The Wearing Evaluation of Vital Sensing Cloth with Development of Textile Sensing Band

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1. INTRODUCTION

Nowadays, the interest about IT convergence technology is being increased. Then, the fiber industry is no exception, and the market of smart wear is being expanded. Especially, among the smart wear, the functionality sports wear that have a function such as vital monitoring is being increased a demand because of increase of interest about well-being culture. So, this paper tries to study the mechanical properties of the textile sensing band for vital sensing cloth, and the wearing evaluation for function and wearing comfort.

2. EXPERIMENTAL

For this study, it had be woven the 6 kinds of textile sensing band with Ag coated conductive yarn, and analyzed the mechanical properties such as tensile properties and electrical resistance. And for measurement of wearing comfort considered the vital sensing function, it is tried to analyze the wearing evaluation of vital sensing cloth. Table 1 shows the specimens of textile sensing band. And Table 2 shows the test methods of mechanical properties.

Table 1. The specimens of textile sensing band

No.	Weave	Material	Denier	Composition rate (PET:Conductive yarn)
1		Warp:PET Weft:Conductive yarn Stitch:Conductive yarn	75D×2 70D×2 70D×2	65 : 35
2		Warp:PET Weft:Conductive yarn Stitch:Conductive yarn	75D×2 70D×2 70D×4	60 : 40
3		Warp:PET Weft:Conductive yarn Stitch:Conductive yarn	75D×2 70D×2 140D×2	58 : 42
4		Warp:PET Weft:Conductive yarn Spandex Stitch:Conductive yarn	75D×2 70D×2 30D 70D×2	35 : 35 : 30(spandex)
5		Warp:PET Weft:Conductive yarn Stitch:Conductive yarn	75D×2 70D×2 70D×2	55 : 45
6		Warp:Conductive yarn Weft:PET Stitch:Conductive yarn	210D×2 75D×2 70D×4	34 : 66

Table 2. The test methods of mechanical properties

Experiment	Method
Tensile properties(Yarn)	KS K 0521
Tensile properties(Fabric)	KS K 0520
Abrasion resistance	KS K 0604
Wash resisance	KS K ISO 105-C06
Electrical resistance	Pressure - 31.25gf/cm2 Extension load - 100gf

And for wearing evaluation, it had been analyzed the garment pressure as a important fact. And for the optimum design of the vital sensing tight-fitting cloth, it had been tried the motion analysis using a high speed camera. The motion analysis was analyzed by calculation of standard deviation of body area. Figure 1 shows the measurement position of garment pressure. Figure 2 shows area of the body for measurement of standard deviation when body is moved.

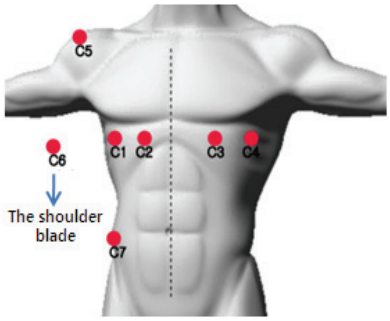


Fig.1. The position of measurement of garment pressure.

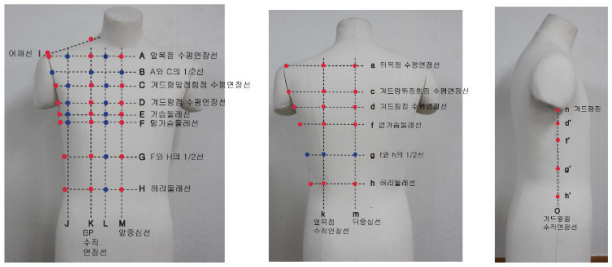


Fig. 2. The area of a body for calculation of standard deviation

3. RESULTS AND DISCUSSIONS

Fig. 4 shows the electrical resistance of the textile sensing band. As shown in the figure, No.6 specimen shows the lowest resistance. This results from floating of conductive yarn. The floating fact is effected by denier, stiffness of yarn, fabric weave. In case of No. 6, denier is the most high and conductive yarn is woven as warp yarn contrary to the another specimens. In case of the specimens which conductive yarn is weaved as weft yarn, due to difference of tension between warp and weft directions, the conductive yarn was floated on surface.

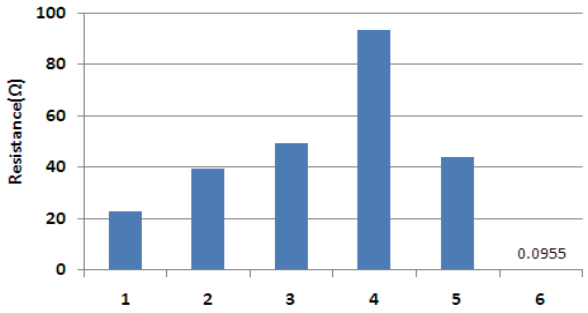
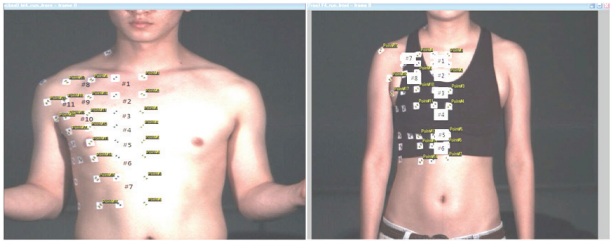


Fig. 3. The electrical resistance of textile sensing band

And No. 6 was shown the most high resistance on washing and abrasion. So, it was selected No. 6 for manufacturing vital sensing smart wear.

Fig. 4 shows the front side of body for motion analysis. As shown in figure, it was measured the standard deviation of each divided area.



(a) man (b) woman

Fig. 4. The area of front side of body for motion analysis

Fig. 5 shows the results of standard deviation of front side area of man's body. It was shown higher standard deviation at center area of body. And due to breathing, area 6, 7 situated on stomach showed higher standard deviation than the other side. Therefore, the area which showed higher standard deviation needs the specific design for fitness of cloth. So, when it is designed, multi layer and high strain structure was applied on vital sensing cloth.

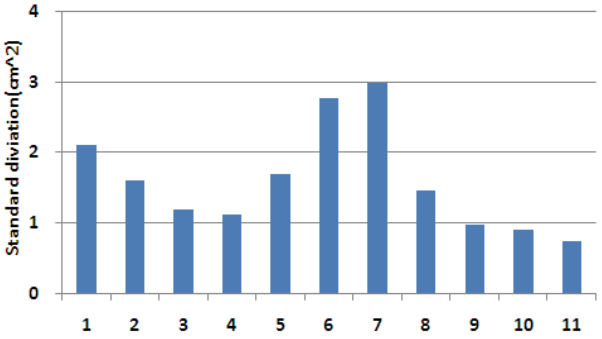


Fig. 5. The standard deviation of front side area of man's body

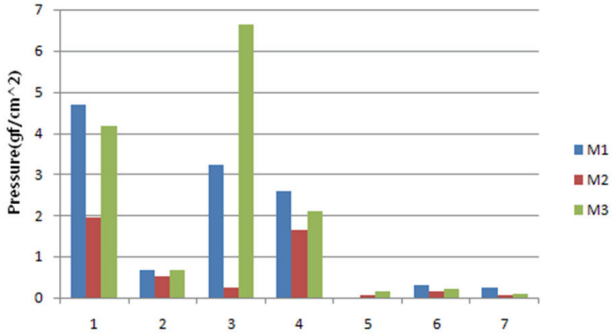


Fig. 6. The garment pressure of vital sensing cloth - man

As shown in figure, it is shown higher pressure at around area than inside area of body.

4. CONCLUSIONS

As a results of this study, it had been drawn the factor of design based on the mechanical properties and wearing evaluation for vital sensing fitness cloth. It was drawn the proper garment pressure, and due to this result, based on the cloth size of domestic standard body of twenty, it was manufactured the vital sensing cloth which has wearing comfort and high sensitivity. And the manufactured cloth was applied the design of multi-layer and high strain structure.

5. REFERENCES

[1] J. H. Jo, J. H. Ryu, and J. H. Jeong; "The Study for Mechnical Properties of Textile Sensor according to Structural Factor for Vital Sensing Smart Wear" *The Korean Fiber Society,* 42(2), 217-218(2009).