‘Science Of Being Seen’ (SOBS)

An in-depth investigation of the most common motorcycle crash of all – the ‘Sorry Mate I Didn’t See You’ or ‘SMIDSY’ collision.

Author: Kevin Williams / Survival Skills

Motorcycle trainer, motorcycle author, motorcycle safety consultant, motorcycle forum moderator, former courier and ever a recreational rider. Is there a common theme here?

https://scienceofbeingseen.org

http://www.survivalskills.co.uk
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Introduction: Science of Being Seen: WHAT IS SOBS?

SOBS looks at why motorcycles aren't seen at junctions. The aim is to offer a better understanding of how, where and why these collisions happen, and to give riders some simple and practical strategies for staying out of trouble.

SOBS was originally created by myself (Kevin Williams MSc) over the winter of 2011-2012 as the third 'accident prevention' module of Kent Fire & Rescue's pilot 'Biker Down' course.

SOBS explores a range of problems:

'looked but COULD NOT see' collisions, where for various reasons – including 'beam blindness' and the 'constant bearing issue' – it was physically impossible for the driver to see the motorcycle in the run up to the crash

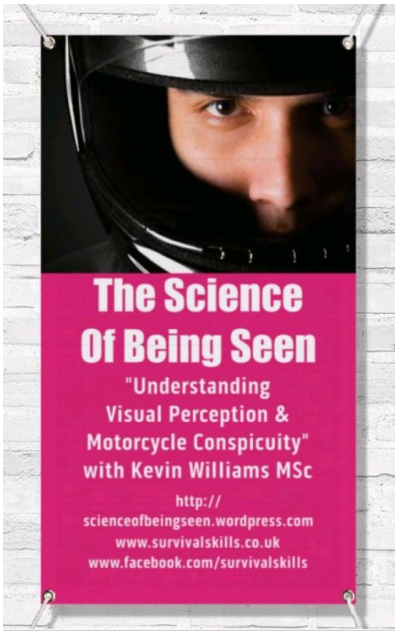
'looked but FAILED TO see' collisions, where the bike was in a place it could be seen but visual perception issues meant that the driver failed to spot the bike

'looked, SAW AND FORGOT' collisions where short term visual memory and workload issues meant that the driver was likely to have seen the bike but mentally lost track of it

'looked, SAW AND MISJUDGED speed and distance' collisions, which tend to happen on faster roads

SOBS takes an objective look at the effectiveness or otherwise of the usual 'passive safety' conspicuity aids – hi-vis clothing and day-riding lights (DRLs), before suggesting some general rules to make them more effective.

Finally, SOBS looks at how motorcyclists can use pro-active techniques to avoid being caught up in a SMIDY collision.



Science-based – SOBS was created to solve a practical riding problem – the SMIDSY collision – but is based firmly on scientific research into these crashes, a body of data extending back into the 1970s. The SOBS website is open to all, regularly updated and provides the background to the presentation, including offering full references for my work.

Regularly updated – new studies continue to emerge and the talk has been updated regularly to reflect the latest thinking such as new studies on lighting arrangements to cope with the widespread use of day-running lights on cars, and the 'looked, saw but forgot' theory that appeared in the literature as recently as 2018.

Award-winning – as well as an insurance industry award for Biker Down, our team at Kent was honoured with a Prince Michael of Kent International Road Safety Award which we collected at the Savoy Hotel in London in November 2012.

Used nationally – As more and more fire services across the UK adopted Biker Down, a stripped-down version of SOBS has been used as the third module on many of these courses, right up to the moment courses were shut down in March 2020 due to the COVID-19 pandemic. I personally continued to deliver SOBS to audience of motorcyclists at Rochester in Kent for KFRS until my final presentation in February 2020.

Going international – SOBS has also gained international recognition. In 2018 and 2019 I was one of a team of international speakers on the nationwide Shiny Side Up rider safety initiative in New Zealand, travelling around the country to visit over a dozen venues on each occasion. In 2021, I was a virtual speaker at Shiny Side Up.

Delivered to rider groups – I travel around the UK in person to deliver SOBS to clubs and rider groups around the UK. And thanks to COVID, I am now able to deliver the presentation online. To organise a talk for your own group contact me at: info@scienceofbeingseen.org.

Available as a book – SOBS is also available as a paperback book or an ebook download. All funds from sales are ploughed back into website hosting, further research and writing.

Other than donations SOBS receives no funding. Your contributions help keep the project alive. https://scienceofbeingseen.org/support-sobs/

Last updated:

Saturday 14 August 2021 – *timeline updated, typos corrected, post converted to page*
Tuesday 30 April 2019 – *rewrite for clarify timeline of development of SOBS, added information about conspicuity aids in official UK motorcycle books*
Friday 23 November 2018 – *edited for clarity, correcting typos*

Science Of Being Seen (SOBS): About

Since the mid-1970s, motorcyclists have been encouraged to use what are often called 'conspicuity aids' – to wear light-colored or hi-vis clothing and helmets, and to ride with their lights on – in order to reduce the risk of collisions with other road users who might otherwise not see them.

Many road safety organizations, as well as police, magistrates and insurance companies, have taken this advice as a statement of self-evident fact:

- motorcyclists not using conspicuity aids have been told they have not been making themselves *"more visible"*. They have been found partly responsible for collisions where the other road user violated the motorcyclist's right of way. They have even been denied full insurance payouts in no-fault collisions.
- drivers not seeing motorcycles where the rider was using conspicuity aids, and thus causing a collision, have been told that should have seen the bike, and if they didn't, then they *"didn't look properly"*.

As a new rider back in the mid-70s, I too took the advice to 'ride bright' on trust. I was an early adopter of hi-vis clothing and day riding lights (DRLs). But after passing out from university, I spent sixteen years covering around half a million miles as a motorcycle courier in and around London.

And the more miles I covered, the less convinced I became that the basic premise behind the use of conspicuity aids was actually sound; as well as my personal experience of dodging errant drivers who failed to see my hi-vis clothing or my lights, I also picked up a number of similarly clad riders who'd just had a *"Sorry Mate, I Didn't See You"* 'SMIDSY' collision with another road user. It wasn't unusual to hear the rider say something along the lines of: *"but I had my hi-vis and my lights on – he / she should have seen me"*. Quite clearly, the driver hadn't. At first, I thought the problem was probably restricted to inexperienced riders, but over time, I realised that experienced riders using conspicuity aids also got taken out by the SMIDSY collision.

I stopped using hi-vis and turned my headlight off in fine weather. I failed to detect any difference in whether or not drivers saw me coming. As by now I was expecting not to be seen, I was ready on the occasions when drivers did fail to see me. Then I became a motorcycle instructor and not only had to tell new riders about the supposed benefits of conspicuity aids, I had to wear hi-vis and use the lights when I was working, as did the trainees. Despite several highly-visible bikes travelling in convoy, we still had to deal with right-of-way violations (ROWVs) from time to time. I was less than happy at having to tell CBT trainees about the 'benefits' from the use conspicuity aids. I wasn't convinced they contributed much to safety but I began to suspect that the advice contributed much to overconfidence and a failure to avoid avoidable collisions. So, during this time when I was delivering CBT on a regular basis – the mid-1990s to mid-2000s – I started to look into the research behind the use of conspicuity aids so that I could better add cautions to the standard CBT advice on hi-vis and DRLs. NOT relying on conspicuity aids became a central plank of my post-test courses, first delivered in 1997. I also

have to credit a number of eye-opening forum discussions with another CBT instructor named Ian Kew.

What qualifies me to write about SOBS?

Before getting involved in riding motorcycles for a living, my own background was in the life sciences at degree and post-degree level. Now, if there is one thing that a background in science achieves, it's to teach us that it's never a good idea to accept something we're told on trust alone. Any time we hear something stated as fact, we need to assess the evidence carefully to distinguish between fact and opinion.

An opinion is a form of mental shorthand, where we draw on a limited selection of facts or ideas to form a personal belief that something is probably true.

But, as the Oxford Dictionary says, an opinion is… *"a view or judgement formed about something, not necessarily based on fact or knowledge"*.

We are all entitled to opinions, but opinion is nearly always simply something that we believe but which falls short of – often well short of – of absolute proof. What we THINK is not FACT. For example, consider the statement *"light-coloured clothing makes motorcyclists more visible"*. What we need is to ask ourselves:

"Who says this? Is there any evidence to support this statement? Am I really looking at a fact? Is it an opinion that is not supported by fact? Or is it a simple coincidence?"

If we can ask questions such as these, we are in a far better position to make our own judgements about what is and isn't true.

We have to be careful to avoid making up our own 'facts' as bogus support for our opinions. Even when we know something as a fact, it doesn't mean that it is relevant to the question we're trying to answer. One of the most important checks is to understand that *"correlation does not imply causation"*. A correlation occurs when a change in one variable is also seen in a second variable – the two sets of data appear to follow each other.

If there is a causal relationship between two things, one process (the cause) is directly responsible for causing the second process (the effect), and more importantly, the link can be demonstrated. For example, our summer days are warmer than winter days because our half of the planet receives more hours of sunlight. The extra sun causes the ground and atmosphere to heat up.

But it may be pure chance. For example, between 1999 and 2009, the number of people drowning in swimming pools rises and falls in line with the number of films that Nicholas Cage appeared in. Unless there are a significant number of people who hate Cage so much they are prepared to leap into pools and drown every time he releases a new movie, this is a good example of a correlation which has no causal relationship. And this is where we get to

motorcycle safety. Many claims for the effectiveness of conspicuity aids, as well as some studies carried out on a non-scientific basis, confuse correlation with causation.

Not so long ago a police force launched a year-long motorcycle safety intervention. Casualties dropped that year. A statement was duly released claiming the safety programme had been a success. The next year, figures were back up despite the intervention running for a second year. It's almost certain the first-year drop was simply chance. If there was a correlation with anything, it was with an exceedingly wet summer – the distance travelled by riders goes down when it rain. The fact that summer had a safety campaign running was a coincidence.

Look critically at any statement, and try to see if there is a solid, logically-reasoned explanation behind it.

And if we can't see such an explanation? Then it's wise to put our belief on hold until we see something better.

But it is also important we listen with an open mind. Just because something doesn't agree with what we think we know or what we've been told in the past doesn't mean it must be wrong. Above all, we need to be sure we're not simply looking for evidence to support our existing opinions, or even making up our own 'facts'.

References:

Clarke, D. D., Ward, P., Bartle, C., Truman, W. (2007). "The role of motorcyclist and other driver behaviour in two types of serious accident in the UK", Accident Analysis and Prevention, 39, 974-981.

Understanding the SMIDSY
"Sorry Mate, I Didn't See You"

What follows is an investigation into the research papers that look at the collisions that happen between powered two-wheelers and other vehicles at junctions, most often when the rider had the legal 'right-of-way'. In the UK, these collisions are often referred to as 'SMIDSY' crashes, from the apology that many drivers offer to the riders – "Sorry Mate, I Didn't See You'.

To help you track the references back to those papers, I use the standard system known as a 'citation' which gives credit to the author(s) and the original paper. The expression 'et al' means that more than one person was responsible for the research.

THE BACKGROUND TO SOBS: It's long been known that riding a powered two-wheeler (or PTW; – i.e., a motorcycle, scooter or moped) carries a high risk of death or injury. Helman et al (2012) in a recent literature review produced by the UK's Transport Research Laboratory (TRL) states:

"…it is far from controversial to say that motorcycling is the most risky form of mainstream transport per kilometre travelled."

When I was invited to create an 'accident prevention' module for the pilot 'Biker Down' course by James Sanderson of Kent Fire and Rescue Service in 2011, there were a range of topics that immediately suggested themselves. Cornering crashes was one. Another was group riding, and I actually did create a presentation based on that issue. But I quickly settled on the infamous SMIDSY collision as the basis for what has become known as the 'Science Of Being Seen' or SOBS for short.

Why focus on the SMIDSY? Quite simple. It's long been believed – both by bikers and by road safety authorities that a particular problem for motorcyclists is the collisions at junctions. Most riders tend to assume the SMIDSY happens when a driver pulls out from the rider's nearside (that would be from the LEFT in the UK and other countries that drive on the left, but on the RIGHT in the US, France and other countries that drive on the right). But is that actually correct? And does it only happen to bikers?

So, the first question to ask ourselves is this: *"do motorcyclists really suffer more collisions with cars?"*

In a recent paper, de Craen et al (2013):

"…tries to unravel whether – acknowledging the differences in exposure – car drivers indeed fail to yield for motorcycles more often than for other cars. For this purpose, we compared the causes of crashes on intersections (e.g. failing to give priority, speeding, etc.) between different crash types (car-motorcycle or car-car). In addition, we compared the crash causes of dual drivers (i.e. car drivers who also have their motorcycle licence) with regular car drivers. Our crash analysis suggests that car drivers do not fail to give priority to motorcycles relatively more often than to another car when this car/motorcycle approaches from a perpendicular angle."

In other words, in this study from the Netherlands, the crash rate with cars that EMERGE from a side turning is much the same whether the approaching vehicle is a car or a PTW. Cars hugely outnumber bikes on the roads, but that is a surprising conclusion. However, they continue:

"There is only one priority situation where motorcycles seem to be at a disadvantage compared to cars. This is when a car makes a left turn, and fails to give priority to an oncoming motorcycle. This specific crash scenario occurs more often when the oncoming vehicle is a motorcycle than when it is a car. We did not find a significant difference between dual drivers and regular car drivers in how often they give priority to motorcycles compared to cars."

Remembering that the 'left turn' referred to is a right turn in the UK, it should be clear that the collisions where motorcycles are over-represented involved another ONCOMING vehicle turning across a motorcycle's path when the motorcycle is on the priority road.

Clarke et al (2007) investigated a sample of crashes involving motorcycles in the UK:

"A sample of 1790 accident cases was considered, including 1003 in detail, from UK midland police forces, involving motorcyclists of all ages, and covering the years 1997-2002 inclusive. Significant differences were discovered in the sample with respect to types of accidents involving motorcyclists (and their blameworthiness). There seems to be a particular problem surrounding other road users' perception of motorcycles, particularly at junctions. Such accidents often seem to involve older drivers with relatively high levels of driving experience who nonetheless seem to have problems detecting approaching motorcycles."

Junction collisions were further described by Helman et al (2012) in the TRL paper:

"It is widely accepted that one key factor in motorcyclist crashes around the world is the difficulty other road users have in detecting an approaching motorcyclist or correctly appraising their speed and position. This is of particular concern at road intersections, when drivers need to detect gaps in oncoming traffic to make turns either across or into traffic flows. If a motorcyclist is not detected by a car driver in this situation (so-called 'looked but failed to see') then this can lead to a manoeuvre that violates the motorcyclist's path, and a potential crash."

So, to sum up, a significant number of collisions between vehicles generally happen at junctions, motorcyclists are most at risk when the other vehicle approaches from the opposite direction and turns across the motorcycle's path, the collision is usually the result of the other road user's actions, and when violating the rider's right-of-way, the problem for the driver appears to be a detection issue.

And that leads us directly to a second question: *"why do drivers fail to detect motorcycles?"* And quite honestly, we're still searching for a definite answer. The fact that a paper entitled 'Sorry, Mate, I Didn't See You: A Plausible Scientific Explanation' could be published as recently as 2006 after more than thirty years of research on the issue should serve as a warning – the problem is complex, and we haven't got to the bottom of it yet! So, to make a start on understanding what goes wrong and what we motorcyclists can do about it, some historical perspective on the research into motorcycle crashes is useful.

A still snipped from a UK road safety information film from the early 2000s.

WHERE IT ALL STARTED: In 1975, the Greater London Road Safety Unit identified PTWs as being over-represented in accidents. Detailed analysis followed and the results indicated that a major contributory factor was that other drivers failed to see the motorcycles in the general street scene. Helman et al (2012) suggest that the 1976 Greater London 'Right Bright' campaign that followed:

"… may have been the first road safety campaign specifically designed to encourage riders of powered two-wheelers to improve their conspicuity by wearing bright clothing, preferably of fluorescent material, and by switching on their headlights in daytime. The campaign was extensive, running from August to October 1978, and involved radio advertising (on two London-based stations in the UK), a poster campaign, leaflets distributed through a number of routes (including dealers, garages, colleges, businesses and by London's Metropolitan Police Service) and give-away items such as combs, pens and key-rings."

In 1977 a US researcher named Harry Hurt co-authored a report with Dupont. They wrote that:

"the most likely comment of an automobile driver involved in a traffic collision with a motorcycle is that he, or she, did not SEE the motorcycle…"

Within a few years Hurt's name would become synonymous with research into motorcycle crashes when he put his name to a mammoth study that became known as the 'Hurt Report' (1981). It has become a seminal work and you can find it easily online. Based on his research in California, what Harry Hurt found (amongst other things) was that:

"Approximately 3/4 of motorcycle accidents involved collision with another vehicle at an intersection. The driver of the other vehicle violated the motorcycle right-of-way and caused the accident in 2/3 of those accidents and did not see the motorcycle or did not see the motorcycle until too late to avoid the collision. Most involved passenger cars…"

Just a year or two later on our own side of the Big Pond, Keith Booth looked at 10,000 motorcycle crashes in London. Although I cannot find the original research, he released a report called "Characteristics of Urban Motorcycle Accidents" through the Institute of Motorcycling. Booth's observation was that in London:

"62% of motorcycle accidents were primarily caused by the other road user. In 2/3 of motorcycle accidents where the driver was at fault, the accident was due to the driver failing to anticipate the action of the motorcyclist."

In other words, the same crashes were happening in big cities on both sides of the Atlantic. The obvious question was: *"why?"* Hurt drew much the same conclusion as the earlier GLC study in London:

"The origin of this problem seems to be related to the element of conspicuity (or conspicuousness) of the motorcycle; in other words, how easy it is to see the motorcycle. When the motorcycle and the automobile are on collision paths, or when the vehicles are in opposing traffic, the conspicuity due to motion is very low, if it exists at all.

"Consequently, recognition of the motorcycle by the automobile driver will depend ***entirely upon the conspicuity*** *due to contrast.*

"If the approaching motorcycle and rider blend well with the background scene, and if the automobile driver has not developed improved visual search habits which include low-threat targets (such as motorcycles and bicycles, as contrasted with the high-threat targets presented by trucks and buses) the motorcycle will not be recognized as a vehicle and a traffic hazard exists."

Note that phrase *"entirely on the conspicuity"*. It's going to be important. These accidents are often categorised as 'Looked But Failed To See' errors (LBFTS), because the driver claims that they looked in the appropriate direction for conflicting traffic, but did not see the approaching motorcycle.

THE ORIGINS OF RIDE BRIGHT & THINK BIKE: Let's turn to the search for practical solutions to the SMIDSY. If drivers were colliding with motorcycles that they hadn't seen because the motorcycle had poor conspicuity, what was the answer?

Let's introduce the concept of 'visual salience'. Some objects have a distinct perceptual quality which draws our eyes – salience. Saliency is relatively easy to measure by looking relative contrast or brightness. It's been theorised that the human brain has evolved to detect salience and it does this by processing the visual field BELOW THE LEVEL OF CONSCIOUSNESS.

ONLY when our visual processing system detects something with visual salience does a signal goes to the real-time 'thinking' brain, and ONLY NOW does the particular area or object pop up into our real-time consciousness. And only NOW can we give it our attention. ONLY at this point do we become aware that our visual system has detected anything. You could say *"out of mind, out of sight"*.

It is important to understand this unconscious / conscious split between what's in our visual field what we are aware of seeing, because this is the fundamental concept underpinning the 'common sense' answers to rider conspicuity:

- **RIDE BRIGHT** – motorcyclists should make themselves more conspicuous and easier to see (that is, increase 'visual salience')
- **THINK BIKE** – drivers should look harder for motorcycles

Not too surprisingly, road safety bodies the world over have adopted these two strategies.

THE RIDE BRIGHT CAMPAIGNS: Three possible ways of increasing visual conspicuity were proposed:

- by increasing the profile of the vehicle, in particular the frontal profile via the mounting of a white fairing (which also provides a place to attach other conspicuity-enhancing devices)
- by using retro-reflective or coloured materials on the motorcycle as well as on for the motorcyclists' garments and helmet
- by using active lighting; suggestions have included day running lights, dipped head lights, additional low-beam lights, high-beam lights, strobes, lights with rotating prisms and many others. Dipped head lights are usually seen as the most practical solution as they are already fitted to virtually all motorcycles

From the mid-70s to the current day, conspicuity campaigns have run all over the world and are still running today – I picked up a hi-vis vest handed out by the local road safety body in Auckland whilst I was in New Zealand in February 2018. Here in the UK, the Highway Code advice to motorcyclists has been to *"wear light-coloured or reflective and fluorescent clothing"* since 1978. The advice to use *"dipped headlights on larger machines"* was added in 1987, and by 1999 PTW operators were being told that *"dipped headlights might make motorcyclists more conspicuous"*. In some places the use of conspicuity aids has been enforced via legislation. In the UK, hi-vis clothing has been a legal requirement for on-road basic training since the introduction of Compulsory Basic Training in 1990 and at least some new riders continue to use it voluntarily after passing the test. Several EU countries including France require day-time lights. Canada and many US states have similar compulsory daylight laws, as do other countries around the world. Whilst the UK has no lights-on rules, new motorcycles in the EU now have no way to turn off the headlight's low (dipped) beam – the switch has been removed. But there's no single policy – there is a mish-mash of voluntary use, coercion and legislation regarding the use of conspicuity aids.

DO CONSPICUITY AIDS WORK: So, what was the result? What happened out on the road? If conspicuity aids worked as billed, we would expect to see a reduction in the number of motorcycle crashes happening at junctions.

After the initial 'Ride Bright' campaign in London – and set against a background of increasing motorcycle use in the city – Lalani and Holden (1978) concluded that the results of the campaign were positive:

"Total daylight motorcycle casualties increased by 6-8 percent, while dark accident casualties rose by 14.9 per cent. Had there been no 'Ride Bright' campaign, daylight motorcycle casualties would also have increased by 14.9 per cent (this being confirmed by casualty data trends prior to the campaign for the years 1974-1976). A saving of 8.1 per cent daylight casualties can be attributed to the campaign, or alternatively 570 casualties."

Although an increase in casualties sounds bad, this study took place at a time of rapidly riding PTW use. So, the conclusions actually suggest a positive result. More recently, a number – though not all – studies suggest that in general, riders using hi-vis clothing and DRLs have a

lower crash risk than riders who have not adopted these measures. Helman et al (2012) stated in their literature review:

"The majority of early evidence (mainly from the 1970s and 1980s) concerned bright clothing and daytime running lights on motorcycles. When considering the weight of evidence, both seem to be capable of improving conspicuity, when this is measured in terms of detection (under search and attention conspicuity conditions), and when measured in terms of a behavioural response (such as size of gap accepted in front of a given motorcycle). The majority of studies covered in this review support this conclusion…"

But there's a problem. Data from the Department of the Environment, Transport and the Regions (DETR) published in February 1999 showed that in 1998 – twenty years after the 'Ride Bright' campaign and Hurt's work, and well over a decade after Booth – collisions involving a motorcycle and another vehicle STILL accounted for **two-thirds of all motorcycle accidents**. Let's move forward to 2004 and a UK-based 'In-Depth Study of Motorcycle Accidents'. The authors reported that in about **2/3rds of crashes where the rider was not to blame, the driver failed to see a rider who was in clear view** and who was often seen by other road users. In about 12% of these cases, the driver failed to see the motorcyclist even though s/he was wearing high visibility garments or using daytime running lights.

If we look outside the UK but still within Europe, the pan-European study 'Motorcycle Accidents In-Depth Study' (or MAIDS for short), first released in 2004 then updated in 2009, it was found that just over half of all crashes involving a powered two-wheeler (ie a motorcycle or moped) took place at an intersection. 60% of these collisions were with a car, 72% of the accidents took place in urban areas, and in 50% the car driver was to blame. And the important conclusion was that **in over 70% of the collisions that were the result of an error on the part of the other driver, the collision involved a failure to see the motorcycle**.

Whilst we cannot see if there has been a reduction in crash NUMBERS, what those percentage figures – 66%, 66% and 70% – reveal is that in terms of accident DISTRIBUTION, nothing much has changed. We haven't seen a genuinely significant reduction in the proportion of junction collisions where drivers do not see the motorcycle. I don't seem to be the only one to have spotted this. In a study involving a simulator, Sager and his colleagues noted in 2014:

"much previous research has focused on motorcycle properties, such as size, shape, and color to explain its inconspicuousness… Much of the motorcycle safety research conducted since has focused on making motorcycles more conspicuous, generally through various lighting treatments such as headlight modulators, additional lights, and bright reflective garments…

"There is some debate, however, regarding the effectiveness of these measures…it has been suggested that the problem may not be one of conspicuity at all…collision statistics remain largely unchanged, suggesting that the issue may not be related solely to the motorcycle's static properties."

If collision statistics remain unchanged, it's hard to see that 'Ride Bright' conspicuity aids for riders or 'Think Bike' campaigns aimed at drivers have had the results that were proposed for them. Espié in the foreword to the book 'Increasing Motorcycle Conspicuity – Design and Assessment of Interventions to Enhance Rider Safety' states that:

"several approaches may be proposed to increase the PTW/rider conspicuity… however many proposed solutions were not supported by scientific evidence."

NEARLY ALL DRIVERS SEE NEARLY ALL BIKES: This is a good place to make the point that whilst SMIDSY collisions may dominate the accident statistics for motorcyclists, a moment's thought should tell us that for every 'Looked But Failed To See' event that results in a ROWV and a subsequent collision, an untold number of drivers actually successfully spot motorcyclists and do NOT turn in front of them. If that were not true, the average rider would never complete his or her journey! Crundall et al (2012) recognise this. The report says:

"Despite the over-representation of motorcyclists in crash statistics, by far the majority of motorcycle journeys do not result in a crash. Car drivers do not want to have a crash, and it is reasonable to assume… that in the majority of cases drivers will respond appropriately to motorcycles. It is the occasional situation that we are concerned with, where attention might lapse, or judgement is made too hastily, which may result in a crash."

I personally have been drawing attention to this specific point for a number of years. When considering collisions between motorcycles and cars, it's important to understand that the vast majority of drivers will NEVER precipitate a 'Looked But Failed To See' collision. That has serious implications for 'Think Bike' driver education and deterrence programmes.

TERMINOLOGY: Although we've now seen three of the terms in common use:

- SMIDSY (Sorry Mate I Didn't See You) to describe the collision
- ROWV (Right Of Way Violation) to assign fault
- LBFTS ('Looked But Failed To See') to explain just how the ROWV occurred

…it's worth noting at this point that despite decades of research and hundreds upon hundreds of studies, there has been little attempt to create a standard lexicon (that is, a specialised vocabulary) to accurately describe these collisions.

What's more, studies have been performed from both the 'drive on the left' (for example, in the UK, Australia and New Zealand) and from the 'drive on the right' (e.g., the EU and USA) perspectives. When driving on the left, a turning on the nearside is on the motorcyclist's LEFT. For studies from other countries such as the rest of the EU and the USA, this is reversed and the turning on the nearside is on the motorcyclist's RIGHT. Whilst the scenarios are a mirror image,

few authors make it absolutely clear whether a drive on the left or a drive on the right regime is the subject of their study. If a driver is stated to have 'turned right', the actual manoeuvre depends on which side of the road the vehicles are driving. The answer can usually be determined by the location of the study but is rarely explicit.

Another lack of clarity arises when studies use expressions such as the vehicle 'turned right' or 'turned left'. Even when clear which side of the road the driver is driving on, this is an inadequate description of the manoeuvre. From where, to where? Whilst the two collisions we are most concerned about involve EITHER a vehicle that emerges and turns across the rider's path from an opening at the rider's nearside OR an oncoming vehicle that turns across the rider's path towards an opening at the rider's nearside, a moment's thought should show us there are four possible 'turned right' manoeuvres that could be performed at a crossroads when driving on the left – a driver could:

- emerge and turn right across the rider's path from the nearside – the side of the road nearest the rider
- emerge and turn right into the rider's path from the offside – the side of the road furthest from the rider
- slow and turn right into a side turning whilst leading – moving in the same direction ahead of the motorcycle
- slow and turn right across the rider's path whilst oncoming – approaching from the opposite direction

Whilst the manoeuvre can usually be inferred from the context, it's not always the case. I will use the terms 'nearside', 'offside', 'emerging', 'oncoming' and 'leading' be applied to define the manoeuvres more precisely. It's worth noting that road layouts and priorities exist which have different priority systems, even though the layout is likely to cause specific problems. The roundabout is one example. The four-way stop is another. In much of Europe the system of 'priority to the right' exists.

There has been at least one attempt to standardise the understanding of these collisions. In a summary report prepared for the Department for Transport: London, Crundall et al (2008) proposed a framework on which to base understanding of the work that has been carried out on these collisions which related "attitudes, knowledge and skills/strategies to three behaviours". They proposed three questions that research needed to ask:

- does the driver look at the motorcyclist?
- does the driver realise that it is a motorcyclist?
- does the driver correctly decide whether the motorcyclist poses a hazard?

Over the next dozen pages, I'll be looking in detail at the research that has been carried out into these questions.

Last updated:

Monday 16 August 2021 – *minor edit for clarity and structure*
Tuesday 30 April 2019 – *minor edit for clarity, typos corrected*
Friday 14 December 2018 – *added dates for advice about conspicuity aids added to the Highway Code, added de Craen et al reference*
Friday 23 November 2018 – *typos corrected, minor edit for clarity, improved explanation of salience*

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Discussion – conspicuity issue or cognitive failure?

SUMMARY – *visual salience and cognitive conspicuity have both been investigated as potential causes of collisions between cars and PTWs… the conspicuity theory is widely accepted at face value… but there is no compelling statistical evidence that shows a reduction in collisions resulting from ROWV at intersections… as the SMIDSY collision happens worldwide in hugely different driving regimes, the implication is that the crashes are a 'human factors' problem, NOT a conspicuity issue… 'Think Bike' campaigns have limited effectiveness… the most effective option is likely to be improving rider understanding of drivers' visual perception issues and cognitive problems, helping the rider adopt a better defensive riding strategy at intersections…*

If you have waded through the previous pages to reach this point, well done. You now have about as good a grasp of why the 'looked but failed to see' (LBFTS) error occurs, how it leads to a 'Right Of Way Violation' (ROWV) and the resulting 'Sorry Mate I Didn't See You' (SMIDSY) crash as it's possible to gain as an 'ordinary' motorcyclist.

This discussion sums up what we know. If you've skipped the detail and headed straight here, you may want to go back in order to clarify specific points after reading this page.

Historically…

The crux of the matter is this. Once it was realised that a major factor in motorcycle casualties was that drivers do not see motorcycles and thus collide with them at junctions, investigations into the reasons for these crashes have looked at two different issues:

- 'salience' or visual conspicuity – the 'bottom-up' factors such as size, brightness and contrast
- 'cognitive' conspicuity – a 'top-down' approach investigating factors such as the workload imposed by driving and the driver's expectations of what he or she will likely observe

Thanks to the commonsense observation that motorcycles are relatively small when placed next to other traffic objects, and are therefore more difficult to detect, much of the earliest research focused entirely on the first problem of visual conspicuity. The Greater London Council's pioneering 'Ride Bright' campaign and earliest 'Think Bike' intervention took the same approach; if the 'Looked But Failed To See' error occurs because motorcycles are hard to see, then the campaign should aim to:

- improve the visual conspicuity of motorcycles
- make drivers to look harder for motorcycles

The GLC's 'Ride Bright' campaign ran in the autumn of 1976. As well as encouraging drivers to look for motorcycles, riders were told to wear bright – preferably fluorescent – clothing and to switch on their headlights in daytime.

Did the campaign work? The outcome of the campaign was subjected to statistical analysis by Lalani and Holden (1978):

"The statistical problems of detecting changes in casualties attributable to the change in behaviour from the 'Ride Bright' campaign are extremely complicated and difficult… absolute conclusions from the casualty analysis are difficult since the change in behaviour at best affects only a quarter of the motorcycling population who use daytime headlights and only accidents occurring in daylight are likely to have benefited."

Nevertheless, they argued that their observations based on comparisons of rider behaviour before and after the campaign showed:

"…highly-significant increases in the number of motorcyclists using their headlights during the day and also wearing distinctive clothing."

The 'distinctive clothing' was any garment *"coloured yellow, orange or white"*. They concluded:

"…from the results in this analysis and from those in other countries it seems reasonable to claim that some benefit to motorcycle casualty trends has resulted from the change in behaviour.

Virtually every road safety campaign that followed the Greater London Council's 'Ride Bright' campaign focused on the same two solutions – brighter bikes, and drivers looking harder. Unfortunately, we didn't see a matching reduction in the proportion of collisions occurring at junctions.

Currently…

The conspicuity theory is still widely accepted at face value and so:

- many research studies continue to try to establish a link between enhanced conspicuity through increased use hi-vis clothing and day-riding lights and reduced PTW crash and/or injury risk
- policy makers, police, accident investigators, courts and motorcycle trainers all subscribe to the conspicuity theory based on historical research
- many motorcyclists do use the conspicuity aids either voluntarily or because it is mandatory

However, in the four decades since these first interventions, there is no compelling evidence from road safety crash statistics that the proportion of collisions occurring at junctions where a driver says *"Sorry Mate I Didn't See You"* has changed for the better.

As long ago as 1989, Olson examined the existing literature in what is known as a 'metastudy' – i.e., a kind of review that looks critically at a number of studies in a particular area to gain a broader overview. He challenged motorcycle conspicuity as the likely explanation for car drivers missing motorcycles:

"There is a widespread belief that motorcycles are more difficult to detect in traffic than are cars and trucks, which has led to much research designed to enhance motorcycle conspicuity. This paper examines the basic concept and finds that it lacks empirical support. Further, a number of other possible explanations could account for the differences one finds when comparing car-motorcycle and car-car collisions."

His reasoning was thus:

"The strongest support for the conspicuity hypothesis may be that the offending operator often reports a failure to detect the other vehicle… considered logically, it seems reasonable that motorcycles should be less conspicuous than cars because they are smaller."

He observed that:

"The conspicuity hypothesis has not been seriously challenged. Almost all investigators have accepted it as fact, concentrating their efforts on means to improve conspicuity rather than on asking whether the hypothesis is correct. This is unfortunate because alternative hypotheses can be advanced. Some have research data to support them; some are speculative. All are consistent with the known facts…"

In other words, because the conspicuity hypothesis was considered to be correct, the researchers were looking to see the results which proved their own test of the conspicuity hypothesis rather

than looking for other explanations of their results. Having found what they were looking for, they published their results, which added to the body of evidence supporting the conspicuity theory. It's become a circular argument.

Olson noted that drivers claiming to have not seen another vehicle is not unique to motorcycle-car intersection collisions. He stated:

"Violations of right of way are a common cause of collisions between automobiles, and afterward the errant driver often claims not to have seen the other vehicle. This should not be surprising. Of all the reasons that someone would deliberately move into the path of an oncoming vehicle, failure to detect it must be high on the list. But if the claimed failure to detect is not unique to motorcycle collisions, then it is not evidence for a special conspicuity problem with motorcycles."

It's worth recalling that the authors of that early TRRL report concluded:

"The true effectiveness of these aids will only be realised when all motorcyclists use them and their effect can be observed in the national accident statistics."

Whilst we don't yet have universal use of hi-vis clothing, many countries do have universal use of day-riding lights and yet there is a lack of real-world evidence indicating a direct relationship between increased visual conspicuity to be expected from the use of DRLs and a reduction in collisions resulting from the 'looked but failed to see' error.

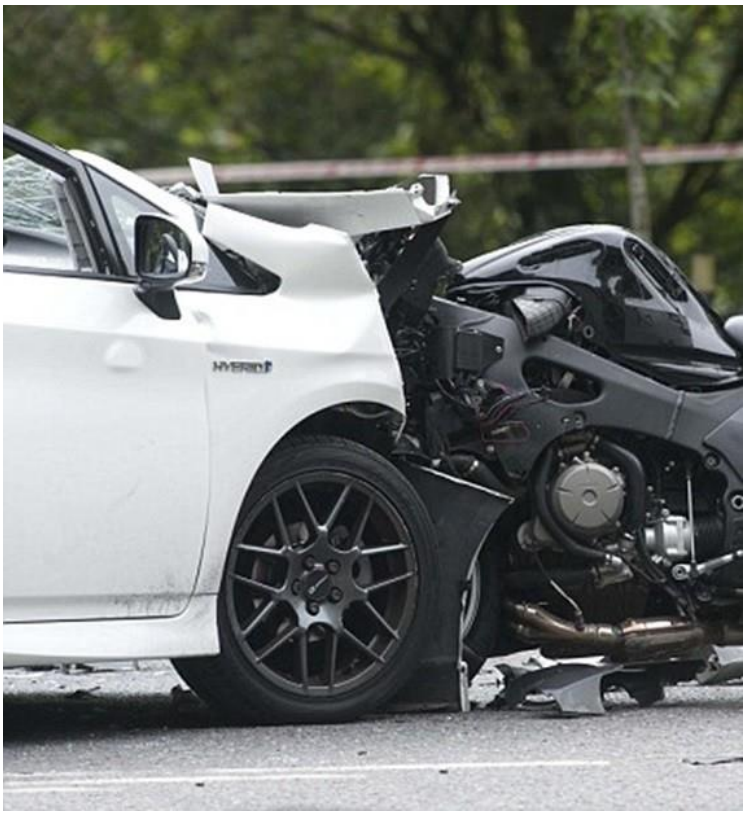
Olson (1989) believed that the basic conspicuity concept "lacks empirical support". Zoi et al (201?) concluded that with the design of current studies:

"Overall, the conspicuity hypothesis testing remains inconclusive…"

The weakness of the conspicuity theory

Firstly, the 'looked but failed to see' error, the subsequent ROWV and the resulting SMIDSY collision are common to ALL driving regimes where motorcycles share the road with other vehicles. To see this, we simply have to look at local crash statistics.

Secondly, if there is such a thing as a 'standard' SMIDSY crash involving the 'looked but failed to see' error and subsequent ROWV, investigations into collisions suggest that it happens during the day in urban areas, involves an experienced driver, and occurs in all weather conditions, including good weather.



So, here's an observation of my own. If the salience of the motorcycle was the sole factor, then it's reasonable to assume that the 'Looked But Failed To See' error, the subsequent ROWV and the resulting SMIDSY collision involving an already difficult-to-see motorcycle would be most common under conditions of poor visibility. Motorcycle / car collisions occur across – and have been studied in – widely differing geographical regions:

- in high latitude countries such as Sweden and Norway where there are very different day / night driving conditions in summer and winter, with widely-differing weather conditions at different times throughout the years. This means ambient lighting conditions also vary enormously throughout the year
- in mid-latitude locations such as Israel and California where day length varies rather less over the course of a year, weather is generally less extreme and ambient lighting conditions are more even
- in countries such as Canada and the USA where the day length, weather and thus ambient lighting conditions varies greatly across a single jurisdiction

I can find no evidence that collision frequency reduces north to south or increases in poor weather. This suggests that the difficulties drivers have are at least partly the result of problems other than visual salience and conspicuity.

Here's my second observation. The 'looked but failed to see' error, the subsequent ROWV and the resulting SMIDSY collision occurs in countries with widely differing driving regimes:

- in countries like the UK and Australia where road users are relatively well-trained before gaining a licence, where there is a road code that is generally adhered to, and where there is a well-developed policing system with a deterrent system for offenders
- in countries like the USA where road users are relatively poorly-trained before gaining a licence, where there is a road code that is generally adhered to, and where there is a well-developed policing system with a deterrent system for offenders
- in countries like Thailand where road users are very poorly-trained, where there is a road code that is barely adhered to, and where there is an erratic policing and deterrent system

If the SMIDSY collision happens the world over, in hugely different driving regimes, the implication is that the crashes are a 'human factors' problem, NOT a conspicuity issue.

I find it remarkable that these observations seem to have been overlooked.

The limitations of 'Ride Bright' campaigns

If the science behind the campaigns calling for the use of hi-vis clothing and day-riding lights can be challenged, then the campaigns themselves should be challenged. Espié in the foreword to the book 'Increasing Motorcycle Conspicuity – Design and Assessment of Interventions to Enhance Rider Safety' states that:

"several approaches may be proposed to increase the PTW/rider conspicuity… however many proposed solutions were not supported by scientific evidence."

The weaknesses of any 'Ride Bright' campaign are these:

- if the motorcycle is where it cannot be seen by the driver (a factor in around one-third of 'looked but failed to see' errors), then visual conspicuity aids can have no positive benefit.
- any benefit that visual conspicuity aids may confer inevitably varies on a moment-by-moment basis as the background behind the motorcyclist changes. There is no 'one size fits all' solution to visual conspicuity.
- visual conspicuity aids are an entirely passive approach to reducing risk, and rely entirely on the driver seeing, then taking action to avoid, the motorcyclist. The responsibility for avoiding the collision is thus handed entirely to the driver.

Furthermore, we cannot assume that what can be seen to work in one part of the world automatically applies elsewhere. Even within the UK, it should be obvious that conditions vary considerably between the south of England and the north of Scotland, and that there a numerous different riding environments from city centres to remote rural roads. It really should be clear to anyone thinking about the motorcycle conspicuity problem that conclusions from a study conducted into motorcycle conspicuity in one part of the world cannot be safely exported to another locality. It's inconceivable that the same 'Ride Bright' advice can be validly applied across the board.

There has been some recognition of this by researchers; for example, several studies have noted that in local conditions of fine, sunny days on rural roads a black-clad rider on a black motorcycle has greater salience than a rider using saturn yellow hi-vis clothing. But in general, the literature has not really made allowance for differing ambient lighting or background conditions.

Probably as a result of this lack of clarity within the studies themselves, there has only been limited acceptance of the geographical and ambient light conditions within road safety thinking. The mandatory headlights-on rule introduced in Australia was overturned in 1997 after representations by the local riders' rights organisation who pointed out that the research on

which the legislation was based had been carried out in Sweden. Elsewhere, this necessary flexibility does not appear to have made significant inroads into road safety thinking. We are still largely saddled with 'one size fits all' motorcycle safety campaigns.

Looking to the future…

'Think Bike' campaigns have been running for as long as the 'Ride Bright' interventions. But if visual conspicuity aids have failed to solve the ROWV and SMIDSY collision, neither has alerting the driver to the need to search harder for motorcycles. Once again, if these campaigns had worked, we would have seen the results in real-life collision statistics, and as we have already seen, there is no significant change.

To date, the message to drivers has been restricted to simplistic advice to 'look harder' or 'look twice'. But if visual conspicuity is not the problem and conspicuity aids are not the solution, then it's hard to see how a driver can make any meaningful improvements to their search patterns. It would seem we must look much harder at the cognitive issues that have been identified. The cognitive issues do not appear to be capable of simple solutions.

Perhaps the message to drivers needs to change, but it's arguable that drivers are the wrong target. On an individual basis, very few drivers will ever make the 'Looked But Failed To See' error and commit a ROWV – in other words, their search will almost always be successful in identifying a PTW. Given that failures are so rare, it's hard to see how an effective behavioural change can be effected to prevent something that almost never happens. As far as most drivers are concerned, it's likely they believe that what they do works and there is no need to change. The 'look harder for bikes' message will be *"for someone else"*.

The situation is somewhat analogous to a medical problem where there are a large number of carriers of an infection but are otherwise unlikely to be affected, and a much smaller number of individuals who are at risk of catching the disease and suffering much more seriously.

Who should we target?

I would suggest that the most effective approach is not to try to eliminate the disease by treating the carriers but to 'inoculate' the smaller, at-risk, population – us motorcyclists.

A valid criticism of the rider thrown up by collision studies is that in an emergency, the motorcyclist rarely manages to perform effective collision avoidance manoeuvres. The 'No Surprise? No Accident!' campaign that I am also involved with has the answer to that – the motorcyclist simply isn't anticipating that things will go wrong. The average motorcyclist still sees it as the driver's job to avoid pulling in front of the bike, not his or her job to predict that possibility that the driver could make an error and be ready to take appropriate action.

The lack of mental preparation for an emergency to develop is the reason that the motorcyclist's response is so poor. Once the expected course of events (that the driver will see the motorcycle and NOT turn into its path) is derailed, so is the motorcyclist's ability to take evasive action.

To my mind, the solution must be for motorcyclists to be better prepared mentally. Defensive driving is a core principle associated with reducing the risks associated with using the roads, and is accepted the world over. There are many definitions of defensive driving but the basic principles require all road users – including motorcyclists – to be vigilant and respond to changing road and weather conditions as well as the actions of other road users.

Collisions between two vehicles are, by their nature, 'Two to Tangle' incidents – if one road user sets up the circumstances in which a collision can happen, the other road user (in this case, the motorcyclist), still has to ride into it for the collision to occur. A defensive-thinking rider should in most cases be able to see and predict a ROWV, and take responsibility for avoiding the other road user's error.

The biggest indictment of the 'Ride Bright' campaign and its successors is that they have produced several generations of motorcyclists who passively accept that the person responsible for the SMIDSY collision is the other road user. Evidence of this thinking can be seen in frequent calls by riders' rights campaigns for stiffer penalties for "the driver who didn't look properly". Unfortunately, this 'blame game' thinking goes directly against the principle of defensive driving by absolving motorcyclists of responsibility for staying out of the SMIDSY crash.

My own belief is that the ‘Think Bike’ message needs to be turned on its head; ‘Biker THINK!’

The vast majority of motorcyclists are aware of the risks posed by the SMIDSY and as a group most motorcyclists will be receptive to suggestions as to ways to mitigate the risk of collision. If we can avoid further demonising the driver – though I am aware it’s not always a popular message – it should be possible to persuade riders to accept that the motorcyclist also plays a part in the SMIDSY collision.

For that reason, targeting bikers to make them aware of the cognitive basis for the ‘looked but failed to see’ error is likely to be far more effective than yet more interventions aimed at drivers.

The ‘Biker Down’ course currently being offered by over half the Fire and Rescue Services in the UK and the nationwide ‘Shiny Side Up’ event in New Zealand are – to my knowledge – the first official campaigns to attempt to systematically educate the motorcyclist to understand how the most careful and conscientious drivers’ search strategies can break down and lead to the ‘Looked But Failed To See’ error, and just why anticipating that a ROWV may occur is so important in terms of the motorcyclist’s response to the emergency. I wrote SOBS for the first, and was a keynote speaker delivering SOBS on the second.

Despite the currently limited reach of these interventions, there are encouraging signs that motorcyclists in general are picking up on the issues almost in spite of rider safety campaigns which continue to push the ‘Ride Bright’ line. Whilst there have been isolated pockets of debate on the issues on motorcycle forums since the arrival of the internet, many more riders now have some awareness of the cognitive issues faced by drivers, such as saccadic masking and motion camouflage. Some of the topics have even reached the traditionally hidebound motorcycle press.

It would be unwise to dismiss the use of visual conspicuity aids out of hand, but I believe that if we are ever to reduce the prevalence of junction collisions, the time is right to move away from the ‘Ride Bright’ line and instead employ rider safety campaigns which explain the cognitive issues and encourage riders to take a proactive approach to their own safety.

What’s next? Now we have a better idea of the research, let’s take what we know, and start putting together some conspicuity strategies that are more likely to be effective.

Last updated:

Wednesday 1 May 2019 – *minor edit for clarity*

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Conclusion – what could work?

SUMMARY – *solving the SMIDSY collision may sound simply but it's not… whilst there is limited evidence that conspicuity aids reduce the collision rate, their use is far from a guarantee the rider will be seen… even when seen, drivers may still misjudge speed and distance… pink hi-vis, the night-time 'ghost jacket' and yellow lights would seem to be more effective than conventional hi-vis and DRLs…. but whatever strategy we do adopt, there's no guarantee we will be seen…*

I've almost finished the Science Of Being Seen puzzle, and I'm about to present my conclusions and my best suggestions. If you skipped straight to this page, be aware I'm not going into great detail to explain these statements. So, if you don't agree, want me to justify my position, have a question about a statement, or simply want more information than is on this page, backtrack to the relevant page(s) which will take you step-by-step through the research studies and show you my thought-processes.

CONCLUSION ONE – The opening 'SMIDSY' pages investigated how drivers fail to see motorcycles at junctions. Typically explained as a simple-sounding problem; "motorcycles are small, they are difficult to detect and it's hard to judge their speed when they are seen", it's anything but. Firstly, the motorcycle may not be where it CAN be seen. If it is capable of being seen, physiological, perceptual and psychological reasons can result in drivers 'looking but failing to see'. Even when seen, drivers misjudge speed and distance. The idea that drivers "don't look properly" or even "don't look at all" is largely a myth resulting from police reporting, and their need to apportion blame to one individual or another.

CONCLUSION TWO – Throughout the 'Strategies' section we focused on understanding *"what doesn't work"* because it offers far better insight into *"what might work"*. Note I used the word 'might'.

CONCLUSION THREE – Whilst we saw positive evidence that conspicuity aids DO reduce the overall rate of collisions, from the perspective of the individual rider they do not confer any kind of guarantee that a driver WILL see the approaching motorcycle. For that reason, we have not seen a significant reduction in the collision risk to motorcyclists at junctions. Urban SMIDSY collisions remain the Number One crash that a rider is likely to have.

CONCLUSION FOUR – Alternative strategies are required for day and night, in urban and rural environments, and at junctions approached at different speeds. There is no 'one size fits all' solution.

CONCLUSION FIVE – At night in urban areas, retro-reflective materials worn above the waist are too high to be effective. Clothing with stripes or patches of reflective material are ineffective. A night-time tri-light light arrangement seems to help differentiate between motorcycles and other vehicles, and assists the driver to make better estimates of a motorcycle's speed and distance than single or paired headlights

CONCLUSION SIX – In daylight, light intensity and background constantly change so we must understand that any colour of clothing may stand out or blend in from moment to moment. We should consider changing hi-vis colour depending on where we ride and the season. We should avoid hi-vis clothing that creates disruptive camouflage effects and adopt single-colour clothing, ideally matching the bike in order to present a quasi-human shape to the observer. Whilst riding lights-on (including the tri-light configuration) seems to be least effective at improving detection in a cluttered (i.e. urban) environment and small-diameter lights are less effective than bigger headlights, DRLs generally appear to be more effective at improving detection at distance in an uncluttered (i.e. rural) environment where the 'triangle of lights' also appears to help drivers acquire more accurate speed and distance information.

CONCLUSION SEVEN – whilst recent assessments suggest DRLs have more potential to enhance rider conspicuity than clothing, the growing use of white day running lights on cars, vans, trucks and similar vehicles has led to a conflict with the use of white DRLs on PTWs. Yellow lights used in the DRL role appear to be more effective.

CONCLUSION EIGHT – Whatever strategy we do adopt, there's no guarantee we will be seen and we should stand ready to take evasive action.

So… is that it? Is there nothing else we can do? Not necessarily. I happen to think we can use what we know to come up with new ideas. For example…

PINK HI-VIS, SLEEVED HI-VIS for DAYTIME USE: For example, I have already suggested that pink hi-vis is almost certainly a better rural riding colour than Saturn Yellow, and that a plain-coloured jacket with matching sleeves offers a better silhouette than a hi-vis tabard or waistcoat, better still make the whole jacket hi-vis. I'm struggling to find a supplier of sleeved, pink hi-vis but if I do I'll let you know.

Spiro 'ghost' jacket – photo courtesy of Mike Roberts

NIGHT-TIME 'GHOST' JACKET: Patches of retro-reflective material placed higher up on jackets and 'traffic vests' are ineffective in urban areas, whilst patches placed lower to catch low-beam headlights reflect brightly but probably don't help drivers identify the wearer as the rider of a PTW. A very recent development is a jacket that is entirely coated with retro-reflective material. Although above low-beam headlights, there is always some scattered light which makes reflective material 'glow' rather than shine. Being sleeved, these 'ghost' jackets create a human silhouette. I'd suggest they are far more conspicuous than 'traffic vests'. Already adopted by cyclists and walkers, the first motorcyclists are starting to wear them. And they don't cost the earth.

YELLOW DAYTIME LIGHTS: Given the growing conflict between new cars with day running lights, yellow lights offer an opportunity for motorcycle DRLs to be visually distinct again. As long ago as 1981, Olson et al looked at permanently illuminating the turn indicators when they were not flashing to signal a manoeuvre. There is some debate about whether a standard 21w bulb behind a yellow lens is bright enough to function effectively as a DRL but Olson et al found always-on amber 'running lights' increased the size of gap that drivers would leave when turning ahead of a motorcycle.

Given the growing conflict between new cars with day running lights, yellow lights offer an opportunity for motorcycle DRLs to be visually distinct again. Paine et al (2005) argue that: *"all that is required is the replacement of normal motorcycle turn signals".* 64th session of the United Nations Working Party on Lighting and Light-Signaling in 2011 a motion called for amber position lamps (APL) to be made

mandatory on motorcycles. Espie et al (2014) concluded that:

"…results indicate that headlight configurations comprising additional yellow lights on the fork and on the motorcyclist's helmet significantly improve motorcycle perceptibility by other vehicle drivers."

Pintoa et al (2014) tested:

"…three conspicuity enhancements designed to improve motorcycle detectability in a car-DRL environment: a triangle configuration (a central headlight plus two lights located on the rearview mirrors), a helmet configuration (a light located on the motorcyclist's helmet in addition to the central headlight), and a single central yellow headlight. These three front-light configurations were evaluated in comparison to the standard configuration (a single central white headlight)… The results revealed better motorcycle-detection performance for both the yellow headlight and the helmet configuration than for the standard configuration."

Even though we have to be a little cautious in accepting the results without question – the study was laboratory-based, and involved *"photographs representing complex urban traffic scenes [which] were presented briefly (for 250 ms)"* – the results are in agreement with Espie et al (2014).

However, the benefits of yellow lights appear not to be confined to position lights alone. Espie et al (2014) also concluded that a SINGLE YELLOW HEADLIGHT had a significant positive

effect, particularly in an environment full of white car DRLs. So why did they NOT suggest yellow headlights?

"In terms of application, it is probably not realistic to assume that [motorcycles] could be equipped with yellow frontal headlights, because they are less efficient for lighting the street."

It's true yellow lights are less effective in their primary role, which serves to confirm the point I made earlier about the essential conflict between the use of a headlight as a DRL with its main role of lighting the way at night. On the other hand, the paper did not consider:

- that the majority of junction collisions happen in daylight
- that of those collisions that do happen at night, most occur under urban street lighting, where the headlight's role of illuminating the roadway is arguably relatively less important than conspicuity
- that a yellow headlight is a simple modification that can be easily retro-fitted to the existing motorcycle fleet
- that a yellow daytime headlight is not necessarily something that cannot be switched back to a white light for night-time use on unlit roads

The big plus is that compared with installing amber turn signal running lights which would require modification of the motorcycle's wiring to carry both circuits, it's an incredibly simple modification. There are two options:

- if the machine is fitted with incandescent bulbs, a bulb replacement is a five-minute job on most motorcycles. If you ride exclusively in built-up areas with street lighting, this may all that you need to do. No alterations to the wiring are needed. It can be carried out by nearly any bike owner.
- if a bulb swap is not possible (for example, new machines are being fitted with LED bulbs), it may be possible to fit a yellow headlight cover secured by hook-and-loop fastenings. They are available as aftermarket parts for most popular bikes, protect the lens from stone chips and can be removed for night riding on unlit roads

In either case – and possibly a decisive factor in rider take-up – neither bulbs nor headlight covers are expensive. In my opinion, Espie et al (2014) based their recommendation on an incomplete understanding of what can be done to modify an existing PTW.

'Dim-high' lights: If you are a more mature reader, you may recall that for a short time in the late 1980s, new UK cars were fitted with 'dim-dip' lighting. This low output setting reduced the intensity of the low beam headlamps to around 10% and 20% of normal brightness. They were not intended to be day running lights, but to provide a night-time low intensity 'town beam' diffused over the headlight's larger surface. You should recall that the research into motorcycle DRLs has also suggested a larger diameter headlight to be more effective. That set me wondering if a 'dim-high' beam – thus avoiding the twin problems of driver dazzle on high beam and poor light distribution on low beam – would prove a more effective DRL. And that in turn reminded me of an idea that was floating around the courier community back in the early 1980s. The tip was to replace the 5w 'parking light' bulb. Barely adequate for parking on unlit streets, it's of no conceivable use as a DRL, but it does have the advantage of being offset in the headlight shell. That means it's not focused like low beam.

I replaced it with a 10w halogen bulb – as you can see, you can still get them from Lucas. The bulb was much brighter, but not so bright it would dazzle, and set off-centre in the lens it was more visible both ahead and to the side. The minus point was the cost and fragility of the bulbs. But modern LEDs offer a mix of intensity and longevity which would make this an easy retro-fitment to any machine with a conventional headlight. As far as I know, no-one has ever tested a 'dim-high' motorcycle headlight!

Combined with a yellow headlamp cover, it could turn out to be the best of both worlds – not only visually distinct from a white light, but also scattering light ahead across a wide angle. As far as I know, this hasn't been tested either.

DON'T EXPECT TO BE SEEN: Regardless of everything I have said in the preceding sections, I believe the key point is to re-calibrate our conspicuity strategy completely: by all means use DRLs, reflective clothing and hi-vis **but don't EXPECT to be seen!** I was making this very point years ago on a bike forum when one rider wrote: *"it makes me feel more confident that I've been seen".* The moment we come to think that, we're at risk because we're mentally dropping our guard. Instead, we need to view the problem from the opposite end of the telescope and understand how other road users detect what's around them. That's how we gain an understanding of why hi-vis and DRLs might not work. It's hardly a new idea. As far back as 1985, Donne and Fulton said at the end of a TRRL study into DRLs that:

"the use of even these effective aids is by no means a guarantee that a motorcycle will be seen in all circumstances and riders should be encouraged to recognise their vulnerability and ride defensively."

BE PRO-ACTIVE: One of the points I repeat regularly is that conspicuity aids are entirely passive – they require the OTHER DRIVER to see us then take appropriate steps to ensure OUR safety. Here's a tale I found on a motorcycle accident claims blog.

"I am a big believer in 'hi-viz' clothing. If it gets you noticed when you are out on your bike I think it is worth its weight in gold. I even went as far as 'borrowing' a hi-viz bag cover for my rucksack… wearing a bright white helmet and riding a bright white bike, I was pretty happy clocking up the miles safe in the knowledge that everyone and their dog will see me.

He then went on to describe his collision with a driver who didn't see him!

Why the driver didn't see the bike is immaterial (though it's possible the bike was in a blind spot). What does matter is that having NOT been seen, the rider didn't have any kind of plan to deal with the situation. He was relying 100% on his passive conspicuity aids and expecting to be seen. Unfortunately, the rider didn't learn this lesson; instead, he thought some extra lights would *"draw the eye"*. As we've seen, that's not a guarantee.

Once we accept that expecting NOT to be seen is vital, then the importance of taking pro-active steps becomes obvious. Remember, junction collisions are 'two to tangle' incidents – if the driver's error sets up the circumstances in which the collision COULD occur, the motorcyclist still has to ride into it to COMPLETE the crash. In late spring 2018 I attended a Metropolitan Police BikeSafe course and one of the topics was how to deal with the threat from SMIDSY-style collisions. I was pleasantly surprised to discover that hi-vis clothing was a long way down in a discussion of possible strategies. Here's what was discussed in the order it was mentioned:

- move away from danger
- see and be seen
- lateral movement
- slow down
- hi-vis clothing
- triangle of lights
- horn

Notice that the use of hi-vis clothing and day riding lights – whilst promoted as a good thing – were not top of the list. To my mind, that's an indication that the limitations of conspicuity aids generally. Instead, the course promoted pro-active responses; movement, setting up lines of sight, slowing down and using the horn. Once we begin to anticipate the need for pro-active responses, we are far less likely to be surprised when an emergency develops. Personally, I'd put reducing speed top of my own pro-active strategy list, because slowing down:

- offers more time to do everything else including assessing the situation and deciding on our other responses
- reduces stopping distance and the space required to swerve
- mentally prepares us for evasive action and avoids us being surprised – No Surprise? No Accident!

Where did BikeSafe hear about lateral movement? As far as I know the original proponents are Duncan McKillop and Malcolm Palmer. Instructor and creative thinker Duncan McKillop proposed the 'SMIDSY Avoidance Manoeuvre quite a few years back and produced a video of the manoeuvre which involves a 'wiggle' of the handlebars to make the headlight move. At least fifteen years ago, Malcolm Palmer, another former instructor, proposed what he called the Z Line. This involves changing position in the lane via a pair of smooth lateral movements forth across the width of the lane, first towards then away from the turning car. Both are aimed at creating lateral movement against the background to help drivers detect the oncoming machine.

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Finally – some advice for drivers

SUMMARY – *if you're a driver, you need to understand how you're likely to make the 'looked but failed to see' error before it happens… far from being 'dangerous' or 'badly-behaved' road users, both the driver and the rider in a SMIDSY are likely to be riding and driving as they usually do… move your head from side to side to check behind the car's blind spots… turn your head more slowly and remember that bikes can be harder to spot… on busy roads take a moment longer to give bikes chance to appear from where they might be hidden… on faster roads take a moment longer to see how quickly bikes are moving…*

So far, SOBS has been aimed at bikers. However, it's likely to have crossed your mind that I've said nothing about the driver – a comment that's been made on a number of occasions: *"yes, SOBS is all very well, but what about the driver who makes the mistake?"*

It's a valid question but I will make still two points:

- the first – as I have mentioned several times already – is that the SMIDSY crash is a 'Two to Tangle' incident – the driver can set up the circumstances in which a collision can happen, but the crash can only happen if the motorcyclist rides into it. As many of the collisions ARE avoidable if the rider sees it coming, AND the rider comes off worst, I am convinced that is really is a reasonable way of approaching the problem of junction collisions.
- the second is a bit more complex but draws on what's known as epidemiology. You may have heard this term used in medical studies. In essence, it's the study and analysis of the distribution (who, when, and where) of health issues and their treatment. We have a similar problem with junction collisions. There are two populations, drivers and motorcyclists. One group – the drivers – cause the collisions. The other group – the motorcyclists – suffer the consequences. Which group does one treat? The obvious answer is to tackle the drivers because they cause the crashes. But they outnumber motorcyclists around 100 to one. For every driver that DOES cause a SMIDSY, there will be 99 that don't. We only have limited resources, so if we think in terms of where we're most likely to do most good with a limited budget to fund interventions to prevent the collisions, 'inoculating' the motorcyclist rather than attempting to 'cure' the driver is probably the best option!

Nevertheless, it doesn't mean we should absolve drivers of responsibility and so the rest of this page is aimed at how drivers can do their bit too. So, if you're a biker reading this, what I suggest you do is send the link to some of your car driving friends.

So, from here on, I'll assume you're a driver.

Image Nikola Treći

First things first. My experience is that debates revolving around 'responsibility' are generally a waste of time when it comes to things that go wrong on the road, and particularly fruitless when it involves motorcycles and cars. Because the motorcycle is nearly always the 'no-fault' vehicle, many bikers firmly believe that the problem rests entirely with the driver, and that the motorcyclist is simply the victim of the crash. Put a motorcyclist and a driver together to discuss the SMIDSY and things often get quite heated, quite quickly. Thanks to our blame culture, the starting point is almost always whose 'fault' it was, with both sides starting with accusations; *"the driver didn't look properly"* says the rider, *"the biker didn't make themselves visible"* says the driver. The argument ramps up; *"the driver was distracted"*, *"the biker was riding too fast"*. If it gets really heated, logical thinking totally evaporates as the two sides retreat behind statements such as: *"all drivers are out to kill bikers"*, *"all bikers have a death wish"*. At that point, any fruitful discussion is at an end, yet a moment's rational thinking on either side would show that the two statements are nonsensical.

I've lost count of the number of times I've seen a debate on driving forums as a biker and a driver go this way as they get stuck into each other. Yet it should be blindingly obvious to both sides that this kind of dialogue takes us nowhere. In fact, it leads to mutual antipathy between two groups of road users who desperately need to understand each other better. Understanding can only happen if we have a better grasp of facts, and that's why I've spent a lot a of time in the previous pages attempting to debunk some motorcycling myths about the SMIDSY.

So, in the interest of balance, and to create a better understanding of the problem for drivers, here's the first myth; *"drivers don't look properly"*. Well, if you didn't, you'd not get very far – you'd be bouncing off things all day long. The road safety industry always talks about how many crashes occur because someone 'did not looking properly', but what we never hear is how many crashes there aren't. The true proportion of 'looked but failed to see' collisions as a total of all the potential incidents is tiny.

Here's the second; *"drivers put bikers at extra risk"*. It's only actually true in one particular manoeuvre – and that's when you are turning into a side road or entrance with a motorcycle coming the other way.

Here's another; *"distracted drivers are a common cause of motorcycle accidents".* Once again, the evidence doesn't support it. Yes, there ARE distracted drivers out there and driving distracted by a phone or something else certainly ups the risk. But the fact is that collisions where driver distraction plays a significant part aren't as common as we tend to believe – in fact, just one fatality out of just over fifty was put down to a distracted driver in the last set of figures I have for fatal motorcycle crashes in London.

And one last one; *"it's the dangerous bikers who are at risk"*. Well, speed certainly affects the CONSEQUENCES of a collision and even the best protective clothing can do little to protect a rider who hits a car at speed. But the evidence suggests that the vast majority of collisions occurred when the motorcyclist was NOT speeding and was actually within the speed limit.

So, the important point for YOU to take away is that the vast majority of collisions between cars and bikes involve ordinary drivers and bikers, both of whom are doing ordinary things that they've done thousands of times before without a problem. In short, the person most likely to cause a SMIDSY is not 'bad driver' but you, the one thinking you're doing everything right.

OK, that sounds a bit accusatory, but it's down to the way our safety culture that has to apportion blame after a crash. The assumption is that careful road users don't make mistakes, and so crashes only happen because of carelessness. In reality, we're human, and humans err. Even careful drivers err, and most crashes involve drivers who a moment earlier believed they were being careful.

So, having got that out of the way, what's my advice to you, the careful driver who wants to avoid putting motorcyclists at risk at junctions?

UNDERSTAND THE BIKER: Picture the scene. The rider is ambling along, in no rush, probably with the headlight on (there's been no off switch on new machines for a while now) and perhaps wearing hi-vis clothing. The rider sees a vehicle ahead waiting to make a turn. With a clear line-of-sight, the rider sees the driver looking in his direction and assumes that the driver has seen the approaching motorcycle. And then the driver pulls into the bike's path.

Because drivers massively outnumber bikers here in the UK, from the individual driver's perspective it's a rare error – you WILL see most bikes and you may never have pulled into the path of a motorcycle, let alone actually caused a crash. But the numbers work both ways – because bikes are massively outnumbered by cars and other vehicles, this scenario will have happened to virtually anyone who rides a powered two-wheeler (PTW). In fact, from the average biker's perspective this ROWV happens over and over and many riders have crashed as a result of not being seen! But unless the rider understand the issues, the only common-sense explanation that explains how a driver looks at him or her but fails to see the approaching bike is *"the driver didn't look properly"*.

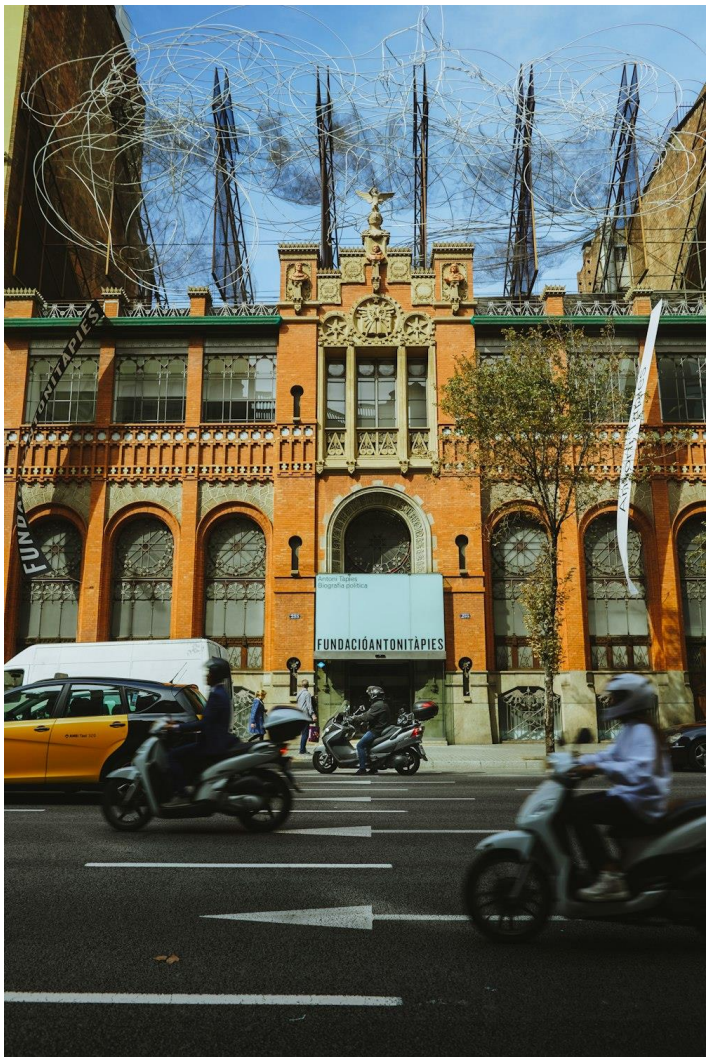

Image Cyrus Gomez

In fact, there are three possible explanations:

- you ‘couldn’t see’ the motorcycle
- you ‘looked but failed to see’ the motorcycle
- you ‘looked, saw and misjudged’ the motorcycle’s speed and distance

You looked but couldn’t see the motorcycle: Motorcycles are small. They are easily hidden. They disappear behind other vehicles and roadside obstructions. It can happen when you’re emerging from a side turning, and even when you’re turning right – remember, a bike is narrow and what looks like a gap may have a PTW tucked over near the centre-line and still out of sight. Whenever possible position to see all of the oncoming lane, and if you can’t see all of it, remember a bike could be hidden.

Maybe you would argue that it’s the biker’s job NOT to hide in this way (and I’ve talked about opening up lines-of-sight in my advice to the bikers), but there’s absolutely nothing the rider can do about the blind spots in your car. Over the years, the windscreen pillars and the vertical

support pillars behind the front doors have all got a lot thicker in order to provide a better safety cage within the vehicle. Because PTWs are tall and narrow they will easily disappear behind them, even when they are scarily close. Remember, the bike could be coming from right or left and if your car is at an angle to the road, then the bike could be concealed by the door pillars, even your passenger or the headrests. If the bike happens to be behind the pillar when you look in that direction… SMIDSY.

One regularly proposed solution is *"take longer to look"* – the idea is that the bike will reappear around the pillar after a moment. But that's not necessarily the case. If the motorcycle's line-of-approach happens to be directly along the line-of-vision blocked by the pillar then it'll stay hidden almost to the point of collision. This can happen when the car is stopped, or when both vehicles are moving. This is sometimes called the 'constant bearing problem' and is better known in nautical and aviation circles. The only solution is not just to take a longer look, but to physically move your head from side to side so as to clear the view behind the pillar blocking your view.

You looked but failed to see the motorcycle: As I said earlier detection failures are massively outnumbered by the detection successes but that's what makes it hard to understand why you can look and not see a motorbike in plain sight. First of all, you only have a narrow cone of focused vision and like all of us, your vision flicks around the from point to point, building up a composite picture of what's around you. But you don't see everything. Your involuntary attention is attracted towards some objects more than others. Other cars, trucks, buses etc. are strong attractants and pull your vision straight to them. Unfortunately, motorcycles are narrow and even when riders use hi-vis clothing and lights, they are weak attractants and harder to spot than a car. It can happen when the motorcycle is being followed by a car. If you only see the car somewhat further off and think you can pull out safely in front of it, you've just set up the circumstances in which a SMIDSY can occur.

Frequently, it's the motorcycle's movement across the background that draws your attention, but if the angles line up just right (wrong?) as the rider approaches the junction where you are planning to make your turn, it's possible that there isn't any significant movement against the background. That's known as 'motion camouflage' and even though the motorcycle is in clear sight, it can be overlooked. You never become aware of it, at least, not until it's right on top of you.

Here's another problem. As your eyes are drawn to the strong attractants you momentarily focus on each (a fixation) – a fraction of a second later you become consciously aware of whatever it is – you 'see' it. And then your eyes move onto the next attractant. As the eyes move from object to object, your vision skips right through areas where nothing attracted your attention. The really bad news is that when your eyes move quickly from one object to another, the brain shuts down the visual feed because the movement would be disorientating and upset your balance. What you actually see is a series of snapshots but you don't realise this happens because your brain cleverly fills in the blind area (known as saccades), but the consequence is that you can look at one car, switch your gaze to the next, and if that hard-to-see motorcycle between them hasn't registered sufficiently to cause a fixation, you simply won't see the bike. The problem is worst when waiting to pull out of a side road – you're looking from left to right and much of what's

between those snapshots goes missing. Maybe you're thinking this seems unlikely… but drivers pull into the path of other cars, even buses and trains, because they never spotted them! Turn your head fast enough and anything can fall into a saccade and never make it to your conscious awareness. The solution is simple – turn your head more slowly to give the harder-to-detect objects a chance to jump out and into your consciousness.

You also learn where vehicles come from, so that's where you look. Of course, as a car driver you're thinking in terms of where your own car would be. That's partly why drivers miss filtering motorcycles and cyclists – you're looking in the wrong place. Don't just look at cars – look either side of them.

Image by Anh-Duc Le

Of course, you probably think that when looking to turn at a junction, you're looking for vehicles. It doesn't work like that. You rely on the ability of vehicles to attract attention to alert you to their presence, but in fact what you're really searching for – and bikers do just the same – is search for gaps in the stream of traffic. All road users rapidly learn to look where they expect to see a gap, and that's where your eyes automatically move. And if that PTW hasn't caught your attention, you won't see it – only the gap. and in front of them. Avoid quick glances. If that means missing the opportunity to turn into a tight gap, it means it was too tight. Turn your head more slowly, take longer to search the scene and if you think you have spotted a gap, scan all the way back towards your car. If you've missed a motorcycle, that's where it will be – already almost on top of you.

You 'looked, saw and misjudged' the motorcycle's speed and distance: It's true that motorcycles are often moving a bit quicker than the traffic around them (they accelerate faster so it's not surprising) but this one is usually down to something called the size-arrival effect. The motorcycle arrives before you expect, shocking you and because you don't misjudge the speed of cars very often, your automatic conclusion is *"the biker must have been speeding"*. Nope, it's a weakness of the human brain – it's not very good at judging speed and distance of small objects like motorcycles. It calculates that there's more time to complete the manoeuvre than there really is. Once again, there's a simple solution to this misjudgement problem – having seen a motorcycle, just pause for a second to watch it. That way you can double-check that it's really as far away and travelling as slowly as you thought it is.

Don't rush: A factor in junction collisions is attempting to make the turn in a rush. It's not always a driver – a scooter rider nearly SMIDSY'd me when I was in the car not so long ago. Snap decisions are the ones that go wrong. Take a little bit longer. Don't 'glance' but LOOK. Don't look once, look TWICE.

Think Once, Think Twice, Think BIKE! It's probably one of the most-well known bike safety slogans and it dates back to a public information film of the mid-70s, yet it still has a point today. It's easy to forget that there are bikes on the road when you don't see them very often. OK, that's pretty much impossible if you drive in London or other major cities but remember wherever you drive, just because you haven't seen a bike doesn't mean there isn't one heading towards you. When the road is full of other cars, vans, trucks and buses, just remember to ask: **"is there a bike there too?"**

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