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Summary:

Traffic safety among motorcyclists

A study of subgroups with particularly high accident risks and possible measures

Survey results show that riders of so called Racing bikes (R-bikes) and riders younger than 19 years, especially youths riding light motorcycles (<125ccm) represent subgroups with particularly high accident risks in the Norwegian population of motorcyclists. Analyses of reports from the Accident Analysis Groups (AAG) of the Norwegian Public Roads Administration show that about half of the fatal accidents involve R-bikes. Nearly all of these fatal accidents with R-bikes involved speeding. We have conducted a literature study and a dialogue meeting with mc-experts in order to consider various measures that could be directed to these subgroups with particularly high accident risks. From our survey, literature studies and the AAG material it seems fairly evident that high speed is the most important risk factor related to motorcycling, at least when it comes to the most serious accidents. As a consequence, we conclude that measures directed to enforcing speed limits have the greatest potential. Increasing the frequency of police control is an obvious measure, as the current ATC-system fails to control motorcyclists. Other relevant measures include stricter regulations on the right to ride light motorcycles and economic incentives related to the ownership and use of certain motorcycles

Background, goals and methods

The Norwegian Public Roads Administration has, in its research program on high risk groups, defined motorcyclists as one of six high risk groups. It is widely known that motorcyclists have a higher accident risk than for instance car drivers. Our knowledge is, however, incomplete when it comes to the mechanisms that produce the relatively high accident risk of motorcyclists. Are particular sub-groups of riders (sex, age, type of motorcycle, place of residence and so forth) contributing to the high average risk of motorcyclists? Are motorcyclists particularly vulnerable in certain traffic situations, in particular roads, at certain times of the year and so forth, and/or are they lacking important skills or safety attitudes. Or is the accident risk experienced by motorcyclists produced by the neglect by other road users?

Such questions are important to answer in order to identify appropriate measures aimed at reducing the accident risk of motorcyclists. The Institute of Transport Economics has been assigned by the The Norwegian Public Roads Administration to map and analyse the behaviour and the accident risk of subgroups of

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motorcyclists, and to recommend possible measures that may be directed to subgroups of motorcyclists with a particularly high accident risk.

We have chosen four methods in our efforts to address these aims: survey, analyses of reports from the Accident Analysis Group (UAG) of the Norwegian Public Roads Administration, literature study and a dialogue meeting with mc-experts.

Results from the survey

The sample of motorcyclists to our survey is drawn from the vehicle register of the Norwegian Public Roads Administration, and it is stratified according to the type of motorcycle (light/heavy). The sample is drawn two times; once in September, 2007 and a second time in March, 2008. A total of 4900 owners of heavy motorcycles (> 125 cm^3) and 4900 owners of light motorcycles (≤ 125 cm^3) participate in the survey. The response rate of the survey was 35 %.

The results from the survey data show that the variables Age, R-bike, Behaviours and Attitudes are particularly important predictors of the accident risk of the motorcyclists in our sample. We constructed an index for Behaviour and an index for Attitudes, and our analyses show that if you have a hazardous traffic behaviour, you are likely to have hazardous traffic attitudes and vice versa. Both indexes contribute significantly to an increase in the accident risk.

Two central subgroups of motorcyclists with a particularly high accident risk are identified in our analyses: 16-17 year olds riding light motorcycles and rides of so called R-bikes. The R-bike variable refers to “Racing bike”: motorcycles that are race replicas, imitating those used in motorcycle races. R-bikes also exist as light motorcycles, and in some cases the two subgroups coincide. The accident risk of R-bikes is in fact twice that of other types of motorcycles. We also found that the traffic behaviour of R-bike riders is twice as hazardous as that of other motorcyclists. The R-bike variable also scores somewhat higher on hazardous traffic attitudes than the other motorcycle types.

We also found a clear risk reduction following from increasing motorcyclist age. The high risk of young motorcyclists is related to risky behaviour, risky traffic attitudes and less experience. The risk reduction following from increasing age is stronger for motorcyclists than it is for car drivers. The traffic attitudes of older motorcyclists are safer than they are among car drivers at a comparable age.

The analyses revealed that the variables Experience and Age largely measure the same phenomena. The analyses show, however, that the variable Age is the most central contributor to a reduction in hazardous traffic behaviours and attitudes. An increase in age directly reduced the accident risk. We found that motorcyclists younger than 19 years old were particularly at risk.

We found that the variable Heavy bike increased the hazardous traffic attitudes and behaviours. However, as the age of the owners of heavy bikes are somewhat high, our analyses show that the variable Heavy bike actually contribute to a reduction of the accident risk.

The variable Place of residence is hard to interpret, as it is not systematically significant in all the models. It appears, however, that the accident risk is somewhat lower in rural areas than it is in more densely populated urban areas.

Results of the analyses of the UAG-material

We have analyzed the UAG reports (2005-2008) involving motorcycles in order to examine whether we will find the same critical factors in this material as we found in the survey. The UAG reports are also important as they may illuminate factors that are not covered in the survey. We have analyzed nearly a hundred UAG reports.

In the analysis of the UAG reports, we found that about half of the fatal accidents in the material involved R-bikes. We also found that nearly all of these cases involved over speeding. A third tendency we found in the UAG material is that many of the deceased motorcyclists had little experience with the motorcycle that they rode as they perished. A fourth tendency that we found in the UAG material is a documented or suspected intoxication on the part of the perished motorcyclist, and that a considerable amount of the accidents involved passengers.

Results from the literature study

The literature study focuses on factors that may explain the risks related to motorcycles, and possible measures that may be implemented to reduce this risk. An analogous literature study was conducted at the Institute of Transport Economics by Pål Ulleberg in 2003. Consequently, our literature study is based on and seeks to update Ulleberg's literature study. We have searched 7 data bases for relevant literature. We have also used compilations as the Handbook of Road Safety Measures and other literature studies. Our literature search for the period 2003-2010 (March) resulted in 105 relevant references.

The literature study examines traffic safety measures that may be directed to riders, motorcycles, road environment and so called social factors. The measures can be classified further according to whether they aim to prevent accidents or reduce the severity of injuries.

When it comes to measures that can be directed to the rider, we discuss lessons that existing research provides when it comes to the traffic safety effects of: education, graduated licensing, protection clothes, helmet and enforcement. Educational measures show, with the exception of voluntary training (of skills) for riders with a license, good traffic safety effects. The results of graduated licensing are somewhat uncertain, but this measure seems to provide good results in New Zealand. Protection clothes and helmet show good results when it comes to reducing the severity of injuries. A British study indicates that enforcement has contributed to reducing the average speed among mc riders.

When it comes to measures directed to the motorcycle, we discuss knowledge provided by existing research when it comes to traffic safety effects of: improved brake systems, regulating engine size, conspicuity, leg protection, airbag and intelligent transport system (ITS). A couple of studies show a remarkable traffic safety effect of ABS for motorcycles. Regulating engine size does not seem to be an efficient measure. Efforts directed at enhancing the conspicuity of motorcycles seem to have a considerable potential. The traffic safety effects of leg protection and airbag seem uncertain. The potential traffic safety effects of ITS measures for motorcycles seem to be considerable, but we need more research and development on these issues.

We discuss the following measures related to the road environment: road "traps", road geometry, road lighting, roadside barriers, and the roadside infrastructure. These factors contribute when it comes to accident risk and severity of injuries, but road lighting is the only measure that has been studied. and proven efficient. in an effect study.

The fourth category of measures, social factors, includes the following measures: risk awareness among car drivers, attitudes in the transport environment, safety dialogues and incentives directed to insurance and economy. These measures are not examined in effect studies, but we include them as they seem to represent possible solutions to central risk challenges.

Results from the dialogue meeting with mc-experts

We arranged a dialogue meeting concerning motorcycle risks and potential safety measures March, 16, 2010, at the Institute for Transport Economics. We convened the meeting to present our results and discuss potential measures with eight invited delegates from the Norwegian Public Roads Administration, the Police, Trygg Trafikk (The Norwegian Council for Road Safety), Trafikkforum and the Norwegian Motorcycle Union. The dialogue meeting mainly focused on two areas of attention: measures that may be applied to the risk picture related to so called R-bikes and measures that may be applied to the risk picture related to youths riding light motorcycles. We may sum up these discussions by stating that the main measures that were discussed for youths riding light motorcycles were: raising competence through education, for instance through schools and conspicuity campaigns directed to car drivers. The measure that first and foremost was discussed for the case of R-bikes was police enforcement.

Conclusion

Our analyses point to two central subgroups of motorcyclists that are particularly at risk: 16-17 year olds riding light motorcycles and riders of so called R-bikes. When it comes to light motorcycles, we found that the risk is higher in the fall and the spring than it is in the summer. A probable reason for this may be that many 16 year olds start high school in the fall, obtain a light motorcycle and start to use roads with which they are unfamiliar. Other possible mechanisms behind the risk at fall may be that young motorcyclists ride more in the dark, that they seek to impress friends, and so forth.

The high risk of R-bike riders is found both in the survey material (self reported behavior and accident), in the AAG-material from Norway, and in accident analyses based on fatal accidents in Sweden and Denmark. Previous Norwegian studies have also found that R-bikes are over represented in accidents. Furthermore, owners of R-bikes state that they choose a riskier behavior than other motorcyclists when they ride, and their traffic attitudes are less safe than those of other motorcycle owners.

The Norwegian AAG-material shows that R-bikes are involved in about half of the fatal accidents, and that high speed on the part of the motorcycle is a contributing

cause in many of the fatal motorcycle accidents. R-bike accidents are almost without exception characterized by over speeding on the part of the motorcycle.

Based on the results from our survey, literature studies and the AAG material it seems fairly evident that high speed is the most important risk factor related to motorcycling, at least when it comes to the most serious accidents. As a consequence, we conclude that measures directed to enforcing speed limits have the greatest potential. Increasing the frequency of police control is an obvious measure, as the current ATC-system fails to control motorcyclists.

We have identified youths riding light motorcycles and R-bike riders as two subgroups which are particularly at risk. These groups consistently ride in riskier ways than other groups of motorcyclists. Thus, if the police and road authorities manage to tailor their enforcement activities to these groups, the effect would be greater than it would be in the case of random controls. One possibility is to intensify police enforcement directed to youths riding light motorcycle to and from school in August when the school starts in order to reduce the risk experienced by this group in the fall. Another possibility is to conduct police controls targeting speed and behaviour in relation to motorcycle events and so forth.

Stricter regulations on the right to ride light motorcycles may also be a relevant measure. We have mainly discussed two types of such restrictions in our analyses: a) graduated licensing for 16-17 year olds riding light motorcycles, or b) increasing the age limit for the right to ride light motorcycles to 18 years. The EU permits such restrictions. A probable side effect of restrictions on the right to ride light motorcycles will be that youths choose to ride moped instead. Before implementing such measures one should therefore examine whether this group's accident risk for mopeds is lower than it is for light motorcycles.

Economic incentives related to the ownership and use of certain motorcycles may also be a relevant measure. The changes in the taxes on light motorcycles, combined with the increased engine volume were probably the main reasons for the strong increase in the popularity of light motorcycles from the mid 1990's. This also brought about a dramatic increase in accidents and injuries involving light motorcycles. This shows that the potential for influencing traffic safety by means of economical instruments is great, and that economical measures aimed at reducing the use of particularly risky vehicles may be very effective.

"Softer" measures like education, information and social influence may also be effective, but this depends on the design of the measures. Although such measures would be politically easier to implement than restrictions, we expect such measures to be less effective than restrictions.

There is also a safety potential related to technical vehicle measures and safety equipment, and new products and solutions are constantly being developed (integrated brake systems, ABS-brakes, personal protective equipment). We did not include such measures, as they only to a small extent can be influenced by Norwegian authorities and are developed by producers and/or being regulated through the EU/EEA.