Final report of Working Group 2:
Traffic psychology

A COST Action TU1101 / HOPE collaboration

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Contents

Citation Information for this Report 2
Contact details 2
Copyright notice 2
Members 4
Acknowledgements 5
I. Introduction 6
1. Background 6
2. Objectives 6
3. Areas for research include: 6
4. Activities 6
5. Outputs and products: 7
II. Projects 8
International survey of bicycle use, attitudes and safety with emphasis on helmet use 8
Presentations scheduled for the September 18-19, 2015 ICSC Conference 21
Future work to be done with the survey 23
Improving Cyclists' Conspicuity and Visibility with an Alternating Flashing Lights (AFL) System 25
III. Short-Term Scientific Meetings (STSMs) 26
1. Design and implement a critical literature review 26
1.1. Purpose of the STSM 26
1.2. Description of the work carried out during the STSM 26
1.3. Description of the main results obtained 27
1.4. Future collaboration with host institution 27
2. A safe Choice or a Good Habit? /Helmet use and Habit Strength 27
2.1 The purpose of the STSM 27
2.2 Description of the work carried out during the STSM 28
2.3. Description of the main results obtained and topics discussed 28
2.4. Foreseen publications articles resulting from the STSM 29
2.5 Confirmation by the host institution of the successful execution of the STSM 29
3. The Effects of a Helmet on Cognitive Performance 30
IV. Published and Presented Research Studies by WG2 members. 31
1. Published refereed journal articles 31
2. Presentations at Conferences 32
3. Technical Reports 35
V. Implications 36
Implications for industry 36
Implications for the legislators 36
Feedback to the COST office 36
Appendix – International cycling survey questionnaire 38

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I. Introduction

1. Background

The workgroup of Traffic Psychology is concerned with the social, behavioral, and perceptual aspects that are associated with use and non-use of bicycle helmets, in their various forms and under various cycling conditions.

2. Objectives

The objectives of WG2 are to (1) share current knowledge among the people already working in the field, (2) suggest new ideas for research on and evaluation of the design of bicycle helmets, and (3) discuss options for funding of such research within the individual frameworks of the participants.

3. Areas for research include:

3.1. The patterns of use of helmets among different users: children, adults, and sports enthusiasts.
3.2. The use of helmets in different environments: rural roads, urban streets, and bike trails.
3.3. Concerns bicyclists have relative to their safety and convenience and the perceived impact of using helmets on comfort and convenience.
3.4. The benefit of helmets for enhancing visibility, and how variations in helmet design and colors affect daytime, nighttime, and dusktime visibility.
3.5. The role of helmets in the acceptance of city-wide pickup-and-drop-off bicycles.
3.6. The impact of helmets on visual search behaviour of bicyclists.

4. Activities

The main activities of the WG2 members consisted of:

4.1. Sharing ideas at periodic meetings and in short-term scientific meetings (STSM).
4.2. Formulating a major cooperative study to be jointly conducted in the different environments/cultures/countries
4.3. Developing research proposals to be submitted to funding organizations – in government and industry.
4.4. Promoting research in this area among graduate students and young Ph.D.'s and cooperating with other researchers in other institutions.

5. Outputs and products:

The bulk of this report will consist of short summaries of the outputs listed below of activities conducted and products generated by the WG2 members in the course of the four years of the COST Action TU1101. The outputs are divided into the three categories listed below.

5.1. Multi-country survey of bicycle use, and attitude, and crash experience by adult bicyclists in 17 countries.
5.2. Short-term scientific meetings (STSMs)
5.3. Presentations, technical reports and scientific papers published by the WG members on cycling with particular reference to cycling safety and bicycle helmets
5.4. Potential applications and implementation of WG2 members' research.

II. Projects

International survey of bicycle use, attitudes and safety with emphasis on helmet use

1. Introduction

The most significant group effort of WG2 was to design and conduct an international survey of bicycling. The initial need arose from the problematic issue of lack of standardized exposure data on cycling in different countries. This makes international comparisons difficult. It also creates barriers to safety improvements by learning from other countries. Consequently, WG2 decided to embark on an international survey in which all members and countries participating in the survey would use an identical web-based questionnaire. The 118 item questionnaire was based on a previous Australian survey and additional questions related specifically to helmet use and attitudes towards helmet use. It was piloted in Israel in 2013, and distributed by the web in the different participating countries using validated translations (back and forth translations). The participating countries (and the lead WG2 members responsible for the translation and dissemination were: Australia (Narelle Haworth), Belgium (Ceri Woolsgrove and Guido de Bruyne), Croatia (Anica Hursa Sajatovic), Estonia (Kalev Kuklane), Brazil (Joao Dias), France (Violla Cavallo), Germany (Dietmar Otte), Greece (Joannes Chliaoutakis), Israel (David Shinar), Italy (Anna Morandi), Netherlands (Maura Houtenbois), Norway (Aslak Fyhri), Portugal (Joao Dias), Spain (Pedro Valero-Mora), Sweden (Kalev Kuklane) Switzerland (Toni Weber), and Turkey (Meltem Saplioglu). Data collection began I mid-January 2014 (in Israel) and ended in June 15, 2015. In total, over 8,500 questionnaires were filled out by adult cyclists in 17 countries. A more detailed description of the survey and initial results from the Israeli survey is provided below. The full survey questionnaire is provided in the appendix.

2. Presented Reports

Note: The text below is from the following paper: Haworth, N., Shinar, D., and Oron-Gilad, T. (2014). Developing an international survey of bicycle and helmet usage. International Cycling Safety Conference, Gotenborg, Sweden, 18-19 November.

ABSTRACT

The European Union-funded collaborative network, COST Action TU1101: Towards safer bicycling through optimization of bicycle helmets and usage, aims to increase scientific knowledge about bicycle helmets in regards to traffic safety and to disseminate this knowledge to stakeholders, including cyclists, legislators, manufacturers, and the scientific community. The COST research team has de-veloped a uniform international survey to better understand attitudinal and other factors that may influence bicycle and helmet

usage, as well as crash risk. The online survey is being distributed by project partners in Europe, Israel, Australia, and potentially the US and Canada. The survey contains four types of questions: (1) biographical data, (2) frequency of cycling and amount of cycling for different purposes (e.g., commuting, health, recreation) and in different environments (e.g., bicycle trails, bike lanes, on sidewalks, in traffic), (3) frequency and circumstances for use and non-use of helmets, attitudes and reasons for it, and (4) crash involvement and level of reporting to the police. While the potential value of comparative data across countries with very different cycling cultures and safety levels is substantial, there are numerous challenges in developing, conducting, and analyzing the results of the survey. This presentation will focus on the scope of the international study, methodological issues and pitfalls of such a collaborative effort, and on initial results from one country (Israel). To illustrate, two findings from the preliminary Israeli survey indicate that: (1) none of the crashes were reported to the police including the ones involving hospital admission. Although underreporting of bicycle crashes by police is well documented in all countries the extent is unknown, and can be extreme. (2) Older riders tend to ride more for health/exercise reasons, while younger riders tend to ride more for commuting. Thus there is an interaction between riders' age and the place and times of riding.

Developing an international survey of bicycle and helmet usage

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Keywords: bicycle helmets, cycling participation, survey, international comparisons.

1 INTRODUCTION

Motorised travel dominates individual mobility in many countries with huge detrimental

impacts on air quality, greenhouse gas emissions, traffic congestion, road trauma and inactivity-related chronic disease. Cycling, in contrast, has health benefits (increased physical activity leading to reduced pressure on health services from chronic disease) and social benefits (meeting new people, building social capital) [1]. Cycling for transport (to work, for errands or local trips) has the additional benefits of reducing traffic congestion and improving quality of life in cities, reducing carbon emissions, and lowering costs of transport and parking [1]. Economic analyses have concluded that the health benefits of active transport far outweigh the injury costs [2-6] but cycling safety continues to be of concern to road safety agencies and is a major reason people give for not riding a bicycle [7-9].

High level international comparisons have shown that the proportion of road fatalities represented by bicyclists is roughly double in low and middle income countries compared to high income countries [10]. Yet these comparisons confound cycling participation and cycling safety, both of which differ markedly across countries. While direct comparisons are not possible given the different data collection methodologies, cycling accounts for approximately 1% of transport mode share for all urban trips in the US, 12% in Germany and 28% in The Netherlands (1995 data) [11]. Even within Europe, cycling participation rates vary dramatically [12]. The daily cycling rate in Denmark is 61% of that in The Netherlands, whereas it is 52% of the Dutch rate in Germany. Other countries have lower levels of bicycle use, such as Poland (26% of Netherlands cycling rates), Romania (16% of Netherlands cycling rates), Greece (10% of Netherlands cycling rates), and Spain, UK and Luxembourg have very low levels (6% of Netherlands cycling rates) [12].

Research has compared bicycle injury rates and fatality rates in the United States, Germany and The Netherlands. Bicycle fatality rates (per 100 million kilometres travelled) and injury rates (per 500,000 kilometres travelled) are highest in the United States (7.2 and 25 respectively), followed by German (3.2 and 1.6 respectively), and The Netherlands (2.0 and 0.4 respectively) [11]. International comparisons of bicycle safety are limited by the paucity of exposure data [12, 13] in many countries and under-reporting of crashes [12, 14-17].

International comparisons of cycling participation often fail to consider differences in the patterns of cycling across countries. Australia and the United States, for example, not only have low rates of cycling participation compared to some European countries [18] but they also have substantially lower participation rates by women than men [19, 20]. While most cycling occurs for transport in countries with high cycling participation rates, it appears that the proportion of cycling that is for recreation, rather than transport, may be greater in low cycling countries such as Australia and the United States. This pattern is even more evident for female riders who make only about quarter of commuter cycling trips [18, 21] but account for about 35% of recreational riders. These differences may reflect the contrasting road user attitudes and behaviours among jurisdictions. Behaviours vary as a result of local policies (and legislation) and traffic culture [22]. Differences in cycling culture between nations suggest an international perspective is needed to develop a comprehensive understanding.
A bicycle helmet is primary safety device available to cyclists. Bicycle helmets have been

shown to be effective at reducing the severity of injury, particularly brain injury, in the event of a crash [23]. Bicycle helmet usage rates differ across ages, and between countries. The majority of research has examined helmet use by children, partly at least because of the introduction of mandatory helmet legislation for children only [24, 25]. The research identified large differences in children's riding rates and helmet wearing rates and a decrease in helmet wearing rates as children aged [26, 27]. Several studies have examined helmet use by adults. For Germans aged 17 years or older, the overall helmet wearing rate was 12%, with wearing rates being higher for men (18%) than women (10%), and higher among those who rode less frequently [28]. Other observational studies in countries without mandatory helmet legislation have shown wearing rates of less than 5% in Paris [29] and rural Georgia in the US, [27], but 24% of adults in Winnipeg, Manitoba [26] and 31.5% in Boston. In Australia, where helmet use has been mandatory for riders of all ages since about 1990, approximately 76% of cyclists were observed wearing helmets in Melbourne (1992) [30], and more recent observations in Brisbane found 97% of cyclists were wearing helmets [31].

A number of factors may influence an individual's decision to use a bicycle helmet when cycling. A review of research found the introduction of legislation increased the proportion of cyclists wearing a bicycle helmet [32], with the actual increase varying between 37% and 91%, across different jurisdictions. Personal factors could pose barriers to bicycle helmet use. Barriers to helmet use are similar for adults and children, and are related to comfort and accessibility [33]. An individual's perception of the safety of cycling in a location may influence helmet use. However, the complex interactions of factors may be difficult to understand. The perceived level of safety protection a helmet offers may be a factor that influences helmet use. Surveys conducted in the United States found that the majority of bicycle riders believed that helmets provided protection from head injury, regardless of whether riders are children, adolescents or adults but the proportion of respondents that used a bicycle helmet was only high for older adults (aged 50 years or older), with only approximately 30% of children, adolescents and adults wearing helmets [33]. Attitudes about bicycle helmet use may also influence helmet wearing. Research in the area of attitudes towards bicycle helmets, and their respective use, has primarily focussed on children and adolescents [34, 35].

International comparison of bicycle rider safety is difficult because of generally poor and inconsistent injury and exposure data. The number of bicycle crashes is the numerator for evaluating bicycle safety. Under-reporting of cycling crashes is a significant problem across jurisdictions and can hide the true nature of bicycle safety [12]. Most analyses of under-reporting examine the difference between police and hospital records but there may also be a large number of less-serious injuries sustained while bicycling which are not be recorded in hospital or police data, as no complaint or treatment was sought. Rider surveys provide an opportunity to measure the extent of under-reporting of bicycling injuries, particularly of less serious injuries. A lack of detailed exposure data [12], and the difficulty in estimating bicycle trips through secondary data (e.g. fuel sales can be used for motor vehicles) or

inconsistent use of travel surveys between countries, makes the comparison of bicycle safety between jurisdictions difficult [36]. The current survey has been developed to collect exposure data, and with consistent exposure measures researchers will be able to make more accurate comparisons between jurisdictions.

The European Cooperation in Science and Technology, COST Action TU1101: Towards safer bicycling through optimization of bicycle helmets and usage, aims to increase scientific knowledge about bicycle helmets in regards to traffic safety and to disseminate this knowledge to stakeholders, including cyclists, legislators, manufacturers, and the scientific community. As part of this collaboration, Work Group 2 examines bicycle helmet safety with respect to traffic psychology. The Group includes researchers from Italy, Greece, Spain, France, Norway, the Netherlands, Portugal, United Kingdom, Turkey, Israel, and Australia. The two major outputs of Work Group 2 will be the current survey and a comprehensive literature review on bicycle helmets.

The Survey of Bicycle Use and Safety Perceptions has been designed to gain a greater understanding of bicycle and helmet use and crash involvement. The objectives of the survey are to develop (1) a tool to measure bicycle riders use and perceptions of helmets and (2) a core set of questions that could be used internationally. The results will establish a pan-European database, and include selected international data also (namely Israel and Australia), of bicycle crashes as well as behaviours and attitudes in regard to bicycle helmet use. The inclusion of data from Australia provides an interesting comparison with results from a country where bicycle helmets have been mandatory for more than 20 years and where a substantial amount of early research regarding the effects of bicycle helmet legislation was conducted.

2 METHODOLOGY

2.1 Questionnaire

The questionnaire consists of 30 core items which are common across countries, and additional items which may have been included to suit the particular circumstances or issues in specific countries (e.g. riding in ice and snow). The first author is happy to provide a copy of the Australian version of the questionnaire upon email request (n.haworth@qut.edu.au). The questionnaire commences with a screening question regarding whether the participant has ridden a bicycle in the last month (although this may differ slightly among countries). This is followed by 7 demographic items with response options taken from international surveys such as SARTRE surveys to allow the representativeness of the survey sample to be assessed. This is followed by 5 items regarding car licences and travel and access to cars and bicycles. There are then 9 questions that measure the frequency of cycling and amount of cycling for different purposes (e.g., commuting, health, recreation) and in different environments (e.g., bicycle trails, bike lanes, on sidewalks, in traffic). The following section comprises 5 questions on circumstances for use and non-use of helmets. There are then two

questions about attitudes to bicycle use and attitudes to helmet use. Many of the constructs of the Theory of Planned Behaviour are incorporated into these items. The items were carefully worded to maximise the relevance and usefulness of information collected from both wearers and non-wearers of helmets. The final 2 questions collect information about crash involvement (including helmet use) and whether the crash was reported to the police. The survey combines new scale items, and items from previous bicycle safety surveys developed by the collaborating researchers including the Queensland Cycling Survey [37], and earlier Greek questionnaires. The base questionnaire was developed in English and translated by researchers in each country. In each country the translated version was then translated again to English to correct any misappropriate translations. The software used to administer the online questionnaire has varied between countries, with KeySurvey being used in a range of countries. The Dutch Institute for Road Safety Research (SWOV) has assisted in programming the survey in several languages.

2.2 Participant recruitment

Convenience sampling via social media, word-of-mouth, and bicycle organisations is the primary recruitment strategy because of lack of funding for the study. Participants were restricted to adults (18 years old or older) who had ridden a bicycle in the last month.

2.3 Data collection and analysis

As at 30 October 2014, data collection has been completed in Israel, Italy and Norway, is underway in Greece, Australia and France, and is yet to commence in Croatia, Denmark, Germany, Portugal, Romania, Spain, Turkey, and United Kingdom. The goal is to complete all data collection before the winter season sets in and riding patterns change (especially in Northern countries). The data will be shared when data collection from all countries is completed.

3 ISRAEL AS A CASE STUDY: Method and Preliminary Results

3.1 Background and method

The first piloting occurred in Israel, where cycling has recently become popular as a hobby and a mean of transportation, but without sufficient cycling infrastructure or regulations related to cycling and cycling culture. Data collection and initial analysis was conducted by two senior Industrial Engineering students as part of their final project. The English questionnaire was translated to Hebrew and back to English by independent translators and the final translation was compared to the original. Discrepancies were eliminated through revisions in the Hebrew version. A pilot survey was conducted in person on five bicycle riders. Participants were recruited through personal contacts, social networks, bicycle riding clubs, and through stickers with barcodes posted on bus stations and bill-boards on campus and off campus directing respondents to the online questionnaire (see Figure 1).

All respondents were directed to a dedicated site of SurveyGismo where they filled out the online interactive questionnaire in Hebrew. A total of 315 people filled out the survey, but 48 were eliminated from the data analyses (either because they were under 18, or because they rode less than 1km per week on the average). However, because not all questions were relevant to all respondents, N is not 267 for all questions. The convenience sample of 267 riders consisted of 76% males; 40% 18-30 years old, 42% 31-49 years old, 14% 50-59 years old, and 5% 60 years old or older.

Figure 1. Sticker attached to various locations on University campus, train stations, bus stations etc., requesting bicyclists to participate in a survey that "could help improve bicycling infrastructure and safety"

3.2 Preliminary Results and Discussion

In terms of occupation, the largest group was students (32%), followed by independent professionals (27%), and closely followed by salaried employees (24%). There was a significant positive correlation between age and the amount of riding (r=.30), with older participants riding more often. Interestingly there was also a positive correlation between the reported amount of car driving and the amount of riding (Spearman's rho = 0.25). In addition, 52% of those who did not own a car rode daily or almost daily, whereas of those who did own a car only 19% reported riding daily or almost daily (x^2= 25.25, p<.001). Thus the relationship between driving and bicycle riding is not a simple one of one substituting for the other.

People ride bicycles for different reasons. The questionnaire provided several reasons, and the respondents had to estimate the number of km they rode for each purpose per week. The reasons were: to work/school (24 km), as part of work, shopping/chores (9 km), to social gatherings, for pleasure (15 km), for health/sport (45 km). Thus respondents used a bicycle as an exercise machine more than as a means of mobility, and this trend increased with age (see Figure 2). Furthermore, this trend depended of the person's socio-economic status: the higher it was, the more frequent the bicycle was used for health/sport (Figure 3). Obviously age and socio-economic status are correlated.

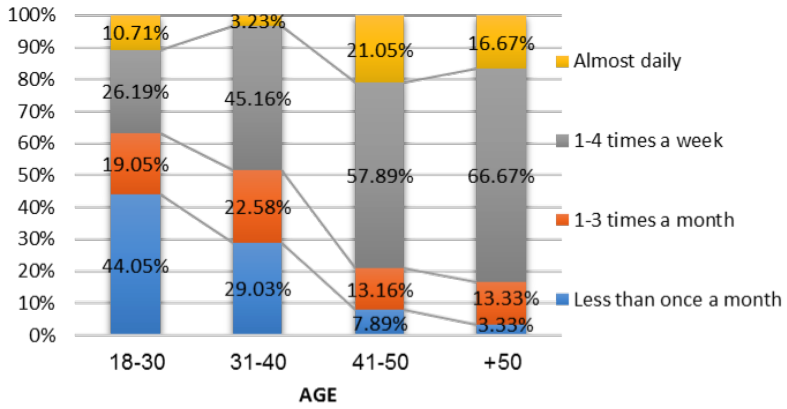

Figure 2. Frequency of bicycling for health/sports reasons as a function of age

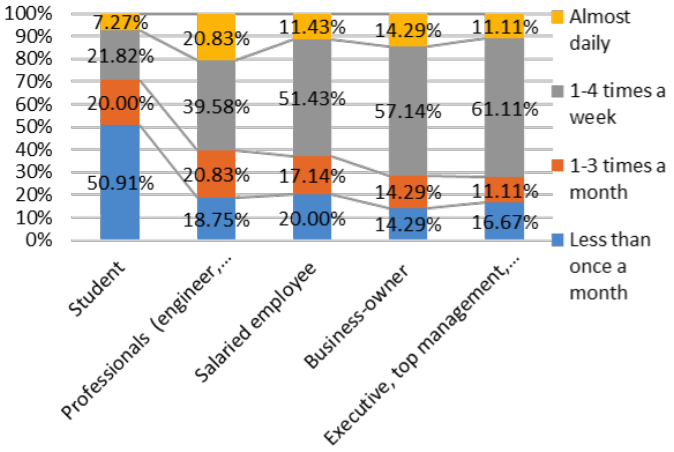

Figure 3. Frequency of cycling for health/sports reason as a function of occupation

Helmet use is not a requirement in Israel for riders over 18 years old but many people use helmets, especially for sport riding on inter-urban roads. In our sample 74% of the respondents said they owned a helmet. There was a correlation between the amount of riding and use of helmets (Spearman's Rho = 0.55). People who said that they never use a helmet rode on the average 16 km/week, and those who used it "nearly always or always" rode an average of 98 km/week (Figure 4). Helmet use was also strongly associated with age: nearly all (>90%) of mature and older people (40+) nearly always or always used a helmet, whereas for riders under 30 years old this was true only for 31% (p=0.58). As might be expected, there was an association between the beliefs about helmet's benefits (based on answers to three questions: riders who do not use them increase their risk, helmets reduce cyclists fatalities, and helmets reduce severe head injuries) and frequency of use: 75% of those with a positive attitude used it always or nearly always, compared to 17% of those with a negative attitude (p=.43). Similarly, those who wore a helmet frequently were less bothered by its negative aspects (sweating and discomfort, ruined hairstyle, and interference with head movements) than those who did not wear one regularly (p=-.48, -.45, -.56, respectively). A logistic regression on the variables that contribute to the prediction of helmet use yielded four significant variables: (1) Gender- females were more likely to

wear a helmet (2) Child passengers – carrying children increased the likelihood of using a helmet, (3) Average riding distance – the greater the distance the more likely a rider was to use a helmet, and (4) Comfort – the more the rider agreed that the helmet use was uncomfortable, the less likely he/she were to use it.

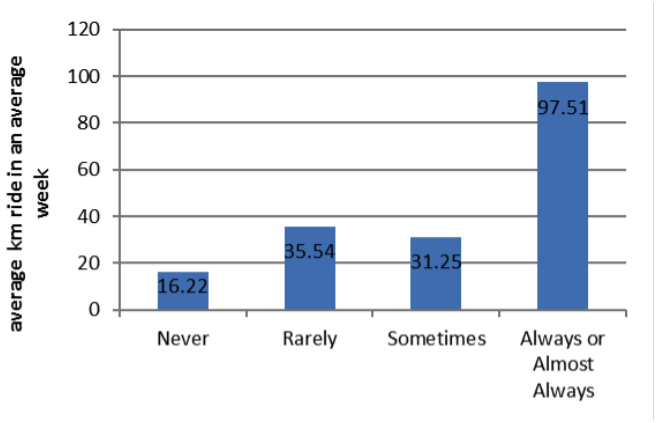

Figure 4. Average number of km ridden per week as a function of frequency of helmet use

Bicycle crashes are notoriously under-reported in police data. Consequently our knowledge of factors associated with cyclists' crash involvement is quite poor. In the survey 20% of the respondents said that they had been involved at least once in a crash as a cyclist (58 crashes), and none of these crashes were reported to the police. Although 73% of these reported crashes did not require professional medical treatment, 11% actually involved referrals to the hospital for ambulatory treatment. In addition, 36% of the respondents were aware of bicycle crashes of others that they knew, totaling 89 crashes. Of these crashes and the ones that they had themselves, 50% were from a fall from the bicycle and only 13% were from a collision with a motor vehicle (Figure 5). For all crash types, over 50% involved minor injuries, but 24% of the falls, 24% of the collisions with other cyclists, and 31% of the collisions with a motor vehicle involved hospital referrals. There were no significant differences in crash involvements between males and females, but age was a significant factor, with riders 30 years old or younger being involved in more crashes than older ones ($x2(1)= 66$, $p=.006$). The effect of exposure on crash involvement was somewhat unexpected. Those who reported riding less than 10 km/week were the least involved (6%). However, beyond that minimum level, exposure had no effect and regardless of km/week of riding crash involvement varied from 22% to 31% in a manner that was unrelated to exposure. Decreasing crash rates with increasing exposure has been reported in other surveys [38]. Crash involvement was apparently not a sufficient incentive to wear helmets. Of those who did not wear a helmet when they had the crash, 89% felt that wearing a helmet would not have reduced their head injuries. On the other hand, when all crashes were considered (to themselves and their friends), regarding those who wore a helmet, 79% of the respondents felt that it reduced the head injuries. Finally, in our sample approximately half the respondents (53%) said they listen to music or talk on the phone while riding. Of those, 11% reported that they were involved in a crash because they were distracted by the music or the conversation.

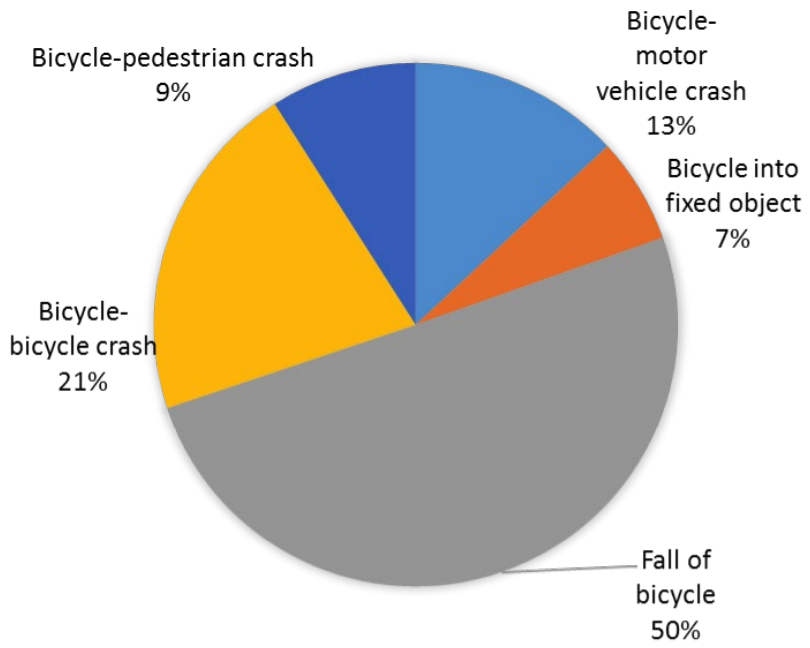

Figure 5. Distribution of bicycle crashes by type.

The final issue addressed in the survey was knowledge of rules of the road (non-core questionnaire items). Because bicyclists are not licensed, and because rules of the road are rarely enforced on them, it is considered in Israel that they are much more likely to commit serious traffic violations. In our survey only 31% responded that they always adhere to the rules of the road, whereas 21% said that they do that occasionally. In general, there was a positive association between perceived knowledge of rules of the road and adherence to them (ρ=.34). However, when asked specifically about the helmet laws in Israel, there was no relationship between knowledge of the law and perceived knowledge of the traffic regulations. Less than 3% knew the law in full and approximately 50% did not know it at all, independently of the proclaimed level of knowledge.

3.3 Limitations

The survey used convenience sampling and this may have biased the sample towards people who are more interested in cycling. This might have inflated the estimates of frequency of use and led to fewer older riders being included. It would be useful to compare the characteristics of the current sample with the results obtained from population surveys. However, it could be argued that the cyclists who ride more (and are potentially over-represented in the sample) are the riders who have the most crashes (even if their rate per km is lower) and therefore they are of most interest to road safety in terms of their riding patterns and helmet use.

The survey did not collect detailed information about the crash circumstances. It would have been interesting to know the extent to which temporary (e.g. slippery surfaces or alcohol) or more permanent (e.g. rough surfaces, poor skills) contributed to the 50% of crashes that involved a fall from the bicycle.

The relatively small sample size in the Israeli pilot survey prevented disaggregation of the sample to better understand the differing characteristics of particular sub-groups (particularly transport and exercise riders). However, the data suggest that there is a complex relationship between age, socio-economic status, purpose of riding, distance ridden and helmet use (and attitudes) that should be explored when larger samples are collected.

3.4 Preliminary Conclusions

The Working Group was able to develop an international questionnaire to measure both bicycle and helmet usage and the individual demographic and attitudinal factors potentially underlying these behaviours, as well as crash involvement. The research method chosen in most countries was a comprehensive web-based survey on cycling and wearing helmets. The survey provided a first step in addressing the lack of data on cycling habits and wearing helmets of cyclists in Israel.

According to the survey findings there is a significant positive correlation between the amount of cycling and frequency of wearing bicycle helmets among riders. Also, 20% of the survey respondents (134) were involved in road crashes and 53% of them described their most serious crash as falling off the bike. However, none of these crashes were reported to the police. Therefore, the police database does not reliably represent non-fatal bicycle crash statistics in Israel. Also, only 1% of respondents were fully proficient in the helmets laws and 51% partially proficient.

While it is important to note that the sample of respondents to the survey was not representative of the entire population due to the limited distribution of the survey, the preliminary conclusions of the study can help us get a general idea of the character of cyclists in Israel and offer interesting and important topics for more systematic research.

Furthermore, once the data from across countries will be added to the database, the effects of additional cross-cultural and legislation factors can be examined.

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Presentations scheduled for the September 18-19, 2015 ICSC Conference

An update of the survey and preliminary results will be presented at the next ICSC conference in Hanover, Germany in 15-16 September 2015 in the context of the final meeting of the action. An abstract of two presentations dedicated to the method and the preliminary results are presented below:

International survey of bicycling exposure, crash involvement behaviors, and attitudes: Rationale and Method

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ABSTRACT

There is an acknowledged problem in documenting crash and injury rates of bicycle riders due to the absence of a valid denominator: the exposure measure. An important purpose of this study was to create several potential exposure measures that could be simultaneously applied in different countries to measure cycling behaviors, cyclists' attitudes, and crash involvement. Such a standardized process to collection of information regarding bicycling, helmet use, and related attitudes has never been done. To this end in a collaborative effort involving researchers from across Europe and Australia, a common questionnaire was developed, pilot tested and – (where relevant) back-translated – to different languages, promoted via different venues and distributed via the internet. The survey includes questions covering the following areas: (1) demographic data including age, gender, education, occupation, and license; (2) travel patterns by mode of travel (private car, bicycle, public transport, moped, walking) in terms of frequency, distance, and purpose of travel; (3) bicycling exposure in terms of frequency, distance, and purpose of riding on roads with bicycle lanes, roads without bicycle lanes, bicycle/pedestrian paths separated from the

road, bike trails, and dedicated pedestrian paths, and use of city sharing bicycles; (4) helmet use, in terms of frequency, and relative to purpose of travel, and type of infrastructure (5) attitudes concerning riding a bicycle in general, and use of helmets in particular; (6) beliefs and perceived norms related to helmet use; and (7) crash experience in terms of types of crashes, severity of crashes, and whether or not the crashes were reported to the police.

Inclusion criteria most often included age of 18 or older and having ridden a bicycle on average at least once a month in the past year. A total of approximately 7,000 questionnaires meeting these criteria were filled out by riders from 18 countries including Australia, Belgium, Croatia, Estonia, Finland, France, Germany, Greece, Israel, Italy, The Netherlands, Norway, Portugal, Romania, Spain, Switzerland, Turkey, and the U.K.

Keywords: Bicycling, bicycle helmet use, International survey.

International survey of bicycling exposure, crash involvement, behaviors, and attitudes: Preliminary results

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ABSTRACT

This paper presents some preliminary results from an international online survey of bicycle riders, who reported riding at least once a month. The methodology is described in a sister paper. Data from 6709 participants from 18 countries were cleaned and checked for consistency. The median distance ridden ranged from 30 kms per week in Israel to 140 kms per week in Greece (overall median 50 km/week). By trip purpose, the median distance ridden was greatest for health/fitness, followed by commuting. Almost half of the riders most commonly rode city/hybrid bikes, followed by 23% riding mountain bikes and 17% riding road bikes. Overall, 61% of respondents reporting wearing a helmet 'always' or 'almost always', varying from 22% in Spain to 92% in Norway, while 28% reported wearing them 'never' or 'almost never'. Thus, individuals appeared to consistently use

or not use helmets. Helmet wearing rates were generally higher when riding for health/fitness or leisure/recreation and on roads without bicycle lanes, but some divergences in these patterns were found between countries. Overall, 29% of respondents reported being involved in at least one bicycle crash in the last year (ranging from 20% in Italy to 52% in Croatia). Among the most severe crashes for each respondent, about half of the crashes involved falling off a bicycle. Just under 9% of the most severe crashes for each respondent were reported to police (ranging from 0% in Israel to 16% in Spain). Among the bicycle-motor vehicle crashes, only 30% were reported to police (ranging from 0% in Israel to 59% in Portugal). Further analyses address questions regarding the influence of factors such as demographic characteristics, type of bicycle ridden, and attitudes on both bicycle use and helmet wearing rates.

Keywords: Bicycle helmets, riding patterns, bicycle crashes, crash data.

*The study involved over 20 researchers from the participating countries who were all involved in this as part of an EU COSTT1101 Action

Future work to be done with the survey

It is the consensus of the WG2 members that the bulk of insights and products to be produced from the international cycling survey will be published after this COST Action is over. Understandings about copyrights and authorships have been discussed and agreed on in WG2 meeting in Zagreb, Croatia May 11, 2015.

A major concern of the data – and extrapolations from it – is that it is a convenience sample rather than a representative sample of the adult cyclists in each of the countries surveyed. Initial guidelines for correcting for various biases – such as age, gender, education, and use of bicycles – have been prepared by Pedro Valero-Mora and are presented below.

Weights for the Bike Helmets study – by Pedro Valero-Mora

Introduction

As we all know, there are many reasons to believe that there will bias in the samples collected in the countries which will jeopardize the conclusions to be reached. However, as bias of this kind is not uncommon in surveys, there are methods for dealing with it that are available in standard statistical packages (i.e. SPSS). The methods add some more complexity to analysis but not much.

The problem

Variables	Categories	Comment
Age	Young people	More computerized
Gender		No especial reasons to lean for overre-presentation of an gender over other but worthy to be checked
Education	More educated people	
Users of bikes	**Regular users of bikes**	**Massive bias towards them**
Others?		**Please, provide ideas of other variables**

There will be proportionally more respondents in our sample than in the population in several categories. As a first guess, some categories and variables that will be over represented are:
Drawing conclusions for the general population is not possible with all this bias. We might claim that our conclusions are representative of a special population that mirrors our sample (i.e. young educated users of bikes) but this is not ideal.

Solution

The solution is simple, calculating the proportion of people in the population in the categories of interest, computing the proportion in our sample and then computing the division. This results in a weight that can be applied to the SPSS file and permits correcting the sample to make it better.

There are many documents explaining the details in the internet. In a cursory review I found this one OK but there might be other sources that are better (I also have some reference books in my bookshelf with more advanced stuff but we can save this for later)

Steps to be taken

1. Agree on variables that could create bias in our samples
2. Investigate the proportions in the population of the categories of the variables. This should be done by country
3. Create the weights. This would take a bit of SPSS programming but I might take over, no problem.
4. Apply the weights to the datafile when it is ready.
5. Analysis could proceed as usual once the weights are applied. However, for those statistical oriented, SPSS has an optional module with more advance techniques or there is free software that might make do too.

Improving Cyclists' Conspicuity and Visibility with an Alternating Flashing Lights (AFL) System

David Shinar, Ben Gurion University of the Negev

Abstract of paper presented at ICSC, November 2014, Gothenburg, Sweden.

The study evaluated the added benefits of a unique cyclist lighting system with alternating flashing lights (AFL) on the handlebars and the helmet, creating a vertical apparent movement effect. Students viewed short video clips of cyclists approaching the camera location in urban streets with moderate traffic flow. Two studies were performed, in each study there were 72 clips consisting of: 3(different streets) X 2 (Daytime and Dusk hours) X 2 (Cyclist's distance from camera: 60m and 160m) X 3 (Cyclists visibility: no light, flashing light on handle bars, and NLS) X 2 (Same combinations but without a cyclist) . In the first study – Conspicuity – subjects were unaware of the study objective and were simply told to note at the end of each 1.0s clip the types of vehicles they saw. In the second study – visibility - subjects were asked to press the <space bar> as soon as they detected a cyclist. The video was either terminated with the response or lasted for up to 2s. In each study percent correct identifications were noted, and in the second study detection RT was recorded too.

The results showed that the AFL system improved both cyclist conspicuity and visibility in the more difficult dusk condition. In the first study (conspicuity) detection likelihood with the AFL was significantly better than with the single flashing light or no lights at all, at both the near distance and the far distance. In the visibility study, the cyclist was detected almost all the time at both distances in daylight, thus the AFL had no benefit. However, at dusk detection likelihood was highest with the AFL, especially at the far distance. In that situation the detection RT was also slightly shorter with the AFL. In conclusion, the AFL creates a unique 'signature' that attracts the viewer's attention and sense of identification of cyclists, especially under conditions of poor visibility such as dusk.

III. Short-Term Scientific Meetings (STSMs)

Three STSMs were held as part of the WG2 Activities:

1. Design and implement a critical literature review

This review focused on the methodological and statistical issues that confront literature on bicycle helmets, with particular emphasis of grey literature that is not commonly available to all. A report of this STSM, summarized by Pedro Valero-Mora is provided below. Unfortunately this planned project did not come to fruition within the time frame of this COST Action.

1.1. Purpose of the STSM

The objective of this STSM was to identify methodological and statistical problems related with the scientific literature on bicycle helmets. These issues will be integrated in a review paper currently drafted by WG2 of the COST action. In particular, the work was focused on the results on the effects of legislation on helmet use in different places and ways of summarizing them. This summary has relevance because some countries are considering the introduction of legislation of this type but critics consider that its effects are not yet sufficiently proven and could be actually the reverse of what is expected.

1.2. Description of the work carried out during the STSM

During the STSM, discussions suggest that a way to summarize the research would be as a causal diagram that would list the variables involved and the relations found between them. The strength and sign of the relationship will be drawn from the literature but a first outline of them was extracted from a preliminary reading of the literature. Figure 1 shows the variables affected by legislation on the use of helmets with bicycles and the sign of the relationship. Positive relationships have been claimed for example between the Use of bicycles and the Health of people, and negative relationships have been found between a good infrastructure for bicycles and car use. This diagram is also useful to clarify the indirect effects, through mediator variables, such as for example the effects of the Use of bicycles on Casualties which can be positive if the Severity of accidents is taken into account but negative if we consider its influence on Health.

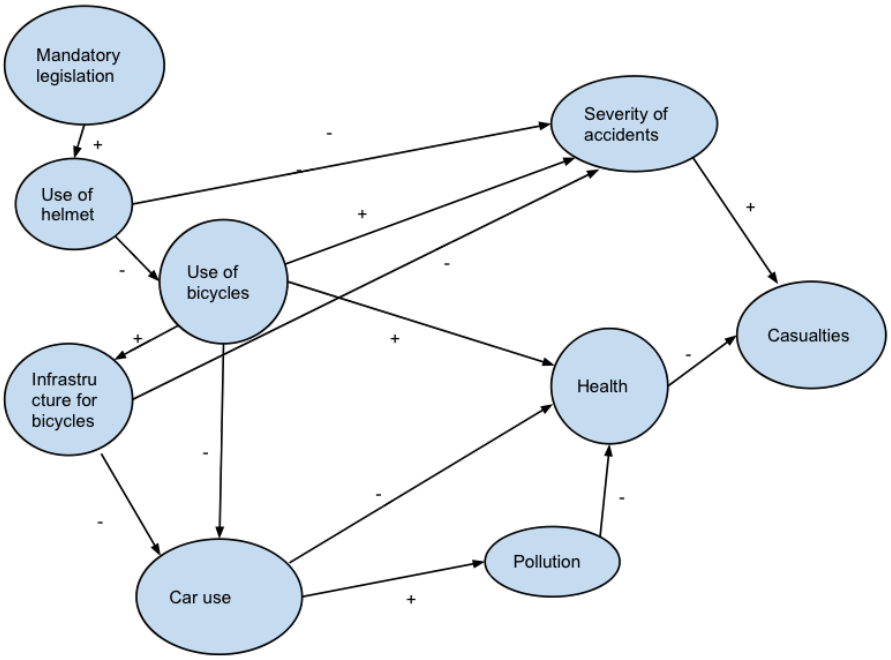


Figure 1. One possible arrangement of variables influencing helmet use.

1.3. Description of the main results obtained

During the STSM, a database of papers was identified and preliminary review was started. This work permitted the elaboration of the diagram in Figure 1.

1.4. Future collaboration with host institution

During the visit, it was agreed to have a meeting with other members of the COST action currently in UK. An invitation was delivered and Nottingham was tentatively suggested as the place for the meeting. However, the meeting could not be celebrated but there are plans for continuing with the review as planned in W2 of the action.

Date, location: 13/09/2013, Valencia (Spain)

2. A safe Choice or a Good Habit? /Helmet use and Habit Strength

2.1 The purpose of the STSM

Promoting cycling is considered to be an important initiative to improve public health, but can also have negative health consequences as bicycles have a higher risk of traffic injury than other transport modes. A device that has the potential to reduce some of this risk is the bicycle helmet.

In response to the number of non-users some countries have enacted mandatory helmet use, but the injury-reducing effect of this legislation has been disputed. The purpose of the Short Term Scientific Mission was to further expand on the knowledge about why some people choose to use a helmet while others do not. More precisely; to increase the understanding of the relationship between helmet use and the theoretical construct of habits, and helmet use and risk perception, and also to finalize an article manuscript. The manuscript investigates social psychological factors that may underlie the decision to use a helmet, by means of the Theory of Reasoned Action, risk perception and habit strengthby means of the Theory of Reasoned Action, risk perception and habit strength.

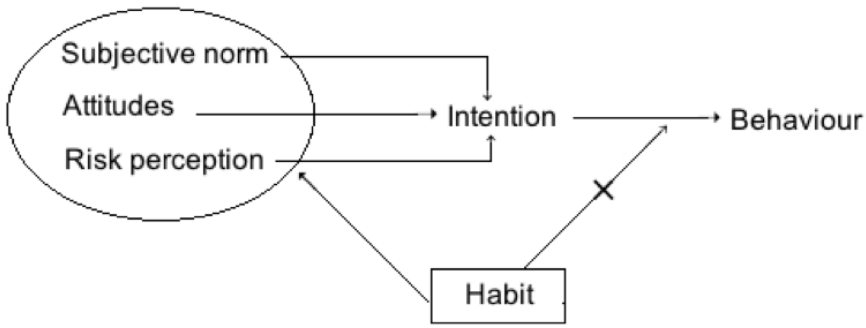
2.2 Description of the work carried out during the STSM

The findings from the study/preliminary results were discussed within relevant theory to increase the understanding of the relationship between helmet use and risk perception and helmet use and habit strength. The manuscript for the foreseen article was hence improved. Possible further analyses and other relevant questions/topics in relation to the findings were also discussed.

2.3. Description of the main results obtained and topics discussed

The results show that subjective norm is the strongest predictor for the intention to use a bicycle helmet, followed by risk perception. Actual helmet use is in turn strongly predicted by intention. The results indicate that cyclists are influenced by their surroundings, to the extent that what others do or think is of relevance for the intention to use helmet. This might, in relation to risk perception, be interpreted as a form of risk perception in the society? In different cultures, different activities are seen as more or less risky. Why is there for example a different focus/ recommendation for helmet use in Denmark compared to Norway?

The results showed that habit strength did not interact with intention to predict behaviour, but interacted with the pre-determinants of intention.



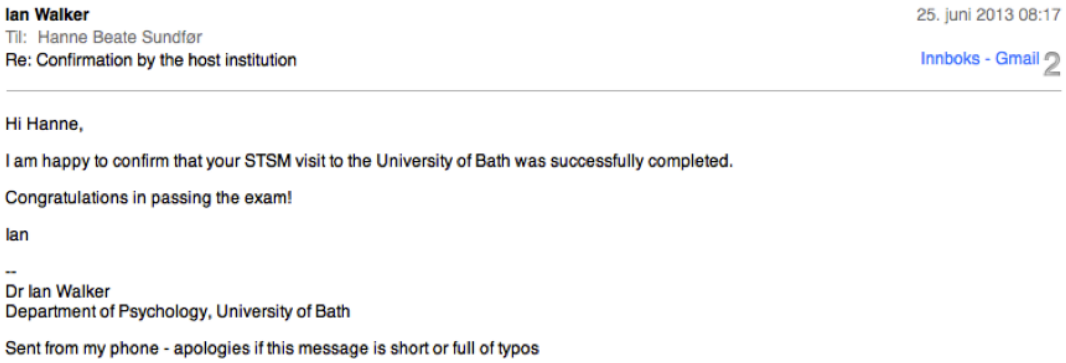
The results indicate that the pre-determinants of behaviour are moderated by habit strength; in the way that intention becomes less guided by subjective norm, attitudes and risk perception as the habit strength increases. Hence, it is among those with weak habit the potential for promoting helmet use is highest. The strong relationship between habits and helmet use highlights the importance of focusing on promoting helmet use before a habit for non-use is established. Thus, aiming future programs for increased helmet use at children and adolescents might be the most effective way to promote the helmet as a safe choice, and the good habit that might follow from such a choice.

Gaining knowledge about the mechanisms that underlie the decision for helmet use is important for understanding the effects of traffic safety initiatives, and why interventions like helmet laws might not have the anticipated effect. A focus on mechanisms other than making it mandatory to use helmet, might also be important from a moral perspective. An important distinction when it comes to cycling and safety could be set between the danger that the cyclists exposes themselves (mountain biking/falling of the bike) and the danger existing "out of their control" (crashing with a car due to poor facilitation). By stating that cyclists are to use helmets in all situations, the cyclists are given all the responsibility for their own safety. Instead of doing something about the reasons causing the danger, a promotion of such an initiative (mandatory helmet use) might be understood as accepting the danger?

2.4. Foreseen publications articles resulting from the STSM

One published article "A safe choice or a good habit? Extending the Theory of Reasoned Action to Explain Bicycle Helmet Use" in Transportation Research Part F: Traffic Psychology and Behaviour.

2.5 Confirmation by the host institution of the successful execution of the STSM



Ian Walker 25. juni 2013 08:17
Til: Hanne Beate Sundfør
Re: Confirmation by the host institution Innboks - Gmail 2

Hi Hanne,

I am happy to confirm that your STSM visit to the University of Bath was successfully completed.

Congratulations in passing the exam!

Ian

--
Dr Ian Walker
Department of Psychology, University of Bath

Sent from my phone - apologies if this message is short or full of typos

3. The Effects of a Helmet on Cognitive Performance.

This STSM was conducted in order to pull together and analyze the results of a laboratory study that evaluated the effects of (motorcycle) helmets on cognitive functioning. The conclusion of all the evaluations was that the effects are either non-existent or minimal. Therefore, one can generalize that bicycle helmets – being lighter and less cumbersome – have no impairing effects on the rider's cognitive performance. The STSM was held in the University of Bath, England. A publication in Applied Ergonomics was the final output of that STSM, and the abstract is below.

Applied Ergonomics 45 (2014) 671–676

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journal homepage: www.elsevier.com/locate/apergo

The effect of a helmet on cognitive performance is, at worst, marginal: A controlled laboratory study

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ABSTRACT

The present study looked at the effect of a helmet on cognitive performance under demanding conditions, so that small effects would become more detectible. Nineteen participants underwent 30 min of continuous visual vigilance, tracking, and auditory vigilance (VIT + AVT), while seated in a warm environment (27.2 (±0.6) °C, humidity 41 (±1)%, and 0.5 (±0.1) m s^{-1} wind speed). The participants wore a helmet in one session and no helmet in the other, in random order. Comfort and temperature perception were measured at the end of each session. Helmet-wearing was associated with reduced comfort ($p = 0.001$) and increased temperature perception ($p < 0.001$), compared to not wearing a helmet. Just one out of nine cognitive parameters showed a significant effect of helmet-wearing ($p = .032$), disappearing in a post-hoc comparison. These results resolve previous disparate studies to suggest that, although helmets can be uncomfortable, any effect of wearing a helmet on cognitive performance is at worst marginal.

IV. Published and Presented Research Studies by WG2 members.

Many members of WG2 conducted independent research projects related to the COST TU1101 Action in collaborations with other Action members or in collaboration with other colleagues and graduate students. The products of these studies are listed below under the headings of published refereed papers, presentations in conferences, and technical reports. The COST Action members' names are in bold letters.

1. Published refereed journal articles

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V. Implications

Implications for industry

a. Some of the research conducted by the WG2 has immediate implications for industry in the sense of improving cyclist visibility through smart lighting systems on the helmet and on the bicycle.

Implications for the legislators

a. The international survey is a useful tool for legislation and regulation as it provides relevant exposure data and can highlight norms and acceptability of various controls, needs for infrastructure, and culture of bicyclists.

Feedback to the COST office

1. The COST program is greatly beneficial for dissemination of information and the formation of scientific workgroups, and the advancement of young researchers and graduate students to other institutions and senior scientists.

2. The meetings are an effective incentive to do work that falls within the Action framework, seek funding, and conduct funded and non-funded research to advance the goals of the Action

3. The fact the COST cannot fund any data collection was a major hindrance to the international survey. Had data collection been funded we would have been able to do the survey on a representative sample in each country rather than on a convenience sample. It would be good to find a funding mechanism for such exceptions.

Appendix – International cycling survey questionnaire

COST Survey- for external partners

This survey seeks to find out about the use of bicycles and bicycle helmets across a range of countries. It is designed to be completed by adults who have cycled, for any purpose, in the past month. The survey will take approximately 10-15 minutes to complete.

Q1.Where do you live?

- ☐ Australia
- ☐ Denmark
- ☐ Germany
- ☐ Greece
- ☐ France
- ☐ Spain
- ☐ UK
- ☐ Italy
- ☐ Other

Q2. What state do you live in?

- ☐ Australian Capital Territory
- ☐ New South Wales
- ☐ Northern Territory
- ☐ Queensland
- ☐ South Australia
- ☐ Tasmania
- ☐ Victoria
- ☐ Western Australia

Q2. What province do you live in?

- ☐ Hovedstaden
- ☐ Midtjylland
- ☐ Nordjylland
- ☐ Sjælland
- ☐ Syddanmark

Page 1 of 20

Q2. What state do you live in?
☐ Baden-Württemberg
☐ Freistaat Bayern
☐ Berlin
☐ Brandenburg
☐ Freie Hansestadt Bremen
☐ Hamburg
☐ Hesse
☐ Niedersachsen
☐ Mecklenburg-Vorpommern
☐ Nordrhein-Westfalen
☐ Rheiland-Pfalz
☐ Saarland
☐ Sachsen
☐ Sachsen-Anhalt
☐ Schleswig-Holstein
☐ Thüringen

Q2. What region do you live in?
☐ Attica
☐ Central Greece
☐ Central Macedonia
☐ Crete
☐ East Macedonia and Thrace
☐ Epirus
☐ Ionian Islands
☐ North Aegean
☐ Peloponnese
☐ South Aegean
☐ Thessaly
☐ West Greece
☐ West Macedonia

Q2. What province do you live in?

- ☐ Alsace
- ☐ Aquitaine
- ☐ Auvergne
- ☐ Bourgogne
- ☐ Bretagne
- ☐ Centre
- ☐ Champagne-Ardenne
- ☐ Corse
- ☐ Franche-Comté
- ☐ Ile-de-France
- ☐ Languedoc-Roussillon
- ☐ Limousin
- ☐ Lorraine
- ☐ Midi-Pyrénées
- ☐ Nord-Pas-de-Calais
- ☐ Basse-Normandie
- ☐ Haute-Normandie
- ☐ Pays de la Loire
- ☐ Picardie
- ☐ Poitou-Charentes
- ☐ Provence-Alpes Cote d'Azur
- ☐ La Réunion
- ☐ Rhône-Alpes

Q2. What province do you live in?

- ☐ La Coruña
- ☐ Álava
- ☐ Albacete
- ☐ Alicante
- ☐ Almería
- ☐ Asturias
- ☐ Ávila
- ☐ Badajoz
- ☐ Islas Baleares
- ☐ Barcelona
- ☐ Vizcaya
- ☐ Burgos
- ☐ Cáceres
- ☐ Cádiz
- ☐ Cantabria
- ☐ Castellón
- ☐ Ciudad Real
- ☐ Córdoba
- ☐ Cuenca
- ☐ Guipúzcoa
- ☐ Gerona
- ☐ Granada
- ☐ Guadalajara
- ☐ Huelva
- ☐ Huesca
- ☐ Jaén
- ☐ La Rioja
- ☐ Las Palmas
- ☐ León
- ☐ Lérida
- ☐ Lugo

- ☐ Madrid
- ☐ Málaga
- ☐ Murcia
- ☐ Navarra
- ☐ Orense
- ☐ Palencia
- ☐ Pontevedra
- ☐ Salamanca
- ☐ Santa Cruz de Tenerife
- ☐ Segovia
- ☐ Sevilla
- ☐ Soria
- ☐ Tarragona
- ☐ Teruel
- ☐ Toledo
- ☐ Valencia
- ☐ Valladolid
- ☐ Zamora
- ☐ Zaragoza

Q2. What province do you live in?

- ☐ Alessandria-Asti
- ☐ Ancona
- ☐ Aosta
- ☐ Arezzo
- ☐ Ascoli Piceno-Fermo-Macerata
- ☐ Avellino-Benevento
- ☐ Bari
- ☐ Bareletta-Andria-Trani-Foggia
- ☐ Brindisi-Taranto
- ☐ Belluni
- ☐ Bergamo
- ☐ Biella-Vercelli
- ☐ Bologna
- ☐ Bolzano
- ☐ Brescica
- ☐ Campobasso-Isernia
- ☐ Caserta
- ☐ Catanzaro-Crotone-Vibo Valentia
- ☐ Chieti-Pescara
- ☐ Como-Lecco-Varese
- ☐ Cosenza
- ☐ Cremona-Lodi-Mantova
- ☐ Cuneo
- ☐ Ferrara
- ☐ Florence-Pistoia-Prato
- ☐ Frosinone-Latina
- ☐ Genoa
- ☐ Gorizia
- ☐ Grosseto-Siena
- ☐ Imperia-Savona
- ☐ L'Aquila-Teramo

- ☐ La Spezia
- ☐ Lecce
- ☐ Livorno-Lucca-Massa Carrara-Pisa
- ☐ Lucania
- ☐ Naples
- ☐ Novara-Verbano-Cusio-Ossola
- ☐ Milano-Monza
- ☐ Modena-Reggio nell'Emilia
- ☐ Padua-Treviso
- ☐ Parma-Piacenza
- ☐ Pavia
- ☐ Pesaro-Urbino
- ☐ Pordenone
- ☐ Reggio Calabria
- ☐ Rieti-Biterbo
- ☐ Romagna
- ☐ Rome
- ☐ Rovigo-Verona
- ☐ Salerno
- ☐ Sondrio
- ☐ Turin
- ☐ Trieste
- ☐ Trento
- ☐ Udine
- ☐ Venice
- ☐ Vicenza

Q2. What Country do you live in?

- ☐ England
- ☐ Scotland
- ☐ Wales
- ☐ Northern Ireland

Q2. What state/province/region do you live in?

.....

Section 1: About you

Q3. What is your age?

- ☐ 15
- ☐ 16
- ☐ 17
- ☐ 18
- ☐ 19
- ☐ 20
- ☐ 21
- ☐ 22
- ☐ 23
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- ☐ 78
- ☐ 79
- ☐ 80
- ☐ 80+

Q4. What is your gender?

- ☐ Male
- ☐ Female

Q5. What is your marital status?

- ☐ Single
- ☐ Married

Other

.....

Q6. Do you have children aged 0-18?

- ☐ Yes
- ☐ No

Q7. What level of education have you completed?

- ☐ Did not complete school leaving qualifications
- ☐ School leaving qualifications
- ☐ Other post-school qualifications (apprenticeship,technical training)
- ☐ University degree

Q8. What is your occupation?

- ☐ Farmer, fisherman
- ☐ Professional, lawyer, accountant etc.
- ☐ Business-owner of shop, craftsman, proprietor
- ☐ Manual worker
- ☐ White collar, office worker
- ☐ Middle management, trainee
- ☐ Executive, top management, director
- ☐ Retired
- ☐ Housewife, not otherwise employed
- ☐ Student, military service
- ☐ Unemployed

Section 2: Transport Options

Q9. Which of the following categories of vehicle do you have a current licence to operate?

- ☐ Car
- ☐ Motorcycle (>50cc)
- ☐ Moped (≤50cc)
- ☐ Bus
- ☐ Truck

Q10. How many years have you held a car licence?

Years

.....

Q11. Comparing your riding in summer and winter, which statement below best describes you?

- ☐ Almost all of my riding is in summer
- ☐ More than half of my riding is in summer
- ☐ I ride the same amount in summer and winter
- ☐ Less than half of my riding is in summer
- ☐ Almost none of my riding is in summer

Q12. During the last 12 months on average how often did you travel by

	Nearly daily	1-4 times per week	1-3 times per month	Less than once a month	Never
Car as a driver	☐	☐	☐	☐	☐
Car as a passenger	☐	☐	☐	☐	☐
Motorcycle (>50cc) as a driver	☐	☐	☐	☐	☐
Motorcycle (>50cc) as a passenger	☐	☐	☐	☐	☐
Walking	☐	☐	☐	☐	☐
Cycling	☐	☐	☐	☐	☐
Public transport	☐	☐	☐	☐	☐
Moped (≤50cc) as a driver	☐	☐	☐	☐	☐

Q13. The access I have to a car best described by the following statement:

- ☐ I do not own a car, and do not have access to one
- ☐ I do not own a car, but have access to one
- ☐ I own a car

Q14. The access I have to bicycles is best described by the following statement:

- ☐ I do not own a bicycle, and do not have access to one
- ☐ I do not own a bicycle, but have access to a private bicycle only
- ☐ I do not own a bicycle, but have access to a public bicycle only
- ☐ I do not own a bicycle, but have access to public and private bicycles
- ☐ I own a bicycle

Q15. In which of these years did you ride a bicycle regularly?

- ☐ 2013
- ☐ 2012
- ☐ 2011
- ☐ 2010
- ☐ 2009
- ☐ Almost all my life

Q16. During the last 12 months, how often did you ride a bicycle in an average week for the following purposes:

	A	B	C	D	E	F	G
Travelling to or from work or study	☐	☐	☐	☐	☐	☐	☐
As part of work (e.g. delivery person)	☐	☐	☐	☐	☐	☐	☐
For shopping and errands	☐	☐	☐	☐	☐	☐	☐
Travelling to social activities	☐	☐	☐	☐	☐	☐	☐
For leisure/recreation	☐	☐	☐	☐	☐	☐	☐
For health and fitness (training)	☐	☐	☐	☐	☐	☐	☐

Legend for rank grid table: Q16. During the last 12 months, how often did you ride a bicycle in an average week for the following purposes:

Columns:

A - Every day
B - Almost every day
C - 4-5 days a week
D - 2-3 days a week
E - One day a week
F - Sometimes, but less than once a week
G - Never

Q17. During the last 12 months, how often did you ride a bicycle in an average week in the following types of locations:

	A	B	C	D	E	F	G
On roads without bicycle lanes	☐	☐	☐	☐	☐	☐	☐
On roads with bicycle lanes	☐	☐	☐	☐	☐	☐	☐
On off-road bicycle-only or bicycle-pedestrian paths	☐	☐	☐	☐	☐	☐	☐
Remote bike paths	☐	☐	☐	☐	☐	☐	☐

Legend for rank grid table: Q17. During the last 12 months, how often did you ride a bicycle in an average week in the following types of locations:

Columns:

A - Every day
B - Almost every day
C - 4-5 days a week
D - 2-3 days a week
E - One day a week
F - Sometimes, but less than once a week
G - Never

Q18. How many kilometres do you ride a bicycle in an average week?

.....

Q19. How many kilometres do you ride a bicycle in an average week for the following purposes?

	km
Travelling to or from work or study	.....
As part of work (e.g. delivery person)	.....
For shopping errands	.....
Travelling to social activities	.....
For leisure/recreation	.....
For health and fitness (training)	.....

Q20. How many kilometres do you ride a bicycle in an average week in the following types of locations?

	km
On roads without bicycle lanes	.....
On roads with bicycle lanes	.....
On off-road bicycle-only or bicycle-pedestrian paths	.....
Remote bike paths	.....

Q21. What type of bicycle do you most commonly use?

- ☐ Road
- ☐ Mountain
- ☐ City or hybrid
- ☐ Electric

Other

.....

Q22. How often have you ridden a bicycle provided by a public bicycle scheme in the last year?

- ☐ Not at all
- ☐ 1-10 days
- ☐ More than 10 days

Bicycle Helmet Use

Q23. Do you own a bicycle helmet?

- ☐ Yes
- ☐ No

Q24. What proportion of your riding do you wear a helmet?

Always	Almost always	Sometimes	Almost never	Never
☐	☐	☐	☐	☐

Q24a. What proportion of your riding do you wear a helmet?					
	Always	Almost always	Sometimes	Almost never	Never
Travelling to work or study	☐	☐	☐	☐	☐
As part of work (e.g. delivery person)	☐	☐	☐	☐	☐
For shopping and errands	☐	☐	☐	☐	☐
Travelling to social activities	☐	☐	☐	☐	☐
For leisure/recreation	☐	☐	☐	☐	☐
For health and fitness (training)	☐	☐	☐	☐	☐

Q24b. What proportion of your riding do you wear a helmet?					
	Always	Almost always	Sometimes	Almost never	Never
On roads without bike lanes	☐	☐	☐	☐	☐
On roads with bike lanes	☐	☐	☐	☐	☐
On off-road bicycle-only or bicycle-pedestrian paths	☐	☐	☐	☐	☐
On remote bike paths	☐	☐	☐	☐	☐

Bicycle Use

Q25. Please rate how much you agree or disagree with the following statements relating to bicycle use

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Riding a bicycle is more risky than driving a car	☐	☐	☐	☐	☐	☐	☐
Riding a bicycle is more risky than walking	☐	☐	☐	☐	☐	☐	☐
Riding will improve my health	☐	☐	☐	☐	☐	☐	☐
I have always ridden a bicycle	☐	☐	☐	☐	☐	☐	☐
I live close to work (or school or other destinations)	☐	☐	☐	☐	☐	☐	☐
My friends expect me to ride	☐	☐	☐	☐	☐	☐	☐
Most other people I know ride bikes	☐	☐	☐	☐	☐	☐	☐
Riding makes you hot and uncomfortable	☐	☐	☐	☐	☐	☐	☐
I don't ride when the weather is bad	☐	☐	☐	☐	☐	☐	☐
Riding a bicycle does not fit well with my image	☐	☐	☐	☐	☐	☐	☐
It is easier to ride than to drive to work	☐	☐	☐	☐	☐	☐	☐
It is difficult or expensive to park a car at my work	☐	☐	☐	☐	☐	☐	☐
Riding a bicycle is a cheap form of transport for me	☐	☐	☐	☐	☐	☐	☐
I am a skilled rider	☐	☐	☐	☐	☐	☐	☐
I enjoy riding a bike	☐	☐	☐	☐	☐	☐	☐
I am a fast rider	☐	☐	☐	☐	☐	☐	☐
I ride but would prefer to travel by another method	☐	☐	☐	☐	☐	☐	☐
Riding is more convenient than public transport for me	☐	☐	☐	☐	☐	☐	☐

Helmet Use

Q26. Where I live, I think that bicycle helmets are: (select all that apply)

- ☐ Compulsory for all ages
- ☐ Compulsory for all ages on roads only
- ☐ Compulsory for children
- ☐ Compulsory for children on roads only
- ☐ Worn by most riders
- ☐ Worn only by children

Q27. Please rate how much you agree or disagree with the following statements relating to helmets							
	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I am likely to have a bicycle crash in the next two years in which my head would hit something	☐	☐	☐	☐	☐	☐	☐
Helmets are effective at reducing the severity of head injury in bicycle-only crashes	☐	☐	☐	☐	☐	☐	☐
Helmets are effective at reducing the severity of head injury in car-bicycle crashes	☐	☐	☐	☐	☐	☐	☐
My friends expect me to wear a helmet	☐	☐	☐	☐	☐	☐	☐
Most other people I know wear helmets	☐	☐	☐	☐	☐	☐	☐
Helmets are not particularly effective at reducing the severity of head injuries	☐	☐	☐	☐	☐	☐	☐
Helmets are hot and uncomfortable	☐	☐	☐	☐	☐	☐	☐
Helmets don't suit my style (or are ugly)	☐	☐	☐	☐	☐	☐	☐
Helmets are a problem because they disturb your hair	☐	☐	☐	☐	☐	☐	☐
It is inconvenient to carry a helmet around	☐	☐	☐	☐	☐	☐	☐
I do not think cycling is risky enough for helmets	☐	☐	☐	☐	☐	☐	☐
I have always worn a helmet	☐	☐	☐	☐	☐	☐	☐
Helmets should be compulsory for adults	☐	☐	☐	☐	☐	☐	☐
Helmets should be compulsory for children	☐	☐	☐	☐	☐	☐	☐
Helmets reduce serious head injuries	☐	☐	☐	☐	☐	☐	☐
Helmets are more important for long rides	☐	☐	☐	☐	☐	☐	☐
Bicycle helmets are expensive	☐	☐	☐	☐	☐	☐	☐
Helmets reduce cyclist deaths	☐	☐	☐	☐	☐	☐	☐
I am used to wearing a bicycle helmet	☐	☐	☐	☐	☐	☐	☐
My friends wear helmets	☐	☐	☐	☐	☐	☐	☐
Beginner riders need to wear helmets	☐	☐	☐	☐	☐	☐	☐
After being involved/seeing previous crashes, I think wearing a helmet is important	☐	☐	☐	☐	☐	☐	☐
People who do not wear helmets are taking risks	☐	☐	☐	☐	☐	☐	☐
Skilled riders do not need to wear a helmet	☐	☐	☐	☐	☐	☐	☐
Wearing a helmet is more important if the road/track conditions are bad	☐	☐	☐	☐	☐	☐	☐
Wearing helmets are more important if you are riding with motor vehicles	☐	☐	☐	☐	☐	☐	☐
Helmets get in the way of comfortable head movements	☐	☐	☐	☐	☐	☐	☐

Bicycle Crash Invovlement

Q28. In the last year, how many accidents have you been involved in as a cyclist in which you ... (please put the number zero [0] in each box, if you have not had a crash that matches the description)

	Number
Had cuts or scrapes that did not require medical attention	.....
Were treated by a nurse or doctor without being admitted to hospital	.....
Were admitted to hospital	.....

Q28(a). For the most serious crash, which term below describes it best:

- ☐ Bicycle-motor vehicle crash
- ☐ Bicycle into fixed object
- ☐ Fall off bicycle
- ☐ Bicycle-bicycle crash
- ☐ Bicycle-pedestrian crash
- ☐ Other/Unknown

Q28(b). Was the crash reported to police?

- ☐ Yes
- ☐ No

Q28(c). Were you wearing a bicycle helmet at the time of the crash?

- ☐ Yes
- ☐ No

Q28(d). Was the helmet fastened at the time of the crash?

- ☐ Yes
- ☐ No

Q28(e). Do you think that wearing a helmet reduced the severity of any head injuries in that crash?

- ☐ Yes
- ☐ No

Q28(e). Do you think that wearing a helmet would have reduced the severity of any head injuries in that crash?

- ☐ Yes
- ☐ No

Q29. During the last 12 months, has someone you know been involved in an accident as a cyclist in which they

	Yes	No
Had cuts or scrapes that did not require medical attention	☐	☐
Were treated by a nurse or doctor without being admitted to hospital	☐	☐
Were admitted to hospital	☐	☐

Q29(a). For the most serious crash involving someone you know, which term below describes it best:

- ☐ Bicycle-motor vehicle crash
- ☐ Bicycle into fixed object
- ☐ Fall off bicycle
- ☐ Bicycle-bicycle crash
- ☐ Bicycle-pedestrian crash
- ☐ Other/unknown

Q29(b). Were they wearing a bicycle helmet at the time of the crash?

- ☐ Yes
- ☐ No

Q29(c). Do you think that wearing a helmet reduced the severity of any injuries in that crash?

- ☐ Yes
- ☐ No

Q29(d). Do you think that wearing a helmet would have reduced the severity of any injuries in that crash?

- ☐ Yes
- ☐ No

Thank you for participating in the survey