Clothing Pressure Measurement and Subjective Wear Test of Commercial Bra Tops for The Development of Active Senior's Yoga Wear

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Recently, women in 50~60s are constantly investing time in their workouts because they are interested in the quality of their lives. Among various indoor activities, they enjoy yoga because these are easy to access and good to make beautiful body shape (Yu & Choi, 2013). According to the market survey, sports wear companies lack awareness of the need for yoga clothing by elderly women, and women in their 50s and 60s have had difficulty buying yoga suits that fit their bodies. In this paper, basic information for the development of yoga wear was studied focused on bra top that is the most important part affecting the fit of yoga wear. Experiments were conducted on the bra tops of yoga clothing brands sold on the market by participating in the 50-60s female subjects with various body shapes. The relationship between clothing pressure and comfortability according to the combination of yoga wear and subject was examined closely. The subjects participated in the experiment are in the range of the standard deviation based on the average size for 50~60s provided by SizeKorea(http//sizekorea.kats.go.kr). A total of 7 subjects participated in the experiment, of which 4 were in their 50s and 3 were in their 60s. The yoga wears were purchased from the brand with high sales ranking in common among various search sites. The four types (A, B, C and D) of three companies were selected and fabric extension was measured by Ziegert method (Ziegert & keil, 1988). Clothing pressure was measured by AMI3037-2 (AMI Techno, Co, Ltd, Japan) while the subject standing during one minute with specific positions. For the measurement, six positions (P1: elastic band of anterior chest, P2: elastic band of lateral chest, P3: upper chest, P4: shoulder strap, P5: posterior chest, P6: elastic band of posterior chest) were selected where can best represent the interaction between the upper body and the bra-top. When wearing four kinds of yoga wear, 9 questionnaires were used to evaluate subjective clothing pressure, ease of movement and wearing comfort using the 7-point Likert scale. The results as follows. Overall, the yoga wear with the highest clothing pressure is C. Yoga wear D had the lowest clothing pressure at all points except P5. P1, P2, and P6 under the elastic band show higher clothing pressure. Clothing pressures of B and C yoga wear are high at P4 (Table 1). According to (Lee et al., 2013), the average clothing pressure of comfortable girdle and waist nipper was about 2.1 ± 0.8 kPa and 1.5 ± 0.8 kPa. However, except for P3 and P5, we found out that clothing pressure of A, B and C were out of the comfortable range. D, however, was in the range of comfort in all parts. There were no differences in the pressure sensation at the center of chest, side band, shoulder strap and back among the yoga wears. The subjective clothing pressure was high in yoga wear A, B and C at the center of front band, yet the yoga wear D was significantly lower. It seemed that the yoga wear A, B and C interfere the respiration of chest with its high pressure of at the center front elastic band. Regarding the overall wear sensation,

the yoga wear D was the most comfortable to wear providing no restraint in moving. There were no differences in overall wear sensation among the four types of yoga wear in shoulder, respiration, and total comfort. The characteristics of the fabric according to the yoga wear were similar, but D had the largest extension rate

Table 1. Clothing pressure of four kinds of compression yoga wear (unit: kPa)

	P1	P2	P3	P4	P5	P6
A	2.40(0.64)^{b}	2.66(0.51)^{b}	0.35(0.22)	1.72(0.98)^{a}	0.52(0.20)	2.02(0.61)^{b}
B	2.28 (0.69)^{b}	2.91 (0.50)^{b}	0.57(0.30)	3.07(0.80)^{b}	0.41(0.27)	2.17(0.58)^{b}
C	2.25(0.89)^{b}	3.22(0.74)^{b}	0.45(0.35)	3.08(0.84)^{b}	0.59(0.38)	2.32(0.77)^{b}
D	1.21(0.46)^{a}	1.49(0.71)^{a}	0.19(0.11)	1.24(0.64)^{a}	0.46(0.24)	0.99(0.55)^{a}
F	4.526	10.207	2.564	9.150	0.516	6.401
p	.012*	.000*	.078	.000*	.675	.002*

a, b: Groups with the same letter have means that are not statistically different by Duncan test, $^{*}p<0.05$

In conclusion, most popular yoga bra tops sold on the market are found to be off the pleasant area around the front chest and shoulder straps due to high pressure over 2 kPa. On the other hand, yoga wear D showed lower clothing pressure of less than 2 kPa at all measurement sites when wearing it, and wearers rated it comfortable because D was relatively thin fabric compared to other yoga wear, and the extension rate was also good. And the subjects felt sensitive clothing pressure at the center of front elastic band. However, in the evaluation of overall wearing comfort during a short time as in this study, wearer evaluated positively for all yoga wears except movement. It is found that four types of yoga wear that are commercially available are out of the range of appropriate clothing pressure in the elastic band of the anterior chest even if they are purchased considering the chest circumference of women in their 50~60s, which indicates the necessity of the development of yoga wear for them. Further, the evaluation of clothing pressure in lower chest area and shoulder strap should be considered together with development of yoga wear for middle - aged women. In addition, when the yoga wear are developed for active senior, their physiological responses during a long time should be considered in future.

References

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