THE EFFECT OF FAMILY CLIMATE ON THE SELF-REPORTED RISKY DRIVING BEHAVIOR OF YOUNG NOVICE DRIVERS

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ABSTRACT

The aim of the study was to examine the relative importance of a young novice driver's family climate on their driving behavior. Young novice drivers between the age of 17 and 24, who held their temporary (or permanent) driver's license for no longer than one year, participated. The participants completed a survey in which their family climate was questioned together with 3 socio-cognitive determinants (i.e. attitude, locus of control and peer compliance). The results showed that family climate indeed is a significant predictor of risky driving behavior, even though the impact mainly originated from one factor. In addition, the results confirmed the importance of other external and internal determinants, to the degree that the socio-cognitive determinants significantly predicted the risky driving behavior of the young novice drivers.

Keywords: Family climate, parental influence, young novice drivers, risky driving behavior

1. INTRODUCTION
1.1. Parenting

Although their participation in traffic is rather low when compared to other age categories, young novice drivers between the age of 18-24 are overrepresented in accident statistics (1,2). Numerous studies have explored the different contributing factors to these crashes such as developmental factors (3), alcohol abuse (4), inexperience (5), background characteristics such as gender and age (6), neurocognitive determinants such as sensation seeking (7,8), etc. Over the last few years social influences, and more specifically the influence of parents, has been explored. As can be derived from Bandura's social learning theory (9) behaviors can be modified by learning from others, both directly through verbal persuasion and experiences, and indirectly through vicarious experiences and thus observable behavior of others. Because of their educative responsibility, parents may influence their children's driving behavior through family socialization (10). Parent-offspring socialization has been explored for a variety of traffic safety related behaviors (11–13). However, the majority of research on the direct and indirect influence of parents that has been carried out, was with regard to the driving behavior of young novice drivers (14–21). A longitudinal study by Shope et al. (16) found that the negative influence of parents (measured by parental monitoring, family connectedness, nurturing and lenient attitude toward young people's drinking) increased young drivers' risk of collision and driving violations, and vice versa. Ferguson et al. (17) indicated that the driving records of children are related to the driving records of their parents, with children whose parents had more than 3 crashes being more likely to be involved in at least one crash themselves. Similar results were found by Wilson et al. (22). Another longitudinal study indicated that the risky driving behavior of young drivers at the follow up measurement was, among others, predicted by parental restrictions (19). Bianchi and Summala (15) showed that the self-reported driving behavior of parents explained the self-reported driving behavior of their children. Scott-parker et al. (14) revealed that anticipated parental reward significantly explained risky driving of youngsters. Miller and Taubman-Ben-Ari (20) further stressed the importance of parental influence, based on significant correlations between the driving styles of young drivers and their parents. Although the impact that parents have on their children's driving behavior has been made evident, further research on how these parental driving behaviors are transmitted is required. What the different aspects of parental influence are and what the impact is relative to other determining intrinsic or environmental factors is still required, and can be meaningful to better understand the process of parent-child socialization in traffic safety.

1.2. Family Climate

Social learning, intergenerational, and socialization theories have placed significant emphasis on familial processes of behavior transmission and focused more particularly on parents as offspring role models (10). Starting from the idea that parenting practices are strongly embedded in a somewhat broader 'family context', Taubman-Ben-Ari and Katz-Ben-Ami (23) recently added the concept of 'family safety climate' to the literature on parenting. In an exploratory study, Taubman-Ben-Ari and Katz-Ben-Ami (23) proposed 7 domains that shape the family climate for road safety (FCRS) concept. Together, these 7 dimensions cover the 2 basic mechanisms of direct and indirect parental transmission as they can be derived from the seminal work on social learning by Bandura (9). More specifically, 2 dimensions stand for forms of indirect social learning (i.e. modeling and non-commitment), and 5 dimensions can be qualified as forms of direct social learning (i.e., monitoring, limits, feedback, messages, and communication). While monitoring relates to the level up to which parents supervise their children's driving behavior, the factor 'limits' stands for the extent to which parents really set clear restrictions.   The relevance of these two factors is derived from studies showing that parental monitoring and imposing proper restrictions (e.g., night time driving, driving with peer passengers) both have an influence on the driving behavior of adolescents (16,19,24,25). Interestingly, for driving restrictions to be effective, it is important that parents and their children are in agreement with each other (25). In addition, it appears best to actively involve children in negotiating driving limits since low autonomy-supportive parental environments have been shown to associate with strong extrinsic aspirations, with the latter being significantly related to an increased propensity to engage in high-risk behavior (26).

Although the factors 'feedback' and 'messages' closely relate to each other, they address two different aspects of the interaction between parents and their children. On the one hand, 'feedback' refers to the encouragement and positive comment parents provide on their children's driving. 'Messages' on the other hand, relates to parents explicitly verbalizing their own personal opinion on the importance of road safety, also outside the context of discussing or evaluating their children's driving behavior.

The factor 'communication' in turn, stands for still another qualitative aspect of parent-child interaction, namely, the level up to which they maintain open and direct contact with each other. The importance of open and more direct parent-child communication for the prevention of risky behavior has been assessed recurrently for a multitude of impaired health-related behaviors other than risky driving (e.g., smoking, substance abuse, unsafe sex, etcetera) (27). Also, as demonstrated by Sherman et al. (28), open communication is important to avoid misunderstandings with respect to the application of any eventual rules and restrictions related to children's driving.

The two remaining factors, i.e., 'modeling' and 'non-commitment' both are to be considered as forms of indirect social learning. Modeling is about the example parents set through their own attitude and driving style. The importance of modeling in driving behavior is undeniable, as research shows that driving behaviors of children mirror the driving behaviors of their parents (10,15,20,29) and that crash rates and violations of parents can predict those of children (17,22). The factor 'non-commitment' refers to parents' tendency to be actively involved in and committed to road safety themselves (or not). There is research indicating that parents' more outspoken engagement in road safety increases desirable attitudes and driving behavior (30). Taubman-Ben-Ari and Katz-Ben-Ami (23) developed a questionnaire (i.e. the Family Climate for Road Safety Survey (FCRSS)) to measure these 7 factors and were able to identify them as the conceptual backbone of 'family safety climate' by means of factor analysis in a sample of Israeli young novice drivers. Moreover, they explored the predictive validity of their 'family safety climate' model, and found that 2 out of the 7 underlying dimensions significantly predicted Israeli young novice drivers' commitment to safe driving. Additionally, 4 out of 7 dimensions also predicted a set of self-reported driving violations. As will become clear, the current study uses this measurement scale in order to assess the effect of family climate on the behavior of young novice drivers in Flanders.

1.3. Socio-cognitive determinants of behavior

Within the literature on health psychology and road safety, it is a well-established fact that an individual's behavior is not only guided by external factors (such as family climate), but by internal dispositions as well (e.g.31). Different socio-cognitive models exist that focus on a variety of such external and internal dispositions (e.g.32). with three of these often cited in studies on young novice drivers, i.e., attitude, peer compliance, and locus of control (LOC). Attitudes are 'tendencies to evaluate an entity with some degree of favor or disfavor, ordinarily expressed in cognitive, affective, and behavioral responses' (33). Attitudes in traffic safety can be seen as the expression of favor or disfavor towards different traffic safety behaviors. It has been shown repeatedly that attitude towards road safety is an important predictor of driving behavior (34,35,36) which explains inclusion of this variable into our study.

Another frequently studied factor which can be taken into consideration when looking at behavior prediction is Locus Of Control. Locus of control consists of 2 dimensions, [1] Internal locus of control: the perceived behavioral control over outcomes, and [2] external locus of control: the perception that outcomes are determined by non-behavioral factors (37). Different studies support that locus of control is a solid and reliable predictor of motor vehicle crashes and that it enables to distinguish drivers that are involved in fatal motor crashes more accurately from drivers that are not (38,39). We therefore also incorporate locus of control into this study.

Besides family climate for road safety, peer pressure is another external factor to take into account when predicting driving behavior. Peer pressure can be either implicit: derived from the behavior of others, or explicit: behavior that is stated or encouraged by others. Different studies confirmed the influence of peers on young people's driving behavior (14,40,41). Since peer pressure is a an element of social learning and its relevance in driving behavior has been made evident, it will be included in the study.

1.4. Objective

The main objective of this study is to examine the relative importance of young novice drivers' family climate for road safety on their driving behavior, when three relevant personal determinants (i.e., attitude, peer pressure, and locus of control) are also taken into consideration. Since we reuse the family climate for road safety scale as it was developed by Taubman-Ben-Ari and Katz-Ben-Ami (23) only in a sample of young novice drivers that differs in terms of nationality (i.e., Flemish vs Israeli), this study also allows us to explore the extent to which this scale validates cross-nationally.

2. METHOD
2.1. Participants

Young novice drivers were recruited via convenience sampling: an online survey was developed and distributed through the University of Hasselt and online boards. One hundred and seventy-one young novice drivers (104 women; 67 men) completed the questionnaire. The participants ranged in the age from 17 to 24 ($M = 19.71$, $SD = 1.49$) and were in possession of their temporary driver's license ($M = 15$ months, $SD = 7$) or in possession of their permanent driver's license for no longer than one year ($M = 8.5$ months, $SD = 3.4$). Respondents participated on a voluntary basis.

2.2. Procedure And Instruments

Participants were asked to complete an online questionnaire consisting of 5 components measuring [1] background data, [2] family climate for road safety and peer compliance as external determinants, [3]

attitude and locus of control as internal determinants, [4] risky driving behavior, and [5] social desirability.

Risky Driving Behavior: the 6 items in the risky behavior scale were derived from several road user behavior questionnaires (34,42,43) and probed for several forms of dangerous driving (e.g., "It sometimes happens that I drive to close to the vehicle in front of me"). Lower values on a 5-point Likert scale indicate commission of unsafe (i.e., risk supportive) actions while higher values imply commission of safe (i.e., risk aversive) actions. TABLE 1 contains the details.

Family Climate for Road Safety: the original scale for measuring family climate for road safety was used, with the exception of 2 items that were discarded because they did not really apply to the Flemish family context . The final survey thus consisted of 52 items. Participants expressed their level of agreement with these items on a Likert scale from 1 (very much) to 5 (not at all). As will be discussed more in detail under section 3.1.1., factor analysis indicated the most optimal solution retained 36 items for which mean values, standard deviations, and factor loadings are reported in TABLE 2.

Attitude: the attitude scale measured the attitude of the young drivers towards risky driving behavior. It consisted of 6 items that were derived from existing surveys such as the Driver Attitude Questionnaire (44) and the attitude scale developed by Iversen (34). The items covered different topics: drinking and driving, drugs, speeding, close following, seat belt use and using a cellphone while driving (e.g., "If you are very careful it is acceptable to drive a little faster"). Items were measured by means of 5-point Likert scales with lower values indicating a negative (i.e., risk supportive) attitude and higher values indicating a positive (i.e., risk aversive) attitude. Mean values, standard deviations and Cronbach's alpha can be found in TABLE 1.

Locus Of Control: the locus of control scale measured the level of control participants believe to have over a selection of risk facilitating traffic situations. We borrowed 6 items from already existing LOC-scales (45,46). More in detail, we used items for both internal (e.g., "If I am in a hurry, it can happen that I drive more recklessly") and external LOC (e.g., When all others drive fast, I will drive faster myself"). Again, we used a 5-point Likert scale with lower values indicating a lower level of control whereas higher values indicate a higher level of control. We refer to TABLE 1 for more detailed information on these items.

Peer Pressure: the peer pressure scale contained 6 items tapping respondents' tendency to take into account (or not) both implicit as well as explicit influences exerted by their peers. Items were drawn from already existing scales such as the 'social norms towards speeding' scale developed by Parker, Manstead and Stradlin (44). Both implicitly (e.g., "My friends regularly use their cellphones while driving") and explicitly expressed peer norms were assessed (e.g., my friends don't mind if you don't wear your seatbelt all the time"). Participants expressed their level of agreement on 5-point Likert scales with lower values suggesting high presence of risk supportive peer norms and higher values standing for low presence of risk supportive peer norms. TABLE 1 contains more detailed information.

Social Desirability: social desirability is a form of response bias driven by respondents' tendency to give answers that make them look good (47). Social desirability can undermine the validity of self-reported measures (47,48) which explains why it is important to probe (and control) for it (if necessary).We adopted items from the Driver Social Desirability Scale (49). This scale assesses both forms of social desirability, i.e., Impression Management (i.e. "the deliberate tendency to give favorable self-descriptions to others") and Self Deception (i.e. "positively biased but subjectively honest self-description") (47,49). Also in this case, we used a 5-point Likert scale with lower values indicating a higher tendency to answer in a socially desirable manner and higher values suggesting a lower tendency to answer in a socially desirable way. We refer to TABLE 1 for more details.

TABLE 1 Variables and items - Averages and Standard deviations

Variable and items	M	SD
Attitude (α = .81)		

You can still drive safely when you have exceeded the alcohol limit with only one glass.	3.49	1.37
If you are extra careful and attentive, you can sometimes exceed the speed limit.	3.08	1.29
Quickly listening to a message on your cellphone isn't that harmful.	3.79	1.17
Even a small amount of drugs while driving can be life-threatening. [-]	4.22	1.23
By driving to close to the car in front of you, you put both yourself and others at risk. [-]	4.14	1.00
If it is for short distances, it is not always necessary to wear your seatbelt.	4.32	1.12
Locus Of Control (α = .75)		
When I am rushed, it can happen that I drive more recklessly.	2.91	1.15
If it is really urgent, it can happen that I use my cellphone while driving.	3.37	1.37
If I would go to a party close to home, I wouldn't mind drinking some alcohol before driving home.	3.71	1.32
It mainly depends on other drivers whether or not I get involved in a car accident.	2.92	1.01
When all others drive fast, I will start driving faster myself.	3.13	1.23
When there is not much traffic, it can happen that I take more risks.	2.89	1.19
Peer Pressure (α = .81)		
My friends use their cellphones regularly while driving.	2.88	1.16
My friends wouldn't mind if you occasionally don't wear a seatbelt.	3.37	1.15
My friends drive faster than the speed limit on a regularly basis.	2.57	1.14
My friends wouldn't mind if you drank a glass of alcohol before driving.	2.92	1.24
My friends sometimes drive to close to the driver in front of them.	2.94	1.13
My friends wouldn't mind if you used a small amount of drugs before driving.	4.24	1.07
Social Desirability (α = .62)		
I have never exceeded the speed limit.	3.93	1.16
I always am sure how to act in traffic situations.	2.77	0.89
I always obey traffic rules, even if I'm unlikely to be caught.	2.54	1.06
I never regret my decisions in traffic.	3.22	0.75
I always keep sufficient distance from the car in front of my car.	2.56	0.91
I always remain calm and rational in traffic.	3.05	1.09
Risky Driving Behavior (α = .86)		
I usually wear my seatbelt in the car (front and backseat), even for short distances. [-]	4.26	1.20
It sometimes happens that I overtake a driver making use of the wrong lane.	3.78	1.38
It sometimes happens that I drive the car when I am not really sure if I drank too much or not.	4.07	1.20
It sometimes happens that I text while I'm driving.	3.57	1.33
It sometimes happens that I cross an intersection when the lights just turned red.	3.95	1.18
It sometimes happens that I overtake another vehicle were this is not allowed.	3.79	1.28

[-] = reversed item

2.3. Statistical Analysis

We analyzed data with SPSS. 20. For the analyses a summary measure of the items was made for each of the variables. First, we conducted an exploratory principal component factor analysis on the 52 items contained by the FCRSS-scale . In order to decide on the rotation technique (i.e., orthogonal vs oblique), we checked the extent to which extracted factors were correlated and whether multicollinearity was an issue or not. Since factors were all correlated in the range of .3 or higher and given there was no question of multicollinearity (VIF < 5), we opted for an oblique Promax rotation, as it is recommended in the statistical literature (50). More precise details on how the final factor

solution was further determined can be found under section 3.1.1. Subsequently, we carried out a Spearman's correlation analysis on risky behavior and the various external and internal determinants (i.e., the different family safety climate factors, peer pressure, attitude and locus of control) in order to explore the extent to which these are associated with each other. Finally, a stepwise hierarchical regression analysis was carried out to determine what the unique contribution was in the prediction of risky driving. Based on the strength of the associations that emerged from the correlation analysis, 4 types of explanatory variables were entered in the following order, i.e., (1) the background variables age, gender, and driver license possession (entered in STEP 2), (2) the personal determinants attitude, LOC, and peer pressure (entered in STEP 3), (3) the FCRSS factors (entered in STEP 4), and (4) the interactions between significant FCRSS factors and significant personal determinants (entered in STEP 5) while controlling for social desirability (entered in STEP 1). Addition of interactions between significant FCRSS factors and personal determinants was done in order to find out whether these interactions would significantly increase the overall predictive power of the model. Based on existing literature (31), it can indeed be expected that external factors (such as FCRSS and peer pressure) interact with internal factors (such as attitude and LOC) and that such interactions optimize the prediction of risky behavior (51).

3. RESULTS

3.1. Factor Analysis - Family climate road safety survey

The results of the factor analysis revealed 12 factors (eigenvalue > 1). Based on the scree plot , a 6-factor solution seemed most preferable, explaining 54,1% of the variance. Altogether, this 6-factor solution retained 36 items of the original scale. Interestingly, the majority of these items loaded on the same factors as in the study by Taubman-Ben-Ari and Katz-Ben-Ami (23), except for items related to the factor 'messages'. In our analysis, this factor did not emerge. Instead, its items spread over two other factors, i.e., 'communication' and 'non-commitment'.

 As presented in TABLE 2, Factor 1 consisted of 7 items loading high (> .32) on the factor and it explained 31.69% of the variance. These items related to direct and indirect parent-child communication and open discussions with regard to safe driving. Therefore, this factor was labeled 'communication'. Factor 2 explained 5.86% of the variance and consisted of 6 items. These items all related to the example parents set to their children concerning driving safely, obeying the law, etc. The factor therefore was labeled 'modeling'. Factor 3 explained 4.55% of the variance and consisted of 6 items which gave an indication of the feedback parents provide and the interest they show in their offspring's safe driving. Factor 3 thus received the label 'Feedback'. Factor 4 explained 4.55% of the variance and consisted of 5 items relating to parents' supervision and control over their children's car use and driving activities. Accordingly, factor 4 was labeled 'monitoring'. Factor 5 explained 3.90 % of the variance and consisted of 5 items and could clearly be labeled as 'limits'. Factor 6 explained 2.80% of the variance and consisted of 6 items which related to parents' involvement, support or unsupportive and irresponsible behavior and therefore was labeled 'Non-commitment'.

 These 6 factors were retained for further analysis.

TABLE 2 FCRSS for Flanders: factor model coefficients, averages and Standard deviations

Factors and items	loading	M	SD
Factor 1 - Communication (α = .87)			
In my family we talk openly about anything related to driving.	.84	2.04	1.01
My parents tell me when they think I'm driving dangerously.	.79	1.75	0.83
In my family we talk openly about mistakes on the road or near accidents so I can learn from them.	.77	2.16	1.08

I can talk freely with my parents about different driving situations.	.74	1.74	0.83
I know how my parents expect me to drive.	.67	1.91	0.87
My parents' expectations from me about driving safely are very clear to me.	.54	1.81	0.89
We talk at home about how to prevent or avoid dangerous situations on the road.	.42	1.80	0.85
My parents talk to me about potential hazards on the road.	.32	2.22	1.04
Factor 2 - Modeling (α = .88)			
My parents set an example by obeying traffic laws.	.78	2.53	1.10
My parents drive safely even when they're in a hurry.	.74	2.45	1.08
My parents tell me to drive carefully even though they're not very careful drivers. [-]	.72	2.61	1.19
My parents talk about safe driving but they don't drive so safely themselves. [-]	.67	2.33	1.19
My parents obey the traffic laws even when they're tired or feeling stressed.	.65	2.70	1.08
My parents serve as role models for safe driving.	.61	2.70	1.02
Factor 3 - Feedback (α = .88)			
My parents compliment me for driving safely.	1.00	2.67	1.01
I get positive feedback from my parents whenever they see me drive safely.	.96	2.53	1.04
I feel that my parents are proud of me when I drive safely.	.87	2.29	0.92
My parents praise me when I drive safely and carefully.	.84	2.64	1.09
My parents take an interest in how I drive.	.63	2.44	0.89
My parents encourage me and applaud me when they see I make sure to drive safely.	.55	2.15	0.88
Factor 4 - Monitoring (α = .83)			
I have to get my parents' permission every time I want to go out in the car.	.81	2.91	1.40
Whenever I take the car, I have to tell my parents when I'll be home.	.78	2.72	1.24
Whenever I take the car, I have to tell my parents where I'm going.	.73	2.53	1.35
Whenever I take the car, I have to tell my parents who I'm taking with me wherever I go.	.66	2.93	1.29
Whenever I take the car, I have to call my parents and tell them if I'm going to be late.	.66	2.84	1.32
Factor 5 - Limits (α = .82)			
My parents made it clear to me that if I didn't obey the traffic regulations they would restrict my driving.	.90	2.63	1.27

My parents take every traffic violation very seriously, even when it doesn't result in a crash.	.79	2.49	1.13
If my parents found out I wasn't driving safely, they would impose limits on my driving.	.60	2.22	1.12
My parents let me take the car more often when they feel I drive safely.	.56	2.27	0.99
My parents make it clear that driving safely is more important than getting somewhere on time.	.53	2.19	1.06
Factor 6 – Non-commitment (α = .82)			
My parents tell me when they think I'm driving dangerously. [-]	.75	4.14	0.94
My parents really care that I drive safely. [-]	.71	4.39	0.94
My parents believe that driving safely is very important. [-]	.66	4.20	0.89
My parents wouldn't let me take the car if I drove recklessly, even if it would make it easier for them if I drove (to go to the store, to pick someone up). [-]	.60	3.74	1.21
My parents are willing to accept it if I get home late because I didn't want to speed. [-]	.40	3.86	1.10
My parents don't spend time teaching me how to drive safely.	.35	4.00	1.15

[-] = reversed item

3.2. Correlation Analysis - Personal determinants, family climate factors and behavior

A Spearman's correlation was run to determine the relationship between the variables. Significant associations were found between all variables, though some correlations were stronger than others (see TABLE 3). The family climate factors correlated highest with attitude and behavior. High associations were found [1] between attitude on the one hand and communication, modeling, monitoring, limits and non-commitment on the other hand; and [2] between behavior on the one hand and communication, modeling, monitoring, limits and non-commitment on the other hand. Attitude and behavior both had the highest correlations with non-commitment and the lowest with feedback. Besides communication, limits, modeling and non-commitment, behavior itself was most strongly associated with attitude and locus of control. Thus, the stronger the self-reported negative behavior, the higher the levels of reported negative attitude, the lower the extent to which the young drivers believe they have control, the less positive communication and limits that are set, the poorer models parents are perceived to be, and the higher the reported level of non-commitment of parents.

TABLE 3 Pearson correlation coefficients between the personal determinants and the FCRSS factors

	Communication	Modeling	Feedback	Monitoring	Limits	Non-commitment	Attitude towards risky driving	Locus Of Control	Peer Pressure	Risky Driving Behavior
Communication	1									
Modeling	.55**	1								
Feedback	.55**	.49**	1							

Monitoring	.33**	.36**	.35**	1					
Limits	.64**	.54**	.43**	.49**	1				
Non-commitment	-.73**	-.62**	-.59**	-.46**	-.68**	1			
Attitude towards risky driving	-.45**	-.44**	-.34**	-.40**	-.48**	.58**	1		
Locus Of Control	-.35**	-.39**	-.30**	-.32**	-.36**	.40**	.69**	1	
Peer Pressure	-.33**	-.32**	-.28**	-.18*	-.24**	.28**	.41**	.37**	1
Risky Driving Behavior	-.49**	-.42**	-.35**	-.34**	-.50**	.56**	.75**	.72**	.43**	1

** Correlation is significant at the 0.01 level
* Correlation is significant at the 0.05 level

3.3. Hierarchical regression analysis

As indicated previously, in the final stage of the analysis we carried out a 5-step hierarchical multiple regression (TABLE 4).

The regression analysis revealed that, in step 1, social desirability contributed significantly to the regression model $F(1,169) = 88.78$, $p <.001$ accounting for 34.4% of the variance. Introducing the background variables gender, age and driver's license explained an additional 2.7%, though the change in R^2 was not statistically significant $F(3,166) = 2.41$, $p=.07$. In this second step, the significant effect for gender did show that young novice male drivers approve of risky driving behavior more than the young female drivers. Introducing the three personal determinants in step 3 explained an additional 31.5% of the variance, with a significant change in R^2, $F(3,157) = 54.67$, $p <.001$. A significant contribution was found for each of the personal determinants: Attitude, $b= .61$, $\beta= .54$, $t= 8.49$, $p <.001$; Locus Of Control, $b= .19$, $\beta= .16$, $t= 2.46$, $p <.01$; Peer Pressure, $b= .1$, $\beta= .09$, $t= 1.90$, $p <.05$. Thus, young drivers that reported (1) more negative attitudes, (2) lower control over events, and (3) more negative influence emanating from peers, were more engaged in risky driving behavior. Adding the 6 family climate factors in step 4 explained an additional 4.7% of the variation in risky driving behavior, with a significant change in R^2, $F(6,160) = 4.64$, $p <.001$. Introducing these 6 factors in the regression model revealed a significant contribution for non-commitment $b= .31$, $\beta= .32$, $t= 3.40$, $p <.001$. Thus, lower non-commitment to safe driving behavior contributed significantly to the young novice drivers' lower reported risky driving behavior. The fifth and final step, in which the interaction terms were introduced, explained an additional 3.8% of the variation in risky driving, with a change in R^2 that was significant, $F(6,151) = 8.60$, $p <.001$. Two interactions had a significant coefficient weight in the regression equation for risky behavior: Non-commitment X Attitude $b= -.29$, $\beta= -.32$, $t= -4.69$, $p <.001$ and Non-commitment X Locus Of Control $b= .16$, $\beta= .18$, $t= 2.96$, $p <.01$. In other words, the results reveal that there is a statistically significant interaction effect between Attitude and Non-commitment and between Locus Of Control and Non-commitment in predicting the risky driving behavior of young novice drivers. Together, the independent variables accounted for 77.2% of the explained variance in risky driving behavior.

The variables 'Non-commitment X Attitde', 'Non-commitment', 'Attitude' and 'LOC' obtained the highest beta weights ($\beta= -.32$, $p <.001$; $\beta= .27$, $p <.001$; $\beta= .26$, $p <.001$; $\beta= .24$, $p <.001$), which demonstrates that these variables made the largest contribution to the regression equation, given that all other independent variables were held constant.

TABLE 4 hierarchical regression analysis for the variables predicting risky driving behavior

	β	t	R square	Δ R²
Step 1			.34	.34***
Social Desirability	-.59	-9.42***		

Step 2			.37	.03
Social Desirability	-.56	-9.00***		
Gender	.13	2.01*		
Age	-.10	-1.43		
Drivers license	-.06	-0.95		
Step 3			.69	.36***
Social Desirability	-.18	-3.20**		
Attitudes towards risky driving	.54	8.49***		
LOC	.16	2.46**		
Peer Pressure	.09	1.90*		
Step 4			.73	.05***
Social Desirability	-.16	-3.05**		
Attitudes towards risky driving	.39	5,711***		
LOC	.18	2,882**		
Peer Pressure	.10	2,126*		
Modeling	.05	.80		
Communication	.01	.08		
Feedback	.03	.51		
Monitoring	.04	.85		
limits	-.12	-1.95		
Non-commitment	.23	3.40**		
Step 5			.77	.04***
Social Desirability	-.15	-3.08**		
Attitudes towards risky driving	.26	3.68***		
LOC	.24	4.06***		
Peer Pressure	.10	2.28*		
Non-commitment	.27	4.05***		
Non-commitment X Attitude	-.32	-4.69***		
Non-commitment X LOC	.18	2.96**		
Non-commitment X Peer pressure	-.15	-3.08		

N = 171; *p < .05; **p< .01; ***p< .001

4. Discussion

Our main research question was to find out whether family safety climate is a useful predictor for the extent to which a sample of Flemish young novice drivers engages in risky driving behavior. Overall, we can say the influence of FCRSS as a multidimensional determinant of risky driving was limited to the factor 'non-commitment'. Paraphrased, young novice drivers whose parents are to a lesser extent committed to road safety appear to engage more in risky driving behavior. This finding makes sense and is in line with the study of Taubman-Ben-Ari and Katz-Ben-Ami (23). Motivating parents to commit themselves to safe driving and stimulating them to show sufficient active interest in their children's driving thus seems to be an important implication. Although the other factors did not emerge as significant predictors of risky driving behavior, they should not be discarded. Analyzed separately, the factors have been proven significant in other studies (a.o., 21,29,52).

Besides FCRSS, this study corroborates a bulk of earlier research indicating that risky driving behavior is substantially dependent upon socio-cognitive determinants as well. More in particular, we see that attitude as well as locus of control and peer pressure significantly predict young novice drivers' self-reported engagement in risky driving. In more specific terms, we establish that (1) more negative attitudes, (2) lower control over risk facilitating events, and (3) more negative influence emanating from peers, increase risky driving behavior. Four implications can be derived from these findings. Firstly, it is important that young novice drivers develop appropriate (i.e., safety supportive and risk aversive) inner mental dispositions towards road safety. Secondly, young novice drivers would probably benefit from more effective strategies to resist negative influence from peers. Such resistance strategies could for instance be trained. Thirdly, given that peers appear to be setting risk supportive examples more than occasionally, it seems important not to focus only on individual young novice drivers themselves, but to take into account surrounding peer communities as well when promoting road safety. Finally, since young novice drivers indicate they do not always feel to be totally in control over risk facilitating conditions, it is important to raise their awareness about what these risk facilitating conditions are more precisely and to offer them easy to implement coping strategies that allow them to deal with these conditions more effectively.

Since both external (such as FCRSS and peer pressure) and internal determinants (such as attitude and LOC) are important in the prediction of risky behavior and given the fact that external and internal factors can be expected to interact with each other, the interplay between FCRSS and the socio-cognitive determinants merits our attention if the intention is to get a more accurate understanding of the precise manner in which FCRSS influences risky behavior. This study demonstrates that the interaction between the FCRSS-factor 'non-commitment' and two internal determinants (i.e., attitude and LOC) adds significantly to the predictive power of a model where these three variables are also treated as (separate) independent variables. In other words, it would be interesting to further explore if (and how) effects generated by FCRSS are moderated (or mediated) by socio-cognitive factors as the ones included in this study.

More from a conceptual point of view, it is interesting to establish that, left aside some overt differences between the 7-factor model proposed by Taubman-Ben-Ari and Katz-Ben-Ami (23), the basic underlying structure found in an Israeli sample overall converges quite well with what we find in a Flemish sample. Put differently, the family safety climate model as proposed by Taubman-Ben-Ari and Katz-Ben-Ami (23) replicates more than well cross-nationally, at least, in a Flemish sample.

Finally, from a methodological perspective, this study supports the idea that, in order for risky driving behavior to be measured and predicted in a decent enough manner, it is important to take into account the social desirability answering bias.

1. Limitations and recommendations for future research

The current study gave a good indication of the importance of some internal and external factors to the risky driving behavior of YND, however, there are some limitations that need to be discussed. Firstly, this study is based on a convenience sample of university students. We should be cautious with student samples, especially in terms of external validity. Peterson for instance (53), concluded that effect sizes derived from college student subjects frequently differ from those derived from nonstudent subjects both directionally and in magnitude. In addition to that, traffic safety research in general shows that (late) adolescent research samples (as the one under study here), more than other age groups, experience problems with risk perception. Indeed, (late) adolescents have been frequently identified as high risk-takers in their daily life-style, as more sensitive to peer influences in adopting inappropriate norms, and as more inclined to drive at high-risk conditions (54). Therefore, the results of this study should be interpreted with care. Nonetheless, the merits of student samples should not be overlooked either (55). To illustrate, meta-analyses stemming from various research areas within social sciences have shown that effect sizes do not always differ significantly between student and non-student samples (56). Also, in our specific case, there is something to say in favor of selecting

students as 'model type' respondents, because the target group is young novice drivers. Another limitation of the study is that the view of parents on family climate for road safety was not measured, whereby the answers of the young drivers with regard to the family climate factors cannot be validated against the vision of parents. It could be an added value to take this up in future studies. To end with, the study did not take the different family structures and specific circumstances into account, and the impact this could have on the way parents educate and communicate with their children. For instance, it is known that mothers and fathers have different relationships and ways of interaction with respectively their sons and daughters (57). In this perspective, investigating the different family structures in future research could shed some light on the impact this has on the way family climate for road safety impacts the risky driving behavior of young drivers.(57).

REFERENCES

1. OECD, ECMT. Young Drivers: The Road to Safety [Internet]. 2006. Available from: http://trid.trb.org/view.aspx?id=794214

2. Safetynet. Novice Drivers [Internet]. 2009. Available from: http://ec.europa.eu/transport/road_safety/specialist/knowledge/pdf/novice_drivers.pdf

3. Arnett J, Irwin C, Halpern-Felsher B. Developmental sources of crash risk in young drivers. Inj Prev. 2002;8(Suppl 2):ii17–ii23.

4. Keall MD, Frith WJ, Patterson TL. The influence of alcohol, age and number of passengers on the night-time risk of driver fatal injury in New Zealand. Accid Anal Prev. 2004 Jan;36(1):49–61.

5. Lam LT. Factors associated with young drivers' car crash injury: comparisons among learner, provisional, and full licensees. Accid Anal Prev. 2003 Nov;35(6):913–20.

6. Murray Å. The home and school background of young drivers involved in traffic accidents. Accid Anal Prev. 1998 maart;30(2):169–82.

7. Jonah BA. Sensation seeking and risky driving: a review and synthesis of the literature. Accid Anal Prev. 1997 Sep;29(5):651–65.

8. Scott-Parker B, Watson B, King MJ, Hyde MK. A further exploration of sensation seeking propensity, reward sensitivity, depression, anxiety, and the risky behaviour of young novice drivers in a structural equation model. Accid Anal Prev. 2013 Jan;50:465–71.

9. Bartholomew LK, Parcel GS, Kok G, Gottlieb NH, Fernandez ME. Planning Health Promotion Programs: An Intervention Mapping Approach. John Wiley & Sons; 2011.

10. Taubman - Ben-Ari O, Mikulincer M, Gillath O. From parents to children—similarity in parents and offspring driving styles. Transp Res Part F Traffic Psychol Behav. 2005;8(1):19–29.

11. Lam LT. Factors associated with parental safe road behaviour as a pedestrian with young children in metropolitan New South Wales, Australia. Accid Anal Prev. 2001 Mar;33(2):203–10.

12. Loubeau PR. Exploration of the barriers to bicycle helmet use among 12 and 13 year old children. Accid Anal Prev. 2000 Jan;32(1):111–5.

13. Morrongiello BA, Barton BK. Child pedestrian safety: parental supervision, modeling behaviors, and beliefs about child pedestrian competence. Accid Anal Prev. 2009 Sep;41(5):1040–6.

14. Scott-Parker B, Watson BC, King MJ. Exploring how parents and peers influence the behaviour of young drivers. Proc 2009 Australas Road Saf Res Polic Educ Conf Smarter Safer Dir [Internet]. Sydney Convention and Exhibition Centre, Sydney; 2009 [cited 2013 Jul 28]. Available from: http://www.rsconference.com

15. Bianchi A, Summala H. The "genetics" of driving behavior: parents' driving style predicts their children's driving style. Accid Anal Prev. 2004 Jul;36(4):655–9.

16. Shope JT, Waller PF, Raghunathan TE, Patil SM. Adolescent antecedents of high-risk driving behavior into young adulthood: substance use and parental influences. Accid Anal Prev. 2001;33(5):649–58.

17. Ferguson SA, Williams AF, Chapline JF, Reinfurt DW, De Leonardis DM. Relationship of parent driving records to the driving records of their children. Accid Anal Prev. 2001 Mar;33(2):229–34.

18. Simons-Morton BG, Hartos JL, Leaf WA. Promoting parental management of teen driving. Inj Prev. 2002 Sep 1;8(suppl 2):ii24–ii31.

19. Hartos J, Eitel P, Simons-Morton B. Parenting practices and adolescent risky driving: a three-month prospective study. Heal Educ Behav Off Publ Soc Public Heal Educ. 2002 Apr;29(2):194–206.

20. Miller G, Taubman-Ben-Ari O. Driving styles among young novice drivers--the contribution of parental driving styles and personal characteristics. Accid Anal Prev. 2010 Mar;42(2):558–70.

21. Taubman - Ben-Ari O, Katz - Ben-Ami L. The contribution of family climate for road safety and social environment to the reported driving behavior of young drivers. Accid Anal Prev. 2012 Jul;47:1–10.

22. Wilson RJ, Meckle W, Wiggins S, Cooper PJ. Young driver risk in relation to parents' retrospective driving record. J Safety Res. 2006;37(4):325–32.

23. Taubman-Ben-Ari O, Katz-Ben-Ami L. Family climate for road safety: a new concept and measure. Accid Anal Prev. 2013 May;54:1–14.

24. Hartos JL, Eitel P, Haynie DL, Simons-Morton BG. Can I Take the Car? Relations Among Parenting Practices and Adolescent Problem-Driving Practices. J Adolesc Res. 2000 May 1;15(3):352–67.

25. Beck KH, Shattuck T, Raleigh R. Parental predictors of teen driving risk. Am J Health Behav. 2001 Feb;25(1):10–20.

26. Williams GC, Hedberg VA, Cox EM, Deci EL. Extrinsic Life Goals and Health-Risk Behaviors in Adolescents1. J Appl Soc Psychol. 2000;30(8):1756–71.

27. Harakeh Z, Scholte RHJ, de Vries H, Engels RCME. Parental rules and communication: their association with adolescent smoking. Addict Abingdon Engl. 2005 Jun;100(6):862–70.

28. Sherman K, Lapidus G, Gelven E, Banco L. New teen drivers and their parents: what they know and what they expect. Am J Health Behav. 2004 Oct;28(5):387–96.

29. Lahatte A, Le Pape M-C. Is the way young people drive a reflection of the way their parents drive? An econometric study of the relation between parental risk and their children's risk. Risk Anal Off Publ Soc Risk Anal. 2008 Jun;28(3):627–34.

30. Ginsburg KR, Durbin DR, García-España JF, Kalicka EA, Winston FK. Associations Between Parenting Styles and Teen Driving, Safety-Related Behaviors and Attitudes. Pediatrics. 2009 Oct 1;124(4):1040–51.

31. Green LW, Kreuter MW. Health program planning: an educational and ecological approach. New York: McGraw-Hill; 2005.

32. Armitage CJ, Conner M. Social cognition models and health behaviour: A structured review. Psychol Heal. 2000;15(2):173–89.

33. Eagly AH, Chaiken S. The psychology of attitudes. Harcourt Brace Jovanovich College Publishers; 1993.

34. Iversen H. Risk-taking attitudes and risky driving behaviour. Transp Res Part F Traffic Psychol Behav. 2004 mei;7(3):135–50.

35. De Pelsmacker P, Janssens W. The effect of norms, attitudes and habits on speeding behavior: Scale development and model building and estimation. Accid Anal Prev. 2007 Jan;39(1):6–15.

36. Ulleberg P, Rundmo T. Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. Saf Sci. 2003 Jun;41(5):427–43.

37. Ajzen I. Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior1. J Appl Soc Psychol. 2002;32(4):665–83.

38. Gidron Y, Gal R, Syna Desevilya H. Internal locus of control moderates the effects of road-hostility on recalled driving behavior. Transp Res Part F Traffic Psychol Behav. 2003 Jun;6(2):109–16.

39. Huang JL, Ford JK. Driving locus of control and driving behaviors: Inducing change through driver training. Transp Res Part F Traffic Psychol Behav. 2012 mei;15(3):358–68.

40. Jongen EMM, Brijs K, Brijs T, Wets G. Inhibitory Control and Peer Passengers Predict Risky Driving in Young Novice Drivers - A Simulator Study. Proc Seventh Int Driv Symp Hum Factors Driv Assess Train Veh Des. WA; 2013.

41. Fleiter JJ, Lennon A, Watson B. How do other people influence your driving speed? Exploring the "who" and the "how" of social influences on speeding from a qualitative perspective. Transp Res Part F Traffic Psychol Behav. 2010 Jan;13(1):49–62.

42. Elliott MA, Baughan CJ. Developing a self-report method for investigating adolescent road user behaviour. Transp Res Part F Traffic Psychol Behav. 2004 Nov;7(6):373–93.

43. Martinussen LM, Hakamies-Blomqvist L, Møller M, Özkan T, Lajunen T. Age, gender, mileage and the DBQ: The validity of the Driver Behavior Questionnaire in different driver groups. Accid Anal Prev. 2013 maart;52:228–36.

44. Mann H. Predicting young driver behaviour from pre-driver attitudes, intentions and road behaviour [Internet] [Thesis]. Heriot-Watt University; 2010 [cited 2013 Jul 22]. Available from: http://www.ros.hw.ac.uk/handle/10399/2396

45. Ozkan T, Lajunen T. Multidimensional Traffic Locus of Control Scale (T-LOC): factor structure and relationship to risky driving. Pers Individ Differ. 2005;38(3):533–45.

46. Levenson H. Reliability and Validity of the I,P, and C Scales - A Multidimensional View of Locus of Control. Montreal, Canada; 1973 [cited 2013 Jul 24]. Available from: http://www.eric.ed.gov/ERICWebPortal/detail?accno=ED087791

47. Paulhus DL. Measurement and control of response bias. JP Robinson PR Shaver LS Wrightsman Eds Meas Pers Soc Psychol Attitudes. New York: Academic Press; 1991. p. 17–59.

48. Harrison WA. Is it finally time to kill self-report outcome measures in road safety? An investigation of common method variance in three surveys of a cohort of young drivers that included the Driver Behaviour Questionnaire. 2010.

49. Lajunen T, Corry A, Summala H, Hartley L. Impression management and Self-Deception in traffic behaviour inventories. Pers Individ Differ. 1997;22(3):341–53.

50. Meyers LS, Gamst G, Guarino AJ. Applied multivariate research: design and interpretation. second. Thousand Oaks, Calif.: SAGE Publications; 2013.

51. Castanier C, Deroche T, Woodman T. Theory of planned behaviour and road violations: The moderating influence of perceived behavioural control. Transp Res Part F Traffic Psychol Behav. 2013 mei;18:148–58.

52. Beck KH, Hartos JL, Simons-Morton BG. Parent–Teen Disagreement of Parent-Imposed Restrictions on Teen Driving After One Month of Licensure: Is Discordance Related to Risky Teen Driving? Prev Sci. 2005 Sep 1;6(3):177–85.

53. Peterson RA. On the Use of College Students in Social Science Research: Insights from a Second-Order Meta-analysis. J Consum Res. 2001;28(3):450–61.

54. Lee JD. Technology and teen drivers. J Safety Res. 2007;38(2):203–13.

55. Enis BM, Cox KK, Stafford JE. Students as Subjects in Consumer Behavior Experiments. J Mark Res. 1972;9(1):72.

56. Verlegh PWJ, Steenkamp J-BEM. A review and meta-analysis of country-of-origin research. J Econ Psychol. 1999;20(5):521–46.

57. Maximo SI, Tayaban HS, Cacdac GB, Cacanindin MJA, Pugat RJS, Rivera MF, et al. Parents' Communication Styles and Their Influence on Adolescents' Attachment, Intimacy and Achievement Motivation. Int J Behav Sci. 2011;6(1):60–74.