Eur J Trauma Emerg Surg (2019) 45:423–429
DOI 10.1007/s00068-017-0872-9

ORIGINAL ARTICLE

The influence of an injury prevention program on young road users: a German experience

Thomas Brockamp[1,2] · Paola Koenen[1,2] · Michael Caspers[1] · Bertil Bouillon[1] · Michael Köhler[3] · Uli Schmucker[2,4,5] · Working Group of Injury Prevention of the German Trauma Society (DGU)[2]

Received: 20 September 2017 / Accepted: 31 October 2017 / Published online: 8 November 2017

Abstract
Purpose Trauma remains a leading cause of mortality and morbidity in youth. The Prevent Alcohol and Risk Related Trauma in Youth (P.A.R.T.Y.) program is an injury prevention program. The aim of the study was to analyze the influence on risk-taking behaviors and risk awareness on young road users by a pre–post-questionnaire.
Methods A pre–post intervention study was performed using a standardized questionnaire. The questionnaire contained three sections with different items (in total 22) to identify differences regarding students' risk behavior and risk awareness. Data were analyzed using the Wilcoxon signed-rank test with significance defined as $p < 0.05$.
Results The study sample contains 193 students (age 14–17, 44% male). We found significant differences for asking if a student "fastens his/her helmet's chinstrap when driving a motorbike" ($p = 0.001$) and for the question "Do you wear a helmet when you go rollerblading" ($p = 0.008$). After attending the program, participants would decrease the use of a mobile phone while driving ($p = 0.038$) and the understanding of the risk "speeding" and "cycling without a helmet" significantly increased.
Conclusions The P.A.R.T.Y. program focuses on items like "use of helmet and mobile phones" and "alcohol/drug abuse". Evaluating the program helps to uncover vulnerabilities and to enhance important effects. Some of these items are addressed by the program, whereas some are not. It will be important to improve the program according to address topics that have not shown significant improvements, so that students learn more about the dangers and the right behavior in road traffic.

Keywords Prevention · P.A.R.T.Y program · Trauma · Youth

✉ Thomas Brockamp
tbrockamp@gmail.com

Paola Koenen
paola.koenen@gmail.com

Michael Caspers
caspersm@kliniken-koeln.de

Bertil Bouillon
bouillonb@kliniken-koeln.de

Michael Köhler
michael.koehler@stw.de

Uli Schmucker
uli.schmucker@auc-online.de

[1] Department of Traumatology and Orthopedic Surgery, Faculty of Health, School of Medicine, Cologne-Merheim Medical Center (CMMC), University of Witten/Herdecke, Ostmerheimer Str. 200, 51109 Cologne, Germany

[2] Working Group of Injury Prevention of the German Trauma Society, The German Trauma Society, Straße des 17. Juni 106-108, 10623 Berlin, Germany

[3] Steinbeis Transfer Center for Research in Intervention and Evaluation, Wieksweg 48, 33378 Rheda-Wiedenbrueck, Germany

[4] Department for Trauma Surgery, University Hospital Regensburg, Franz-Josef-Strauss-Allee 11, 93042 Regensburg, Germany

[5] AUC, Academy for Trauma Surgery, Wilhelm-Hale-Str. 46b, 80639 Munich, Germany

Abbreviations

P.A.R.T.Y	Prevent alcohol and risk related trauma in youth
RTC	Road traffic collisions
ED	Emergency department
ICU	Intensive care unit

Introduction

Trauma remains one of the leading causes of death, especially in the group of 15- to 24-year-old road users. They are the most vulnerable group with a high incidence of mortality and morbidity in road traffic collisions (RTC) [1]. In most regions of the world, the problem of road traffic injuries is still increasing. However, RTCs affect not only the current low- and middle-income countries but also the industrialized regions in Europe and North America [2]. Each year, nearly 30,700 people die due to RTCs in Europe and approximately every 2 h a person dies during RTCs in Germany [3]. Unfortunately, RTCs are also the leading cause of death among young people between 16 and 24 years of age. The top three causes are speeding, alcohol intoxicated driving and overestimation [4].

To reduce the global burden of injury by RTC among all age groups, the United Nations together with the World Health Organization (WHO) launched the "Decade of Action for Road Safety 2011–2020" in May 2011. In fact, there is a growing global movement that is fighting against RTCs. For example prevention strategies, alcohol taxation, reducing alcohol availability, legal and legislative strategies and strategies addressing the servers of alcohol have been shown to reduce driving under the influence of alcohol [5, 6].

Educational measures are also known to reduce injury rates in the short term [7, 8]. The P.A.R.T.Y. program (Prevent Alcohol and Risk Related Trauma in Youth) is an educational measure with a focus on young road users. There is evidence that this program can positively influence the behavior of young road users to reduce road traffic collisions and the severity of injuries [5, 9].

The program was developed at the Sunnybrook Health Sciences Centre (Ontario, Canada) in 1986. Since then numerous associated partner programs have been established. Currently, hundreds of trauma centers offer P.A.R.T.Y. programs in Canada, the US, Japan and other countries around the world. Yet, a comparable large-scale hospital-based road injury prevention program was not available in Germany or Europe. Therefore, the University Hospital in Cologne-Merheim initiated the German partner program in 2011 under the patronage of the German Trauma Society (DGU, Deutsche Gesellschaft für Unfallchirugie e.V.). In the initial phase, the original P.A.R.T.Y. program was adopted to the German road injury (e.g., role of bicycle injury in youth road users, different alcohol legislation) and trauma care standards (e.g., physician-based emergency system). In a second phase, train-the-trainer measures and evaluation instruments were piloted. In the meantime, the partnership with the German Road Safety Council (DVR, Deutscher Verkehrssicherheitsrat e.V.) and the German Insurers Accident Research (UDV, Unfallforschung der Versicherer) under the continuing patronage of the German Trauma Society enabled the nationwide roll-out of the program. Currently, the German P.A.R.T.Y. community consists of more than 40 hospitals and performs well over 100 programs annually.

The authors are convinced that the P.A.R.T.Y. program has the potential for a phased European roll-out. P.A.R.T.Y. may serve as a role model for a joint prevention program of the European trauma and orthopedic community. As far as the German experience is considered, the role of national trauma and orthopedic societies is evident and crucial for the area of wide success of prevention programs. In this context, the term "success" refers to a broad spectrum of political, professional and scientific management aspects such as standardized program set-up and management, professional quality assurance and evaluation. Regarding a future European roll-out, a responsible role of a European society like ESTES is of the utmost significance.

This paper describes the standardized German P.A.R.T.Y. program based on initial evaluation results. A pre–post study design was used to evaluate the effects of the P.A.R.T.Y. program in a Level-1-Trauma hospital in Germany on risk-taking behaviors and risk awareness among young road users.

Methods

The P.A.R.T.Y. program

The P.A.R.T.Y. program is a 1-day in-hospital injury awareness program for youth aged 14 years and older. The program provides information about trauma and its consequences and it enables participants to recognize potential injury-producing situations, decide for safety-oriented choices and adopt behaviors that minimize preventable risk. The individual programs are held in a trauma hospital and the participants face real trauma patients and their history of injury. Students spend about 6 h on a single day in a trauma unit. The academic and nursing staff of these trauma centers are specially trained regarding the teaching of the participants. The program starts with an interactive presentation held by a trauma surgeon who explains trauma and the way a severely injured patient is rescued and treated. Next, a session is presented by a local police officer, outlining risk-taking behaviors and possible consequences of bad choices,

e.g., drug or alcohol use, no helmet use. Each presentation and discussion lasts about 20–30 min. After a break, students are divided into small groups and commence tours of the paramedic services, emergency department (ED), intensive care unit (ICU), trauma ward and physical therapy unit (Fig. 1). The students are encouraged to touch and feel real equipment at mock bed spaces and to ask questions during the visit to the intensive care unit and trauma wards. The students are given the opportunity to meet and talk to injured survivors about their experiences, injuries and the choices that led to the experience of trauma. The program is a component of the growing community effort to reduce traumatic intentional and unintentional injury and death in youth, resulting from alcohol, drug, and risk-related crashes and incidents [10].

Questionnaire development

The starting point for our questionnaire development draws on statistical data of the area of North Rhine Westphalia (2010) on young road users aged between 13 and 20 years who were injured and killed in RTCs. In a next step, we examined how these RTCs are related to the use of specific means of transportation. Most of the collisions occurred in car use, followed by bicycle, moped or motorcycle use and as pedestrians. Looking only at our target group of the 14–17 years old, the proportion of RTCs in the context of passengers in a car is significantly lower and the contexts of bicycle and motorbike use account for about 60% of this target group.

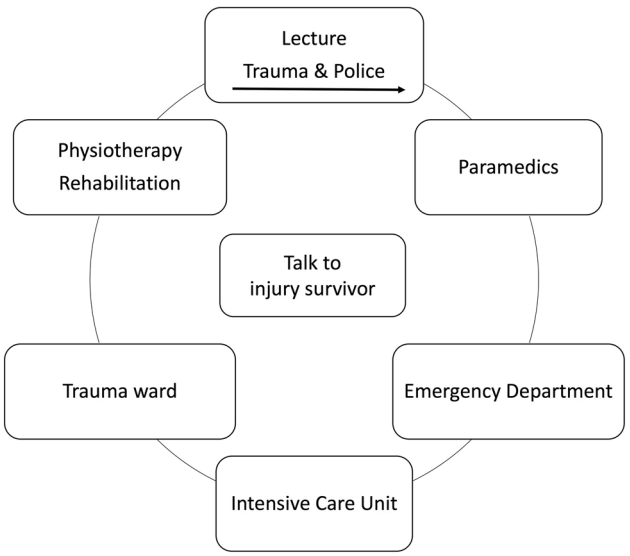

Fig. 1 P.A.R.T.Y. round. Structure of the P.A.R.T.Y. prevention program. Students start at the lecture room and finish with a talk to an injury survivor

In the field of traffic safety research, the generic error model system (GEMS) is a frequently employed approach [11]. The GEMS distinguishes two basic categories of risk behaviors—'errors' and 'violations', each of which is determined by different psychological mechanisms and therefore requires different interventions. 'Errors' are unintentional deviations from safe practices and reflect inadequate capabilities (e.g., due to inexperience) or unfavorable temporary conditions (e.g., fatigue). 'Violations', on the other hand, are deliberate deviations from safe practices (e.g., consciously crossing a red traffic light) that reflect a person's behavioral motivation (e.g., the desire to save time). The GEMS is also used to analyze risk behavior among young people [12, 13]. In addition to the distinction of 'errors' and 'injuries', Elliot et al. introduced the distinction between three other types of risk indicators: 'dangerous play', 'lack of protective behavior' and 'unsafe crossing' [12]. Based on these theoretical considerations, a series of standardized questions for the recording of risk behavior and risk awareness of young road users, such as pedestrians, cyclists and motorized two-wheel users have been established and aided by the development of our questionnaire.

Questionnaire measures

The questionnaire includes three sections with different types of questions (in total 22 questions) to evaluate the students' interpretation of risk behavior and risk awareness.

Section 1: risk-behavior items

The pre-questionnaire includes ten questions: Have you driven your car/motorbike after drinking alcohol or taking drugs? Have you been given a lift by someone who had consumed alcohol or taken drugs? Do you wear a seatbelt when driving a car? Do you wear a helmet when you drive a motorbike/moped? Do you fasten your helmet's chinstrap when you drive a motorbike/moped? Do you wear a helmet when you ride a bicycle? Do you wear a helmet when you go rollerblading or skateboarding? Do you make calls on your mobile phone when driving/cycling? Do you often listen to music through headphones when driving/cycling? Do you observe the speed limit? Participants could choose from the following responses based on a five-point scale: "always; frequently; sometimes; rarely or never". When evaluating question one, answers were only considered for those students who had a driver's license.

Section 2: risk-awareness items

The second section includes seven questions. Which of the following situations would you consider to be high risk/dangerous? Jumping into a lake without knowing how

deep the water is? Riding as a passenger in the boot of a car? Cycling without a helmet? Overtaking a car on a mountain road or a bend? Speeding, skydiving, drunk-driving? Participants could choose from the following responses: "strongly agree; somewhat agree; somewhat disagree or strongly disagree".

Section 3: belief/opinion items

The third section includes five questions focusing on what students think about themselves in various situations and about how they would react in different situations. Statements included: "I generally consider myself to be a "safety-loving" person. I try to avoid dangerous/risky situations. I sometimes take a risk instead of weighing up a situation. In the past 30 days, I have done things that some people would consider to be dangerous. Having fun while also being aware of my health/safety and that of other people is important to me". Possible responses: "yes, completely true; somewhat true; not really true and no, not at all true". Questionnaires were written in German language. The post-questionnaire was linguistically adapted and aimed at actions in the future.

Data collection

All schools were selected by a random principle in the City of Cologne, Germany. Only students of classes 9–11 (age 14–17) were included, due to the fact that students between 14 and 17 years of age start driving cars (e.g., accompanying driving) and motorbikes, and students under the age of 14 were too young to participate. Finally, comprehensive schools and secondary modern schools (comprehensive schools offer a higher educational level than secondary modern schools) were randomly selected to participate in the program.

Before participating, a consent form was signed by the parents of the students. Medical staff was trained to help with data collection. A pre-questionnaire was explained and handed out by our medical staff after the students arrived at the hospital and before attending the program. The post-questionnaire was filled out at the end of the same day. Students who were absent on the day of data collection or students who did not have written consent from their parents to participate in the evaluation were excluded from the pre- and post-evaluation. We also removed results of driving-related items of participants who were too young to have a driver's license. The evaluation was carried out to see whether the responses to individual questions from each section showed statistical differences between the pre- and post-evaluation forms.

Data analysis

The evaluation was carried out to see whether the responses to individual questions showed statistical differences before and after attending the prevention measure. Descriptive statistics were reported as means for continuous measures, and proportions (%) for categorical measures. Additionally, the median is presented (ordinal categorical data). We analyzed data using the Wilcoxon signed-rank test. Because this analysis was exploratory, we did not undertake any adjustment for tests that we conducted. All tests for significance were at the 5% significance level. Statistical analyses were performed with SPSS (version 22).

Results

193 students between 14 and 17 years of age (mean age 15,9 years) attended the program between 2011 and 2013. 44% were male students. 49.7% live in a medium-sized or large town (≥ 20.000 residents). 56.5% are students of a comprehensive school, whereas 43% visit a secondary modern school (Table 1).

Table 2 shows the results of the evaluation regarding risk behavior. We found significant differences for asking if a student "fastens his/her helmet's chinstrap when driving a motorbike/moped" (pre: 2.5 vs. post: 1.9; $p = 0.001$) and for the item "Do you wear a helmet when you go rollerblading or skateboarding" (pre: 4.2 vs. post: 4.0; $p = 0.008$). After attending the program, participants would also decrease the amount of using a mobile phone while driving or cycling (pre: 4.1 vs. post: 4.3; $p = 0.038$).

Table 3 shows a significant difference regarding "Cycling without a helmet" (pre: 2.4 vs. post: 2.1; $p = 0.012$) and "Speeding" (pre: 1.8 vs. post: 1.6; $p = < 0.001$).

Table 1 Basic data ($n = 193$)

Characteristic	*N*	%
Age		
≤ 15 years	65	33.7
≥ 16 years	128	66.3
Gender		
Male	85	44
Residence		
Village	63	32.6
Small town	32	16.6
Medium-size city	96	49.7
Large city	2	1
School		
Comprehensive School	109	56.5
Secondary modern School	83	43

When asking, if the participants consider themselves to be "safety-loving persons", we found a significant increase after attending the prevention measure (pre: 2.4 vs. post: 2.1; $p = 0.012$). Finally, a positive effect was seen when asking "Having fun while also being aware of my health/safety and that of other people is important to me" (pre: 1.7 vs. post: 1.5; $p = 0.041$) (Table 4).

Discussion

This study focused on the effectiveness of a hospital-based injury prevention program using a questionnaire to evaluate changes regarding risk behavior and risk awareness of school students. To the best knowledge of the authors, neither short-term nor long-term effects of the German P.A.R.T.Y program have been published using a pre–post-intervention approach.

The P.A.R.T.Y. program has a focus on certain issues, especially "use of helmet", "use of mobile phones" and

Table 2 Risk-behavior items

	Pre *M* (median)	Post *M* (median)	Wilcoxon test
1. Have you driven your car/motorbike after drinking alcohol or taking drugs?	4.8 (5)	4.9 (5)	$p = 0.059$
2. Have you been given a lift by someone who drank alcohol or taken drugs?	4.5 (5)	4.5 (5)	$p = 0.209$
3. Do you wear a seatbelt when driving in a car?	1.3 (1)	1.4 (1)	$p = 0.364$
4. Do you wear a helmet when you drive a motorbike/moped?	1.9 (1)	1.9 (1)	$p = 1.00$
5. Do you fasten your helmet's chinstrap when you drive a motorbike/moped?	2.5 (2)	1.9 (1)	$p = 0.002$
6. Do you wear a helmet when you ride a bicycle?	4.2 (5)	4.0 (4)	$p = 0.191$
7. Do you wear a helmet when you go rollerblading or skateboarding?	4.2 (5)	4.0 (5)	$p = 0.011$
8. I sometimes make calls on my mobile phone when driving/cycling	4.1 (4)	4.3 (5)	$p = 0.026$
9. I often listen to music through headphones when driving/cycling	4.0 (5)	3.9 (4.5)	$p = 0.329$
10. Do you observe the speed limit?	2.3 (2)	2.1 (2)	$p = 0.186$

Results of the pre- and post-evaluation. Scale: 1 = always to 5 = never

Table 3 Risk-awareness items

	Pre *M* (median)	Post *M* (median)	Wilcoxon test
1. Jumping into a lake without knowing how deep the water is	2.0 (2)	1.9 (2)	$p = 0.929$
2. Riding as a passenger in the boot of a car	2.1 (2)	2.0 (2)	$p = 0.195$
3. Cycling without a helmet	2.4 (2)	2.1 (2)	$p = 0.006$
4. Overtaking a car on a mountain road or a bend	1.5 (1)	1.4 (1)	$p = 0.711$
5. Speeding	1.8 (2)	1.6 (1)	$p < 0.001$
6. Skydiving	2.9 (3)	2.8 (3)	$p = 0.094$
7. Drink-driving	1.3 (1)	1.2 (1)	$p = 0.268$

Results of the pre- and post-evaluation. Scale: 1 = strongly agree to 4 = strongly disagree

Table 4 Belief/opinion items

	Pre *M* (Median)	Post *M* (Median)	Wilcoxon test
1. I generally consider myself to be a "safety-loving" person	2.3 (2)	2.0 (2)	$p < 0.001$
2. I try to avoid dangerous/risky situations	2.0 (2)	1.9 (2)	$p = 0.259$
3. I sometimes take a risk instead of weighing up a situation	2.7 (3)	2.7 (3)	$p = 0.625$
4. In the past 30 days I have done things that some people would consider to be dangerous	2.8 (3)	2.9 (3)	$p = 0.148$
5. Having fun while also being aware of my health/safety and that of other people is	1.7 (1)	1.5 (1)	$p = 0.058$

Results of the pre- and post-evaluation. Scale: 1 = yes, completely true to 4 = no, not at all true

"alcohol/drug abuse" when driving or cycling. One aim of the program is to improve knowledge about the dangers in road traffic. Evaluating the program is mandatory and helps to uncover vulnerabilities and to enhance important effects. This evaluation shows that some of the topics are addressed by the program, whereas some others are not. Because the abuse of alcohol and drugs while driving is a constant problem and the number of RTCs and the severity of injury is still on a high level for young road users, there is a great interest in prevention to decrease these numbers [14–16]. We did not measure a significant difference regarding the topic "alcohol/drug abuse" in the pre–post comparison. We think that this important issue needs to be better represented in our program and therefore the program should be adapted to better communicate the dangers of "alcohol and drug abuse".

Another important topic concerns texting and calling while driving and other cell-phone reading and writing activities, because these are high-risk activities associated with motor vehicle collisions and mortality [17, 18]. The program draws attention to this risk and tries to elucidate problems associated with cell-phone use. There were significant changes when asking some helmet-related items ("Do you fasten your helmet's chinstrap when you drive a motorbike/moped?" and "Do you wear a helmet when you go rollerblading or skateboarding?"). There is some evidence that "helmet use" reduces head injuries [19, 20]. However, we think that it is important to teach students about the benefit of helmet use and about the consequences of head injuries.

Today, a lot of injury prevention strategies and methods were set up to enlighten young road users about the consequences of trauma. Especially educational measures, community-based measures, as well as legislative measures were set up to reduce injuries in the young population. Evidence of the effectiveness for each program is rare. The results reported from community-based approaches are encouraging and there is little evidence that purely educational measures reduce injury rates in the short term [7, 8].

Legislation has been developed to prevent incidents by modifying human behavior, changing environmental factors, and decreasing access to hazards. Many studies support a decrease in alcohol-related collisions by increasing legal drinking age and a decrease in collisions and injuries by graduated licensing [21–24]. Laws have also targeted limiting injury during an incident. When mandatory helmet laws were introduced in various states in the United States, the fatal accident rate fell by 30–37% [25]. Within the last decades, there have also been several changes in the legislation in Germany, but despite this nearly one in eleven fatalities has still been alcohol related in Germany in 2010 [4].

Community-based prevention models give the opportunity to experience what it is like to be an injury survivor. In the hospitals, they can gain as many impressions as possible with all their senses. Some of these programs are well designed and an integral part of prevention measures (e.g., the CHAT—Community and Hospital against Trauma and the IMPACT—Impaired Minds Produced by Alcohol Cause Trauma program). All programs involve tours of intensive care units, rehabilitation areas, or patient wards. They allow interaction of participants with trauma patients at various stages of healing [21, 26].

The P.A.R.T.Y. program is an educational measure. There is evidence that this program can have a positive effect on young road users [5, 9]. However, prospective studies looking at the long-term effect of the program are still missing. Banfield and colleagues published a 10-year retrospective analysis of the effectiveness of the program. They matched P.A.R.T.Y. participants with subjects having the same age, gender, residential area, and initial year in database, who did not attend the program. They found out that there were fewer traumatic injuries in the study group than in the control group. This difference was stronger in females. They concluded, that the P.A.R.T.Y. program effectively reduced the incidence of traumatic injuries among its participants [9]. In 2012, Ho and colleagues published a retrospective cohort study including 3659 juvenile justice offenders. They found out that the incidence of subsequent traffic or violence-related offences was significantly lower for those who had attended the program compared to those who did not. They concluded that participating in an injury education program involving real-life trauma scenarios was associated with a reduced subsequent risk of committing violence- or traffic-related offences, injuries, and death for juvenile justice offenders [5].

Reducing the number of road traffic injuries and deaths as well as the severity of injury patterns is an important issue. Factors that are responsible for these injuries include speeding, lack of helmet use, lack of seat-belt and child restraint use, drinking and driving, and lack of conspicuity [2]. These factors need to be addressed by injury prevention strategies.

The present study has certain limitations as it is a simple pre–post design. It is a single center evaluation, as we only focused on one major trauma center and not on different centers across the country and further conclusions can only be made in a multi-center study. No long-term results are available. Only a third of all asked items show a positive influence on the students. This might be because of a structural problem of the program or due to problems in our study design. However, a prospective and multicenter evaluation of the program will help us to improve the setting and to measure an effect the program might have on young road users.

Conclusions

Acting against morbidity and mortality due to road traffic injuries in youth is important. Injury prevention measures

were set up to decrease the number of road traffic accidents and the consequences of trauma. We presented the results of a pre–post-questionnaire evaluation of a prevention measure on a collective of school students. The program shows some positive effect on items like "helmet use", the dangers in "using a mobile phone while driving" and "speeding".

We believe that the P.A.R.T.Y. program can contribute to improve the knowledge about more protective behavior in road traffic and that it contributes to explain the consequences of trauma due to road traffic collisions. Injury prevention strategies can have a positive impact on young road users. A prospective, multicenter study will be needed to better evaluate the influence of the program in the long term.

Acknowledgements The authors thank the participating members of staff of the Cologne-Merheim-Medical-Center for its collaboration.

Author contributions TB contributed to study design, acquisition and interpretation of data, recording of paper and analyzing data. MK provided statistical advice on study design. PK, MC, BB and US conceived on the study, provided statistical advice on study design. PK, MC, BB and US contributed to analysis and interpretation of data and revision of the article. All authors read and approved the final manuscript for publication.

Compliance with ethical standards

Funding None.

Conflict of interest The authors declare that they have no competing interests.

Availability of data and materials Data and materials are available from the author.

Ethical approval and consent to participate Written informed consent from parents/guardians was required for the evaluation questionnaires to be given to students. Students who were absent on the day of data collection and students who did not have written consent from their parent to participate in the evaluation were excluded from the evaluation. The study protocol and consent procedures were approved by the ethic committee of the University Witten/Herdecke. Reference Number: 09/2014. Member: RA Prof. Dr. med. P. W. Gaidzik.

References

1. Gore FM, Bloem PJN, Patton GC, Ferguson J, Joseph V, Coff C, et al. Global burden of disease in young people aged 10–24 years: a systematic analysis. Lancet. 2011;377:2093–102.
2. Toroyan T. Global status report on road safety. Inj Prev. 2009;15:286.
3. Statistisches Bundesamt. Statistisches Bundesamt Verkehrsunfälle Zeitreihen bis 2015. 2016.
4. Statistisches Bundesamt W. Unfallentwicklung auf deutschen Straßen. 2010. 2010;5–93.
5. Ho KM, Litton E, Geelhoed E, Gope M, Burrell M, Coribel J, et al. Effect of an injury awareness education program on risk-taking behaviors and injuries in juvenile justice offenders: a retrospective cohort study. PLoS One. 2012;7:e31776.
6. Howat P, Sleet D, Elder R, Maycock B. Preventing alcohol-related traffic injury: a health promotion approach. Traffic Inj Prev. 2004;5:208–19.
7. Munro J, Coleman P, Nicholl J, Harper R, Kent G, Wild D. Can we prevent accidental injury to adolescents? A systematic review of the evidence. Inj Prev. 1995;1:249–55.
8. Jones NE PC. The effect of legal drinking age. Am J Public Health. 1992;82:1990–3.
9. Banfield JM, Gomez M, Kiss A, Redelmeier D a, Brenneman F. Effectiveness of the P.A.R.T.Y. (Prevent Alcohol and Risk-related Trauma in Youth) program in preventing traumatic injuries: a 10-year analysis. J Trauma. 2011;70:732–5.
10. McDowall A. Prevent alcohol and risk related trauma in Youth—Perth 2011. Rep Sunnybrooks HSC Toronto 2011. 2011;3–14.
11. Reason J, Mandstead A, Stradling S, Baxter J, Campbell K. Errors and violations on the roads: a real distinction? Ergonomics. 1990;33:1315–32.
12. Elliot M. and BC. Adolescent road user behaviour: A survey of 11–16 year olds. Report. Prep. Road Saf. Devision. Dep. Transp. 2003.
13. Feenstra H, Ruiter RAC, Schepers J, Peters G-J, Kok G. Measuring risky adolescent cycling behaviour. Int J Inj Contr Saf Promot. 2011;18:181–7.
14. Borges G, Cherpitel C, Mittleman M. Risk of injury after alcohol consumption: a case-crossover study in the emergency department. Soc Sci Med. 2004;58:1191–200.
15. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: a review of the literature. Alcohol Clin Exp Res. 2004;28:18S–28S.
16. Ogden EJD, Moskowitz H. Effects of alcohol and other drugs on driver performance. Traffic Inj Prev. 2004;5:185–98.
17. Gliklich E, Guo R, Bergmark RW. Texting while driving: a study of 1211 US adults with the distracted driving survey. Prev Med Rep. 2016;4:486–9.
18. Llerena LE, Aronow KV, Macleod J, Bard M, Salzman S, Greene W, et al. An evidence-based review. J Trauma Acute Care Surg. 2015;78:147–52.
19. Macpherson A, Spinks A. Bicycle helmet legislation for the uptake of helmet use and prevention of head injuries (Review). Cochrane Collab. 2010. https://doi.org/10.1002/14651858.CD005401
20. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. Cochrane Database Syst Rev. 2008. https://doi.org/10.1002/14651858.CD004333.
21. Bandiera GW HT. Evaluating programs to prevent unintentional trauma in Canada :challenges and directions. J Trauma. 1999;47:932.
22. Levy DT. Youth and traffic safety: the effects of driving age, experience, and education. Accid Anal Prev. 1990;22:327–34.
23. Laberge-Nadeau CM. The effects of age and experience on accidents with injuries: should the licensing age be raised? Accid Anal Prev. 1992;24:107–16.
24. Moskowitz J. The primary prevention of alcohol problems: a critical review of the research literature. J Stud Alcohol. 1989;50:54–88.
25. Kraus JF, Peek C, McArthur DL, Williams A. The effect of the 1992 California motorcycle helmet use law on motorcycle crash fatalities and injuries. JAMA. 1994;272:1506–11.
26. Grant KA, Lane PL, Janus G OL. An evaluation of a hospital-based drinking and driving prevention program. Can J Public Health. 1995;86:91–4.