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ВСЕМИРНАЯ ОРГАНИЗАЦИЯ ЗДРАВООХРАНЕНИЯ
ЕВРОПЕЙСКОЕ РЕГИОНАЛЬНОЕ БЮРО

Technical Group on Protective Devices and Restraint Systems in Road Traffic Accident Prevention

Meknès, Morocco, 26-28 June 1979

ICP/ADR 010/7
2 May 1979

ORIGINAL: ENGLISH

PATTERNS OF INJURY FROM ROAD ACCIDENTS, VARIATIONS WITH CLASS OF ROAD USER AND METHODOLOGICAL PROBLEMS

by

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Injury pattern and categories of accidents

When dealing with descriptive statistics on the pattern of injuries sustained in road traffic accidents (RTA) it is important to note the sampling frame used. There are significant differences between the pattern of injuries found among fatalities, surviving hospital inpatient and outpatient cases. Dalgård et al. (1) have described typical syndromes for fatally injured car riders, two-wheelers and pedestrians according to accident situation. Severe head lesions were found in about two-thirds of the material, and truncal injuries formed the remaining one-third of the causes of death for all groups. In addition to the lesions directly leading to death, car riders showed characteristic facial lesions and unprotected road users had characteristic bumper lesions on the legs.

Patterns of injury among survivors have been described in numerous investigations. Figures 1 to 9 from a casualty room survey performed by the Accident Analysis Group in Odense illustrate the pattern of injury according to injured region, severity of injury, use of seat belts and helmets and age group for selected important accident situations (2). The predominance of head injuries in all situations is obvious. Cyclists involved in single accidents sustain a high number of upper extremity lesions of medium severity, mainly fractures. All unprotected road users sustain a high number of medium to severe lower leg injuries when colliding with cars. Fatality rates and severity of lesions are considerably higher in the elderly age groups.

These findings (abstracted above), when compared to findings from other research groups, reveal only minor differences.

Figure 10 shows the distribution of injury severity according to the Abbreviated Injury Scale (AIS) in four typical collision situations. There is a significant difference between pedestrians hit by cars and the other groups. However, the three other groups do not differ significantly from each other. This observation may partly be explained by a relative overrepresentation of small children and elderly persons in the pedestrian group.

Methodological problems

Monitoring and analysis of road traffic accidents in relation to background observations, exposure, sampling conditons and stratification of materials pose many problems.

From a scientific viewpoint - especially when using epidemiological techniques - a major drawback to the majority of RTA studies is that background information is often very scarce or of limited validity and relevance. First, the population in the area under study may not be known, and the fraction of transients may often be very roughly estimated. Second, the fraction of this population which theoretically should form the population at risk is hard to estimate. Third, the population exposed in accident situations - and hence subjected to biomechanical forces - is usually underestimated, since most monitoring systems will only catch a fraction of the persons injured in the accidents, usually the fraction seeking medical care at a larger hospital unit. Only special programmes will allow an estimation of the number of people actually injured in RTAs.

These three drawbacks are of paramount importance to studies aimed at evaluating the effectiveness of protective devices. Relative risk or cross-product ratios for various categories of road users (using and not using protective devices) may become impossible to calculate.

Even within the monitoring site itself, there are numerous problems related to the establishment of the validity of the internal and external data collected. Some standardization in injury description has been achieved by means of the WHO N-codes. The XVIIth section (accidents, poisoning and violence) of the 8th Revision of the International Classification of Diseases (ICD) has a dual classification according to external cause (E) and to nature of injury (N). However, the detailed description of lesions is normally of minor importance in analyses aimed at setting up preventive action programmes. On the other hand, it is extremely important that injuries be divided into at least two well defined severity groups, the use of these definitions being stable over periods and comparable between different monitoring centres.

As examples of different systems for stratification of severity one may use: patient disposition, estimation of duration of incapacitation, actual measurement of the sociomedical consequences (a rather time-consuming and expensive approach) and AIS scaling. The latter method is in widespread international use and is very useful, especially in biomechanical studies. However, the use of AIS scaling is somewhat time-consuming in voluminous material in epidemiological studies.

Information about the accident circumstances, i.e., biomechanical circumstances in the crash period and factors influencing the pre-crash period, are of utmost interest for the usefulness of materials. A rough description of these factors can usually be obtained from victims, witnesses or from the police if the accident is recognized by the latter. Such anamnestic information, however, must be supplemented by on-the-spot investigations and in-depth studies for further penetration into the nature, frequency and preventability of accident and injury causing mechanisms.

In broader large-scale epidemiological studies computer techniques and modern statistical methods have been shown to be not only very useful but also indispensable. Such techniques should preferably be closely linked to the further development of the concepts of risk and exposure/liability applied to RTA studies.

REFERENCES

1. Dalgård, J.B. & Møller, L. The lesions seen at autopsies of victims of traffic accidents. Traffic speed and casualties. Odense University Press, 1975.

2. Damholt, W., Nielsen, H.V. & Nordentoft, E.L. Correlations between accident circumstances and the type and grade of injuries in traffic accidents. International Committee on Biomechanics Conference proceedings, Birmingham, 1975.

DISTRIBUTION OF MOST DISABLING LESION

FIGURE 1. PROTECTED ROAD USERS

FIGURE 2. UNPROTECTED – SINGLE

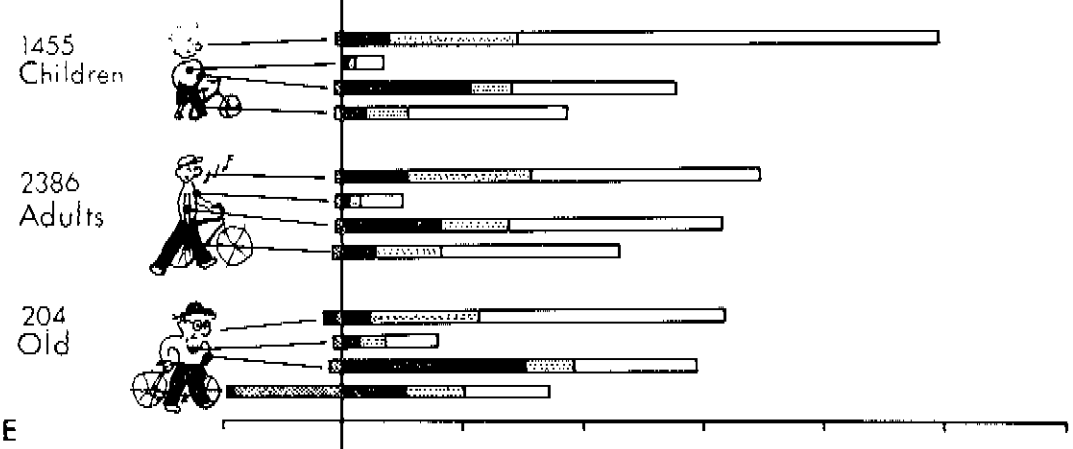
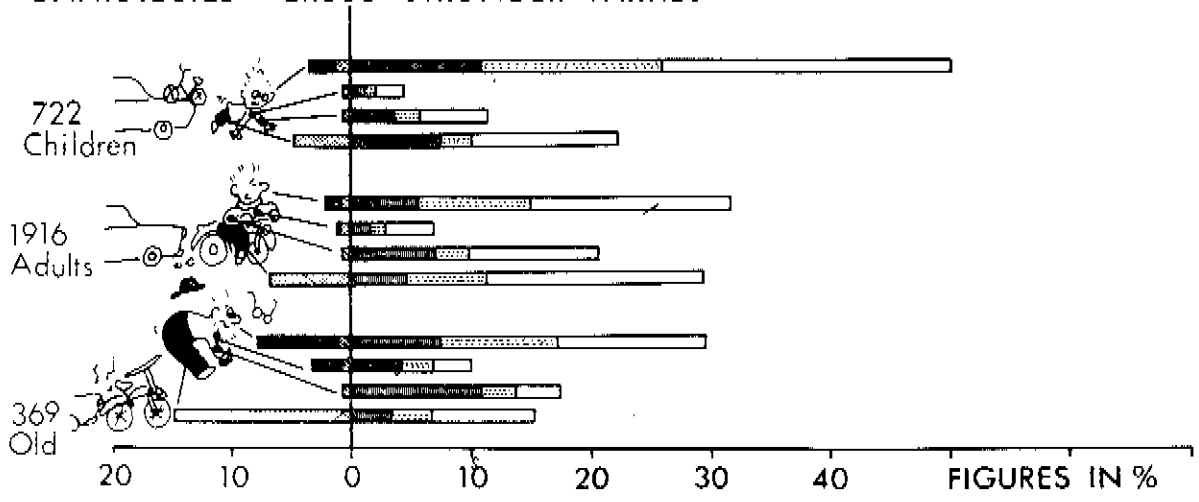


FIGURE 3. UNPROTECTED VERSUS STRONGER PARTIES



AAG 1975

FIGURE 4. DRIVERS

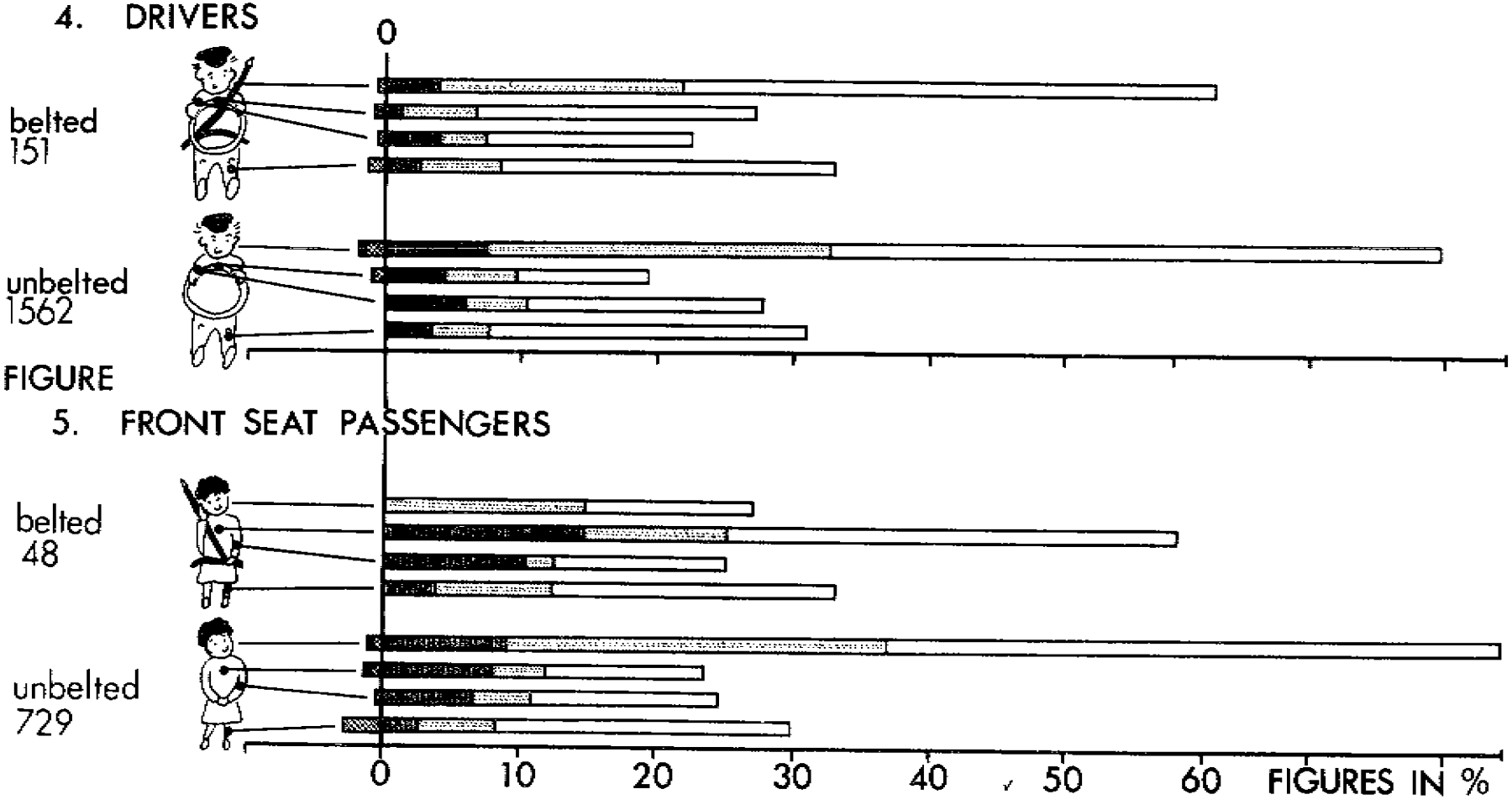


FIGURE 5. FRONT SEAT PASSENGERS

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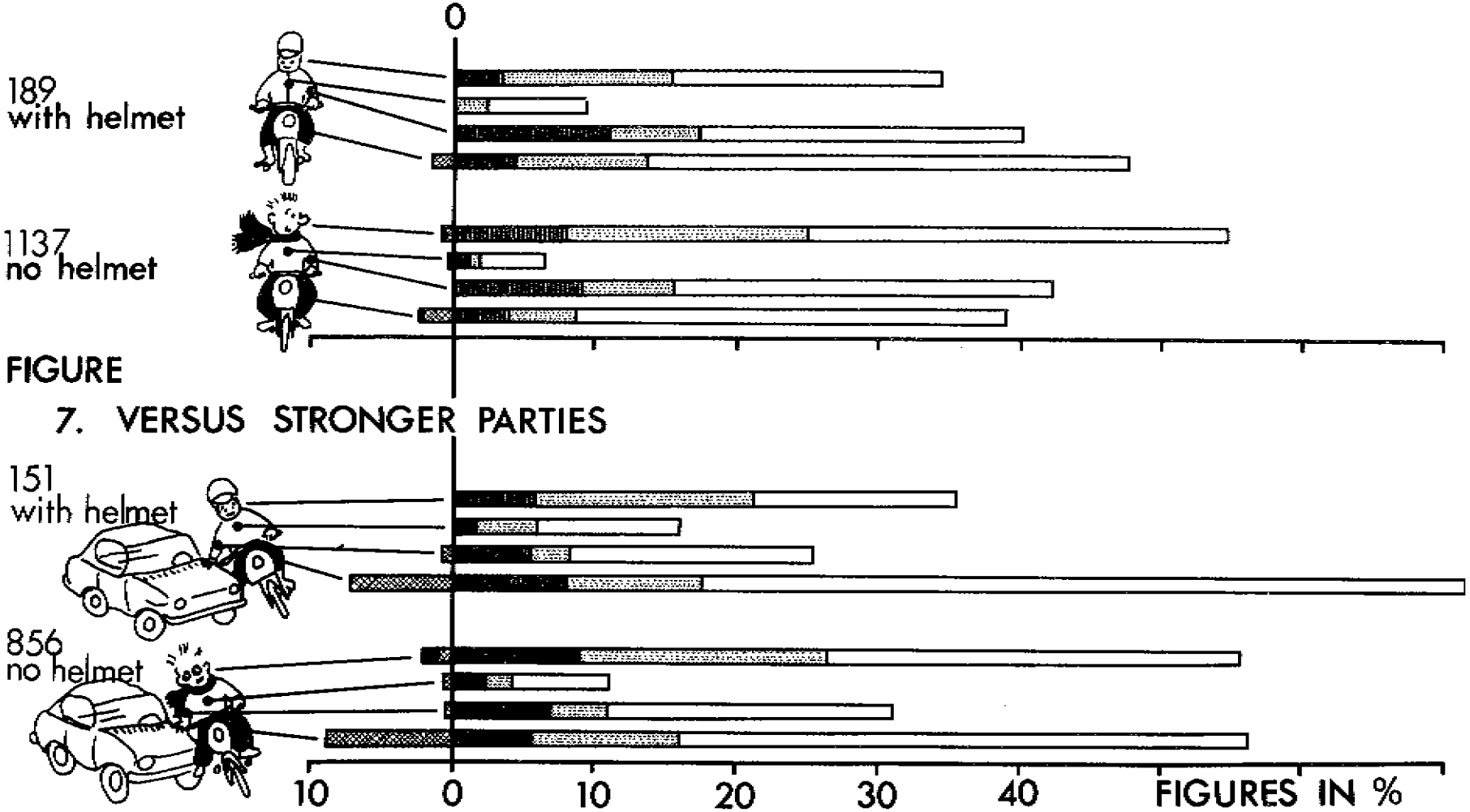
FIGURE

6. MOPED RIDERS SINGLE



FIGURE

7. VERSUS STRONGER PARTIES

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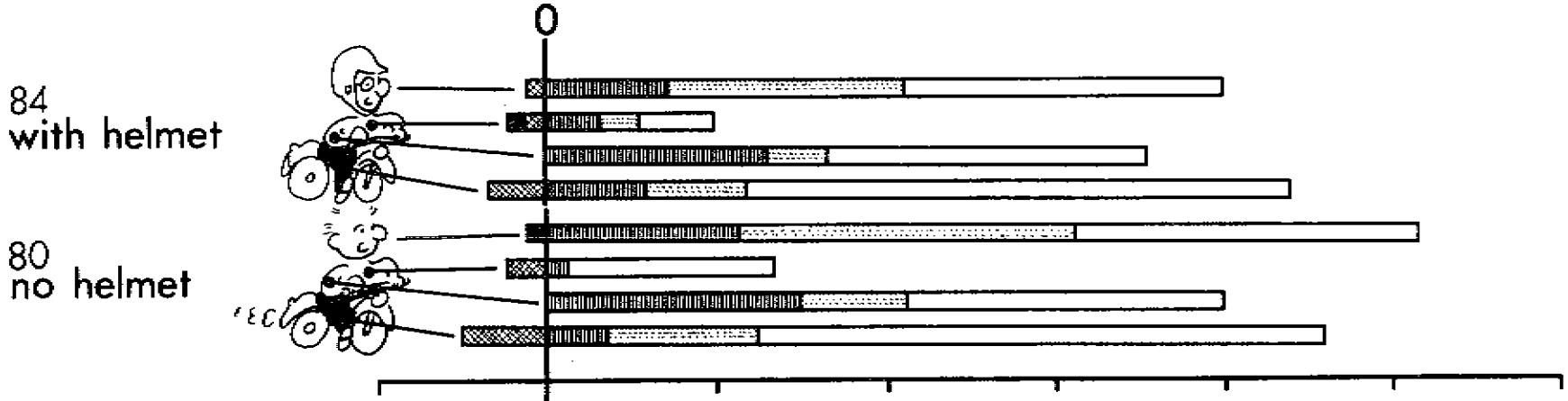
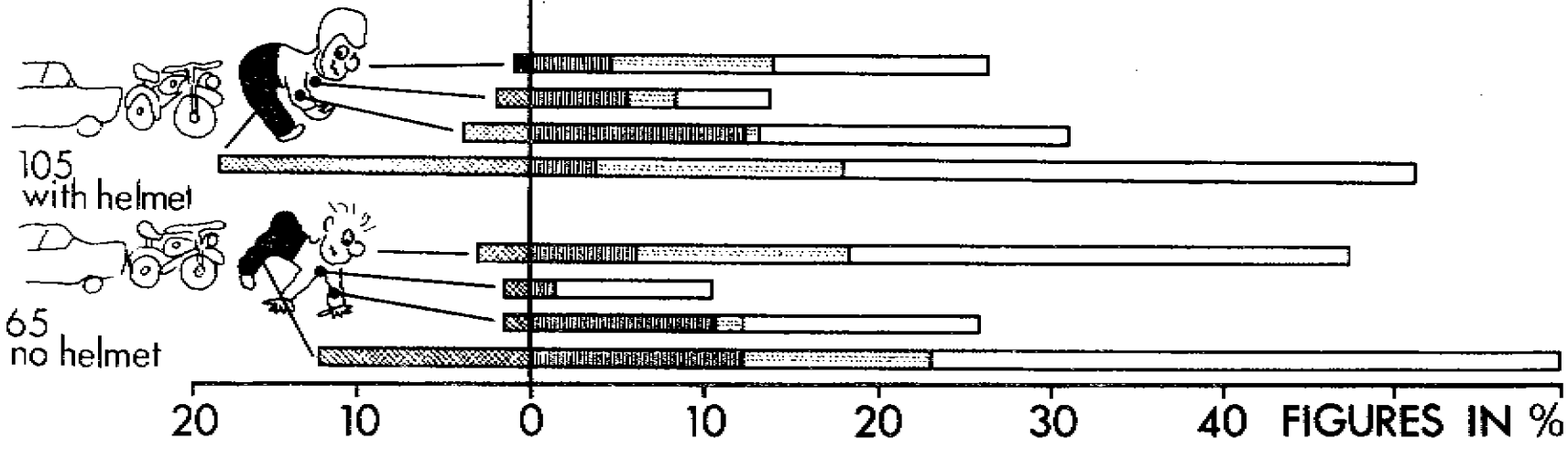
FIGURE

8. MOTOR-CYCLISTS SINGLE



FIGURE

9. MOTOR-CYCLISTS VERSUS STRONGER PARTIES



AAG 1975

Figure 10

Severity of lesions by road users category