

# THE MOST IMPORTANT HEALTH HAZARDS OCCURRING IN THE MOTORCYCLE SPORT

## NAJWAŻNIEJSZE ZAGROŻENIA ZDROWOTNE WYSTĘPUJĄCE W SPORCIE MOTOCYKLOWYM

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### ABSTRACT

**Introduction.** The motorcycling is becoming more popular year-on-year, especially among young people. The number of motorcyclists is constantly growing, hence getting to know the most important factors bringing health risk and knowing challenges and troubles the motorcyclists face in road traffic is of such great importance.

**Aim.** The aim of this study was to investigate the major health hazards occurring in the motorcycle sport.

**Material and methods.** The method of a diagnostic survey with the use of a questionnaire technique was applied in research. The tool for carrying out research was the questionnaire. 115 motorcyclists (85 men and 30 women) were surveyed. Research was conducted in southern Poland. The age range of respondents varied from 18 to 65.

**Results.** Results of conducted research have confirmed that injuries of upper and lower limbs as well as injuries related to the spine are the most frequent health hazards occurring in this sport. Car drivers create the biggest hazard to motorcyclists. Results of research also indicate that the type of the motorcycle which is most frequently involved in a collision is a sports motorcycle, whereas an inexperienced young man who rides with bravado is an average motorcyclist.

**Conclusions.** The occurrence of the major health hazards in motorcycle sport differs significantly in the selected age groups. Young people are by far exposed most often to all sorts of injuries. Inappropriate speed not adjusted to the road conditions as well as speeding can be classified as major reasons for road accidents.

KEYWORDS: injuries, extreme sport, risk, accidents, hazards.

### STRESZCZENIE

**Wstęp.** Sport motocyklowy z roku na rok staje się coraz popularniejszy, szczególnie wśród ludzi młodych. Liczba motocyklistów ciągle rośnie, dlatego tak ważnym tematem jest poznanie najważniejszych czynników zagrażających zdrowiu, wyzwań i trudności z jakimi spotykają się oni w ruchu drogowym. Celem badań było poznanie najważniejszych zagrożeń zdrowotnych występujących w sporcie motocyklowym.

**Materiał i metody.** W badaniach zastosowano metodę sondażu diagnostycznego, techniką ankietowania. Narzędziem do przeprowadzenia badań był kwestionariusz ankiety. Przebadano 115 motocyklistów, w tym 85 mężczyzn oraz 30 kobiet. Badania przeprowadzono na terenie południowej Polski. Rozpiętość wiekowa uczestników wynosiła od 18. do 65. roku życia.

**Wyniki.** Wyniki przeprowadzonych badań potwierdzają, że najczęstszym zagrożeniem zdrowotnym występującym w tym sporcie są urazy kończyn dolnych oraz górnych, jak również urazy związane z kręgosłupem. Najczęstszą z kolei przyczyną wystąpienia wypadku motocyklowego, a tym samym największym zagrożeniem dla motocyklistów są kierowcy samochodów osobowych. Wyniki badań wskazują również, że motocyklem, który najczęściej bierze udział w kolizji jest motor sportowy, natomiast statystyczny kierowca motoru to młody niedoświadczony człowiek odznaczający się brawurą.

**Wnioski.** Występowanie najważniejszych zagrożeń zdrowotnych w sporcie motocyklowym znacząco różni się w wybranych grupach wiekowych. Zdecydowanie częściej na wszelkiego rodzaju urazy narażeni są ludzie młodzi. Do głównych przyczyn wypadków drogowych zaliczyć można m.in. niedostosowanie prędkości do warunków panujących na drodze, przekraczanie prędkości oraz nieprawidłowe wyprzedzanie.

SŁOWA KLUCZOWE: urazy, sport ekstremalny, ryzyko, wypadki, zagrożenia.

### Introduction

The motorcycling is becoming more and more popular among young people. The number of motorcyclists is constantly growing, hence getting to know the most important factors bringing health risk is of such great importance. Pointing at challenges and troubles motorcyclists face in road traffic as well as taking steps

thanks to which it will be possible to stop the growing number of motorcyclists who are killed or injured in road accidents, are also essential [3, 4].

In the year 2013 motorcyclists were involved in 2 210 accidents in total. Data have shown that in 967 cases they were responsible for the occurrence of the accidents. As a result of these accidents 253 people were

killed in total and 2 075 injured (of which 1808 were drivers and 267 passengers) [3, 4]. For comparison car drivers caused 22 036 accidents and cyclists 1 786 respectively. Truck drivers caused 1 179 accidents, a bit more than cyclists [1, 2]. In the year 2014 motorcyclists caused 1 023 accidents [3, 4].

In the year 2014 motorcyclists were involved in 2 378 road accidents, 1 023 of which were caused by them. In these accidents 261 people in total were killed and 2 495 injured. The majority of victims were motorcyclists - 230 killed and 1 964 injured and those who travelled with them - 7 killed and 269 injured. In comparison to the year 2013, therefore, the number of fatalities decreased (by twelve), whereas the number of injured increased (by 156) [5, 6].

Motorcyclists are especially prone to fractures, dislocations, subluxations, rotations, damages of tendons or ligaments. Intense drive and perfecting the motorcycle drive increase the wearing out of tissues [5, 6, 7, 8]. The most frequent injuries in motorcycle accidents are limbs and spine injuries. Majority of them concern upper limbs, especially shoulders, including fractures of clavicles [12].

The aim of the research was to investigate the major health hazards occurring in the motorcycle sport. The influences of age, gender, education level and place of residence on the occurrence of health hazards among motorcyclists were acknowledged as research variables. It is expected that the knowledge gained will be possibly used to create health programs aimed at reducing the incidence of traumas occurring in the motorcycle sport.

## Material and methods

The main research problem in this study was stated as follows: What are the major health hazards occurring in the motorcycle sport?

In order to thoroughly investigate the problem the following detailed issues were addressed: First – To what degree do the health hazards occurring in the motorcycle sport depend on the place of residence? Second – To what degree does the occurrence of health hazards vary in the selected age groups? Third – What significance to the reduction of the occurrence of specific effects of accidents does the motorcyclists' knowledge of the causes of accidents have?

Research conducted in this study allows to put forward the following main hypothesis: the major health hazards occurring in the motorcycle sport are craniocerebral and spine traumas as well as limbs injuries.

Apart from the main hypothesis the following detailed hypotheses were formulated: the health hazards occurring in the motorcycle sport depend on the place

of residence; the occurrence of the health hazards differs to a large extent in the selected age groups; the motorcyclists' knowledge of the causes of accidents is of great significance to the reduction of the occurrence of the health hazards.

The incidence of health hazards in motorcycle sport was acknowledged as a dependent variable. On the other hand, the operands in this study are: age (empirical indicator: age range < 18 - 30, > 31 - 65), gender (empirical indicator: woman, man), education (empirical indicator: higher, secondary, vocational, primary), place of residence (empirical indicator: village, town up to 10 thousand, town up to 100 thousand, town > 100 thousand). The indicators of dependent variables (Zz) were the answers given by the motorcyclists coming from questionnaires.

The method of a diagnostic survey was used in this study. The questionnaire technique was applied in the next step of the research. The tool for carrying out research was the questionnaire which contained 24 close questions. The first part of the questionnaire was a certificate in which general questions were placed. They related to: age, sex, education and place of residence. The second part of the questionnaire contained questions related to the number of motorcycles in possession, the distance covered (in kilometers), questions concerning dangers and effects of riding a motorcycle as well as questions related to the errors most frequently made by motorcyclists. The research was conducted in the year 2014 (from the middle of April to the end of October) during the so-called motorcycling season. 115 motorcyclists, among them 85 men and 30 women were surveyed. Research was conducted in southern Poland in the following cities and towns: Kielce, Częstochowa, Kraków, Tarnów, Rzeszów and Bałtów. The age range of respondents varied from 18 to 65.

## Results

The relations between age, gender, education level or place of residence and different determinants of health hazards characteristic of motorcycling were investigated with the use of the chi-square test. The activity was aimed at revealing different relationships. In the case of the tables in which significant connections between variables were shown, in order to assess their interrelation force the V-Cramer and C-Pearson rates were applied.

There are interrelations between the age of the initiation into motorcycling and the sex of a motorcyclist. Up to 25% of women had their first contact with a motorcycle when they were 25 years of age. In the group of men a substantial proportion (44.4% of the surveyed) had their first contact with a motorcycle when they were between 21 and 25 years of age. Only three respon-

dents had their first contact with a motorcycle before they were 10 years of age.

$t = 1.902069$ ,  $p = 0.04$ . The result is statistically characteristic with the assumption  $p < 0.05$ .

**Table 1.** The age of the respondents' first contact with a motorcycle (by gender)

First contact with a motorcycle	Number of respondents					
	Women		Men		Together	
	n	%	n	%	n	%
>25	13	25.0	8	12.7	21	18.3
21-25	4	7.7	28	44.4	32	27.8
19-20	10	19.2	23	36.5	33	28.7
16-18	3	5.8	18	28.6	21	18.3
15-10	0	0.0	5	7.9	5	4.3
<10	0	0.0	3	4.8	3	2.6
Together	30	26.1	85	73.9	115	100

Source: author's own analysis

The relation between the type of an accident experienced and the gender of respondents was also investigated. On the basis of the results of the chi-square test a significant connection between variables was shown. The highest percentage of women (21.2%) had an accident which was described as fall and glide on the road surface (cut), while the smallest number of persons who had an accident experienced an accident with a passenger (3 respondents). As far as men are concerned the majority of them experienced a collision and suffered from the fall.

$$\chi^2 = 11.614, df = 5, p = 0.040, Rc = 0.303$$

**Table 2.** Type of an accident experienced (by gender of respondents)

Type of an accident	Number of tested					
	Women		Men		Together	
	n	%	n	%	n	%
Fall	8	15.4	17	27.0	25	21.7
Cut	11	21.2	16	25.4	27	23.5
Collision	8	15.4	18	28.6	26	22.6
Running into/Hovering	0	0.0	8	12.7	8	7.0
An accident with a passenger	3	5.8	13	20.6	16	13.9
Other	0	0.0	13	20.6	13	11.3
Together	30	26.1	85	73.9	115	100.00

Source: author's own analysis

Statistical analysis of the most common causes of accidents and the gender of respondents revealed the significant relation between variables. Among women the lack of experience was the most frequently given

cause of accidents (17.3%), the second most commonly pointed out was the error of a car driver (11.5%), the smallest percentage of respondents – 1.9% showed the ride under the influence of intoxicants and disobeying the traffic rules as the cause of an accident. In the case of men the highest percentage of causes of accidents also accounts for the error of a car driver (28.6%), the second cause most commonly pointed out by respondents were bad weather conditions (20.6%). The least commonly mentioned cause of an accident was the error of another motorcyclist – 4.8%. Among all answers the highest percentage of causes of accidents accounts for the error of a car driver (20.9%), whereas the smallest one for a defective motorcycle (3.5% responses).

$$\chi^2 = 19.26, df = 9, p = 0.023 Rc = 0.379$$

**Table 3.** The most common causes of an accident (by gender of respondents)

Cause	Number of tested					
	Women		Men		Together	
	n	%	n	%	n	%
Complicity	4	7.7	4	6.3	8	7
Error of another motorcyclist	2	3.8	3	4.8	5	4.3
Error of a car driver	6	11.5	18	28.6	24	20.9
Excessive speed	3	5.8	11	17.5	14	12.2
Bad weather	2	3.8	13	20.6	15	13
Poor condition of roads	2	3.8	10	15.9	12	10.4
Lack of experience	9	17.3	5	7.9	14	12.2
Driving under the influence of intoxicants	1	1.9	8	12.7	9	7.8
Disobeying the traffic rules/ Failure to comply	1	1.9	9	14.3	10	8.7
Faulty motorcycle	0	0	4	6.3	4	3.5
Together	30	26.1	85	73.9	115	100

Source: author's own analysis

The research on the correlation between the overall length of motorcycling given in kilometers and the sex of respondents has not shown any significant interrelations between variables. Accordingly, additional rates were not examined, though on the basis of own observations it may be noticed that men are those who drive their motorcycle longer, 24 men has from 10 to 15 years of experience, while there are only 8 such women. Taking into consideration both sexes it may be stated that the highest percentage of respondents (27,8%) accounts for those who drive a motorcycle from 10 to 15 years, whereas the smallest one (20%) accounts for those respondents whose experience in motorcycling falls into the range between 4 and 6 years, it is worth mentioning that 9.6% of the surveyed women pointed out the same riding experience.

$$\chi^2 = 4.271, df = 3, p = 0.234$$

**Table 4.** The length of motorcycling given in years (by gender of the respondents)

The length of motorcycling given in years	Number of tested					
	Women		Men		Together	
	n	%	n	%	n	%
10-15 years	8	15.4	24	38.1	32	27.8
6-9 years	5	9.6	28	44.4	33	28.7
4-6 years	9	17.3	14	22.2	23	20.0
0-3 years	8	15.4	19	30.2	27	23.5
Together	30	26.1	85	73.9	115	100

Source: author's own analysis

Statistical analysis made with the use of the chi-square test revealed the significant statistical relations between variables. In the case of women the highest percentage (21.2%) accounts for those who covered the distance less than 5 thousand kilometers, none of the women covered the distance more than 100 thousand kilometers, whereas the smallest percentage (7.7%) accounts for those who covered from 20 to 50 thousand kilometers. In the case of men it is slightly different – since the highest percentage (30.2%) accounts for the respondents who covered from 5 to 10 thousand kilometers.

$$\chi^2 = 18.899, df = 5, p = 0.002 R_c = 0.37$$

**Table 5.** Distance covered in kilometers (by gender of respondents)

Distance	Number of tested					
	Women		Men		Together	
	n	%	n	%	n	%
>100 thousand	0	0.0	11	17.5	11	9.6
50-100 thousand	0	0.0	14	22.2	14	12.2
20-50 thousand	4	7.7	18	28.6	22	19.1
10-20 thousand	6	11.5	14	22.2	20	17.4
5-10 thousand	9	17.3	19	30.2	28	24.3
<5 thousand	11	21.2	9	14.3	20	17.4
Together	30	26.1	85	73.9	115	100.00

Source: author's own analysis

## Discussion

Motorcycle accidents with certainty do not happen as frequently as car collisions, however the injuries and the consequences of the first ones are by far more severe for the motorcyclists as well as for their passengers. The motorcyclists are not protected in any way by their vehicles in contrast with car drivers. Numerous research concerning the analysis of accidents with the participation of motorcyclists and their injuries shows the broadness of the issues. The research into the major health hazards occurring in the motorcycle sport which has been carried out allows to recognize those hazards as well as the factors leading to their occurrence.

According to the analysis made by the authors of this study around 75% of the injuries motorcyclists are subjects to are both upper and lower limbs injuries, including fractures, dislocations, subluxations, damages of shoulders or joints.

The analysis of the results of research conducted by The European Association of Motorcycle Producers – ACEM (*Association des Constructeurs Européens de Motocycles*), also revealed that in the case of motorcyclists the highest percentage of traumas (around 32%) accounted for upper and lower limbs injuries (around 24%) [3, 12].

According to the analysis made by the authors of this study the majority of the respondents (84%) pointed out that the main cause of collisions and falls of different types as well as other sorts of accidents was the irresponsibility of a car driver. This is the very group of traffic participants which is responsible for the majority of collisions. It may result from the fact that in our country drivers are not accustomed to looking into mirrors, do not pay enough attention to others who take part in the traffic. The equally important cause of the accidents in the opinion of respondents (around 20% responses) is the excessive speed not adjusted to the road conditions.

On the basis of the results of research conducted by The European Association of Motorcycle Producers – ACEM, it may be stated that cars were most frequently in collisions with motorcycles (around 60% cases). Hence they created the biggest hazard for the motorcyclists [3, 5, 6, 12].

The results of own research show that over 60% of motorcyclists do not always use the complete motorcycling suit, i.e. the one which would allow to limit potential injuries during an accident with high speed. This is of particular importance as far as putting on a motorcycle helmet is concerned. Such behavior may result from the fact that among the respondents there are young, inexperienced beginners just starting motorcycling. Such persons who are guided by bravado may not exercise full consciousness of the fact that the helmet is a crucial body protection which may save life.

Wearing a motorcycling suit is meant to reduce the scale and degree of body injuries which may be sustained during road accidents [38, 39]. According to the authors of the publication entitled *Costs of Injuries Resulting from Motorcycle Crashes* [29] there is a correlation between the use of motorcycling clothing and the weakening of the severity of injuries, mainly of lower limbs. The function of motorcycling clothing is to protect a motorcyclist from injuries, damages and atmospheric factors. Yet, it is necessary to remember that motorcycling clothing also influences the organism of a motorcyclist (with high temperatures it reduces the perception of a rider). The research mentioned above



did not show however that the motorcyclists did not use the complete protective clothing [38, 39].

The type of a motorcycle which definitely most frequently took part in accidents is described as a sports motorcycle or the so called racing motorcycle. This type of a motorcycle reaches very high speed. However, it is designed for professional riders who possess sufficient knowledge of the vehicle itself and above all adequate experience. The straight majority of persons surveyed who were in a collision, i.e. around 89% of respondents, owned a sports motorcycle. The least, i.e. around 9% owned a scooter and around 2% had any accident riding this type of a motorcycle.

The results of research conducted by The European Association of Motorcycle Producers show that the majority of motorcycles which were in any types of collisions constituted sports motorcycles (65% cases) as well as cross/enduro type motorcycles (45%). It is worth emphasizing that the first were in collisions which took place on the outskirts of towns or cities while the latter were more often in collisions which happened on A roads or at the intersections [33].

## Conclusions

The current discussion may be put into the framework of clear conclusions. They constitute a peculiar summary of issues raised in this article. The first conclusion coming to one's mind is the statement that the most common health hazards occurring in the motorcycle sport are injuries of limbs and the spine. Secondly – health hazards occurring in the motorcycle sport are not dependent on the place of residence. Thirdly – the occurrence of health hazards differs significantly in selected age groups and fourthly – the motorcyclists' knowledge of the causes of accidents has significance to the reduction of the frequency of the occurrence of health hazards.

Taking into consideration the constantly growing popularity of the motorcycle sport it seems to be justified to continue research on the subject.

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