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Novel buoyant fabrics created by integrating inlay knitted structure

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1. Introduction

Most drowning incidents among children aged 1 to 4 years occur in residential swimming pools when they swim alone or with a same-aged peer who does not have swimming, rescue, or resuscitation skills (Brenner et al., 1995). Typically, when children are learning to swim, they are equipped with flotation devices to protect them from accidental drowning. The large, bulky commercially available floating suits feature large blocks of foam could restrict the movement of swimming children. Therefore, there is a prompt need for an improved article of clothing having the buoyant properties. In this study, knitting technology is proposed to create fabrics with floating effect.

2. Experimental

2.1 Knitted inlaid fabric samples

Different types of buoyant materials with different diameter were inlaid into the fabric samples during the knitting process. The diameter of the buoyant material is ranging from 1mm-4mm in two material types that are in tube and foam rods. The buoyant material is inlaid into knitted fabric for every course of half Milano stitch. During knitting, the knitting tension and knitting parameters are the same for all specimens. There are fourteen kinds of specimens are knitted with 5 pieces of fabric in each type of specimens. Then they are tested for its net buoyant force by experiments.

Fig.1 The inlaid knitted fabric, FA-4.7

3. Results and Discussion

Among the inlaid fabrics, it can be seen that FA-4.7 has highest net buoyant force as shown in figure 2. FA-4.7 fabric and TC-4.8 are inlaid with buoyant material in around 5mm diameter which both have high net buoyant force of fabrics. The increase in diameter of the inlaid tubes increases the net buoyant force in tubes TC and TA. This shows that the larger in the outer diameter of the inlaid material give a larger volume of the fabric and finally have a higher buoyant force. However, the net buoyant force of FB is constant when increase in the outer diameter of the inlaid material. It is due to the weight of the tube increase significantly when increase in outer diameter of the FB inlaid material which weaken the ability of positive buoyancy in the fabric. It also found that the net buoyant force has significant relationship with the average outer diameter of the inlaid material but not the material type.

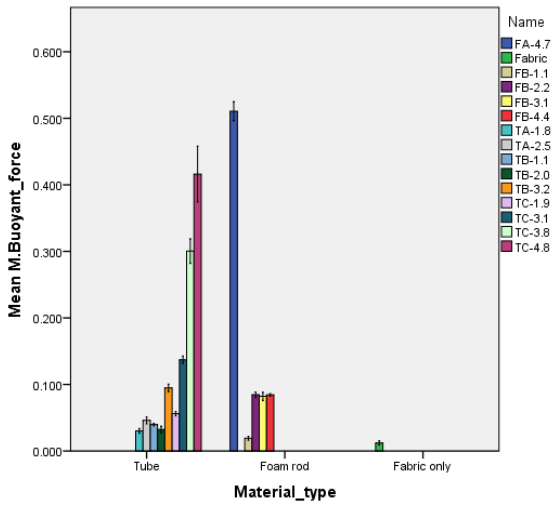

Fig. 2 The comparison of the mean net buoyant force of fabrics

4. Conclusions

It is important to find that the average diameter of inlays in around 5mm with highest net buoyant force of fabric. The fabrics with excellent buoyant performance in the experiment and are selected to do further developments in order to create the final design of a buoyant swimsuit with maximum buoyant ability.

References

Brenner, R. A., Trumble, A. C., Smith, G. S., Kessler, E. P., & Overpeck, M. D. (1995). Where Children Drown. *American Academy of Pediatrics*, *108*(1), 85-89. doi:10.1542