

The Motorcycle Protective Clothing Assessment Program: A Star Rating System

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Abstract

Motorcyclists wear protective clothing and helmets to reduce their injury risk. However the protective performance of motorcycle clothing in crashes is variable and many garments are poorly designed for use hot climates. In the absence of objective evidence, motorcyclists must rely on advertising, brand reputation and social networks when buying protective clothing. The objective was to develop an independent process for testing and publicizing the protective and thermal management performance of motorcycle clothing to encourage usage and reduce injury rates. Protocols were based on existing standards to allow a smooth transition for industry to improve their products where necessary.

Background

Despite the benefits of personal protective equipment (PPE), a substantial proportion of motorcycle clothing (jackets, pants and gloves) fail under crash conditions, with neither brand nor price a reliable predictor of protection (de Rome 2011a). In addition, many motorcyclists ride unprotected and are three times less likely to wear protective clothing in hot conditions (de Rome 2011b). Consultations and research suggested an evidence-based ratings scheme could increase usage of protective clothing and reduce the incidence and severity of crash injuries (de Rome 2003, de Rome 2005, Haworth 2006, Haworth 2007, de Rome 2012, de Rome 2014, Hurren 2016). The Motorcycle Protective Clothing Assessment Program is coordinated by the NSW Centre for Road Safety to provide independent ratings of injury protection and thermal management performance by motorcycle protective jackets, pants and gloves in the Australasian market.

Methods

The ratings are based on established standards and consistent with existing industry testing regimes. Ratings for injury protection are based on tests of impact abrasion, burst strength and impact energy attenuation for the relevant impact risk zone (Figure 1) as specified in the European Standard (EN13595-1:2002). EN13595 is the most comprehensive and objective means of assessing garments' likely performance under crash conditions. Additional test protocols were included for harvesting material samples from constructed garments, because the Standard's certification methods often rely on pre-production flat samples provided by manufacturers. Thermal management ratings are based on tests of thermal and moisture vapour resistance (Kar 2007).

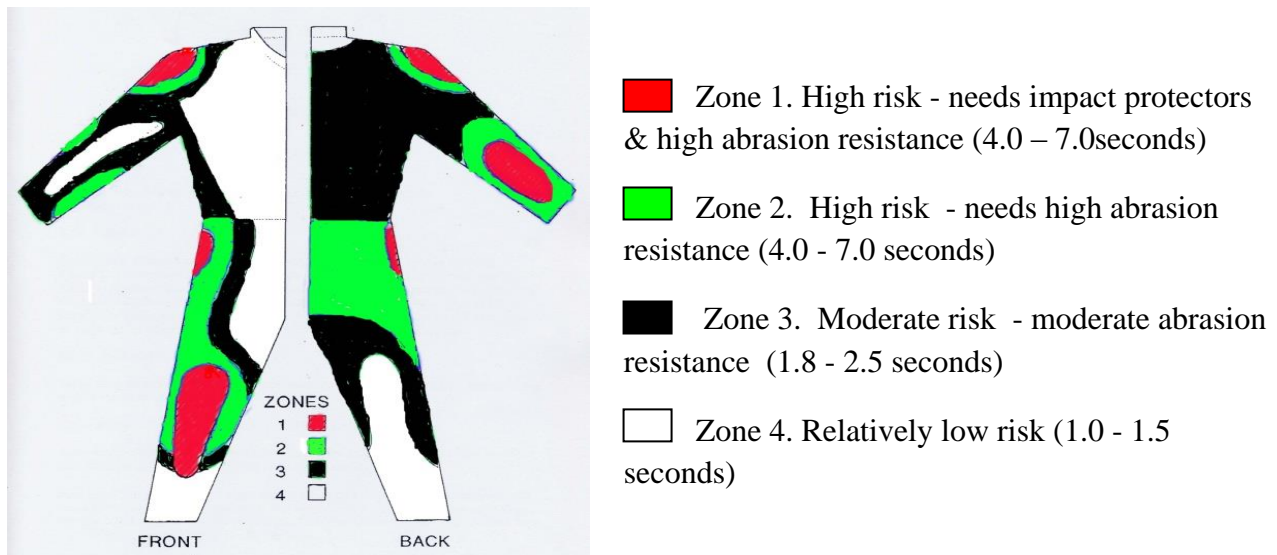


Figure 1. Motorcycle rider crash impact risk zones

Results and discussion

The ratings for injury protection are based on a weighted combination of scores for impact protection (30%), impact abrasion (50%) and burst strength (20%) resistance, based on their observed prevalence in crash-damaged PPE. Samples from each of the four defined impact risk zones are tested for abrasion resistance and the results weighted by zone (Zones 1/2:60%, Zone 3:25% and Zone 4:15%). Penalties are included to discourage manufacturers from minimizing garments' area of Zones 1/2. The final abrasion rating is expressed in time-to-hole seconds.

Burst strength of garment seams is also weighted by risk zones. The highest risk seams are those within and around Zones 1/2, the burst resistance scores of lower risk body seams are weighted to 50% of high risk seams. Burst strength for jackets and pants is tested using hydraulic pressure, whereas gloves are tested with tensile force due to their exposure to different types of impact forces.

The tests of impact protectors for the shoulders, elbows, hips and knees measure the transmitted force, which is scaled using body location, retention and coverage of the Zone 1 area. The impact protection rating method can be applied to aftermarket impact protectors. Thermal management is assessed as the extent to which clothing traps metabolic heat, thereby restricting the body's thermoregulatory system. The thermal management ratings are derived from measuring garments' evaporative resistance (breathability) and thermal resistance (dry heat insulation) to calculate scores on the Relative Vapour Permeability Index.

The challenges are to fully fund and manage the introduction of the scheme to allow local industry to improve their products where necessary.

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