Motorcycle and Scooter Safety Forum

Motorcycle Protective Clothing

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Patterns of injury risk and usage of protective clothing.

What are the barriers to usage

What could we do?
This graph shows the proportion of riders with injuries to each part of their body. These are taken from two large scale studies of motorcycle crash injuries in Europe published in 1987 and 2004.

There is almost no difference in the injury patterns reported, except for the head. The 1987 data included a substantial proportion not wearing helmets, and I have used the data for whose without helmets. Inclusion of the helmeted riders brought the head injury percentage down to 48% in the 1987 study.

References:

These are the results of a couple of surveys of riders in NSW. The columns show the proportion who always wear motorcycle protective clothing by part of their body. The line is taken from the previous slide, showing injury patterns from MAIDS (2004).

The Riders (2006) survey were generally experienced riders, >50% were motorcycle clubs members, they read motorcycle magazines and accessed motorcycle websites. They were relatively well informed about motorcycling matters.

Novices were surveyed when they attended for their Provisional rider licence test. So had less than one year, and many had just 3 months riding experience.

Both groups were least likely to protect their legs and feet, but we know from the previous slide that the legs are the part of the body most likely to be injured in a crash.

People sometimes assume, there is no point in protecting legs, because clothing can’t prevent a fracture. In the MAIDS study, of the 74% with leg injuries, the majority had only soft tissue injuries, less than half had fractures.

References:


Effective protective clothing can prevent or reduce many soft tissue injuries.

Protective clothing can also reduce the risk of infection and complications by reducing the risk of open wounds.

This is not a trivial benefit. Scarring and joint damage are a major cause of disability for motorcycle casualties.

One study found protected riders had 7 days less in hospital and 20 days earlier return to work (Schuller, 1986).

Soft tissue injuries amount to up to half of all the injuries suffered in motorcycle crashes (MAIDS, 2004).

For many riders, this type of injury is the only injury they suffer (MAIDS, 2004).

Reference:

Protective clothing won’t save you from being bent or crushed by another vehicle
Or from the impact of hitting a solid object, particularly not at high speed.

But, most motorcycle crashes are not high impact crashes.

The MAIDS study, found that 75% of crash impacts occur at speeds of 50 Km or less. (30 mph)

And speed contributes less than 10% of the variance in injury severity, object hit is more important. This does not mean that speed is not a serious issue for riders, just that you don’t have to be going very fast to get hurt.

They also found, 40% of riders in a crash tumbled, rolled or slid along the road without further impact with another object.

It is these types of crashes where injuries are most likely to be reduced or prevented by appropriate clothing.

References:
This table shows the severity of the most serious injury suffered by the riders in the MAIDS study.

You can see, the most serious injury suffered by 39% of the riders, was minor. Another 33% were rated as moderate.

Protective clothing can have a role in these types of crashes.
Different parts of the body have different injury risk levels in a crash.

The red zone needs impact protectors and high abrasion resistant materials. 4 -7 seconds
The green zone needs the same level of abrasion resistance, but not impact protectors.

The white zone – can be made of mesh or elasticised relatively low abrasion materials for comfort. Still needs to give at least 1 second abrasion resistance.

These zones were devised from analysis of the impact points and damage to 100 leather suites from crashes.

Reference:
The first principle is to cover all exposed skin.
With abrasion resistant materials, that will protect the rider’s skin as they slide across a road’s surface.
Impact protectors should be worn over all the joints and bony bits.

Impact protectors that comply with the European standard, are designed to limit the force of a blow at the point that bone may break, but it won’t shatter.
Clothing needs to fit closely so that it stays in place during the twisting and dragging forces of a crash.

The most common single failing in motorcycle clothing is the failure of seams and fastenings, which burst open on impact.

Riders need to look for multiple layers of stitching when they buy gear.
Part of the difficulties is that motorcycle clothing has to serve a number of different functions.

- Protection from injury
- Protection from other motorists
- Protection from weather
- General clothing
Protection from being cold, wet or too hot are also safety issues

By improving comfort, you reduce fatigue, distraction and dehydration.

Being cold can result in loss of feeling to hands and feet, which interferes with operating the controls.

Lowering body core temperature can affect the brain – decision making or emotion reactions – irritable, detached.

Being wet is uncomfortable, but water conducts heat – so can increase wind chill. Not just rain, perspiration can also problem with chilling.

Heat is probably the issue that is hardest to deal with, for Australian riders and one we need to address urgently.

Ventilation and reflection of heat are the keys, but it is a difficult issue.
We know protective clothing can reduce injuries, but many riders do not fully protect their bodies. Why not?

What are the barriers?

- Climate - Few products designed for hot weather
- No independent evidence of product performance
- Limited range – particularly for women, commuters and scooter riders
- Cost
Most products have been developed for the northern hemisphere.

Helmets are a particular case in point. Helmet design is at complete odds with how to avoid heat stress.

For all gear, ventilation and reflection are the keys – vents, mesh panels, cooler packs.

But ventilation only works when moving, less value in slow traffic and vented helmets are noisy helmets.

We need products designed for tropical climates.
Some of the clothing sold to motorcyclists is just fashion without any serious protective function.

The only standards for motorcycle protective clothing are in Europe. There is a different standard and different number for each item of clothing.

While the European intention was for manufacturers to submit their products to the tests in order to be able to sell them as protective clothing.

In fact few have complied, they tend to avoid marketing their products as ‘protective’ so that they don’t have to go through the expensed of testing and requirement to comply with the standards. As a result the majority of European products sold here have not been tested and are not labelled as PPE.

The other major source of products sold here are from the USA where there are no standards.

The good thing is that the EU standards specify objective tests to assess performance.

These can be used to provide independent assessments for consumers.
Ride magazine in the UK, regularly publishes the results of such tests.

This shows the results for tests of 2-piece leathers published in 2005, only 1 of the 11 leather suits passed the tests.

The columns show the score out of 21, 14 was the pass mark. The line shows the cost in UK pounds.

These are all well known brands. A rider buying any of these suits could not know, just by looking at them, how they might perform if put to the ultimate test.

Neither cost or brand name are reliable indicators.

One of the cheapest leather suits scored second highest. Two very expensive suits, both very well known brands, came last.

http://www.motorcyclenews.com/Ride/Product-Tests/
These are the results on the same tests for 16 two piece fabric suits. The pass mark was 25 out of 35.

They did better than the leathers. but still only half, 8/16 passed.

And apart from the one high achiever, there is no relationships between cost and performance.

Tests of boots and gloves have found similar levels of poor performance. There are also products that perform well, but currently the only independent assessment available to riders is by reading Ride magazine.

The sad thing is that the test reports also indicate that relatively minor adjustments to production methods, such as seam design would over come many of the problems.

Reference:
http://www.motorcyclenews.com/Ride/Product-Tests/
Under the current system, riders have no certainty about the products they wear.

People tend to assume the more expensive or better known brands will be safer. But this is not the findings of the Ride tests.

My own research into motorcycle crashes and what riders were wearing, confirms that a lot of gear does perform very well in crashes. But some doesn’t.

The issue is that riders have no means for comparing different products.

A lot of information comes from the manufacturers – but how much of that is advertising spin and what is objective science?

There are websites and other sources of advice for riders on what to look for when buying gear, but this is putting responsibility onto riders to make decisions about what is essentially unknowable.

I have published information in a number of websites and reports. The Federal government have recently commissioned a product to be called the Good Gear Guide, which is intended to help riders choose the gear, but no one can tell just by looking at a product, how it will perform in the ultimate test of a crash. All we can say is how to identify the features of gear that is most likely to provide the necessary protection.
What riders wear is often driven by what is available. We are a small market on the world stage, most of our product is imported from the US and Europe.

The market is segmented into even smaller numbers:

In particular there is very little for women riders. Women cannot wear motorcycle clothing designed for men. This is not just a fashion issue, to be effective, it has to fit closely and particularly the impact protectors have to stay in place in a crash.

There is also insufficient product for use by commuters and for those for whom riding is general transport. Much of the gear is designed for recreational riding, where you go for a ride and then come home. Very little that is suitable for use as general clothing at a destination.

Gear promoted as providing injury protection tends to be designed for sports bike and off road riders, where injury risk is more accepted.

Gear is also very expensive, a scooter costs $3000, the most basic gear will cost half that again. And it is clothing – if you ride every day, one of each is not going to be enough. For example, kevlar lined jeans cost around $300.

At the least it should be recognised as safety gear and not attract GST, perhaps it should also be recognised for a rebate on medical insurance premiums.
Riders need:

- Information about injury risks
- Credibility about product quality
- Products suitable for Australian climate
- Wider range of products
- Incentives e.g. insurance benefits for costs.

Industry needs:

- Information, incentive and support to provide reliable protective gear.

Riders need:

- Information about injury risks
- Independent information products performance
- Products suitable for Australian climate
- Wider range of products suitable for different riding styles/destinations.
- Incentives e.g. insurance benefits for costs.

Industry needs:

- Information, incentive and support to provide reliable protective gear.
Mandating usage of protective clothing cannot work, because we cannot define what would be appropriate product nor can we guarantee a supply of such products.

There is clothing not designed for motorcycling, that may well provide better protection than other clothing that is designed as motorcycle apparel but is fashion rather than protective.

It is difficult for riders to tell the difference and impossible for enforcement purposes.

Product standards are good for riders and good for industry.

Set independent bench marks for performance.

Ensure that riders are able to make well informed decisions and that the products available are fit for purpose.

However, product standards would also be impossible to enforce in Australia, given the size of our market, because most of the products available internationally do not comply with any standards.
We can, however, make use of the tests developed for the European Standards and which replicate crash conditions.

These tests ensure that products are made from abrasion resistant material that will last when being dragged against the road surface. The requirements vary according to the part of the body. The highest risk areas need between 4 and 7 seconds.

( note: Good leather might last up to 10 seconds but your average denim jeans offer 0.6 of one second)

The tests are to ensure that:

- The material cannot be cut, penetrated or torn by sharp objects in a crash.
- The seams, fastenings and the material itself, will not split or burst open on impact with the road.
- There are impact protectors over key joints, to spread the force of the impact at a less damaging rate.
- It will stay on and in place during a crash.
Mandatory standards will not work, we have seen that in Europe.

But we can learn and benefit from that experience:

We can devise a consumer protection system, that will provide the information and incentives to encourage usage and improve the quality of available products. This could operate the way (NCAP) the New Car Assessment Program, assess cars – which has led to substantial improvement in the safety performance of cars.

We can devise a product performance assessment system, which is based on the EU standards tests.

But includes assessment of factors relevant to comfort such as weather and heat protection.

The system would be consumer oriented, to enable riders to make informed purchasing decisions.

And will provide industry with the incentive to provide those types of products.

I have been working with the Motorcycle Council of NSW, on ways to achieve this for some years. A number of government agencies have expressed interest and in the last couple of years, together with Narelle Haworth, we wrote a report for VicRoads on how a star rating system might be devised. A list of research projects and reports is attached.
THANK YOU FOR YOUR ATTENTION
2000 - Standards Australia, Motorcycle Protective Clothing; Guidelines for Manufacturing (Victoria)


2004 – MAA/RTA advertisements promoting use of protective clothing (NSW)


2007 – TAC website and advertisements promoting usage of protective clothing (Victoria)


Contact: liz@lderconsulting.com.au
Motorcycle protective clothing: Guidelines for manufacturing

Standards Australia document published in December 2000

Four “end use categories”

A. Strong enough for racing
B. Strong enough for sports road riding
C. Strong enough for commuting
D. Not strong enough to offer crash protection

- not mandatory
- no labelling
- apply only to clothing (not gloves, impact protectors and boots).