To cite this article: Arnau-Sabatés, L., Jariot, M., Martínez-Muñoz, M., Montané, J.(2013). The relationship between awareness of road safety measure and accident involvement in pre-drivers: the basis of a road safety programme. *Journal of Risk Research, 16*(1), 1366-9877. doi:10.1080/13669877.2012.761272

Post-printed version

The Relationship between Awareness of Road Safety Measure and Accident Involvement in Pre-drivers: the Basis of a Road Safety Programme

Laura Arnau-Sabatés*
Mercè Jariot*
Màrius Martínez*
Josep Montané*

* *Universitat Autònoma de Barcelona, Bellaterra, Spain*

Abstract

Objectives. This research aims to carry out a first validation of the QAR-Precon screening questionnaire (pre-driver risk-assessment questionnaire) applied in Catalonia during the drivers' initial training, analyse the differences in risky road user behaviour according to two main variables: whether they had any experience of an accident and sex, and examine the different risky road user patterns of pre-drivers.
Methods. In order to group the questionnaire variables together, an exploratory factorial analysis (PCA) was used. Subsequently, the reliability coefficients of the questionnaire and the subscales were calculated. Lastly, ANOVA models were used to compare differences in the whole sample and a cluster analysis was performed to identify different risky pre-driver groups.
Results. The factorial analysis (PCA) reveals the existence of 5 risk factors (speed and risk, external circumstances, distraction, alcohol and driving and other elements of driving) that explain 44.6% of the variance. More males than females reported that they had a higher tendency to take risks in all the risky factors exposed and injured pre-drivers reported less awareness of road safety than pre-drivers who had not been injured. A two-cluster solution indicated that it was possible to distinguish a group of pre-drivers who engaged in high risky behaviour *(high group)* from the group who engaged in moderate and low levels of risky road user behaviour (*low group*).
Conclusions. The implications of these findings for programme designs and training initiatives to improve efficiency in reducing the accident rate are discussed.

1. INTRODUCTION

The accident rate continues to be a full-scale problem worldwide. According to the WHO, road accidents claim 1.3 million lives each year and cause injury or other types of disability to 50 million people. They remain the main cause of death among young people aged between 10 and 24 years old. The majority of causes of death in young people —with traffic accidents in first place— are preventable and treatable (WHO 2011). In Europe, almost 39,000 people lost their lives in road accidents (Eurostat 2010); more than 1,300 were in Spain (General Directorate of Traffic (DGT) 2009) of which 400 occurred in Catalonia (Catalan Traffic Service (SCT) 2010). The percentage of the youth population affected by accidents is

overrepresented in statistics, as revealed by different official databases (WHO 2011; DGT 2009; SCT 2010) and several research works (Begg and Langley 2001; Ferguson 2003; Fernandes, Hatfield and Job 2010; Fernandes, Job and Hatfield 2007; Jonah 1990; Williams 2006). However a global decrease of traffic mortal accidents is confirmed in Catalonia over the past ten years due to at the implementation of Point System Driving and other preventive and reductive measures (SCT, 2011).

Research on predictors of risky behaviour has considered different factors associated with the person: speeding, drunk driving, driving while fatigued and not wearing seat belts (Fernandes, Hatfield and Job 2010; Harrison and Fillmore 2011; Senserrik 2006), elements associated with the profile of the driver such as gender (roles stereotypes, influence of masculinity), age, tendency to take risks (Ferguson and Jonah 1990), personality traits (sensation seeking, normlessness and aggression) (Fernandes, Job and Hatfield 2007; Iversen and Rundmo 2004; Ulleberg and Rundmo 2003) and emotional abilities (Arnau-Sabatés, Sala-Roca and Jariot-Garcia 2011). Also all the influences of the social environment of the young pre-driver (parents, siblings and peers) may explain the risky behaviour (Assailly, 2011). The passenger and also the condition of the vehicle, the road, the traffic, the weather and the traffic rules and signs (DGT 2009; SCT 2010) which, according to the accident rate statistics, do feature in a proportion of road traffic accidents and can therefore be considered risk factors. Examining certain risk factors associated with specific risky driving behaviors may explain individual differences in risk perception, risk acceptance and risk-taking behaviour and involvement in accidents, thereby enhancing knowledge that can improve traffic safety.

Researchers have also considered, specifically, the effect of age and gender variables on the accident rate (Begg, Langley and Stephenson 2003; Chen et al. 2010; Williams et al., 2012) and their interaction with some of the risk factors. The relevance of these variables in explaining the differences in the tendency to take risks, perception of risk and the accident rate is highlighted, identifying a greater tendency to take driving risks in young people and people aged over 60, compared to middle age adults. Clarke, Ward and Truman's (2005) findings suggest that a large percentage of young drivers' accidents resulted from a voluntary risk-taking rather than lack of skill. A higher incidence of this problem has also been demonstrated in men compared to women, especially regarding speed, attitudes towards risk, alcohol consumption and risk-prone feelings and sensations (Boyce and Geller 2002; Iversen 2004; Iversen and Rundmo 2004; Laapotti, Keskinen and Rajalin 2003; Tronsmoen 2011; Waylen and MCKenna 2008). The effect of being involved in a traffic accident is also considered. Some studies have pointed out the effects of having been involved in an accident on attitudes towards driving (Falk and Montgomery 2007; Kouabenan 2002; McKenna and Albery 2001; Rajalin and Sumala 1997) but results are sometimes contradictory.

Although, on a formative intervention level, research on programmes or actions tends to focus on one or a reduced number of risk factors, as pointed out by Williams (2006), in public health areas (such as the accident rate and its prevention) comprehensive programmes based on attitude change have worked better than those based on singular elements. Falk and Montgomery (2009) highlight the role of affective and emotional factors related with the ghastly consequences of accidents in order to increase pre-drivers' protective behaviour and road safety awareness. The European Matrix GDE (Goals for Driver Education) proposes

four hierarchical levels in road behaviour and high levels (third and fourth) including emotional, motivational and axiological issues related to the awareness of road safety behaviour (Siegrist 1999, Assailly 2010; Tronsmoen 2011). Thus, the role of the emotional dimension should not be ignored in initial road safety training. However, if programmes based on changing pre-drivers' attitudes were applied it would also be necessary to highlight the importance of understanding which cognitive and behavioural intentions can influence the pre-river risky behaviour (Eagly and Chaiken 1993 2007; Maio and Haddock 2010). There are considerable practical implications of working with emotional abilities and attitudes, including the ability to design intervention strategies aimed at enhancing the effectiveness of changing pre-drivers' attitudes and decreasing the accident rate on the road.

The present research attempts to systematically explore the association between awareness of road safety measure and accident involvement in young pre-drivers, detecting differences in the pre-driver risk profile (overall and per factors) according to whether they had suffered an accident before and sex. Also, we want to examine which risk factors are triggered by previous involvement in an accident and identify different risky pre-driver profiles and the main differences between them. Finally, we propose practical implications to design and implement training programmes that highlight each and every one of the elements that may lead to the young person having a traffic accident.

2. METHOD

2.1. Sample

The total number of pre-drivers who participated in the research was 253; the sample selection was determined by the driving instructors from different areas of Catalonia who participated in the subject recruitment applying the questionnaire in their different driving schools. All of whom had taken part in a driving instruction training course given by the Servei Català de Trànsit (Catalan Traffic Service) where they were first instructed to apply the QAR-Precon screening questionnaire. By doing this training we have tried to reduce bias as much as possible. An attempt was made to assign the driving schools in a stratified and proportional way according to the variables area, type of driving school and sex. The sex average is balanced, 131 men (51.8%) and 122 women (48.2%). The majority of the sample (76.2%) is aged between 18 and 24 years old, 18.8% are between 25 and 35 years old and the remaining 5.9% are more than 35 years old. 19.4% of participants also ride a motorcycle. When participants were asked about their experience of accidents as a driver, cyclist, and car passenger or pedestrian, 52.6% of the pre-drivers said they had never had an accident, while 47.4 % claimed they had already had an accident. The intensity of the injuries was mostly slight (51.4%); in the remaining cases they stated they had suffered serious (38.8%) and very serious (9.8%) injuries.

2.2. Instrument

A screening instrument was used to measure road safety awareness and possible risk indicators at the beginning of driving. The instrument was adapted from a validated questionnaire to evaluate risky pre-driving attitudes (QAR-Precon questionnaire -pre-driver

risk evaluation questionnaire-) (Jariot and Montané, 2009). This instrument is composed of a risky road user behaviour measure ($\alpha = 0,991$) and it helps to determine the weak points of each pre-driver and highlight those aspects most related to reducing the accident rate when driving in order to improve their awareness of road safety.

To do the QAR-Precon questionnaire, several studies to assess the accident risk when driving were consulted, as well as the risk factors contributing to the accident rate of young people and the theoretical framework related to changing attitudes in road education and safety. It is divided into three blocks:

I. Personal health and care: it attempts to determine the importance each person ascribes to their integrity and health. If these habits are not looked after or are not considered to be important, it will be more difficult to incorporate safe and responsible driving habits. It consists of 6 items.

II. Main risk factors: it attempts to determine the risk factors associated with crash risk. They are referred to in the extensive literature in this area: speeding, alcohol and tendency to take risks. Other specific risk factors are taken into consideration: the driver's role, the passenger's role, the type of vehicle, the vehicle, the road, traffic and traffic rules, weather, and driving signs. It consists of 75 items.

III. Effective driving maturity test: it attempts to assess the young person's record during the training, and the role each agent must play in preventing accidents. It consists of 9 items.

In this study, we have used block II (main risk factors) to create the screening instrument, since it is related to the behavioural intentions of risky road users. After the reliability analysis described above (point 3.1.), the screening instrument, measured with a conventional Likert style response, contains 50 items concerning pre-drivers' risky road user behaviour in terms of various risky factors, and produces an estimate of risky driving intentions including an "overall risky road user behaviour". The screening instrument included basic demographic information (sex and age) and variables related to accident experience and the injuries suffered as well as self-reported questions regarding behavioural intentions towards different risk factors associated with risky behaviour and involvement in accidents.

2.3. Procedure

The screening questionnaire was given during the drivers' initial training process. They were administered by driving instructors in their training classes (45-min). Questionnaires were photocopied and delivered to the driving schools selected for the sample. The participants were asked to respond sincerely and honestly on the questionnaire in order to minimise inaccurate responses (Zhao et al., 2006). When the questionnaires were completed we were contacted to collect them from the driving schools.

The data was analysed using the statistic programme SPSS (Statistical analysis Package for Social Sciences, 20th version). In order to group the screening questionnaire variables together, an exploratory factorial analysis was used, employing Principal Component

Analysis (PCA). Subsequently, the reliability coefficients of the questionnaire in question and the subscales were calculated using the reliability procedure. An analysis with ANOVA models was used to compare differences and detect the effects of variables sex and involvement in an accident and their interactions in the awareness of road safety behaviour and in each risk factor assessed. Lastly, a two-step clustering procedure was undertaken to identify groups with differing profiles of risky road user behaviour.

3. RESULTS

3.1. Reliability analysis of the QAR- Precon Screening Questionnaire

Of the 75 initial items from block II (main risk factors) of the QAR-Precon questionnaire, after a first correlation analysis of each item with the total sum, 25 were eliminated as they did not obtain a value of more than .3. We observe that the correlation of each item with the total-item less the item and the reliability of each one, if the element of the 50 selected items is eliminated, the high reliability of the scale and the correlations above .3 for each element can be appreciated. The overall reliability of the QAR-Precon screening questionnaire shows a good and acceptable level of internal consistency (α =.944) with a correlation average of .494 between items (see Table 1).

Table 1. Level of internal consistency (alfa de Cronbach) and correlation of each item with the total-item

Items	75 initial items of the QAR_precon Questionnaire		50 selected items for the screening questionnaire	
	Correlation of each item with the total-item	Level of internal consistency if the item is eliminated	correlation of each item with the total-item	Level of internal consistency if the item is eliminated
Ítem7	,093	,933	---	---
item8	,448	,930	,413	,943
item9	,390	,931	,336	,944
item10	,316	,931	,301	,944
ítem 11	,227	,931	---	---
item12	,372	,931	,301	,944
item13	,390	,931	,300	,944
ítem14	,231	,931	---	---
item15	,586	,929	,586	,942
item16	,476	,930	,511	,942
item17	,356	,931	,373	,943
item18	,549	,930	,549	,942
item19	,645	,929	,639	,942
item20	,625	,929	,630	,942
ítem 21	,181	,932	---	---
item22	,601	,930	,637	,942
item23	,631	,929	,630	,942
item24	,583	,930	,617	,942
item25	,528	,930	,567	,942
item26	,264	,931	---	---
item27	,527	,930	,543	,942
item28	,242	,931	---	---
item29	,228	,931	---	---
item30	,613	,930	,644	,942
item31	,295	,931	---	---

item32	,468	,930	,456	,943
item33	,404	,931	,399	,944
item34	,519	,930	,514	,942
item35	,474	,930	,497	,943
item36	,267	,932	---	---
item37	,462	,930	,472	,943
item38	,357	,931	,343	,943
item39	,349	,931	,342	,944
item40	,485	,930	,454	,943
item41	,411	,930	,414	,943
ítem42	-,022	,932	---	---
item43	,291	,931	---	---
item44	,460	,930	,461	,943
item45	,292	,931	---	---
item46	,319	,931	,327	,943
item47	,211	,931	---	---
item48	,124	,932	---	---
item49	-,019	,933	---	---
item50	,146	,932	---	---
item51	,676	,929	,664	,941
item52	,598	,929	,608	,942
item53	,408	,930	,370	,944
item54	,559	,930	,568	,942
item55	,310	,931	,300	,944
item56	,211	,931	---	---
item57	,454	,930	,486	,943
item58	,688	,929	,668	,942
item59	,518	,930	,557	,942
item60	,452	,930	,435	,943
item61	,693	,929	,704	,942
item62	,144	,932	---	---
item63	,498	,930	,561	,942
item64	,353	,931	,409	,943
item65	,040	,932	---	---
item66	,544	,930	,529	,942
item67	,533	,930	,544	,942
item68	,507	,930	,503	,943
item69	,634	,929	,647	,942
item70	-,105	,933	---	---
item71	,150	,932	---	---
item72	,154	,932	---	---
item73	,177	,932	---	---
item74	,298	,931	---	---
item75	,528	,930	,520	,943
item76	,360	,931	,383	,943
item77	,126	,933	---	---
item78	,582	,929	,594	,942
item79	,547	,930	,555	,942
item80	,381	,931	,365	,944
item81	,464	,930	,487	,943

3.2. Exploratory Factorial analysis

After the factorial analysis using the varimax rotation, 5 elements that account for 44.6% of the variance were obtained. The factorial structure of the QAR- Precon Screening Questionnaire shows a dominant factor that accounts for 14.18% of the variance. Factor 2 accounts for 9.42%, factor 3, 8.6%, factor 4, 94% and factor 5, 5.44%.

Table 2. Rotated component matrix

Items	Component				
	1	2	3	4	5
My friends drink alcoholic beverages (I.8)		,426		,301	
I think that "I get on" better when I drink alcoholic beverages (I.9)					.410
Knowing me, I think that I will drive after having had more than one glass of brandy, one glass of spirits, two beers or two glasses of wine (I.10)					.700
I am sure that if I drink I won't drive (I.12)					.770
I think that I can drive well after more than two or three glasses of wine (I.13)					.755
I like the feeling of speed (I.15)	.584	.366			
I like feeling how speed takes over the car (I.16)	.582				
My friends are speed-lovers (I17)		.324			
I think that calm driving is boring (I.18)	.634				
I think that if traffic allowed me I would drive faster than the limit (I.19)	.521	.443			
I think that I will speed more than others if the car allows me to (I.20)	.688				
Sometimes I like to take risks to impress the passengers (I.22)	.553		.327		
It is exciting to feel a sense of risk sometimes (I.23)	.523	.330			
I would like to do competitions in areas with little traffic (I.24)	.656		.359		
I would like to be one of those drivers who tailgates the vehicles in front (I.25)	.551		.382		
I think that I would call myself a daring driver (I.27)	.485			.322	
I like learning how to drive safely (I.30)	.486		.583		
I will smoke while I drive (I.32)			.304	.529	
~~*I want to have my licence so that I can go out at the weekends without having to depend on others (I.33)*~~	~~*,163*~~	~~*,279*~~	~~*,175*~~	~~*,235*~~	~~*,104*~~
I get anxious when drivers drive slowly (I.34)	.385	.519			
I will drive faster with my seatbelt on because it is a safety device (I.35)	.496			.425	
I think that I will be able to drive for three hours straight without any breaks (I.37)	.355				
When I feel tired I think I will stop to sleep (I.38)		.455			
Night driving is as safe as day driving (I.39)			.433		
I like the drivers who have their radio or CD on "full-blast" (I.40)				.637	
I think that I will talk on the phone when I'm driving (I.41)		.486			
I put the music on very loud when I am a passenger (I.44)				.724	
I think I will pass the roadworthiness test (I.46)			.639		.328
I would like to test the limits of my car (I.51)	.553			.347	
I would like to have a car that does not weigh very much and that is very powerful (I.52)	.526				
I will have my mobile connected when I drive (I.53)		.565		.384	
If I had an old car or a car with problems, I would drive slower (I.54)		.371	.335		
I always put the seatbelt on in the same way (I.55)		.314	.316		
If my car had safety systems such as ABS or antiskid, I would often put it to the test in extreme situations (I.57)	.464			.356	
If my car was a GTI or similar, I would overtake a lot (I.58)	.453	.426		.246	
I will slow down before arriving at a crossroads or a roundabout, even if there are no speed reduction signs (I.59)	.347	.332	.571		
On the road, I will overtake at less than 150 metres from a crossroad (I.60)	.307			.327	
I will approach curves faster than the speed limit (I.61)	.521	.300	.462		
I will pay heed to speed reduction signs when there are works on the road (I.63)	.424		.570		
I think that driving is more exciting and fun when there is traffic (I.64)	.519				
When I am in a hurry I will try to overtake (I.66)		.654			

I think that I will prepare myself for possible traffic jams before taking the car, and then when I meet a traffic jam I will remain calm (I.67)		.357	.467		
Traffic in the city makes me anxious. That is why it is better to finish the journey as soon as possible when driving in the city(I.68)	.316	.314			
When I end up in traffic jams I will try to make up the lost time afterwards by driving faster (I.69)	.344	.456	.353		
When there is fog, I will dip my headlights, I will slow down and I will not overtake (I.75)			.411		
I will drive at the same speed whether or not it is raining (I.76)	.321		.410		
When the traffic light is about to turn red I will speed up (I.78)		.550	.373		
It is not strictly necessary to stop at a Stop sign. Sometimes you can look and if there are no cars coming you can keep driving (I.79)	.314		.466		
When I come across a sign that gives me right of way I will make use of it and force the other drivers who don't have right of way to let me pass (I.80)				.380	
There are a lot of traffic signs that have no use (I.81)				.471	
Explained variance (%) **Total:** 44.6 %	**14.2**	**9.42**	**8.6**	**6.94**	**5.44**

Factor 1. Speed and risk: The first factor consists of 22 items (15, 16, 18, 19, 20, 22, 23, 24, 25, 27, 35, 37, 51, 52, 57, 58, 60, 61, 64, 68, 76, 79) with positive correlations oscillating between .307 and .688. This large factor is composed of items that relate the emotions that encourage risk and speed. Some items also have correlations greater than .3 in other factors (2, 3 and 4). However, the correlation coefficient is always higher in factor 1. (See table 2).

Factor 2. External circumstances: The second factor consists of 9 items (8, 17, 34, 38, 41, 53, 66, 69, 78) with positive correlations oscillating between .426 and .654. All the items are related to either elements or circumstances that are external to the driver, or to nearby people and other drivers. Two items (38 and 78) may appear to be different, but they are unforeseen elements or circumstances (sleep or a traffic light that turns red), and, therefore, are considered to be external to the driver. Four of the nine items overlap with other factors (1, 3 and 4) with correlations higher than .3 (See table 2).

Factor 3. Other driving elements: The third factor, consisting of 9 items (30, 39, 46, 54, 55, 59, 63, 67, 75), presents positive correlations oscillating between .316 and .639. This factor is related to rational safety elements. The behaviour described in the items generally demonstrates a certain degree of awareness towards safe behaviour. Item 39 (night driving is as safe as day driving) only features in this factor but it must be considered with caution since the use of the gerund does not necessarily have to imply risk. However, nor does it imply safety. On the contrary, the example in item 76 "I will drive at the same speed whether or not it is raining" is clearly located in the tendency to take risks factor. Five of the nine items overlap into factors 1 and 2.

Factor 4. Distraction: The fourth factor, consisting of 5 items (32, 40, 44, 80, 81) with correlations oscillating between .380 and .724, is related to the elements of attention/distraction when driving. Only one item overlaps into another factor (3). The items gather information about what young people think about traffic signs (80 and 81). Young drivers may also interpret these signs as distraction factors.

Factor 5. Alcohol and driving: The fifth factor comprises four items (9, 10, 12, 13) which do not overlap into any other factor. They present positive correlations oscillating between .410 and .770. The factor exclusively includes those elements linked to alcohol consumption.

The factorial analysis (as can be observed in the rotated component matrix) reveals the presence of one item (33) with correlations lower than .280 in the 5 factors. After the result was obtained, and despite the fact that its correlation with the total items was .399, a decision was made not to consider it, since its content (see table 2) could potentially not mean safety or risk, and nor is it representative of the target population of the analysis.

3.3. Analysis of reliability according to the five risky factors explored

In Factor 1 (speed and risk) the alpha coefficient obtained (0.917) is high or excellent, indicating that the items of which it is composed have a high internal consistency and measure the construct in a coherent manner. Factors 2 (external circumstances) and 3 (other elements of driving) show an acceptable level of reliability (alpha of 0.772 in factor 2 and alpha of 0.752 in factor 3). In factor 4 (distraction), the reliability level can be considered to be acceptable (alpha 0.648), while in factor 5 (alcohol and driving) a low reliability level can be observed, since the alpha coefficient obtained is less than 0.5 (alpha 0.344).

3.4. Differences in results according to the sex and accident experience variables

A Two-Way ANOVA analysis was conducted, taking into consideration “sex” and “accident experience” variables as independents and risky road user behaviour and each risk factor assessed as dependents.

Analysis shows significant differences between men and women in the sample: male pre-drivers show a significantly higher overall risky road user behaviour than women [M= 1.82 vs M= 1.73; $F(1, 252) = 3.782$; $p=0.05$]. Men also reveal a higher scores than women in speed and risk [M= 1.87 vs M= 1.67; $F(1, 252) = 10.718$; $p<0.005$]. In the alcohol consumption factor, external circumstances factor, distraction factor and in other elements of driving factor there are no significant differences between sexes.

Significant differences are highlighted according to experience of an accident. Contrary to our initial hypothesis, pre-drivers who had experienced an accident reported less awareness of road safety and tended to score higher in their overall risky road user behaviour than those who had never been involved in an accident [M= 1.88 vs M= 1.67; $F(1, 252) = 18.714$; $p<0.0005$]. Pre-drivers who had had an accident also tended to assume more risky behavioural intentions in the five risk factors assessed: in alcohol consumption [M= 1.65 vs M= 1.34; $F(1, 252) = 21.451$; $p<0.0005$], in speed and risk [M= 1.87 vs M= 1.67; $F(1, 252) = 10.182$; $p<0.0005$], in the distraction factor [M= 2.14 vs M= 1.91; $F(1, 251) = 8.628$; $p<0.005$], in other elements of driving [M= 1.50 vs M= 1.38; $F(1, 252) = 5.384$; $p<0.05$] and in the external circumstances factor [M= 2.26 vs M= 2.07; $F(1, 252) = 9.015$; $p<0.005$]. The analysis also confirms that there are no significant differences between the severity of the injuries that pre-drivers had suffered and their road safety awareness. Nevertheless, pre-drivers who had suffered the most serious injuries reported a higher tendency for risky behaviour.

No significant interactions were found between sex and accident experience variables in the overall risky road user behaviour and each risk factor.

3.5. Relation between risky road user behaviour and involvement in an accident

Logistic regression analyses were conducted to determine which of the five risky driving factors assessed best predict involvement in a road accident treated as a dependent variable. The results produce one model in which the alcohol factor increases triple the probability of being involved in a traffic accident [Odds Ratio= 2.9; p<0.005]. The other four risky factors don't predict accident involvement significantly.

3.6. Identification of different risky driving groups

To identify the most appropriate cluster solution, a series of analyses (The dendogram and agglomeration schedules and a series of non-hierarchical cluster analyses (i.e. K-means)) indicated that it was possible to distinguish two cluster solutions characterised by low/moderate and high risky driving clusters of young pre-drivers.

The clusters identified were:

High group (n = 36, 14.2% sample, 66.7% male). This small cluster scored higher for all the risk factors examined reporting that, on average, they tend to take more risks. 80.6% had had a crash experience and 83.3% of them had suffered serious and very serious injuries.

Low group (n = 217, 85.8% sample, 49.3% male). This cluster reported, on average, more awareness of road safety and the rates of speed and risk, external circumstances, alcohol consumption, driving elements and distraction were considerably lower than the high group. 41.9% had had a crash experience and 57.1% of them had suffered injuries.

The viability of this two-cluster solution was assessed comparing differences on the overall road user behaviour (awareness of road safety) and the five risky road user factors assessed measured as dependent variables and cluster group as independent. In the awareness of road safety measure [low: M= 1.7; high: M= 2.5; $F(1, 252) = 285.468$; p<0.0005], the high group reported less awareness of road safety than the low group. The cluster groupings were also compared for all the risk factors assessed. Significant group differences were evident (See Table 3).

Table 3. Means, Standard deviations and statistical comparisons of the two risky driving clusters on the five defining risk factors applying ANOVA one way

	Low (n=217)		High (n=36)		ANOVA (1, 252)
Unsafe road user behaviour	Mean	S.D.	Mean	S.D.	*F*
speed and risk	1.64	0.33	2.55	0.64	13.985***
external circumstances	2.05	0.40	2.82	0.42	108.993***
other elements of driving	1.35	0.26	1.94	0.66	86.776***
distraction	1.88	0.50	2.86	0.56	112.030***
alcohol consumption	1.37	0.40	2.21	0.69	105.448***

***<0.0005

High group achieved higher scores for each risk factor than the low group. Differences in speed and risk factor were also significant, even though they were smaller.

The two risk driving groups differed significantly in gender composition, $\chi 2(1) = 3.725$, $p = 0.5$, with significantly more males in the high group, and more females in the low group. Significant group differences were evident in the rates of accident involvement, $\chi 2(1) = 18.470$, $p = <0.0005$; the high group reported experiencing significantly more situations of being involved in an accident than the low group.

4. DISCUSSION

This screening questionnaire is relevant as a self-report to assess young pre-drivers. The tool in its entirety is valid and reliable although the subscales related to distraction and alcohol should be reviewed. The scarce number of items on these two subscales (5 for distraction and 4 for alcohol) should be increased so that each of the QAR-Precon subscales can be used to make educational decisions on each and all of the risk factors assessed, as advised by authors such as Iacobucci (2001), Iacobucci and Duhachek (2003), Kaplan and Sacuzzo (2009) and Nunnally and Bernstein (1994). The 25 items that overlap into more than one factor should be examined with a view to improving the psychometric properties of the QAR-Precon. These items need to be reviewed or deleted:

> Regarding the 5 items that overlap in Speed and Risk – External Circumstances, it is proposed that the way in which the 4 items are written should be changed as they may confuse the pre-driver, either because they include two questions (item 68) or because the writing is complex (items 19, 34 and 58).
>
> An examination of the 8 items that overlap into Speed and Risk - Other elements of driving, reveals that since the pre-driver lacks experience as a driver, another situation must be used to assess the tendency to take a risk (item 22), the question should be more explicit (items 24, 25, 30) or the sentence should be less complex (items 63, 76, 79):
>
> An examination of the 6 items that overlap in Speed and Risk – Distraction, reveals the need to simplify the statement in item 27, clarify or change the words in items 35 and 51, and replace all those questions which, in order to answer them require experience as a driver, with others that show if the pre-driver has incorrect information (items 37, 57, 60)
>
> An examination of the items overlapping in External Circumstances – Other elements reveals the need to specify the situation analysed in some items (54 and 78), simplify the writing of item 55 and shorten the statement in item 67 since it contains two questions.
>
> Lastly, item 69 which overlaps in Speed and Risk – External situations – Other elements of driving, should be improved, specifying the situation analysed. (E.g.: I.69: If I meet a traffic jam, when I pass it I will drive faster to make up the lost time).

This research confirms that significant gender differences were evident, with more males than females reported a higher tendency to take risks. Men present a higher overall and per factor risk profile (speed and risk) in their awareness of read safety than women. These data are consistent with research undertaken by Fernandes, Job and Hatfield (2007), Fernandes, Hatfield and Job (2010), Sirkku and Keskinen (2008) and Waylen and McKenna (2008), who highlight greater risky behaviour when driving in the case of male pre-drivers, and a higher number of accidents, than in the case of women. Research consulted indicates that young

men present, in general, a higher tendency to take risks than women (Arnett 1992; Arnett 1994; Byrnes, Miller and Schafer 1999; Roth, Schumacher and Brahler 2005), which correlates directly with an increase in risky behaviour when driving (Harré and Sibley 2007).

It seems reasonable that involvement in an accident would increase the beliefs and emotions about negative events and heighten the sense of susceptibility to the consequences of accidents. Surprisingly, we found that pre-drivers who had had an accident reported less awareness of road safety and tended to assume more risky road user behaviours even when the severity of the injuries had been serious. In the same vein, Rajalin and Sumala (1997) found that drivers tend to resume their previous driving style a few months after the accident and only those drivers who attributed the cause of a fatal accident to themselves reported having changed their driving style permanently. On the contrary, McKenna and Albery (2001) found that drivers who had suffered serious injuries from an accident manifested less intention to speed in the future. Kouabenan (2002) also found that those who had experienced an accident took less risk compared to drivers who had never suffered an accident.

The results indicate that a change in driving style intentions may not be a general outcome of being involved in an accident. Therefore, experience of an accident does not have a direct effect on self-reported risky road user behaviour. Consequently, it could not be considered as a variable of road safety awareness in this target group. Meanwhile, we should be cautious with these results; future research must test the effect of experiencing an accident and the evolution of the tendency to accept and take risks over time in pre-drivers and in the general population in order to confirm our findings and the indirect effect that age, driving exposure and emotional skills development probably have on self-reported risky driving intentions. Furthermore, it would be interesting to carry out an in-depth analysis of the relationship between road safety awareness and the severity of the injuries, the relationship with accident victims or if the victim or the offender is oneself.

As mentioned in the results, the two-cluster solution (characterised by clusters reporting low-moderate and high levels of risky driving behaviour) was considered. There are clear significant differences between them. Young pre-drivers engaged in high risky driving behaviour (*high group*) differed significantly from others in aspects of the overall risk profile and in the five risk factors assessed, and reported more accident rates on average. There were on average more males in the high group, and more females in the low group, confirming that males are in fact more likely to engage in risky driving behaviour than females.

The results obtained in the research justify and are consistent with the idea of highlighting, in education, the transmission and incorporation of feelings and emotions related to the experiential understanding of the consequences of risk factors such as speed, the tendency to take risks and the ghastly consequences of accidents, especially for those pre-drivers who are in the high risk group. Falk and Montgomery (2009) suggested the importance of incorporating the transition of feelings into young people's road education in order to integrate their negative accident experience and increase in this way their protective behaviour and road safety awareness. Intervention built on imagining the personal emotion of being the perpetrator of a serious accident, the transmission of feelings through the

presence of people who are sensitive to the consequences of traffic accidents, and the incorporation of values through a group dynamic between the witness, the driving instructor as a moderator, and the users are different intervention strategies to reduce the accident rate that should be developed and tasted.

However, we must also take into consideration the fact that emotions are only one dimension of the change in attitude. Feelings help to strengthen the ideas and safety habits related to safe driving, but they alone are not enough. The basis for a pre-driver safety programme should include the three elements of attitude change. We find that ideas tell us how information influences attitude change, how emotions include feelings that encourage and discourage risk, and how understanding behavioural elements helps us to understand how attitude is established and its possible resistance or facility towards change (Eagly and Chaiken 1993, 2007; Maio and Haddock 2010). Preventive programmes on consuming alcoholic drinks and driving (Arnau et al. 2011; Aresi et al. 2009) and others related to reducing speed (Jariot and Montané, 2009) have shown that it is possible to improve and change the attitudes of young pre-drivers by acting on each dimension of attitude separately.

The results obtained recommend that the design and development of educational interventions aimed at young pre-drivers should consider emotions, beliefs and behavioural intentions related to the five risk factors assessed, especially speed and risk, increasing the effectiveness and efficiency of the intervention. Improving safety and bringing about a change in attitude in the different risk groups requires preventive educational programmes that incorporate each and every one of the elements that may contribute to the accident rate.

The measures were self-reporting and thus, the influence of socially desirable response tendencies should not be excluded. Nevertheless, the participants were asked to respond sincerely and honestly on the questionnaires in order to minimise inaccurate responses (Zhao et al. 2006). Some risky driving studies confirmed the accuracy of self-reporting in this field (Iversen 2004; Lajunen and Summala 2003; Tronsmoen 2011). However, apparent differences in risk preference could be associated with cultural differences. For this reason, it's important to evaluate cultural differences in the perception of the risk and in attitude towards perceived risk at both the individual and group levels in order to better profiling its applicability (Nordfjærn, Jrgensen and Rundmo 2011). It would be interesting for future research to identify factors that may predict involvement in crashes and to further explore the link between the effects of a personal negative experience such as an accident (e.g. the number of crashes when driving, whether alone or carrying passengers, whether the crash resulted in property damage or injury/death), protective driving behaviour and awareness of road safety.

5. ACKNOWLEDGMENTS

The authors wish to thank *Servei Català de Trànsit* (Catalan Traffic Service) and *Càtedra de Formació i Educació Viàries* (Chair of Road Training and Education) for their support, and also thank the respondents who answered the questionnaire.

6. REFERENCES

Aresi, G., L. Fornari, C. Repetto, and M. Scolari. 2011. Evaluación de una intervención con conductores designados para prevenir los accidentes de tráfico provocados por el alcohol en las discotecas de Milán, Italia. *Adicciones* 21: 279-288.

Arnau-Sabatés, L., J. Sala-Roca, and M. Jariot-Garcia. 2011. Emotional abilities as predictors of risky driving behaviour among a cohorte of middle aged drivers. *Accident Analysis and Prevention* 45: 818-825.

Arnau, L., G. Filella, M. Jariot, and J. Montané. 2012. Evaluación de un programa de cambio de actitudes con preconductores para prevenir los accidentes de tráfico provocados por el alcohol en Cataluña. *Adicciones* 23: 257-275.

Arnett, J. 1992. Reckless behaviour in adolescence; a developmental perspective. *Developmental Review* 12: 339–373.

Arnett, J. 1994. Sensation seeking: a new conceptualization and a new scale. *Personality and Individual Differences* 16: 289–296.

Assailly, J P. 2010. Les réformes du permis de conduire en cours en Europe et les recherches dans ce domaine: comment former le conducteur, comment éduquer l'homme?. *Educar* 46 : 9 – 26.

Assailly, J P. 2011. *The psychology of risk*. Nova Science Publishers, New york.

Begg, D.J., and J.D. Langley. 2001. Changes in risky driving behavior from age 21 to 26 years. *Journal of Safety Research* 32: 491−499.

Begg, D.J., J.D. Langley, and S. Stephenson. 2003. Identifying factors that predict persistent driving after drinking, unsafe driving after drinking, and driving after using cannabis among young adults. *Accident Analysis and Prevention* 35: 669−675.

Boyce, T. E., and E.S. Geller. 2002. An instrumented vehicle assessment of problem behaviour and driving style: Do younger males really take more risks?. *Accident Analysis and Prevention* 34: 51–64.

Byrnes, J., D. Miller, and W. Schafer. 1999. Gender differences in risk taking: a meta-analysis. *Psychological Bulletin* 125: 367–383.

Chen, H. Y., T. Senserrick, H.Y. Chang, R.Q. Ivers, A. L. C. Martiniuk, S. Boufous, and R. Norton. 2010. Road Crash Trends for Young Drivers in New South Wales, Australia, from 1997 to 2007. *Traffic Injury and Prevention* 11: 8-15.

Clarke, D. D., P. Ward, and W. Truman. 2005. Voluntary risk taking and skill deficits in young driver accidents in the UK. *Accident Analysis and Prevention* 37: 523–529.

DGT. 2009. Las principales cifras de la siniestralidad vial – España 2009. Available at: http://www.dgt.es/was6/portal/contenidos/es/seguridad_vial/estadistica/publicaciones/princip_cifras_siniestral/cifras_siniestralidadl009.pdf, Accessed on November 12, 2011.

Eagly, A. H., and S. Chaiken. 1993. *The psychology of attitudes*. Fort Worth, TX, Harcourt Brace.

Eagly, A. H., and S. Chaiken. 2007. The advantages of an inclusive definition of attitude. *Social Cognition* 25: 582-602.

EUROSTAT. 2010. Road safety statistics at regional level. Available at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Road_safety_statistics_at_regional_level, Accessed on November 12, 2011.

Falk, B., and H. Montgomery. 2007. Developing traffic safety interventions from conceptions of risks and accidents. *Transportation Research Part F* 10: 414–427.

Falk, B., and H. Montgomery. 2009. Promotion traffic safety among young male drivers by means of elaboration-bases interventions. *Transportation Research Part F* 12: 1-11.

Ferguson, S.A. 2003. Other high-risk factors for young drivers—how graduated licensing does, doesn't, or could address them. *Journal of Safety Research* 34: 71– 77.

Ferguson, S. A., and B. A. Jonah. 1990. Age differences in risky driving. *Health Education Research* 5: 139−149.

Fernandes, R., J. Hatfield, and R.F.S. Job. 2010. A systematic investigation of the differential predictors for speeding, drink-driving, driving while fatigued, and not wearing a seat belt among young drivers- *Transportation and Research Part F* 13: 179-196.

Fernandes, R., R. F. S. Job, and J. Hatfield. 2007. Different factors predict different risky driving behaviours: A challenge to the assumed generalizability of prediction and countermeasure. *Journal of Safety Research* 38: 59-70.

Harré, N., and C. G. Sibley. 2007. Explicit and implicit self-enhancement biases in drivers and their relationship to driving violations and crash-risk optimism. *Accident Analysis and Prevention* 39: 1155–1161

Harrison, E., and M. T. Fillmore. 2011. Alcohol and distraction interact to impair driving performance. *Drugs and alcohol dependence* 117: 31 – 37.

Iacobucci, D., and A. Duhachek. 2003. Advancing Alpha: Measuring Reliability with Confidence. *Journal of Consumer Psychology* 13: 478-487.

Iacobucci, D. 2001. Methodological and statistical concerns of the experimental behavioral researcher. *Journal of Consumer Psychology* 10: 55–62.

Iversen, H. 2004. Risk - Talking Attitudes and risky driving behavior. *Transportation Research Part F* 7: 135-150.

Iversen, H., and T. Rundmo. 2004. Attitudes towards traffic safety, driving behaviour and accident involvement among the Norwegian public. *Ergonomics* 47: 555–572.

Jariot, M., and J. Montané. 2009. Actitudes y velocidad en jóvenes. Aplicación de un programa de educación. *Relieve* 15: 1-21.

Jonah, B. A. 1997. Sensation seeking and risky driving: A review and synthesis of the literature. *Accident Analysis and Prevention* 29: 651−665.

Kaplan, R. M., and D. P. Sacuzzo. 2009. Pycological Testing. Principles, aplications and issues. Wadsworth, Cengage Learning.

Kouabenan, D. R. 2002. Occupation, driving experience, and risk and accident perception. *Journal of Risk Research* 5: 49–68.

Laapotti, S., E. Keskinen, and S. Rajalin. 2003. Comparison of young male and female drivers' attitude and self-reported traffic behaviour in Finland in 1978 and 2001. *Journal of Safety Research* 34: 579–587.

Lajunen, T., and H. Summala. 2003. Can we trust self-reports of driving? Effects of impression management on driver behaviour questionnaire responses. *Transportation Research Part F* 6: 97–107.

Maio, G. R., and G. Haddock. 2010. *The psychology of attitudes and attitude change.* London, SAGE.

Nordfjærn, T., Jrgensen, S., Rundmo, T. 2011. A cross-cultural comparison of road traffic risk perceptions, attitudes towards traffic safety and driver behavior. *Journal of Risk Research* 14(6): 657-684.

Nunnally, J. C., and I. H. Bernstein. 1994. Psychometric theory (3rd ed.). New York, McGraw-Hill.

McKenna, F. P., and I.P. Albery. 2001. Does unrealistic optimism change following a negative experience?. *Journal of Applied Social Psychology* 31: 1146–1157.

Rajalin, S., and H. Summala. 1997. What surviving drivers learn from a fatal road accident. *Accident Analysis and Prevention* 29: 277–283.

Roth, M., J. Schumacher, and E. Brahler. 2005. Sensation seeking in the community: sex, age and sociodemographic comparisons on a representative German population sample, *Personality and Individual Differences* 39: 1261–1271.

SCT. 2010. Anuari estadístic d'accidents a Catalunya. Available at: http://www20.gencat.cat/docs/transit/Documents/Seguretat%20viaria/anuari_accidents_2009.pdf, Accessed on November 12, 2011.

Senserrick, T. M. 2006. Reducing young driver road trauma: guidance and optimism for the future. *Injury Prevention* 12: 56 – 60.

Siegrist, S. ed. 1999. Driver training, testing and licensing —towards theory-based management of young drivers' injury risk in road traffic. Résultats du projet de l'Union Européenne GADGET, work package 3: Bfu-Report 40. Schweizerische Beratungstelle Fuer Unfallverhuetung, Berna.

Sirkku, L., and E. Keskinen. 2008. Fatal Drink-Driving Accidents of Young Adult and Middle-Aged Males—A Risky Driving Style or Risky Lifestyle?. *Traffic Injury and Prevention* 9: 195–200.

Tronsmoen, T. 2011. Differences between formal and informal practical driver training as experienced by the learners themselves. *Transportation Research Part F* 3:176–188.

Ulleberg, P., and T. Rundmo. 2003. Personality, attitudes and risk perception of risky driving behaviour among young drivers. *Safety Science* 41: 427-443.

Waylen, A. E., and F.P. McKenna. 2008. Risky attitudes towards road use in pre-drivers. *Accident Analysis and Prevention* 40: 905–911.

WHO. 2011. Día Mundial en Recuerdo de las Víctimas de Accidentes de Tráfico 20 de noviembre de 2011. Available at: http://www.who.int/mediacentre/events/annual/road_victims/es/index.html, Accessed on November 12, 2011.

Williams, A. F. 2006. Young driver risk factors: successful and unsuccessful approaches for dealing with them and an agenda for the future. *Injury Prevention* 12: 4- 8.

Williams, A. F., B.A. Bethany, R. West, and R.A. Shults. 2012. Fatal Crashes of 16- to 17-Year-Old Drivers Involving Alcohol, Night time Driving, and Passengers. *Traffic Injury Prevention* 11: 8-15.

Zhao, J., R. E. Mann, M. Chipman, E. Adlaf, G. Stoduto, and R. G. Smart. 2006. The impact of driver education on self –reported collisions among young drivers with a graduate license. *Accident Analysis and Prevention* 38, 35–42.