Consumers' Smart Fitness Apparel Purchase Intention: Do Social Acceptability Attributes, Environmental Concerns, and Health Beliefs Matter?

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Introduction and Background. Smart fitness apparel (SFA), often known as wearable technology or e-textiles, encompasses clothing and footwear embedded with functionalities and communication capabilities (Dominique & Crégo, 2018; Stephenson et al., 2020). SFA encompasses "the factors that affect the degree of comfort the wearer experiences while wearing a device, including physical, psychological, and social aspects" (Dunne et al., 2014, p. 4159). The SFA market was valued at US$ 2.9 billion in 2021 and is projected to reach US$14.8 billion by 2032 (Future Market Insights, 2024). This growth in SFA is driven by trends in advanced technology, multi-functionality, and higher costs associated with smart fabrics. The advancement of SFA necessitates interdisciplinary approaches that encompass understanding functional designs and wearable technologies, as well as a profound knowledge of textile properties, application techniques, and fabrications in various industries (e.g., fashion, sports, healthcare, military, etc.), offering diverse technological features to different end-users (Yanfen & Pu, 2011).

Increasingly, consumers are seeking active involvement in fitness activities (e.g., yoga, running, weight training, etc.) to enhance their quality of life and wellness (Jones et al., 2020). Consistently, SFA (connected device) has been focusing on consumers' well-being and fitness applications, monitoring healthy eating habits (such as consumption of food calories), regular exercise patterns (for determining fitness levels or optimizing performance), body health (stress levels, sleeping patterns, heart rate), and other metrics (e.g., for entertainment purposes) (Aroganam et al., 2019; Zeng & Wang, 2023). Thus, many wearable devices are integrated into fashion, technologies, textiles, and apparel, ranging from fitness trackers to highly advanced sportswear.

Research on SFA investigated the effects of wearables' social acceptability attributes on consumers' purchase intention. For example, attributes, including design approaches, garment usage, and materials, have been identified as pivotal factors in consumers' adoption behavior in the context of SFA (Hassabo et al., 2023; Kim & Lee, 2023; Mohammadi et al., 2022). However, limited research delves into purchase intention toward SFA, especially if environmental concerns and health beliefs are pertinent factors. Therefore, based on the extant literature review (Chuah et al., 2016; Kim & Choi, 2005; Nam & Lee, 2020; Suki, 2016), four hypotheses in a conceptual framework were proposed (see Table 1). Hence, this study aimed to explore the effect of the social acceptability of SFA (e.g., design, materials, etc.) on environmental concerns, health beliefs, the wearers' attitudes, and intentions toward purchasing SFA. Understanding potential users' perceptions and attitudes toward SFA is crucial for designers and marketers, as these clothing and footwear items are expected to be integral to the future of the smart fitness industry.

Method. The study recruited participants in the United States aged 18 years old via Amazon Mechanical Turk. The survey questionnaire consisted of three sections: (1) demographics, (2) open-ended questions, and (3) multiple-item measurements (wearables' social acceptability attributes, environmental concerns,

and health beliefs) that were adapted and modified from the previous research (Chuah et al. 2016; Kim & Choi, 2005; Nam & Lee, 2020; Suki, 2016). The multiple-item measurements included questions for the proposed conceptual constructs using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Structural equation modeling (SEM) was performed to test the hypothesized paths in the proposed research framework using SPSS 28 and SmartPLS software 4.

Results. In total, 549 responses were collected. The data were screened for incomplete responses and outliers (using Mahalanobis distance and the chi-square distribution function [$p < 0.001$]). After screening the data, the final sample of survey respondents was 480. Most participants identified as Caucasian (86%), with an average age of 34. Regarding gender distribution, the sample was predominantly male (n = 382; 76.7%). All measures employed demonstrated adequate reliability ($\alpha > 0.70$). Furthermore, the average variance extracted (AVE) values were greater than the acceptable values of 0.5, which showed the establishment of convergent validity. Following Fornell and Larcker's (1981) suggestion, the discriminant validity was ensured since the square root of AVEs was larger than the correlations among constructs.

PLS-SEM revealed that SFA's social acceptability attributes had a significant impact on environmental concern (H1a; $\beta = 0.59$, $p < 0.05$) and health belief (H1b; $\beta = 0.60$, $p < 0.05$). Environmental concerns were significantly associated with attitudes toward SFA (H2a; $\beta = 0.12$, $p < 0.05$). However, no significant was found between environmental concerns and purchase intentions toward SFA (H2b). The results showed that health beliefs had significant impacts on attitudes (H3a; $\beta = 0.44$, $p < 0.05$) and purchase intentions toward SFA (H3b; $\beta = 0.37$, $p < 0.05$). Lastly, attitudes toward SFA were significantly associated with purchase intentions toward SFA (H4; $\beta = 0.40$, $p < 0.05$). The variance explained by the constructs—environmental concerns, health beliefs, attitudes, and purchase intentions were 35%, 36%, 28%, and 51%, respectively.

Conclusion. The findings of this study indicated the importance of considering social acceptability, environmental concerns, and health beliefs to predict wearers' attitudes and intentions toward SFA. This study suggests that the social acceptability of wearables plays an important role in shaping health beliefs and wearers' attitudes and behaviors toward SFA than environmental concerns do. This insight could prove invaluable for companies operating in the wearable technology industry, urging them to prioritize sustainable functions that cater to health-conscious exercise and dietary patterns when improving SFA and its associated marketing strategies. Future research is warranted that explores additional variables and potential moderators to enhance the model's predictive power and provide more comprehensive insights into consumer behavior in the wearable technology industry. This study will contribute to a deeper understanding of the complex interplay between social, environmental, and health-related factors in shaping consumer decisions regarding wearable fitness technology.

Table1. *PLS-SEM Path Analysis Results*

Hypotheses Paths		**Model** *β (p-value)*	**Label**
H1a	Wearables' social acceptability → Environmental concerns	0.59*	Accepted
H1b	Wearables' social acceptability → Health beliefs	0.60*	Accepted
H2a	Environmental concerns → Attitudes toward SFA	0.12*	Accepted
H2b	Environmental concerns → Purchase intention toward SFA	0.05	Rejected
H3a	Health beliefs → Attitudes toward SFA	0.44*	Accepted
H3b	Health beliefs → Purchase intentions toward SFA	0.37*	Accepted
H4	Attitude toward SFA → Purchase intentions toward SFA	0.40*	Accepted

Note. $p < 0.05$*

References

Aroganam, G., Manivannan, N., & Harrison, D. (2019). Review on wearable technology sensors used in consumer sport applications. *Sensors*, *19*(9), 1-26.

Chuah, S. H. W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior*, *65*, 276-284.

Dominique, P., & Crégo, P. (2018). *Wearables, Smart Textiles & Smart Apparel*. Elsevier. 168-198.

Dunne, L. E., Profita, H., Zeagler, C., Clawson, J., Gilliland, S., Do, E. Y. L., & Budd, J. (2014). The social comfort of wearable technology and gestural interaction. In *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (pp. 4159-4162). IEEE.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39-50.

Future Market Insights (2024). Smart Fabric Market Snapshot (2022 to 2032) https://www.futuremarketinsights.com/reports/smart-fabrics-market

Hassabo, A. G., Elmorsy, H., Gamal, N., Sediek, A., Saad, F., Hegazy, B. M., & Othman, H. (2023). Applications of nanotechnology in the creation of smart sportswear for enhanced sports performance: Efficiency and comfort. *Journal of Textiles, Coloration and Polymer Science*, *20*(1), 11-28.

Jones, P., Ratten, V., & Hayduk, T. (2020). Sport, fitness, and lifestyle entrepreneurship. *International Entrepreneurship and Management Journal*, *16*, 783-793.

Kim, S., & Lee, H. (2023). Tightness evaluation of smart sportswear using 3D virtual clothing. *Journal of the Korean Society of Clothing and Textiles*, *47*(1), 123-136.

Kim, Y., & Choi, S. M. (2005). Antecedents of green purchase behavior: An examination of collectivism, environmental concern, and PCE. *Advances in Consumer Research*, *32*, 592.

Mohammadi, R. A., Shirazi, M., Moaref, R., Jamalpour, S., Tamsilian, Y., & Kiasat, A. (2022). Protective smart textiles for sportswear. In *Protective Textiles from Natural Resources* (pp. 317-345). Sawston, United Kingdom: Woodhead Publishing.

Nam, C., & Lee, Y. A. (2020). Validation of the wearable acceptability range scale for smart apparel. *Fashion and Textiles*, *7*, 1-17.

Stephenson, T., Ellero, C. C., Sebastia-Saez, D., Klymenko, O., Battley, A. M., & Arellano-Garcia, H. (2020). Numerical modeling of the interaction between eccrine sweat and textile fabric for the development of smart clothing. *International Journal of Clothing Science and Technology*, *32*(5), 761-774.

Suki, N. M. (2016). Consumer environmental concern and green product purchase in Malaysia: Structural effects of consumption values. *Journal of Cleaner Production*, *132*, 204-214.

Yanfen, L., & Pu, H. (2011). Smart sportswear. *In 2011 International Conference on Future Computer Science and Education* (pp. 135-138). IEEE.

Zeng, S., & Wang, J. (2023). Research and Application Progress of Wearable Sensor in Sports Monitoring. *Journal of Medicine and Healthcare*, *5*(6), 1-6.