Human Factors in Design, Engineering, and Computing, Vol. 159, 2024, 1425–1433
https://doi.org/10.54941/ahfe1005710

Preferences of Elderly People in Western Taiwan Towards Smart Sportswear

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ABSTRACT

This study was designed to determine the preferences of 300 elderly people in western Taiwan, aged 55 to 85, with regard to smart sportswear. It employed non-random sampling, in the form of a structured questionnaire, and an independent sample t-test, a single factor variance analysis, a post hoc test, and a chi-square test of statistical analysis to analyze the responses to the 16 questions. The research datasets were categorized based on gender, age, and exercise duration. The findings revealed that half sleeve and three-quarter sleeve tops were more commonly chosen by women than men, while shorter tops and trousers were more commonly chosen by men than women. In terms of color, men and women preferred blue and red, respectively. The majority of the participants reported the knees and ankles to be the most commonly injured body parts. They preferred to wear loose-fitting garments, crew neck tops, ankle-length trousers, hip-length garments, and short sleeve tops. However, only 8.7% of participants had experience wearing smart clothing. Fifty-six percent of participants expected to pay between 33USD and 166USD for smart sportswear.

Keywords: Smart sportswear, Elderly people, Clothing preferences

INTRODUCTION

When formulating policies the ministries and councils in Taiwan direct particular attention towards the issue of the elderly population. In 2020, the National Development Council (2020) indicated that Taiwan had/would become an aging society by 1993, an aged society by 2018, and a super-aged society by 2025. In fact, by 2020, the super-aged population (i.e., those aged 85 and above) accounted for 10.7% of the population. By 2070, the elderly population is projected to rise to 27.4%. With an increasing number of individuals comprising the elderly population, maintaining the physical function and mental health of this group through beneficial exercise habits is essential. To promote health and improve the physical fitness of elderly people and those with physical and mental disabilities, the Sports Administration initiated several activities in 2018 encouraging elderly people to exercise (Lin, 2024, August 17th). These activities included exercise coaching classes, exercise LOHAS programs, and annual community physical fitness promotion programs. The aim of these classes and programs was to motivate elderly people to exercise, and to help them develop a good understanding of the principles of effective exercise. Additionally, the Sports

Administration planned to introduce and utilize a system between 2022 and 2027 to identify and recruit physical fitness instructors to provide local exercise coaching, and build an integrated exercise and health information-related system to promote smart data and personalized exercise prescriptions to predict the effects of public exercise participation and fitness levels on the population's physical and mental health.

ELDERLY PEOPLE

The definition of "elderly people" appears in related studies, which classify elderly people into middle-aged, older middle-aged, seniors, pre-elderly, and elderly people. Pan (2016) noted that according to the World Health Organization, the age at which elderly people are defined as such is 65 and above. Article 2 of Taiwan's Senior Citizens Welfare Act stipulates "elders are people who are aged above 65 years old." Psychologist Erikson defined the stage of old age as from 65 years onwards. Chen, Chung, and Tsai (2012), Chen and Chou (2012), and Wang, Cheng, and Lai (2016), all defined elderly people as those aged 65 and above, because the retirement age set by industrial and service industry regulators in 2013 was 65. By contrast, the Workforce Development Agency (2021) and Senior Workforce Employment Resource Center services identify individuals aged 55 and above, as those who have retired or are in need of employment. This group targets employers interested in hiring elderly people, and people, agencies, or organizations concerned with developing opportunities for elderly people in the labor force. The Taipei Public Library (2012) referred to those aged 55 and above as elderly learners when they engaged in learning activities. Additionally, there is a trend towards early retirement around the age of 55 in Taiwan, and there has been a debate on elderly learners being offered forward-looking information to determine the needs of elderly people to develop smart clothing. Furthermore, Huang (2004) and the American Library Association (2008) defined the elderly population as those aged 55 and above.

ELDERLY PEOPLE AND EXERCISE

Many domestic studies have examined exercise among elderly people; including exploring the use of smart technology to diversify elder care options and the benefits of developing exercise habits to slow down the aging process, promote mental health, prolong life, and prevent and treat chronic illnesses and disability symptoms to improve quality of life in the elderly (Huang, Chen, and Chen, 2007). Tung (2015) used smartwatches to monitor the physiological parameters of elderly people with chronic illnesses, tracking their daily exercise situations, and checking whether the amount of exercise they engage in meets experts' recommendations, ensuring comprehensive exercise management. Wang (2017) developed the two-wheeled inverted pendulum (TWIP) robot equipped with wearable smart ankle devices, providing functions such as walking assistance, obstacle avoidance, tracking, gait analysis, and safety mechanisms to evaluate mobility issues in elderly people; and assess their long-term gait postures for safety care. Lin, Lo, Wei,

and Wang (2017) developed the SaFePlay system, combining it with smart insoles and smart knee protectors to detect users' gait information and return it to the SaFePlay service platform. Through gait analyses and the SaFePlay database, the system prevented knees and lower limb injuries. Projects funded by the National Science and Technology Council include numerous studies and designs focused on aging issues, reflecting the government's attentiveness to elderly people in Taiwan (Shih, Chi, Lin, and Lin, 2018). Acknowledging the trend toward an aging society, and understanding the importance of exercise combined with smart devices, this study explored the clothing preferences of elderly people to facilitate the development of appropriate smart sportswear to benefit this group.

CLOTHING PREFERENCES OF ELDERLY PEOPLE

We designing clothing for elderly people based on their likes and preferences, Sung (2020) investigated the purchasing behaviors of older middle-aged women, triggered by their preferences and needs, and emphasizing the importance of overall comfort. They recommended the use of soft, cool, quick-drying, elastic, and functional fiber materials, emphasizing attention to detail; and simple, natural clothing that made their bodies appear slim. Wang (2011) examined the effect of perception on the functional clothing preferences of pre-elderly people. Lee (2013) investigated the effect of lifestyle, clothing values, and functional clothing needs on consumer values. Tseng (2017) examined the effect of middle-aged people's involvement in exercise and health related behavior, considering the role of self-efficacy in the promotion of a healthy lifestyle. Liu (2015) addressed the daily life clothing preferences and needs of elderly people in southern Taiwan and those who had recently become elderly, solving their clothing issues. Li (2015) improved smart gloves, smart temperature-sensitive vests, and apparel invented by Chen and Li (2015) at the Wearable Technology Workshop in 2014, exploring the effect of lifestyle and attitude on the clothing preferences of elderly people, and applying these preferences when designing smart accessories. Based on the above research, this study focused on a population composed of older middle-aged people, aged 55 to 64, and elderly people aged 65 and above.

RESEARCH QUESTION

The objective of this study was to understand the perceptions and preferences of elderly people in western Taiwan with regard to smart sportswear styles. This data served as preliminary data for the development of smart sportswear, assisting in the design and development of smart clothing products that would be suitable for users.

RESEARCH DESIGN AND METHODS

In this study, we used questionnaires chiefly to collect the necessary information with which to determine subsequent explanations or interpretations. We used IBM SPSS 26.0 as the data analysis tool, and

conducted independent sample t-tests, single factor variance analyses, post hoc tests, and chi-square tests, to determine whether significant differences existed between participants of different genders, ages, and exercise duration.

QUESTIONNAIRE

In this study, we divided the questionnaire into six main sections, totaling 20 questions: Section 1 (5 questions) concerned demographic data relating to the participants, including gender, age, residential area, health condition, and investigated whether they depended on others for their daily care. Section 2 (3 questions) questioned the participants' exercise activities, including the types of exercise they regularly engaged in, the duration of those exercises, and their injury-prone body parts. Section 3 (6 questions) inquired about the participants' subjective intentions towards sports clothing, specifically their preferred sports clothing styles and colors, including sleeve lengths, garment lengths, trouser lengths, collar styles, fit, and colors. Sections 4–6 (2 questions each) investigated the participants' expectations regarding market price. We employed a 7-point Likert scale ranging from "very unimportant," "quite unimportant," "unimportant," "neither important nor unimportant," "important," "quite important," to "very important," corresponding to scores of 1, 2, 3, 4, 5, 6, and 7, respectively.

PARTICIPANT DEMOGRAPHIC INFORMATION

The participants in this study were 252 individuals aged 55–65 and 50 individuals aged 66 and above from western Taiwan. In total 302 questionnaires were distributed, of which 300 valid completed responses were obtained. In total, 150 men and 150 women returned completed valid questionnaires, 105 of whom lived in the northern area of western Taiwan, 98 from the central area, and 97 from the south. Of the 300 participants, 115 were in good health, 181 were in fairly good health, and 4 were in poor health and unable to care for themselves, 18 required some assistance from others in their daily lives, and 5 were heavily dependent on others for care.

Many of the participants (93 men and 94 women) reported habitual brisk walking as their main form of exercise. The second most popular form of exercise was cycling (37 men and 24 women). 35% of the participants exercised for 30 to 60 minutes weekly Their knees were reported to be the most commonly injured body part (37.4%), followed by the ankles (15.6%).

RESEARCH DATA ANALYSES

This study analyzed participants' subjective intentions towards purchase choices in the domain of sports clothing, focusing on four variables (i.e., gender, color, participants' subjective intention, and expected prices) to understand the distribution of clothing preferences. Characteristics considered by gender were: sleeve lengths, garment lengths, trouser lengths, collar styles, and fit.

Sleeve length: The majority of the participants, regardless of gender, chose short sleeves (61.7% overall; 68.0% in men and 55.3% in women). The next most popular choice was long sleeves (12%), with women preferring three-quarter sleeves (14%) and men preferring sleeveless (12.7%). Half sleeves

and three-quarter sleeves as a preference were most common among women. Subsequent chi-square tests were performed to determine whether significant differences in sleeve lengths existed between different genders, where the results showed significant differences (X2 (4, N = 300) = 14.643, $p = .006$), indicating that men and women had varying sleeve length preferences. Women were more accepting of half sleeves and three-quarter sleeves than men were.

Table 1. Sleeve length preferences for smart sportswear in this study.

	Sleeve Length	Sample Size	Sleeveless	Short Sleeves	Half Sleeves	Three-Quarter Sleeves	Long Sleeves
							
	Overall	N = 300	31(10.3%)	185(61.7%)	21(7.0%)	27(9.0%)	36(12.0%)
Gender	Men	N = 150	19(12.7%)	102(68.0%)	7(4.7%)	6(4.0%)	16(10.7%)
	Women	N = 150	12(8.0%)	83(55.3%)	14(9.3%)	21(14.0%)	20(13.3%)

Note: gender (X^2 (4, N = 300) =14.643, p =.006)
*Unit (in percentages)
*The percentages show the distribution of the different sleeve lengths for the different genders.

Garment length: The majority of participants, regardless of gender, preferred hip length (50.7% overall; 53.3% in men and 48.0% in women). The next most popular choice for men and women was abdomen length (24.7% overall and 30.7% in men) and below the hip length (25.3%), respectively. Additional chi-square tests were performed to determine whether significant differences existed in terms of garment length preferences between the two genders and the results showed significant differences (X2 (3, N = 300) =19.186, p =.000). More men preferred waist and abdomen length than women, who generally preferred longer garment lengths.

Table 2. Garment length preferences for smart sportswear in this study.

	Garment Length	Sample Size	Waist	Abdomen	Hip	Below Hip
						
	Overall	N = 300	19(6.3%)	74(24.7%)	152(50.7%)	55(18.3%)
Gender	Men	N = 150	15(10%)	46(30.7%)	72(53.3%)	17(11.3%)
	Women	N = 150	4(2.7%)	28(18.7%)	80(48.0%)	38(25.3%)

Note: gender (X^2 (3, N = 300) = 19.186, p =.000)
* Unit (in percentages)
* The percentages show the distribution of the different garment lengths for the different genders (age groups).

Trouser length: The majority of the participants, regardless of gender, chose ankle length (61.7% overall; 59.3% in men and 64.0% in women). The next most common choice overall among women was calf length (15.3% and 25.3%, respectively), while for men it was knee length (18.7%). Chi-square tests were performed to determine whether significant differences existed in trouser length preferences between the two genders. The results showed significant differences (X2 (3, N = 300) = 39.699, p = .000), indicating men and women's preferences differed. A higher percentage of men preferred thigh and knee lengths than women did; women chose ankle length more than men did, revealing women generally prefer long trousers and men short trousers.

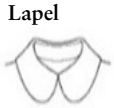
Table 3. Trouser length preferences for smart sportswear in this study.

	Trouser Length	Sample Size	Thigh Length	Knee Length	Calf Length	Ankle Length
						
	Overall	N = 300	33(11.0%)	36(12.0%)	46(15.3%)	185(61.7%)
Gender	men	N = 150	25(16.7%)	28(18.7%)	8(5.3%)	96(59.3%)
	women	N = 150	8(5.3%)	8(5.3%)	38(25.3%)	98(64.0%)

Note: Gender (X^2 (3, N = 300) = 39.699, p = .000)
* Unit (in percentages)
* The percentages show the distribution of the different trouser lengths for the different genders (age groups).

Collar style: The majority of participants, regardless of gender, chose crew neck (39.0% overall; 32.7% in men and 45.3% in women). The next most popular choice overall, for both men and women, was V-neck (21.7% overall; 24.0% in men and 19.3% in women). Chi-square tests were performed to determine whether significant differences existed in the collar style preferences between the two genders. The results reported no significant differences in collar style preferences between men and women (X2 (4, N = 300) = 5.868, p = .209).

Table 4. Collar style preferences for smart sportswear in this study.

	Collar Style	Sample Size	Lapel	Mandarin Collar	Crew Neck	V-neck	U-neck
							
	Overall	N = 300	35(11.7%)	21(7.0%)	117(39.0%)	65(21.7%)	62(20.7%)
Gender	men	N = 150	21(14.0%)	10(6.7%)	49(32.7%)	36(24.0%)	34(22.7%)
	women	N = 150	14(9.3%)	11(7.3%)	68(45.3%)	29(19.3%)	28(18.7%)

Note: Gender (X2 (4, N = 300) = 5.868, p = .209)
* Unit (in percentages)

Fit: The majority of the participants, regardless of gender, chose loose-fitting garments (63.0% overall; 58.0% in men and 68.0% in women). The next most popular choice was fitted garments (34.7% overall; 40.0% in men and 28.7% in women). Chi-square tests were performed to determine whether significant differences existed in garment fit preferences between the two genders. No significant differences in garment fit preferences between men and women (X2 (2, N = 300) = 5.592, $p = .061$) were found.

Table 5. Garment fit preferences for smart sportswear in this study.

	Fit	Sample Size	Skin-Tight	Fit	Loose-Fitting
					
	Overall	N = 300	7(2.3%)	104(34.7%)	189(63.0%)
Gender	men	N = 150	2(1.3%)	61(40.7%)	87(58.0%)
	women	N = 150	5(3.3%)	43(28.7%)	102(68.0%)

Note: Gender (X2 (2, N = 300) = 5.592, p = .061)
* Unit (in percentages)

Garment color: The majority of the participants, regardless of gender, chose black (27.0% overall; 24.0% in men and 27.0% in women). The next most common choice overall among men was blue (660 C/V18) (13.7% and 18.0%, respectively), while women preferred red (Strong Red C/V1) (13.3%).

Table 6. Garment color preferences for smart sportswear in this study.

	Overall	BK	V18	lt14	
	N = 300	81(27.0%)	41(13.7%)	33(11.0%)	
Gender	men	BK	V18	W	
	N = 150	36(24.0%)	27(18.0%)	18(12.0%)	
	women	BK	v1	v24	lt14
	N = 150	81(27.0%)	20(13.3%)	19(12.7%)	19(12.7%)

- Experience wearing smart clothing: The majority of the participants had no experience in wearing smart clothing. Twenty-six of the 300 participants (8.67%) had experience wearing smart clothing, among those 12 were men and 14 women. Moreover, 19 out of the 26 participants wore smart clothing for sports, among whom 11 were men and 8 women.
- Expected selling prices for smart sportswear: 144 of the participants agreed they would accept a price for a set of sportswear between NT$501 and NT$1000, of whom 77 were men and 67 were women. One hundred sixty-six of the participants would accept a price between NT$1001 and NT$5000, of whom 86 were men and 80 were women. For the participants, the less they needed to spend on sportswear and smart

clothing the better. The prices most acceptable to them were generally those below the average selling price.

CONCLUSION

The results of this study on elderly individuals' preferences for smart sportswear are as follows:

- The people over 55 who participated in this study subjectively perceived the main feature of most types of exercise they regularly engaged in as potentially most damaging to the feet. Therefore, they paid particular attention to foot protection, but also focused on their knees and ankles.
- Genders was found to affect garment length preferences: half sleeve and three-quarter sleeve tops were more commonly preferred by women than men, who preferred shorter tops and trousers. Additionally, most participants preferred short sleeve tops, hip-length garments, ankle-length trousers, crew neck design, loose-fitting garments, and black clothing. Regarding garment color, the most common choice among men was blue (660 C), while that among women was red (Strong Red C).
- The participants had minimal experience wearing smart clothing (only 8.67%). That is, most elderly people had no experience wearing smart clothing, and expected that the selling prices for such clothing to be lower than current market prices.

ACKNOWLEDGMENT

This research was Review Board agreed by Fu Jen Catholic University.

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