

HEAD INJURIES TO MOTOR-CYCLISTS

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MUCH of the research on the usefulness of crash helmets has been peculiarly concerned with army experience, since the pioneering work of Sir Hugh Cairns (1) at a military hospital in 1941, about the time when the compulsory use of crash helmets was being introduced into the army. This first paper was a discussion of seven case histories, and in due course, by 1943, in association with Holbourn (2), he had amassed data on 106 accidents to wearers of helmets. These were cases admitted to the Military Hospital for Head Injuries near Oxford, and were therefore a selection from all accidents, but the authors showed that a marked difference existed between these cases and another group who were not wearing helmets, and concluded that the helmet was of great protective value.

In an address to the Royal Society of Medicine in 1946, Cairns (3), reviewing the work, appealed to the Army Medical Services in peace time to carry out investigations, since they were in a unique position to make further contributions. This is indeed true in a sense, since the wearing of helmets has remained compulsory for soldiers riding motor-cycles on duty ever since, while among civilians it is still a novelty. It would appear to be of interest, therefore, to compare accidents in the two groups, and also between the army motor-cyclists and other army road-users. Some work by the Army Operational Research Group (4) soon after the last war produced an estimate of the proportion of head injuries among motor-cyclists from a series of Claims Commission files, and there have been tentative comparisons with civilians in reviews made by the Road Research Laboratory (5), but although the indications have been in favour of the wearing of crash helmets, the evidence itself appeared to be slender owing to the doubtful comparability of the sets of data.

The opportunity now exists to examine more up-to-date figures from the records of hospital admissions which were the result of transport accidents, the term "admission" being defined as a stay of over forty-eight hours; the coverage is theoretically complete for every soldier involved in an accident, whether admitted to a military hospital or other medical unit, or to a civilian hospital. At the same time, a General Register Office survey (6) has become available covering civilian road-users who were admitted to hospital, and happily one of the bugbears of comparison has been removed by the common use of the International Statistical Classification (7); but there are plenty of other causes for doubt, as will appear. For one thing, the civilian sample may not be com-

pletely representative because it was collected, in great part, from teaching hospitals in large towns; for another, there is no "home nursing" for soldiers, and it may be supposed that they are admitted to hospital in cases of lesser severity rather more often than civilians. For this reason, the category "superficial injuries" (International Code N910-N929) is omitted from the comparisons in Table 1, although this only goes part of the way to solving the problem. There is the possibility, for example, that superficial head injuries (included in N850) are more readily admitted to a military hospital; however, in a comparison with civilians, this would weight the evidence against helmets, and cannot be said to weaken the argument in their favour; as between groups of army road-users the same standards apply to all.

The civilian figures relate to 1949, while the army figures relate to admissions for the whole of 1952, to medical units in the United Kingdom. Only males were counted in each group.

Table 1. *Head injuries* expressed as percentages of all injuries†*

	Pedestrians	Pedal cyclists	Motor-cyclists	Other Vehicles
Army	48.8	32.4	30.8	38.2
Civilian	48.3	50.5	46.7	42.3
Difference	0.5	18.1	15.9	4.1
Standard of error of difference	8.2	6.9	4.4	4.4
<i>Actual numbers of injuries</i>				
Army { Head	21	22	127	125
All	43	68	412	327
Civilian { Head	130	111	79	82
All	269	220	169	194

* International Code N800-N804, N850-N856.

† Except International Code N910-N929.

The most significant difference is where one would hope to find it, between army and civilian motor-cyclists, and in further support of the case for helmets, the former have an advantage of 7.4 ± 3.5 per cent. over the drivers of other army vehicles. Incidentally, the nearest thing we have to a control is the similarity of other vehicle accidents among civilians, and this might be held to satisfy the point made above about different standards of hospital admissions, in so far as this affects the site of injury.

Having stated the results that suit our book, we must not fail to observe what other conclusions can be drawn from the figures; for example, army pedal cyclists (on a much smaller sample) seem to have an advantage over civilians—and they do not wear helmets yet. (This particular comparison is more easily attacked on the grounds of the differing age distribution, since child cyclists are included, whereas they are automatically ineligible for the motor-cycle comparison.) It is notable that in spite of crash helmets, a large number of head injuries continue to occur, so that their presence does not have a sort of talisman effect. Cairns (1) set a proper bound to the problem in his first paper

when he said: "The most effective method of preventing head injuries in motor-cyclists is careful driving. In addition the use of a crash helmet is advocated." There is no direct evidence in the tables that the actual number of injuries is reduced, only that the distribution is altered; a badly designed and fitted helmet could easily lead to greater risk of an accident.

Another point to notice in the tables is the high incidence of head injuries among car drivers, and indeed all accidents connected with transport have this feature as compared with other types of accident; in the army, the average over all accidents is about 13 per cent. of injuries to the head: there is a greater difference here than between the various groups of road-users. In a "Discussion on Head Injuries in Civilian Practice" at the Royal Society of Medicine, Section of Surgery, Walpole Lewin (8) of the Radcliffe Infirmary, Oxford, drew attention to the risk of car occupants sustaining head injuries by hitting some projection, and raised the question of redesigning for car manufacturers. Discussing crash helmets for motor-cyclists in the same contribution, he spoke as follows of recent experience at the Military Hospital for Head Injuries, Oxford: "Of the last 20 motor-cyclists admitted with head injuries, 17 sustained their accidents off duty, usually at the week-ends, and when they were not wearing crash helmets." It is interesting to consider how that statement, from a hospital which specializes in head injuries, is related to Table 2, which covers all injuries throughout the country in a single year.

In this table the same army data as for Table 1 are partitioned according to whether the injuries were or were not stated to have been sustained on duty (including training). It may be seen that the percentage of injuries to the head was significantly lower for those stated to have been on duty, not only for the motor-cyclists, but also for the occupants of other vehicles.

Table 2. *Head injuries expressed as percentages of all injuries*

<i>Army motor-cyclists</i>				
On duty	...	...	...	24.1 per cent. (32 out of 133)
Off duty or unspecified	...	...	...	34.1 per cent. (95 out of 279)
Difference	...	...	...	10.0 ± 4.9 per cent.
<i>Other army motor vehicles</i>				
On duty	...	...	...	33.5 per cent. (75 out of 224)
Off duty or unspecified	...	...	...	48.5 per cent. (50 out of 103)
Difference	...	...	...	15.0 ± 5.7 per cent.

It is likely that many of the unspecified cases were in fact on duty, and their presence with the off-duty cases would presumably tend to keep the percentage lower.

On the evidence of the motor-cyclists alone, it might seem fair to conclude that crash helmets were not so often worn off duty (as suggested by the observation of Walpole Lewin), and that this caused the higher rate of head injury. But the same feature in occupants of other vehicles indicates that different factors may also be at work. For instance, off-duty accidents may be more severe, and this circumstance could be reflected in a higher percentage of head injuries.

The week-end spare time army motor-cyclist is engaged in a pursuit which has perhaps more affinity with civilian motor-cycling, and the wearing of a helmet is only the most distinctive sign of the on-duty motor-cyclist. The latter is probably a more proficient rider, and his machine is better maintained. (We should observe that off-duty drivers are likely to contain a considerable proportion of men who never drive as a duty and may be relatively unskilled.)

Undoubtedly, there will be further weaknesses in the argument from clinical data, although they are undeniably consistent with the hypothesis that helmets afford protection. Our purpose has been to show that, when fuller civilian figures can be obtained, there exists a reasonable control in army experience.

SUMMARY

Figures of injuries resulting from transport accidents have been obtained from army medical records, and compared with such civilian figures as are available, and also examined for internal evidence of a difference between motor-cyclists and other road-users. The percentage of injuries which affected the head was lower for army motor-cyclists than for civilians, and, within the army, lower for on-duty motor-cyclists than for those off duty. These differences could be accounted for by the fact that on-duty motor-cyclists would wear crash helmets whereas those off duty might not, and civilians (in 1949) very largely would not. But soldier occupants of motor vehicles other than motor-cycles are less prone to head injuries when they are on duty than when they are off, and it seems that factors other than the wearing of crash helmets might be operating, such as proficiency in driving and the maintenance of the vehicle. Although it might appear that these could only reduce the total number of accidents, it is possible that the distribution of accidents could also change when they are of lesser severity: for example, in non-transport accidents the percentage of head injuries is much lower.

REFERENCES

- (1) CAIRNS, H. (1941). *Brit. Med. J.*, **2**, 465.
- (2) CAIRNS, H., & HOLBOURN, H. (1943). *Brit. Med. J.*, **1**, 591.
- (3) CAIRNS, H. (1946). *Brit. Med. J.*, **2**, 322.
- (4) BAYLY PIKE, D. F. (1947). A.O.R.G. Report No. 358.
- (5) CHANDLER, K. N. (1953). R.R.L. Note 2008.
- (6) MACKAY, D. (1951). G.R.O. Studies No. 45.
- (7) W.H.O. (1948) Manual of the International Statistical Classification.
- (8) LEWIN, WALPOLE S. (1954). *Proc. Royal Soc. Med.*, **47**, No. 10, 865.