34$ ,  $SD = 1.78$ ).

With respect to fit preference for each type of exercise apparel, most male and female respondents (over 70%) preferred semi-fitted to fitted jackets, sweatshirts, hoodies, T-shirts, sweaters, and shorts, while many of them preferred to have loose-fitting pants and leggings (male: 24.5%, pants; 35.9%, leggings, female: 38.0%, pants; 57.0%, leggings). Male and female participants reported their preference for each type of exercise apparel's fit differently: Female respondents preferred to have more fitted jackets ( $M_{\text{male}} = 2.09$ ,  $M_{\text{female}} = 2.36$ ,  $F = 16.52$ ,  $p < .001$ ,  $\eta^2 = .18$ ), sweatshirts ( $M_{\text{male}} = 2.30$ ,  $M_{\text{female}} = 2.56$ ,  $F = 17.87$ ,  $p < .001$ ,  $\eta^2 = .18$ ), hoodies ( $M_{\text{male}} = 2.27$ ,  $M_{\text{female}} = 2.62$ ,  $F = 32.45$ ,  $p < .001$ ,  $\eta^2 = .24$ ), T-shirts ( $M_{\text{male}} = 2.09$ ,  $M_{\text{female}} = 2.29$ ,  $F = 9.38$ ,  $p < .01$ ,  $\eta^2 = .13$ ), and sweaters ( $M_{\text{male}} = 2.20$ ,  $M_{\text{female}} = 2.40$ ,  $F = 10.32$ ,  $p < .01$ ,  $\eta^2 = .14$ ) than male respondents. However, male respondents preferred to have more fitted pants ( $M_{\text{male}} = 2.04$ ,  $M_{\text{female}} = 1.78$ ,  $F = 16.20$ ,  $p < .001$ ,  $\eta^2 = .18$ ) and leggings ( $M_{\text{male}} = 1.86$ ,  $M_{\text{female}} = 1.54$ ,  $F = 24.55$ ,  $p < .001$ ,  $\eta^2 = .22$ ) than did female respondents.

The results with respect to support in ideal exercise apparel showed that overweight and obese adults needed more support in exercise apparel overall ( $M = 4.63$ ,  $SD = .75$ ) with marginal gender differences ( $M_{\text{male}} = 4.56$ ,  $M_{\text{female}} = 4.68$ ,  $F = 3.13$ ,  $p = .08$ ,  $\eta^2 = .08$ ). The greatest support that male participants required in exercise apparel included the stomach ( $M = 4.81$ ,  $SD = 1.11$ ), back ( $M = 4.76$ ,  $SD = 1.12$ ), knees ( $M = 4.76$ ,  $SD = 1.27$ ), abdomen ( $M = 4.74$ ,  $SD = 1.09$ ), feet

( $M = 4.62$ ,  $SD = 1.24$ ) and waist ( $M = 4.61$ ,  $SD = 1.10$ ). Female participants reported that they required the greatest support in their ideal exercise apparel in the bust ( $M = 5.20$ ,  $SD = 1.31$ ), stomach ( $M = 5.09$ ,  $SD = 1.21$ ), abdomen ( $M = 5.01$ ,  $SD = 1.20$ ), waist ( $M = 4.90$ ,  $SD = 1.18$ ), back ( $M = 4.78$ ,  $SD = 1.04$ ), and knees ( $M = 4.75$ ,  $SD = 1.12$ ).

**Conclusions and Implications.** The results of this study revealed that overweight and obese adults have difficulties with current exercise apparel because of fit problems and lowest fit satisfaction with abdomen across gender. Further, fit preference and levels of support needed for specific body sites in their ideal exercise apparel were identified. Novel and functional exercise apparel for overweight and obese consumers that can maximize fit and support in the areas needed to facilitate physical activity and minimize pain attributable to lack of support is needed. This study provides essential insights into exercise apparel for apparel designers, developers, and producers to meet overweight and obese consumers' functional needs, which will consequently help them engage in physical activity.

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