DID YOU KNOW?

Marine Corps Safety & Force Preservation

NEW STUDY DISSECTS MOTORCYCLE PPE USE AND EFFECTIVENESS

"Protect your whole body, wear body armor, wear boots not shoes, and ride safely." – Liz deRome

Increases in injuries and deaths from motorcycle crashes are not unique to the Marine Corps, but represent a worldwide problem. Our mates "down under" conducted the first major scientific study of motorcycle Personal Protective Equipment (PPE) effectiveness since Europe established standards for motorcycle protective clothing. What's that got to do with Marines? While these standards are not mandatory outside Europe, they have had a major impact on the design and selection of motorcycle clothing worldwide. Manufacturers compete in worldwide markets and there are advantages to applying a uniform standard to all products in a particular line, not just the products heading to regulated markets.

The European standards focus on two major areas – the resistant of the clothing to tears, cutting or abrasive failure, and the use of body armor to distribute impact forces across a wider area in order to diminish impact injuries from a crash. The deRome study[1] can help any rider make good decisions about gear that will get the most protection for dollar spent.

What makes this study different is that it did not look only at crashes reported through the police and emergency services, which tend to be the most serious, but instead sought out referrals to individuals through motorcycle repair shops based on repairs to bikes that were dropped or otherwise damaged in an accident. This led to interviewing the riders who crashed and did enough damage to their bike to warrant repairs, but did not do enough damage to their person to warrant a hospital stay or burial. The results show how different types of PPE worked, and whether the PPE sustained damage or failed in the crash. This is especially important because the value of PPE is realized to a much greater extent in lower energy crashes that do not result in death. Higher energy crashes on the other hand impose forces on the body and internal organs that are not substantively mitigated by PPE. This study also does not address helmets, which are already well proven in reducing head injuries, and subject to more proven standards of design and testing.

Semper Ride the movie executes an intentional low side crash by professional stunt man and trainer Teach McNeal at approximately 35 mph. Teach wore a full leather track suit, as well as track quality boots, gloves and of course, helmet. The Semper Ride controlled test resulted in impact area failure of the leather exterior down to the protective Kevlar layer, but still presents only a single data point.

The deRome study measures the results of over 200 crashes at a range of speeds using a wide variety of PPE. The study included riders with minimal or no PPE as well as full PPE with body armor. The analysis shows the comparative risk of injury requiring hospitalization for each article of PPE as it relates to the part of the body it is intended to protect, compared to the rider not wearing that article.

Chris "Teach" McNeal intentionally low sides in the movie "Semper Ride"

DID YOU KNOW?

THE DEROME STUDY

In the study, PPE use is broken down in three categories:

- **None** means non-motorcycle specific clothing – for example a rider NOT wearing a jacket, or a long-sleeve windbreaker or a sweatshirt, are all considered to NOT be wearing a motorcycle jacket.
- **Motorcycle-specific PPE without armor** are articles of PPE that meet the Euro Standard for abrasion resistance but do not meet the standard for body armor.
- **Motorcycle-specific PPE with armor** are articles of PPE that meet the Euro Standard both for abrasion resistance and for body armor.

The study also examines type of injury as soft tissue (cuts, bruises, lacerations, abrasions), open wounds (same as soft tissue but excluding bruises), or fractures. Results are provided in the study to show relative risk for each injury group and for any injury.

Looking at a sample of 200+ events, each of which contains a different mix of PPE, speeds, conditions and resulting injuries, there have to be enough observations of any particular result to make it count. It is fairly obvious that more gear is better, and the kind of PPE worn by racers and track enthusiasts is clearly driven by lots of experience and understanding of the risks involved. But for most of us, cost is an issue. Comfort and practicality matter too. You might want to invest in a $1,000 plus set of leathers for track riding, but you probably wouldn't wear them to take a date to a movie.

The table below lists only the results that were considered statistically significant. The findings basically support the same message Jason Britton delivers in Semper Ride – "Go out & put as much gear on your body as you possibly can." But there are a few surprises in the data.

Part of Body	PPE	Relative Reduction in Risk of	
		Any Injury	Open Wound Injury
Feet/ankles	Non-motorcycle boots	53%	76%
Hand/wrist	Motorcycle gloves + BA	45%	73%
Feet/ankles	Motorcycle boots + BA	45%	90%
Leg only	Motorcycle pants + BA	39%	59%
Upper body	Motorcycle jacket + BA	23%	63%
Back/Spine	Rigid Foam insert in jacket	-116%	NA

- **Wearing any type of boot provides a 53% reduction in risk of any foot or ankle injury, and a 73% reduction in risk of an open wound injury. But armored motorcycle boots make a much bigger difference in reducing the risk of an open wound injury (90%).**
- **For gloves, pants and jackets, non-armored motorcycle-specific clothing does not give significantly more protection than clothing that is not designed for motorcycle use. For any injury category you can significantly reduce your risk by wearing gear with body armor incorporated.**
- **For spinal injuries, foam back inserts actually correlated to an increase in risk of a soft tissue injury to the spine or back. This finding suggests that more study on the design of body armor for the back and spine is needed.**

DID YOU KNOW?

There are two basic take-aways for the rider who wants to pick the best gear, but needs to build their PPE inventory over time and at reasonable cost:

Protect your feet! Boots make a big difference. Durable high-tops, hiking, or work boots are a good alternative if armored motorcycle riding boots are beyond your current budget. But remember that motorcycle footwear is designed to give good traction on paved surfaces, be oil resistant, and not interfere with pegs, shifters, brakes and other appendages on your bike. Boots with laces, loops, hooks or flaps can snag on your bike and contribute to an embarrassing drop or a loss of control. Keep that in mind when shopping for lower cost alternatives.

Get Armored! More gear affords more protection, but body armor is the way to go. If you can't afford the armored jacket or pants right now, spending less money on a non-armored product that has a "motorcycle" label or logo is not going to significantly lower your risk any more than even less expensive "mall leather" jacket and jeans. For gloves, armor also makes a big difference. Consider also that there might be big price differences on very similar glove products that are marketed for street motorcycles, off-road motorcycles or snowmobiles/ATVs.

For questions, comments or more information, contact your installation Safety Office or visit www.semperride.com

[1] deRome,L.,etal.,Motorcycleprotectiveclothing:Protectionfrominjuryorjusttheweather?Accid.Anal. Prev. (2011),doi:10.1016/j.aap.2011.04.027

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