Answer to six points that are frequently put forward in favour of motorcycle daytime lights:

1. 'Most motorcyclists are themselves in favour of daytime lights'
2. 'It is obvious that daytime lights will reduce motorcycle accidents'
3. 'The findings of the research studies are overwhelmingly in favour of motorcycle daytime lights'
4. 'The findings of the research studies in favour of motorcycle daytime lights are incontrovertible'
5. 'Motorcycle daytime lights may do no good, but they will also do no harm'
6. 'Motorcyclists who question the evidence in favour of motorcycle daytime lights are more interested in playing politics than in saving motorcyclists' lives'

Stephen Prower 15 December 1996

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1. 'Most motorcyclists are themselves in favour of daytime lights'

A 1990 British survey[1] did indeed find that 68% of the moped and motorcycle riders whom the survey interviewed thought that 'all new motorcycles should be fitted with daylight riding lights' (ie all new motorcycles should be 'hard-wired' with the headlight, or purpose-built 'daytime running lights', permanently on).

And I believe that an equally high, or even higher, proportion of motorcycle riders in other countries take the same view.

1.1 Findings of British experimental study

But a 1985 British experimental study[2] found that only a headlight approaching a power output of 40watt, and a diameter of 6in (15cm), was large and powerful enough to achieve a significant increase in the 'conspicuity' (ie noticeability) of a moped or motorcycle in daylight.

And 75% of the riders in the 1990 British survey rode 'a moped, motorcycle up to 125cc, or motorcycle up to 400cc', namely a moped or motorcycle whose headlight will—save for a small number of 250cc, 350cc, and 400cc models of motorcycle—have been under 6in in diameter.

The other 25% of the riders rode 'a motorcycle over 400cc', namely a motorcycle whose headlight will also, in the case of most 'custom' or 'trail'—as opposed to 'road' or 'sports'—styled motorcycles, have been under 6in in diameter.

Or in short some three-quarters of the riders in the 1990 British survey rode a moped or motorcycle whose headlight was, in fact, too small (and in most cases, probably, also too weak) to increase the motorcycle's conspicuity.

1.2 Opinion of motorcyclists at odds with the findings of scientific enquiry

Anecdote or opinion that is based upon personal experience is often reliable.

But it must be doubted that the opinion of many of the motorcyclists who express themselves to be in favour of daytime lights reflects any true improvement that they may have experienced, when using daytime lights, in the behaviour of other drivers or other road users towards them.

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1 Gosnell 1990 Transport Research Laboratory (Contractor) UK

2 Donne & Fulton 1985 TRL UK
[The digest paper Donne (Undated)[3] supplies the supplementary information that the diameter of headlight was 6in, as opposed to 7in, as erroneously implied by Donne & Fulton 1985]

3 Donne (Undated) TRL UK

2. 'It is obvious that daytime lights will reduce motorcycle accidents'

A man who is running a 100yd (91m) race can perfectly well see another man who is standing on the finish line.

Similarly a driver can perfectly well see a motorcycle that is 100yd away from him or her.

2.1 100yd (or 3sec) distance of the motorcycle away from the other driver at which motorcycle accidents 'start to happen'

Three studies have made findings that, taken between them, suggest that the majority of motorcycle accidents occur when another driver infringes the right of way of a motorcycle rider who is only a short distance away from him.

1. Survey finding of speed of travel of the motorcycle prior to a collision: First, a 1980 British survey[4] studied all motorcycle injury accidents that were notified to the police in the Slough and Newbury divisions of the Thames Valley Police force area in 1974.

The survey found that:

- In 75% of all accidents the motorcycle was travelling at less than 30mph (48kph)
- In 93% of all accidents the motorcycle was travelling at less than 40mph (64kph)[5].

2. Calculation of distance of the motorcycle away from the other driver at which a collision becomes inevitable: Second, a 1990 American mathematical simulation study[6] took as its 'scenario' an intersection between a major road with two lanes in either direction, and a minor road.

The study then calculated, for a motorcycle travelling on the major road, the nearest, and furthest, distances of the motorcycle away from the intersection, or 'collision

zone', within which a collision was inevitable if a motorcar at the intersection infringed the motorcycle's right of way.

In brief summary[7], the study found that, for a motorcycle travelling at 30mph (48kph), even if the motorcycle rider is totally unalert, a collision may 'inevitably' result only if the other driver infringes the rider's right of way when the rider is less than 96yd (87m) from him.

Whilst if the motorcycle rider is alert, and is properly positioned in the road and brakes optimally, the distance is reduced to 56yd (51m)[8].

3. Experience of motorcycle rider test 'subjects' in avoiding a collision with an 'infringing' other driver at a time separation between them of 3sec or less: And third, an undated American study that is thought to have been published in 1980[9] asked volunteer motorcycle rider 'subjects' to travel at a set time gap behind a 'lead' car along a major thoroughfare near Ann Arbor, Michigan, and record how often other drivers at intersections infringed (or respected) their right of way. The speed limit of the thoroughfare—to refer back again to the findings of the 1980 British survey—was for the most part 70kph (43mph), but sometimes it fell to 55kph (34mph).

The motorcycle rider subjects followed the lead car at time gaps down to below 3sec, ie in terms of distance, at a separation of below:

46m (50yd) at 55kph
58m (64yd) at 70kph .

Yet, although, at a time gap of '3sec or less', some 5% of other drivers infringed the motorcycle rider subject's right of way, none of the subjects had an accident[10].

Summary of findings of three studies taken together: Thus, to sum up the findings of the three studies together:

- The 1980 British survey found that 93% of motorcycle accidents take place at a speed of travel of less than 40mph (64kph)
- The 1990 American simulation study calculated that a motorcycle rider who is travelling at a speed of some 30mph (48kph), even if totally unalert, is only at hazard of a collision if another driver infringes his right of way when he is less than 96yd (87m) away from the other driver
- The volunteer motorcycle riders who participated in the 1980 American study were almost certainly fully alert; nevertheless, they travelled at a speed of mostly 43mph (70kph), and did not suffer any accidents, even though roughly 1 in 20 of other drivers infringed their right of way when they were less than 3sec in time, or 64yd (58m) in distance, away from the other driver.

Or in other words, between them the studies suggest that it is only when another driver infringes a motorcyclist's right of way when the motorcyclist is less than 100yd, or 3sec, away from him that motorcycle accidents, in substantial numbers, 'start to happen'.

2.2 Critical issue therefore the response of the other driver when he does see the motorcycle

Correspondingly—as is freely accepted by the better daytime lights studies—, the issue in most motorcycle accidents at intersections is likely to be, not why the other driver failed to see the motorcycle, but why the other driver failed to notice, or ignored, the motorcycle.

Sometimes the other driver may, indeed, fail to see the motorcycle, because he or she failed to look directly in the direction of the motorcycle.

If so, daytime lights, if sufficiently bright, may act as a stimulus to the driver's peripheral vision.

But, once again, daytime lights will only make the other driver see the motorcycle. How far they will also make him notice, and respond correctly to, the motorcycle is another matter.

In short, what is critically at issue is the response of the other driver to a motorcycle that he has in fact seen.

Or as the experienced motorcycle rider instructor instructs his pupils: 'It's not what they do when they haven't seen you that you've got to worry about. Rather it's what they do—or don't do—when they have seen you.'

2.3 Two other causes of motorcycle accidents besides 'failure of the other driver to see the motorcycle'

One cause stands out why another driver should fail to notice, or ignore, a motorcycle: that, because of the limits of human perceptual capacity, he subconsciously, or consciously, misestimated the motorcycle's speed in head-on view.

And one cause stands out why a motorcycle rider might fail to avoid a collision should another driver fail to notice, or ignore, him: that, because motorcycle riders have a compulsive tendency to monitor the road surface, he did not look in the direction of, and so see, the other driver.

2.4 Misestimation of the speed of the motorcycle by the other driver

Failure of Japanese experimental study: Only one study, a 1980 Japanese study[11], has to date attempted to measure the errors that experimental subjects make when they attempt to estimate the speed of a motorcycle.

But the method of the study failed to distinguish between subjects' errors of estimation of speed, and errors of estimation of distance, and the findings of the study were therefore invalid.

Speculations of own 1990 digest paper: However a 1975 British experimental study[12] measured, under laboratory viewing conditions, the 'threshold' figures

below which small changes of angle were no longer detectable by the human eye.

The findings of the study suggested that, for an exposure of 2sec, the threshold figure of longitudinal movement was approximately 1min of arc.

Accordingly, in a 1990 digest paper[14], I in turn suggested that:

- Allowing for the elevation, under road viewing conditions, of the threshold figures that the 1975 study measured
- Allowing for the frequent lower length of exposure, under road viewing conditions, than the length of exposure that the 1975 study permitted its experimental subjects
- Noting the narrow and confused outline of a motorcycle and rider in 'head-on' view,

with the exception of perfect road viewing conditions, it is unlikely that another driver will be able to detect the changes in angle 'subtended' that a motorcycle and rider in head-on view[15] make to him.

So, since, as a matter of trigonometry, at most intersections another driver will only observe a motorcycle in head-on view until it commences its final traverse past him[16], other drivers will often receive insufficient perceptual information to be able to estimate the speed of a motorcycle at all.

2.5 Compulsive tendency of motorcycle riders to monitor the road surface

Findings of Japanese experimental study: And only one study, a 1979 Japanese study[17] by the same authors as the 1980 Japanese study, has attempted to record and compare the respective distribution of the 'fixations'[19] of motorcycle riders, and motorcar drivers, as between the road surface and the road in front of them.

The study found that, 'time-weighting' the fixations, at a speed of approximately 50kph (31mph) the experimental subjects, when riding a motorcycle, directed:

- 82% of their fixations below the road horizon
- 29% of their fixations directly at the road surface;

by comparison, the same subjects, when driving a motorcar, directed just:

- 11% of their fixations below the road horizon
- 0% of their fixations directly at the road surface.

Or the 1979 Japanese study made findings that are highly suggestive that there is indeed a compulsive tendency of motorcycle riders to monitor the road surface.

2.6 Scant but persuasive scientific research findings and speculation carry greater weight than popular intuition

One unsuccessful preliminary study and one successful preliminary study, both by the same authors; the speculations of one digest paper published, not by an academic road safety research scientist, but, by default, by a motorcyclist: this is scant enquiry into the two causes.

But scant though it is, it is quite sufficient to establish 'unobvious':

- Subconscious or conscious misestimation of motorcycle speed by the other driver,

either operating on its own, or in combination with similarly 'unobvious':

- Motorcycle rider compulsively looking at the road surface,

as a far more likely cause of a motorcycle accident than that a driver may be able to look at, and fail to see, a motorcycle that is 100yd or less away from him.

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4 Whitaker 1980 TRL UK

5 It should be noted, by way of supplement to the findings, that Whitaker 1980 also found that the proportion of higher speeds of travel was 'above average' for accidents in non built-up areas; single-vehicle accidents; accidents involving motorcycles over 250cc; and accidents involving severe or fatal injuries

6 Ouellet 1990 Academic author USA

7 To give fuller details of the study findings, four of the 'motorcycle conditions' that the study considered were:

a. Motorcycle rider practises optimum braking and 'best' positioning
b. Motorcycle rider practises optimum braking and 'worst' positioning
c. Motorcycle rider practises no braking (or braking 'into a collision') and 'best' positioning
d. Motorcycle rider practises no braking (or braking 'into a collision') and 'worst' positioning.

For a motorcycle travelling at 30mph (48kph), the study calculated, for the combination of the four motorcycle conditions and four further 'motorcar conditions', the following 'collision inevitable' zones:

1. Motorcar executing left turn from rest off major road into minor road: motorcycle speed, 30mph (48kph)

a.	No zone	b.	41–66	c.	66–96	d.	41–75yd
	No zone		38–61		61–87		38–69m

2. Motorcar executing 'rolling' left turn at 13mph off major road into minor road: ditto

a.	44–56	b.	17–44	c.	44–66	d.	17–45yd
	41–51		15–40		41–61		15–41m

3. Motorcar crossing intersection from rest on minor road from motorcycle rider's near-side: ditto

a.	43–46	b.	22–43	c.	39–63	d.	22–48yd
	40–42		20–40		35–58		20–44m

4. Motorcar crossing intersection from rest on minor road from motorcycle rider's far-side: ditto

a.	No zone	b.	No zone	c.	41–78	d.	41–67yd
	No zone		No zone		37–71		37–61m

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Varying the speed of the motorcycle, for the motorcar condition, 'Motorcar executing left turn from rest off major road into minor road', the study calculated (to repeat the figures for 30mph) the following collision zones:

1. Motorcar executing left turn from rest off major road into minor road: motorcycle speed, 25mph (40kph)

a.	No zone	b.	36–56	c.	56–83	d.	36–65yd
	No zone		33–51		51–76		33–59m

2. Motorcar executing left turn from rest off major road into minor road: motorcycle speed, 30mph (48kph)

a.	No zone	b.	41–66	c.	66–96	d.	41–75yd
	No zone		38–61		61–87		38–69m

3. Motorcar executing left turn from rest off major road into minor road: motorcycle speed, 35mph (56kph)

a.	No zone	b.	47–77	c.	76–109	d.	47–86yd
	No zone		43–70		70–99		43–78m

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[8] Ouellet 1990's simulation treated dry weather braking conditions only. It should be borne in mind that, because of the lower adhesion of the tyres, and the diminished ability of the rider to 'read' the road surface, in wet weather the braking distance of a motorcycle will be substantially greater than the braking distance in dry weather

[9] Olson et al 1980? University of Michigan, etc USA

[10] 'In the more than 20,000 miles accumulated during the tests, the riders experienced one minor crash and a few near misses. Interestingly, *none of these occurred while collecting data*, but all involved pre-crash configurations of the classic type described earlier in this paper.'

[11] Nagayama et al 1980 Osaka University, etc Japan

[12] Hills 1975b TRL UK [Digested by Hills 1980[13]]

[13] Hills 1980 TRL UK

[14] Prower 1990 Motorcyclist author UK

[15] The perceptual distinction between 'head-on' view, and 'oblique' view, is that, in head-on view, an object that is moving towards an observer will 'make' only small changes in the angle that its outline 'subtends' to the observer. By contrast, in oblique view, the object will display 'angular motion', ie make large changes in angle across the observer's retina.

The small changes in angle subtended of head-on view will only be detectable, if detectable at all, in the observer's central vision. By contrast, the large changes of angle of oblique view may not only be detectable in the observer's peripheral vision, but also act as a peripheral 'stimulus', ie actively attract the attention of the observer to the object.

In head-on view, a motorcycle, possessed of a narrow, small, 'confused', outline, as opposed to a motorcar, possessed of a broad, large, 'contrasting', outline, and extensive glazed surfaces, will not only make smaller changes of angle to the observer than the motorcar, but also less easily perceived changes of angle. By contrast, in oblique view, all objects make the same changes of angle to the observer, so that the motorcycle will afford the observer identical perceptual information to a motorcar.

So, although, in head-on view, the observer will have difficulty in estimating both the speed of an approaching motorcycle, and the speed of an approaching motorcar, the difficulty will be much greater for the motorcycle than for the motorcar.

Whereas, in oblique view, the observer will have little difficulty in estimating the speed of either the motorcycle, or the motorcar.

It is not possible to estimate precisely a comparative figure of the greater difficulty that the observer will have in estimating the speed of the motorcycle in head-on view than the speed of a motorcar.

But typically the motorcycle and rider, at 1.5ft (0.46m) wide, will be 4 times narrower than the motorcar, at 6ft (1.83m) wide. To repeat, the outline of the motorcycle and rider will be far less readily perceivable by the observer than the outline of the motorcar.

So it is reasonable to suggest that, out on the road, it may be 10 times more difficult for another driver to estimate the speed of the motorcycle in head-on view, than it is for him to estimate the speed of a motorcar in head-on view.

[And correspondingly, to point, the changes of angle subtended that the motorcycle makes to the other driver will fall below the threshold figure for perception by the human eye:

- Under far less adverse viewing conditions than for a motorcar
- Even though the other driver views the motorcycle at a far more close distance to him than he views the motorcar.]

[16] Thus after a motorcycle accident the other driver will often say, not, 'I didn't see the motorcycle', but, 'I only saw the motorcycle at the last moment', or 'I only saw the motorcycle when it was too late to do anything'.

[17] Nagayama et al 1979 Osaka Univ, etc Japan [For a readable reproduction of the figure in which Nagayama et al 1979 present the distribution of 'fixations', see Nagayama 1984[18]]

[18] Nagayama 1984 Osaka Univ Japan

[19] 'Fixations' are the discrete glances that, between them, make up human sight. Helmers et al 1977[20] [Digested by Luoma 1986[21]] reports that drivers usually fixate at a rate of 4–5 fixations per second. Nagayama et al 1979 record the duration of individual fixations of their experimental subjects as being, most frequently, some 50msec (the shortest duration that they recorded). They also record the duration as being, overall, predominantly under some 250msec

[20] Helmers et al 1977 (Unpublished) ?University of Uppsala Sweden

[21] Luoma 1986 Liikenneturva *[Central Organisation for Traffic Safety]* Finland

3. 'The findings of the research studies are overwhelmingly in favour of motorcycle daytime lights'

The whole body of motorcycle and motorcar daytime lights studies comprises 'monitoring' studies; 'accident and control group' studies; 'fleet' studies; and 'experimental' studies.

3.1 Restriction of treatment to the major daytime lights monitoring studies

However it is the findings of the major monitoring studies that persons are usually referring to when they say that the findings of the studies are 'overwhelmingly' in favour of motorcycle (or motorcar) daytime lights.

Accordingly, first, I shall restrict myself here to treating only the major monitoring studies[22].

3.2 Treatment of the major motorcycle and motorcar monitoring studies together

The motorcycle and motorcar daytime lights studies investigate the same phenomenon, and share the same methods. In consequence, between them, the findings of the motorcycle and motorcar studies constitute a single body of findings, namely a body of findings that 'hang or fall together' .

Accordingly, second, I shall treat motorcycle, and motorcar, daytime lights studies together.

3.3 Findings of the first major motorcycle, and the first major motorcar, monitoring study

The first major monitoring study of the effect of motorcycle daytime lights was a 1971 American study[25].

It made the 'mixed' finding that, whilst motorcycle daytime light laws in the four US states of Indiana, Montana, Oregon, and Wisconsin were followed by a reduction of motorcycle accidents in three out of the four states (Indiana, Oregon, and Wisconsin), they were followed by an increase in the fourth state (Montana).

The first major monitoring study of the effect of motorcar daytime lights was a 1976 Finnish all-vehicle study by Swedish and Finnish authors[26].

It similarly made the mixed finding that, whilst multi-vehicle accidents, pedestrian accidents, and other accidents (mainly animal accidents) fell substantially after daytime lights were officially recommended in Finland for all vehicles in winter outside built-up areas, only other accidents in turn also fell substantially after the recommendation was made compulsory two years later: multi-vehicle accidents and pedestrian accidents effectively did not change.

3.4 Findings of the ten subsequent major motorcycle and motorcar monitoring studies

Since then (counting the two parts of the 1984 American study as separate studies) the 1971 American motorcycle study has been followed by six more major motorcycle monitoring studies, and the 1976 Finnish all-vehicle study by four more major motorcar studies:

- A 1977 American motorcycle study[27] found a reduction of motorcycle accidents following a motorcycle daytime lights law in North Carolina; but it also found, on 'disaggregation' of its findings, that whereas multi-vehicle accidents fell in the year following the law, daytime accidents remained stable (and only fell in the second year after the law)
- A 1978 British motorcycle study[28] found a reduction of motorcycle accidents following a pro motorcycle daytime lights campaign in Greater London; but it also found, on disaggregation of its findings, an increase of motorcycle accidents at 'uncontrolled junctions'
- A 1979 Danish motorcycle study[29] found an increase of motorcycle accidents following a motorcycle daytime lights law in Denmark
- A 1981 Swedish all-vehicle study[30] found a lower figure of accidents in the first year following an all-vehicle daytime lights law in Sweden; but it also found a higher figure of accidents in the second year following the law
- A 1984 American motorcycle study[31] found no change of accidents following a law in California that required that all new motorcycles be hard-wired with the headlight permanently on
- The same 1984 American motorcycle study[32], and another 1985 American motorcycle study[33], found a lower figure of motorcycle accidents in 14 US states with a motorcycle daytime lights law than in respectively 33, or 30, 'control', or comparison, US states without a motorcycle daytime lights law; but it is not possible to disaggregate the findings of the two studies in regard to the 14 US states with a motorcycle daytime lights law into separate findings for each state
- A 1986 Norwegian all-vehicle study[34] found a reduction of accidents following an all-vehicle daytime lights law in Norway; but a 1989 digest paper by a Dutch author[35] states that the reduction was inexplicably large
- A 1993 Danish motorcar study[36] found only a reduction in 'left turn conflicts' following a motorcar daytime lights law in Denmark
- A 1994 Canadian motorcar study[37] found a lower figure of accidents of motorcars of model-year dating after a law in Canada that required that all new motorcars be hard-wired with 'daytime running lights' permanently on; but the reduction of accidents, as measured by the study two years after the law, was inexplicably more than twice as high for one-year-old model motorcars as it was for brand-new model motorcars.

3.5 Reappraisal of the findings of two of the major motorcar studies

And two critical studies have subsequently reappraised the findings respectively of two of the major motorcar studies:

- A 1993 study by a Norwegian author[38] reexamined the data of the 1986 Norwegian all-vehicle study, and made, in contradiction of the findings of the original author, the mixed finding that there had been a reduction of multi-vehicle accidents (excluding rear-end collisions); no change of pedestrian accidents, or twilight accidents generally; and an increase of multi-vehicle accidents (rear-end collisions) following the all-vehicle daytime lights law in Norway
- A 1995 study by Dutch authors[39] reexamined the data of the 1981 Swedish all-vehicle study, and concluded, in contradiction of the findings of the original authors, that there had been no change of accidents following the all-vehicle daytime lights law in Sweden.

3.6 Ragbag of possibly favourable, mixed, neutral, and adverse findings of the twelve studies

Thus, in summary, there have been twelve major motorcycle and motorcar monitoring studies of the effect of daytime lights, made up of seven major motorcycle studies, and five major motorcar studies.

Out of the 7 major motorcycle studies, only 2 studies made possibly unmixed findings in favour of daytime lights:

- 2 studies made 'aggregated' findings for 14 US states taken together that, were it possible to disaggregate them into separate findings for each state, might, or might not, have been unmixed findings[40].

Rather, out of the remaining 5 motorcycle studies:

- 3 studies made mixed findings[41]
- 1 study made a neutral finding[42]
- 1 study made an adverse finding[43].

Out of the 5 motorcar studies, no study at all made unmixed findings in favour of daytime lights.

Rather, out of the 5 studies:

- 1 study made unmixed findings that a later author has contradicted, and states should have been mixed findings[44]
- 3 studies made mixed findings[45]
- 1 study made mixed findings that later authors have contradicted, and state should have been neutral findings[46].

It is impossible to describe this diverse ragbag of possibly favourable, mixed, neutral, and adverse study findings as a body of findings that are 'overwhelmingly' in favour of motorcycle (or motorcar) daytime lights.

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22 As regards the residue of 'accident and control group', 'fleet', and 'experimental' daytime lights studies that I do not treat here, I have attempted to treat the whole body of daytime lights studies, including both the 'accident and control group', 'fleet', and 'experimental', and the 'monitoring' studies, in the previous digest papers, Prower 1985 (unpublished)[23], Prower 1990 (unpublished)[24], and Prower 1990.

The conclusion of the papers was that the findings of the whole body of studies, taken on balance together, did not supply convincing evidence that motorcycle or motorcar daytime lights were effective to reduce accidents.

I have not since updated the papers: but what later study findings I have read do not suggest that, were I now again to attempt a full digest paper, it would come to a different conclusion.

23 Prower 1985 (unpublished) Motorcyclist author UK

24 Prower 1990 (unpublished) Motorcyclist author UK

25 Janoff & Cassel 1971 Franklin Institute Research Laboratories USA

26 Andersson & Nilsson 1981 Statens Väg- och trafikinstitut *[National Road & Traffic Research Institute]* Sweden

27 Waller & Griffin 1977 University of North Carolina, etc USA

28 Lalani & Holden 1978 Greater London Road Safety Unit, etc UK

29 Lund 1979 Rådet for Trafiksikkerhedsforskning *[Danish Council of Road Safety Research]* Denmark

30 Andersson & Nilsson 1981 VTI Sweden

31 Muller 1984 (Part 1) Pennsylvania State University USA

32 Muller 1984 (Part 2)

33 Zador 1985 Insurance Institute for Highway Safety USA

34 Vaaje 1986 Transportøkonomisk institutt *[Institute of Transport Economics]* Norway [Digested by Koornstra 1989 below]

35 Koornstra 1989 Stichting Wetenschappelijk Onderzoek Verkeersveiligheid *[Institute for Road Safety Research]* Holland

36 Hansen 1993 RfT Denmark [Digested by Arora et al 1994 below]

37 Arora et al 1994 Transport Canada Canada

38 Elvik 1993 TØI Norway

39 Theeuwes & Riemersma 1995 TNO Human Factors Research Institute Holland

40 Muller 1984 (Part 2); Zador 1985

41 Janoff & Cassel 1970; Waller & Griffin 1977; Lalani & Holden 1978

42 Muller 1984 (Part 1)

43 Lund 1979

44 Vaaje 1986

45 Andersson et al 1976; Arora et al 1994; Hansen 1993

46 Andersson & Nilsson 1981

4. 'The findings of the research studies in favour of motorcycle daytime lights are incontrovertible'

In spite of the true mixed nature of the findings of the 1971 American, and 1976 Finnish, studies[47], in summarising the findings, the authors of the two studies respectively 'aggregated out Montana', or 'aggregated in animal accidents'.

In this way, the American authors of the first study presented the results of the motorcycle daytime lights laws of Indiana, Montana, Oregon, and Wisconsin, and the Swedish and Finnish authors of the second study the result of the all-vehicle winter daytime lights law of Finland, to the cursory (or non-Swedish speaking) reader as an unmixed success.

4.1 Defects of method of the major motorcycle and motorcar daytime lights studies

However by far the most serious objection to the validity of the findings of all ten out of the twelve major monitoring studies that I have read in full—ie all of the studies apart from the 1986 Norwegian study (read only in incomplete digest[48]), and the 1993 Danish study (read only in very brief digest[49])—is not the defects of presentation of the findings, but the defects of method whereby the studies arrived at the findings.

Thus each of the three tests that the studies used to measure the predicted effect of daytime lights upon the accident data before them was not only, as intended by the study authors, sensitive to the effect of daytime lights upon the data, but also, contrary to their intention, sensitive to the effect of other, important, extraneous influences, or 'other factors'.

4.2 Accident data before the studies

The accident data before the ten studies was:

- The figure of motorcycle accidents in US states with and without a motorcycle daytime lights law (Part 2 of the 1984 American study, and the 1985 American study[50])
- The figure of motorcar accidents in Canada for motorcars of model-year dating before and after the Canadian motorcar hard-wiring daytime lights law (the 1994 Canadian study[51])
- The figure of motorcycle or motorcar accidents before and after the national motorcycle or motorcar daytime lights law under study (the other seven studies[52]).

4.3 Predicted effect of daytime lights upon the accident data

The predicted effect of daytime lights upon the accident data was 'selectively' to reduce the figure of daytime multi-vehicle accidents (DMVA), but not to reduce the figure of other accidents (DSVA+NMVA+NSVA).

In other words, the figure of daytime multi-vehicle accidents relative to other accidents should be:

- Lower for US states with daytime lights laws than for US states without daytime lights laws
- Lower for motorcars of model-year dating after the Canadian motorcar hard-wiring daytime lights law than for motorcars of model-year dating before the law
- Lower for motorcycle or motorcar accidents after the national motorcycle or motorcar daytime lights law under study than for accidents before the law.

4.4 Tests for the effect of daytime lights upon the accident data applied by the studies

The studies correspondingly applied one of three measuring tests for a selective reduction of daytime multi-vehicle accidents to the data:

1. The test of the 1971 American, and 1985 American studies[53] was to compare the ratio of 'daytime accidents' to 'nighttime accidents' before and after the daytime lights law—or as between the 'comparison groups'—under study, namely to measure the figure:
   (DMVA+DSVA):(NMVA+NSVA)
2. The test of the 1977 American study[54] was to compare the ratio of 'daytime multi-vehicle accidents' to 'total accidents' before and after the daytime lights law under study, namely to measure the figure:
   (DMVA):(DMVA+DSVA+NMVA+NSVA)
3. The test of the 1976 Finnish, 1978 British, 1979 Danish, 1981 Swedish, 1984 American (Part 1), 1984 American (Part 2), and 1994 Canadian studies[55] (and probably also the 1986 Norwegian, and 1993 Danish studies[56]), was to compare the ratio of the two ratios:
   - The ratio of daytime multi-vehicle accidents to daytime single-vehicle accidents
   - The ratio of nighttime multi-vehicle accidents to nighttime single-vehicle accidents

   before and after the daytime lights law—or as between the comparison groups—under study, namely to measure the figure:
   (DMVA:DSVA):(NMVA:NSVA).

4.5 Sensitivity of the first two tests also to the effect of the other factor: 'Change in the volume of nighttime driving'

It takes very little knowledge of algebra, or familiarity with the road accident statistics, to discover the defect of the first and second tests.

The first and second tests are not just sensitive to the effect of daytime lights, but also to the effect of any other factor, such as, in particular:

- A change in the volume of nighttime social driving or riding
- A change in the incidence of nighttime driving under the influence of alcohol,

that causes a selective reduction or increase of nighttime accidents (NMVA+NSVA) by comparison with daytime accidents (DMVA+DSVA).

4.6 Sensitivity of the third test also to the effect of the other factor: 'Change in the volume of late nighttime driving'

It takes more familiarity with the road accident statistics to discover the defect of the third test.

In addition, the manner of formulation of the test obscures what precise changes of accidents it will respond to.

Formulation of test: The purpose of the formulation of the third test is to eliminate the 'parallel' sensitivity of the first and second tests, as just described, to changes in the volume of nighttime (or daytime) driving.

So, for instance, the volume of nighttime driving may change, but the ratio of nighttime multi-vehicle accidents to nighttime single-vehicle accidents (NMVA:NSVA)—and so the figure yielded by the test—will remain the same.

Assumptions of test: The defect of the test is that it still assumes, alternatively, either that:

1. The ratio, NMVA:NSVA, is 'constant', or does not alter, throughout the hours of darkness
2. The ratio, NMVA:NSVA, will vary 'in step' with the ratio of daytime multi-vehicle accidents to daytime single-vehicle accidents (DMVA:DSVA).

Error of first assumption: But the ratio, NMVA:NSVA, is not 'constant' throughout the hours of darkness.

Rather it may be expected to fall, in step with falling traffic density, as the hour of the night becomes later. So it will vary, eg, with changes in the volume of late nighttime driving.

Error of second assumption: And although the ratio, DMVA:DSVA, in like fashion to the ratio, NMVA:NSVA, will vary with changes in the volume of early daytime driving, it will not usually do so 'in step' with it.

Thus the purposes of late nighttime driving are largely social, and 'peripheral', whereas the purposes of early daytime driving are largely business or domestic, and 'essential'.

So the volume of late nighttime driving will be determined by different social and economic influences to the volume of early daytime driving.

Defect of third test: The result is correspondingly, again, that the third test may be expected to be, not just sensitive to daytime lights, but also to any other factor, such as, in particular:

- A change in the volume of late nighttime social driving or riding
- A change in the incidence of late nighttime driving under the influence of alcohol,

that causes a selective reduction, or increase, in the incidence of late nighttime accidents; so selectively alters the proportion of late nighttime accidents to early nighttime accidents; so selectively alters the overall 'ratio of nighttime multi-vehicle accidents to nighttime single-vehicle accidents'; and so also causes the test to respond to it.

Confirmation of defect by practical example: And confirmation that the third test is indeed markedly sensitive, as so 'theoretically' predicted, to other factors besides daytime lights is afforded by the practical example of:

1. The monthly figure of the test for multi-vehicle accidents in Finland for 1968–1974, which varied wildly with the hour of onset of darkness between a lowest figure of 1.29 (December 1974) and a highest figure of 6.22 (August 1974)[57]
2. The monthly figure of the test for multi-party accidents in Sweden for 1975/76–1978/79, which again varied wildly with the hour of onset of darkness between a lowest figure of 0.86 (November 1977) and a highest figure of 5.18 (April 1976)[58]
3. The yearly figure of the test for non-motorcycle accidents in North Carolina for 1971–1976, which steadily rose, in step with the increasing influence of some undetermined other factor, successively from 3.24 to 3.41, 3.70, 3.87, 4.07, and 4.29[59].

4.7 Lack of specificity of the tests incapable of being ignored

It might be possible to ignore the sensitivity of the three tests to other factors, or 'lack of specificity' of the tests, if the effect of daytime lights were known to be a very large effect; or if, say, the volume of nighttime, or late nighttime, social driving and driving under the influence of alcohol during the period of the studies were known to be a stable volume.

But the size of the effect of daytime lights is the very matter that the studies were intended to establish; the social, economic, and climatic background of the post-war years affords no confidence that the volume of nighttime social driving during the period of the studies was stable; and since the 1960s there has been, as I believe, a downward trend in most of the study countries in the volume of drinking and driving.

4.8 Findings of studies correspondingly scientific dross and worthless

Far from being 'incontrovertible', therefore, the findings of all twelve, save only possibly two, of the major research studies in favour of daytime lights derive from an inherently unspecific, and incurably defective, test, and are consequently scientific dross and worthless.

[47] Janoff & Cassel 1971; Andersson et al 1976

[48] Vaaje 1986 [Digested by Koornstra 1989]

[49] Hansen 1993 [Digested by Arora et al 1994]

[50] Muller 1984 (Part 2); Zador 1985

[51] Arora et al 1994

[52] Janoff & Cassel 1971; Andersson et al 1976; Waller & Griffin 1977; Lalani & Holden 1978; Lund 1979; Andersson & Nilsson 1981; Muller 1984 (Part 1)

[53] Janoff & Cassel 1971; Zador 1985

[54] Waller & Griffin 1977

[55] Andersson et al 1976; Lalani & Holden 1978; Lund 1979; Andersson & Nilsson 1981; Muller 1984 (Part 1); Muller 1984 (Part 2); Arora et al 1994

[56] Vaaje 1986; Hansen 1993

[57] Andersson et al 1976
[By comparison Andersson et al 1976 relied for their finding in favour of daytime lights upon changes in the yearly figure of the third test for multi-party accidents in winter in non built-up areas in Finland for 1968/69–1973/74 of just:
2.16, 2.30;
Use of daytime lights officially recommended:
1.99, 1.77;
Use of daytime lights compulsory:
1.66, 1.93 ;
or upon changes in the two-year by two-year figure (as presented in their summary) of:
2.23; 1.88; 1.76 .]

[58] Calculation from data of Andersson & Nilsson 1981
[By comparison Andersson & Nilsson 1981 relied for their findings in favour of daytime lights upon changes in the yearly figure of the third test for multi-party accidents in Sweden for 1975/76–1978/79, as also calculated from their data, of just:
2.24, 1.95;
Use of daytime lights compulsory:
1.88, 1.98 ;
or upon changes in the two-year by two-year figure (as presented in their paper) of:
2.11; 1.95 ,
or to correct a minor error in their calculation:
2.11; 1.93 .]

[59] Calculation from data of Waller & Griffin 1977
[By comparison the changes in the yearly figure of the third test for motorcycle accidents in North Carolina for 1971–1976, as also calculated from Waller & Griffin 1977's data, were just:
1.70, 1.67, 1.97;
Use of daytime lights compulsory from 1 Oct 1973:
1.58, 1.77, 1.91 .]

5. 'Motorcycle daytime lights may do no good, but they will also do no harm'

In order to establish the proposition that motorcycle (or motorcar) daytime lights 'do no harm', in the first case, it must be shown that they have no actual, or potential, adverse effect upon:

- The motorcycle rider who uses daytime lights
- The other driver (and other road users) who perceive daytime lights as used by the motorcycle rider.

And in the second case, it must be shown that the fruitless research that has been conducted into motorcycle daytime lights to date has not been, and is not being, conducted to the prejudice of the conduct of research into potentially more fruitful other motorcycle safety measures or other areas of motorcycle safety enquiry.

In each case, in fact, the opposite is true.

5.1 Adverse effect of motorcycle daytime lights that are ineffective upon the motorcycle rider who uses them: False confidence

First, the effect of motorcycle daytime lights upon the motorcycle rider who uses them must be to give him confidence that 'Other drivers will see and give way to him'.

Adverse effect of False confidence: But if daytime lights 'do no good', the confidence will be a 'false' confidence. The false confidence may, more or less rapidly, be dissipated, without harm to the motorcycle rider,

by experience. Or it may instead, before it has been dissipated by experience, be dissipated by an accident.

In other words, if daytime lights 'do no good', by giving the motorcycle rider who uses them False confidence that other drivers will see and give way to him, they will also actively 'do harm'.

Method of estimating the number of accidents that False confidence may cause: To attempt a qualitative estimate of the number of accidents that a False confidence in daytime lights may cause motorcycle riders to suffer, the number will derive from, and be related to:

1. The number of motorcycle riders who use daytime lights with a False confidence that other drivers will therefore see and give way to them
2. The number of motorcycle accidents in which another driver fails to give way to the motorcycle.

1. Number of motorcycle riders who may ride with False confidence: The headlight of a motorcycle may be insufficiently large or powerful to attract the attention of the other driver.

Thus, to refer back to the findings of the 1985 British study and the 1990 British survey[60] that were cited earlier under the Answer to Point 1, the headlights of some three-quarters of the mopeds and motorcycles in the survey were not sufficiently large or powerful to attract the attention of the other driver.

Or the headlight of a motorcycle may be sufficiently large or powerful to attract the attention of the other driver, but nevertheless fail to alter his response to the presence of the motorcycle.

Thus to refer back to the points that were made under the Answer to Point 2, even though the other driver may see or notice a motorcycle, if he then, subconsciously or consciously, misestimates the speed of the motorcycle, it is likely that he will still ignore it.

So the new rider of every moped or motorcycle, insofar as he uses daytime lights, and believes them to 'work', whatever the size or power of the lights, will ride with False confidence.

A figure of 68% of the moped and motorcycle riders who were interviewed by 1990 British survey thought that all new motorcycles should be fitted with 'daylight riding lights'.

A figure of 61% said that they used 'daylight riding lights' (presumably, in fact, ordinary daytime lights) themselves.

Accordingly it could well be that, in total, some 60% of new moped and motorcycle riders in Britain use daytime lights with a False confidence that other drivers will therefore see and give way to them.

2. Number of accidents in which another driver fails to give way to the motorcycle rider: The 1980 British survey of motorcycle accidents[61] that was cited earlier under the Answer to Point 2 found that:

- Multi-vehicle accidents at junctions, roundabouts, or private entrances made up 51% of all motorcycle accidents
- 'The motorcycle was going ahead, and the other vehicle manoeuvring' in 72% of multi-vehicle junction accidents.

Thus, presuming the 72% figure to have applied also to multi-vehicle accidents at roundabouts and private entrances, in 37% of all motorcycle accidents another vehicle failed to give way to the motorcycle.

A 1975 British survey of junction accidents[62] found that, in the higher figure of 91% of motorcycle accidents at junctions not controlled by traffic lights, the motorcycle rider was 'on the major road'.

In other words, it may be that another driver fails to give way to a motorcycle rider in some 40% or more of all motorcycle accidents in Britain.

Important number of accidents that False confidence in motorcycle daytime lights may cause: Accordingly, in Britain:

- Some 60% of new moped and motorcycle riders may use daytime lights with a False confidence that other drivers will therefore see and give way to them
- In maybe some 40% or more of all motorcycle accidents, another driver fails to give way to the motorcycle rider.

It can therefore be concluded that motorcycle daytime lights in Britain, by giving motorcycle riders False confidence that other drivers will see and give way to them, are likely to cause an important number of motorcycle accidents.

5.2 Adverse effect of motorcycle daytime lights that are ineffective upon the other driver (and other road users) who perceive them: Glare & Distraction

Second, the effect of motorcycle daytime lights upon the other driver (or other road user) who perceives them is not just beneficial attraction, but also adverse glare and distraction.

Purpose of daytime lights: Thus it is accepted by road safety research scientists that other drivers do not fail to give way to a motorcycle because they fail to see it, but because they fail to notice it.

Motorcycle (and motorcar) daytime lights are therefore not recommended with the intention that, neutrally and 'passively', they shall make the motorcycle

more visible to the other driver in 'central' vision, ie when he is looking directly at it.

Rather they are recommended with the intention that, actively and 'forcibly', they shall attract his attention to it in 'peripheral' vision, ie when he is looking, at a greater or lesser angle, away from it.

Adverse effect of Glare & Distraction: However, first, whereas, even in daylight, it requires only a weak light to make a vehicle more visible to the other driver in central vision[63], it requires a bright light to attract the attention of the other driver to it in peripheral vision[64].

So, as discussed in a 1975 Swedish experimental study[65] that attempted to establish the necessary compromise intensity of brightness for purpose-designed motorcar 'daytime running lights', daytime lights 'trade off' adverse glare after dark under streetlights in central vision for beneficial attraction in peripheral vision[66].

However, second, it is a commonplace that: 'What attracts, also distracts'.

So daytime lights also 'trade off' adverse distraction of other road users from where their attention should be directed, for the beneficial attraction of the other driver to where his attention should be directed

Glare & Distraction inherent as adverse effects of Daytime lights: Or in summary, daytime lights are not an exclusively 'benign' road safety measure, ie a measure that is intended to achieve only beneficial effects.

Rather they are a 'net safety benefit' measure, ie a measure that is intended to achieve a positive balance of beneficial effects over adverse effects.

And Glare and Distraction are inherent in daytime lights as the adverse effects in question.

Correspondingly, if motorcycle daytime lights 'do no good', namely attract the attention of the other driver to the motorcycle, but do not alter his response to it, the beneficial attraction of daytime lights will be lost, but the inherent adverse effects of daytime lights of Glare and Distraction will remain.

Significant number of accidents that Glare & Distraction from motorcar (but not motorcycle) daytime lights may cause: To attempt a qualitative estimate of the number of accidents that Glare and Distraction from daytime lights may cause other drivers, or other road users, to suffer, in the case of motorcycle daytime lights, the number will be very small.

Thus, eg, in Britain, in 1994 motorcycles made up just 1% of traffic on the road[67].

In the case of motorcar daytime lights, by contrast, together, the movement of traffic, and the presence of a number of other irritating or distracting stimuli and objects, already combine, on busy roads, or in busy towns or cities, to create a 'hostile' perceptual road environment.

The Glare and Distraction of motorcar daytime lights will substantially add to the irritating or distracting stimuli, and so 'hostility', in question

So it may be expected that the Glare and Distraction of motorcar daytime lights will cause other drivers, and other road users, between them to suffer a significant number of accidents.

5.3 Adverse effect of motorcycle daytime lights that are ineffective upon the road safety research scientists who study them: Neglect of other causes of motorcycle accidents

Last, to repeat from the Answer to Point 2, all of the little body of scientific work that has, so far to date, investigated in full the possible causes of type of motorcycle accident in which the motorcycle rider collides with another driver who fails to give way to him, as supported, I believe, by much of the far greater body of scientific work that has, more widely, investigated the limitations and capabilities of human perception, points to:

- A combination of the three causes:
  1. 'Other driver did not look in direction of the motorcycle'
  2. 'Subconscious or conscious misestimation of motorcycle speed by the other driver'
  3. 'Compulsive tendency of motorcycle riders to monitor the road surface',

not:

- The cause:
  4. 'Other driver did not see the motorcycle',

as the probable true main cause of such accidents.

And out of the first three causes in question, only Cause 1: 'Other driver did not look in direction of the motorcycle' is, in part[68], treated by motorcycle daytime lights.

Preoccupation of road safety research scientists with daytime lights studies: Yet, since the publication of the first daytime lights study, the 1964 American Greyhound Bus study, in 1964, whereas, when I digested the literature in 1990, I was able to list references to 39 motorcycle (and 33 motorcar) daytime lights studies that had studied the first and fourth causes, I was able to list just 2 studies that had investigated the second and third causes.

And since 1990 I count the addition of more motorcycle and motorcar daytime lights studies, but still just the 2 studies on the other side of the account.

Grave adverse effect of preoccupation upon motorcycle safety: If motorcycle daytime lights 'do no good', this preoccupation of road safety research scientists with daytime lights loses its last shred of justification. The preoccupation has led to the gross neglect of enquiry into other causes of motorcycle accidents. It has reprehensibly done, and continues to do, grave harm to motorcycle safety.

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[60] Donne & Fulton 1985; Gosnell 1990

[61] Whitaker 1980

[62] Faulkner 1975 TRL UK

[63] Per Hörberg & Rumar 1975[65]:
'1. In central vision even intensities of 50cd have a positive effect on vehicle conspicuity [in daylight]'

[64] Ibid:
'2. At peripheral angles about 30° intensities of the size of low beam [400cd] are required to increase vehicle conspicuity
3. At large peripheral angles (about 60°) very high intensities [high beam: 60,000cd] are required to increase vehicle conspicuity.'

[65] Hörberg & Rumar 1975 University of Uppsala Sweden

[66] 'The glare effects of vehicle lights in well lighted areas are objectively quantified in this study while earlier only theoretical analyses and subjective evaluations were available.
It is shown that also rather low running light intensities (50cd) will cause such glare that the visibility of some objects on the road will be decreased as compared to side lights.
Further the relation between the positive running light effect on vehicle conspicuity during night driving in lighted streets and the negative effect of running light glare in the same situation is analyzed.
Also the relation between vehicle conspicuity as caused by running lights in daylight and in night driving on lighted streets is demonstrated.
It is shown that an increase of light intensity from 50 to 150cd has roughly no effect on vehicle daylight conspicuity while the night driving visibility is increased with about 35%.
On the other hand an increase of light intensity from 150 to 400cd (low beam) will increase vehicle daylight conspicuity with about 100% while the night driving vehicle conspicuity will be increased by about 25%.
This indicates that an increase of running light intensity above 150cd has a limited effect on vehicle night driving conspicuity while the vehicle daylight conspicuity will be markedly affected.
... [Omitted] ...
Ideally the intensity of the running light should continuously change with the general illumination.
Since this is unrealistic the second best would be to have two intensity levels—–one for night driving in lighted streets.
The levels suggested on the basis of the present results are 1000cd ± 500cd for daylight conditions and 100cd ± 50cd for night driving in lighted areas.
The daylight specification includes the present low beam which due to the vertical and horizontal curves of the road and the dynamic movements of the car in reality gives considerably higher intensities in the direction the oncoming road users than is indicated by the isocandela diagrammes.
... [Omitted] ...
However there are several arguments for a more simple solution of the running light problem.
... [Arguments listed] ...
Reasons like these favour a compromise solution of the running light design.
A suggestion based on arguments like the above mentioned could be one general running light intensity of about 200cd [, a luminous area of at least 50cm^2 and white or yellow colour] .
It is not to be expected, however, that such a compromise although having a definite positive safety effect would be optimal from the safety point of view.'

[67] Road Accidents Great Britain 1995 Department of Transport UK

[68] Thus, as described in the text and footnotes of the present Answer, it is the intention of daytime lights that they shall be sufficiently bright to act as a stimulus to peripheral vision at an angle of up to some 30°.
However daytime lights will only treat cause, 'Other driver did not look in direction of the motorcycle', as the cause of a motorcycle accident.
They will not also treat cause, 'Subconscious or conscious misestimation of motorcycle speed by the other driver', which may then be expected to replace cause, 'Other driver did not look in direction of the motorcycle'.

6. 'Motorcyclists who question the evidence in favour of motorcycle daytime lights are more interested in playing politics than in saving motorcyclists' lives'

Many motorcyclists who 'question' the evidence in favour of motorcycle daytime lights are indeed making political points.

But they are not, as sneeringly implied by persons who suggest that they are 'playing politics', doing so, without mind for their fellow motorcyclists' safety, in pursuit of ultimate political, not motorcyclist's, ends.

6.1 Motorcycle safety purposes of the political activity of motorcyclists

Rather they are properly supporting, with scientific argument and justification, the political attack of the motorcyclist that the wide credence that publicity in favour of motorcycle daytime lights has given to the 'difficulty' of seeing motorcycles has wrongly established

in the mind of the motorcar-driving public that to be involved in a motorcycle accident, whilst it may be regrettable, is also excusable.

So out on the road motorcyclists more and more encounter an attitude of motorcar drivers that motorcycle accidents are not their 'fault', but the fault of motorcyclists for 'choosing to ride' a type of vehicle that is vulnerable, unstable, and 'difficult to see'.

For instance, after a motorcycle accident, to the shock of police and bystanders, a motorcar driver will sometimes explode in irrational anger towards an injured motorcyclist accusing him of having caused the driver to have a distressing and inconvenient accident by 'motorcyclists being allowed to be on the road in the first place'.

And even the political attack is just as much a road safety attack, since the wrong attitudes of motorcar drivers that the motorcyclist accuses daytime lights of fostering may plausibly, in fact, cause more motorcycle accidents than daytime lights prevent.

6.2 Short answer to persons who impugn the motives of motorcyclist critics of the daytime lights evidence

However I do not see that it serves any useful purpose for me to descend into the arena with the sort of persons in the road safety world who decline to meet the motorcyclist's daytime lights evidence with evidence, but prefer to bandy about personal imputations that the evidence is put forward by people who 'do not care about motorcyclists' lives'.

Instead I shall let what I have written in this paper stand as my own short answer, as one of the 'questioning' motorcyclists, to them.

Stephen Prower
Sunday 15 December 1996