

Comfort and stab resistant performance of body armor fabrics and vests literature...

[Law](#), [Security](#)



Body armor, not a new phenomenon, has been progressively used by security and military forces to mitigate serious injuries during their professional activities. Soft body armor and hard body armor design became more effective against projectiles and stabbing, and light in weight for the comfort of wearers' activities. Originally developed by the Japanese, soft body armor is constructed of woven or ballistic resistant fabrics and can surpass 30 layers. In 1970s, the manufacture of Kevlar® was sponsored by the National Institute of Justice. Modern hard body armor is much lighter and effective since it has a large amount of new generation materials. The body armor panel was created to guard the vital human organs and ensure no restrictions to the wearer's movement.

The use of knives is widespread these days and causes up to ninety percent of all injuries. To ensure a due protection to their officers, stab resistant armor and fabrics with a dense weave, or thick layers was invented. At the same time, the armor needed to provide enough of comfort for the wearer. Chadwick et al. researched the force associated with knife attacks to formulate well-suited armored fabrics for maximal protection. Tien et al. studied the anti-stab key aspects of fiber composites used with cotton to increase the wearers' comfort. His findings suggested that an increase in fabric density should prevail over an increase in fabric thickness to achieve the preferred outcome.

Aramid fiber and high-performance polyethylene were largely used by numerous manufactures in making exceedingly sustainable body armor formation. Kevlar was a substitute to steel since it weighs 10% less and provides a reduced amount of deformation. Other materials integrated were

Twaron® that has a high energy absorption, persistence, and flexibility; Dyneema® and Spectra® as part of high-performance polyethylene (HPPE) collection. PBO under the trademark Zylon® was recognized by professionals for its high compressive power.

Most shielding garments of today are constructed using panels of the multi-layered ballistic pattern. In research, Alpyildiz et al. discovered that the double-face inlay structures exhibit the highest results between the special fabrics we have come to know these days. Lin (2005) encouraged the use of cushion layers within the armor itself to diminish the direct effects of trauma.

Other problems persist concerning the produce of female body armor since manufacturers can no longer use the old cut-and-stitch technique. To overcome the majority of problems, Bruniaux offered to transfer the flat pattern to a 3D pattern; as a result the protective zone of the female vest was entirely accustomed. Nevertheless, this method has one negative aspect related to closures that ultimately make the female bust the weakest against the bullet collision.

Mellian invented a special type of female armor with a sufficient front protective panel. The panel's multiple layers of ballistic-resistant fabric were made of polymer yarns. The right contour was designed by overlapping the seams. The outcome was the front armor panel precisely designed to the bust's curving. The new method of molding the shape ensured the wearer with enough comfort of movement.

The innovative method, first discovered by Hussein and Parker, ensured retaining of the molded female shape to provide the wearer with the ease of

movement and enough of comfort. Last but not least, Smith and Ting made-up a three-dimensional woven structure to the female armor. Based on previous findings, Chen and Yang came up with a mathematical formula for the molding of angle-interlock textile to suit the female armor needs. Manufacturers and researchers have acknowledged that the comfort is psychologically and physically an undividable aspect. The main objective, therefore, is to present permeability comfort to the body armor and reduce the weight and thickness that can signify the evaporation of the sweat. For low-level safety reasons, ballistic material might be feasible to wear next to the skin. To conclude with, advanced body armor technologies intend to reduce the vest weight and boost the comfort level. The foremost drawback with body armor remains its multi-layered design, which still lacks a good deal of air permeability.