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Child passengers and driver culpability in fatal crashes by driver gender

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ABSTRACT

Objective: Studies based on accident statistics generally suggest that the presence of a passenger reduces adult drivers' accident risk. However, passengers have been reported to be a source of distraction in a remarkable portion of distraction related crashes. Although the effect of passengers on driving performance has been studied extensively, few studies have focused on how a child passenger affects the driver.

A child in a car is a potential distractor for parents, especially for mothers of small children who often suffer from sleep deficit. The aim of this study was to examine how the presence of child passengers of different ages is associated with a higher driver culpability, which was expected due to child related distraction and fatigue.

Methods: The analysis was based on the comprehensive data of fatal crashes studied in-depth by multidisciplinary road accident investigation teams in Finland during 1988-2012. Teams determine the primary party who had the most crucial effect on the origin of the event. We define the primary party as culpable and the others involved as non-culpable drivers. The culpability rate was defined as the percentage of culpable drivers and rates were compared for drivers with a child/teen passenger aged 0-17 year (N=348), with an adult passenger without children (N=324) and when driving alone (N=579), grouped by child age and driver gender.

Drivers with specific risk-related behavior (substantial speeding, driving when intoxicated, unbelted, or without license) were excluded from the analyses, in order to make the drivers with and without children comparable. Only drivers 26-47 years old were included, representing parents with children 0-9 years of age.
Results: Male drivers were less often culpable with 0-17 year old passengers in the car than alone or with adults. This was not the case with female drivers. The gender difference in culpability was most marked with small children of 0-4 years. Female drivers' culpability rate with a 0-4 year old child passenger was higher but male drivers' lower as compared to drivers without passengers or with only adult passenger.

Conclusion: The results indicate that female drivers are at higher risk of crashes than male drivers when driving with small children. Further research is needed to replicate this finding and to determine causal mechanisms.

Keywords: Motor-vehicle accidents, Responsibility analysis, Child passenger, Co-driving, Distraction, Fatigue

INTRODUCTION

The presence of passengers may motivate a driver towards risk averse driving behavior but may also distract him/her in a way that increases the risk of causing a crash. These effects can be expected especially when children travel in a car. Although a passenger's effect on driving performance has been studied extensively, few studies have focused on how a child occupant affects the driver. This study analyzed whether a child passenger's presence is associated with higher driver culpability in fatal crashes studied in-depth by multidisciplinary road accident investigation teams in Finland between years 1988-2012, by child age and driver gender.

In general, studies based on accident data have suggested that the presence of passengers reduces adult drivers' crash risk, but that the effect is neutral or even reversed when a teenage driver is driving with teenage passengers (e.g. Lee and Abdel-Aty 2008; Preusser et al. 1998; Rueda-Domigo et al. 2004; Vollrath et al. 2002). However, a child passenger seems to decrease teenage drivers' crash risk (Aldridge et al. 1999), as well as the crash risk of drivers over 65 years old (Braitman et al. 2014). The only research of drivers' accident risk who were probably the parents of the child occupant (based on the ages of child passenger and driver) was conducted by Rueda-Domingo et al. (2004). In their study, a 4-15 year old child passenger lowered drivers' risk of causing an accident, and the effect was stronger for male drivers. Considering that male drivers are more prone to risky driving behavior (e.g. Harré et al. 1996; Rhodes and Pivik, 2011; Turner and McClure, 2003), Rueda-Domigo et al. (2004) suggest that a child occupant mitigates male drivers', presumably fathers', risk taking behavior.

According to previous studies, a child in the car may motivate safer driving, but children may also add to crash risk by distracting the driver. Driver distraction, often defined as an activity unrelated to the driving task competing for the driver's attention, is a prominent causes of traffic crashes (NHTSA 2013). Vehicle occupants have been reported to be the source of distraction in over 10% of distraction related crashes (Stutts et al. 2001), but distractions caused by child passengers have received surprisingly little attention. Two studies, Stutts et al. (2005) and Koppel et al. (2011), have considered a child passenger's impact on driving performance in a naturalistic setting using video recording while driving. The former reported that a driver's interactions with a child or an infant were many times more frequent but only half as long as with an adult passenger. The latter, in which 12 families with children 1-8 years old were studied, found that out of all potentially distractive events, 12% included an interaction with a child passenger. When the vehicle was in motion, 10% of interactions with a child passenger involved driver glances of two seconds or longer away from the road, which have been estimated to lead to twofold increase in crash risk compared to baseline driving (Klauer et al. 2006; cf. e.g. Wierwille 1991; Zwahlen et al. 1988).

It has been suggested that female drivers perceive the risks of driving with children as higher than males, which may motivate safer behavior (Megias et al. 2014). According to the Koppel et al. (2011) results, male drivers had significantly more overlong glances towards a child passenger than female drivers. On the other hand, Romano and Kelley-Baker (2015) report in their child injury study that female drivers were more likely than male drivers to ignore red lights or stop-signs, which may suggest distraction or drowsiness.

The relation of child passenger's age to driver's risk of crash has not been previously studied. It is possible that parents of older child/teens face challenging situations when travelling with adolescents, but presumably a crying infant passenger in the car might be an especially distracting factor for the driver, as the primary function of crying is to get attention from caregivers (Zeifman 2001). Parents of small children, possibly mothers even more than fathers, also may suffer from sleep deficit or hormonal conditions e.g. postpartum depression (O'Hara and Swain 1996, Parks et al. 1999; Henry and Sherwin 2012), which may further add to the risk of a crash.

In this study, we examined the relationship of the child passenger's presence and driver's culpability in fatal crashes by driver's gender. Because the aim was to study the impact of child passengers' presence in different age groups, we controlled other factors potentially affecting drivers' culpability such as age of the drivers and drivers with specific risk taking behaviors.

METHODS

Data

The database used in this study consisted of information on all fatal crashes which occurred in Finland during 1988-2012. As the number of fatal crashes involving child passengers is low, we included as many years as possible in the analysis. Data from year 1988 onwards was included into analysis because using seat belts on back seats has been mandatory in Finland since the end of 1987. All fatal crashes in Finland are studied in depth by multidisciplinary road accident investigation teams that include a police officer, vehicle engineer, traffic engineer, physician, and in certain cases a psychologist or another behavioral scientist (VALT 2002). These teams make on-the-spot and other investigations, including simulations, resulting in extensive and detailed documentation and analysis of the crash.

Culpability

The Finnish road accident investigation teams do not explicitly determine the guilt or culpability of drivers, but based on their investigation, teams select one driver whose actions contributed most to the origin of the crash. We defined those as culpable drivers. Drivers who the team has considered to have had a less significant (or non-existing) impact on the occurrence of the crash we defined as non-culpable drivers. In single vehicle crashes, we determined that the driver is always culpable.

The culpability rate of the examined groups was defined as the percentage of culpable drivers. It can be argued that the culpability rate (percentage of culpable drivers in each examined group) can be used to determine which group has a higher risk of incurring a fatal crash, i.e. a higher rate equates to higher risk (cf. quasi-induced exposure, Haight 1970)

Drivers' Inclusion Criteria

The target group consisted of drivers of private passenger cars (motor vehicles with 8 or fewer passenger seats) who incurred a fatal crash in which any person in either motor vehicle died. Both single and multiple vehicle crashes were included. However, in crashes with more than two vehicles, only two first vehicles were included based on the collision sequence. Although we only analyzed drivers of private passenger cars, the second vehicle type was not restricted. Because crashes involving pedestrians or bicyclists have been recorded in the database only from 1996 onwards, these were excluded from analysis. Crashes involving animals were also excluded from the analysis since the effect of driver's actions to the origin of the crash, as in multivehicle crashes, has not been determined in the database.

In this data, the mean age of drivers carrying 0-9 year old children was 36.8 years (SD=10.2). The age range of analyzed drivers was limited to the mean age plus and minus one standard deviation in order to meaningfully compare drivers accompanied with a child passenger to drivers without a child. Thus the selected age range was 26-47 years which essentially covered the typical age of parents of children of that age.

Differences in the frequency of risk behavior between male and female drivers as well as drivers with and without children could bias the analysis. In order to control for these effects, the drivers with specific risk behaviors were excluded from later analysis (see table in appendix for percentages of each of the four categories by driver gender and passenger condition.).

Driving distance in the past year (the only available individual measure for driving experience and exposure to risk) might also have effect on culpability. Because driving distance information was missing from 299 drivers which represented 23.9% of all cases, the effect of it was controlled for in a separate analysis.

Table 1 shows the number of drivers and crashes left after each step.

Table 1. Inclusion criteria. The original data from the database of Finland fatal crashes 1988-2012 (total 12674 motor vehicle driver in 8127 crashes).

	Inclusion criteria	Number of crashes left after this step	Number of drivers left after this step
Type of the drivers' vehicle, crash and crash counterpart	- Driver is driving private passenger car - Single and two vehicle crashes - Crashes with more than two vehicles only the two first vehicles as based on the collision sequence (note that crashes involving pedestrians, bicyclists or animals excluded)	5530	6744
Characteristics of the driver	-Driver age is between 26 to 47 years - Crash not caused by driver's sudden illness	2244	2439
	No specific risk behavior: - Not driving under the influence of alcohol (more than the legal limit of 0,05 % BAC) or drugs - Not speeding more than 50 km/h over local speed limit (usually in Finland a limit for gross endangering of traffic, Penal Code Ch. 23 Sec. 2), a highly deviant criterion also in terms of post-crash reconstruction validity - Valid driver' license - Seat belt in use	1142	1251 (=total number of drivers included to analysis)
	- Distance driven during the past year is known	876	952 (=total number of drivers included in analysis with known driving distance during past year)

Examined Passenger Conditions

In order to analyze the influence of child passengers' age on driver culpability, the following passenger conditions were formed.

- Drivers with at least one small child aged 0-4 years
- Drivers with at least one child aged 5-9 years
- Drivers with at least one older child aged 10-17 years
- Drivers with at least one adult (18 years or older) passenger, without 0-17 year old passengers
- Drivers without passengers

The child passenger conditions had some overlap, for example a driver with 3 and 7 year old passengers would be counted in two conditions. Therefore, we also made analyses with an additional condition: "Drivers with at least one 0-17 year old passenger, with or without adult passenger," and the effect of overlap between conditions was controlled in the analyses. Passengers aged 16 to 17 years old were grouped into the "older child" condition since in Finland it is possible to have a driving license at age 18 or older.

RESULTS

Comparisons between Different Passenger Conditions and Drivers' Gender

To examine how the age of the child passenger and driver gender affects driver culpability rate, the amount of culpable and non-culpable drivers in different passenger conditions by driver gender was compared with Pearson Chi-square test in a pair wise manner.

Table 2. Frequencies of culpable and non-culpable drivers in different passenger conditions and compared groups. Number of single vehicle crashes in parenthesis.

	Male drivers		Female drivers	
Passenger(s) age	Culpable	Non-culpable	Culpable	Non-culpable
No passengers	189 (32)	187	110 (6)	93
18 year- (no child passengers)	103 (8)	131	47 (9)	43
0-17 year	78 (15)	146	76 (14)	48
0-4 year*	27 (7)	72	38 (9)	16
5-9 year*	34 (5)	66	32 (10)	18
10-17 year*	35 (7)	59	32 (5)	25

*Conditions within 0-17 year old passenger overlap.

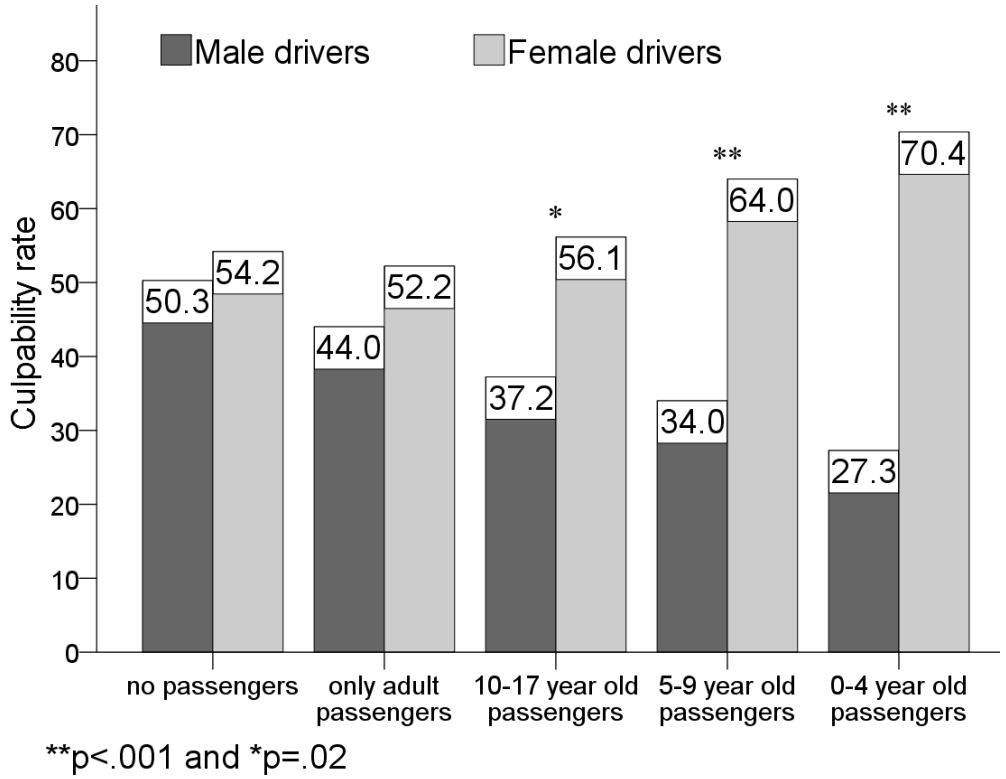

Fig. 1. Culpability rate by passenger condition and driver gender expressed as percentage of culpable drivers. Gender difference in culpability for each passenger condition was tested with the Pearson Chi-Square tests. Note that the conditions within 0-17 year old passenger overlap.

The culpability rate for male drivers was lower when a 0-17 year old passenger was present compared to male drivers without child passenger (driving alone or only with adult passengers) (p=.001). However, there was no similar significant difference for female drivers (p=.15) (Table 2.). As seen in Figure 1., there was a significant gender difference in culpability rate in all child conditions, which appears to be most marked when a 0-4 year old child was present.

The female drivers with a 0-4 year old child had higher culpability rate compared to female drivers without a passenger (p=.03) or with only adult passengers (p=.03), but in comparisons of the proportion of culpable female drivers between other passenger conditions the difference was not significant.

The male drivers without passengers had a higher culpability rate than male drivers with a 0-4 year old child (p<.001), 5-9 year old child (p=.004) or with 10-17 year old child passenger (p=.02), but there was no significant difference to male drivers with only adult passengers. In addition, male drivers' culpability rate with adult passengers was significantly higher than that of male drivers with a 0-4 year old child passenger (p=.004), though in comparisons to male drivers with 5-9 or 10-17 year old passengers, the difference was not significant.

Controlling Overlap between Child Passenger Conditions

Overall, 54.9% of male and 51.3% of female drivers had passengers of any age and 26.9% of male and 29.7% female drivers had a 0-17 year old child passenger in the car. As seen in Table 3., there was some overlap between passenger conditions. The distribution of drivers carrying child passengers is fairly even between the genders. For example, drivers of both genders had a 0-4 year old child and also a 5-9 year old child in about every third car, and a 10-17 year old in every ninth car. In contrast, male drivers with any 0-17 year old passenger were much more often accompanied by an adult passenger than female drivers. We also compared the proportion of culpable drivers in the child passenger cases where there was no adult passenger present. As seen in Table 4., the number of cases without adult passengers is very small, but female drivers with passengers 0-4 years old are still more often culpable than male drivers with similar aged passengers (p=.013). However, no effect at all seems to prevail any more in the older child group.

Table 3. Percentages of crashes when a passenger(s) from other age condition was in the car.

		Age of other condition's passenger(s)			
		Adult	10-17 year	5-9 year	0-4 year
	Age of the child passenger(s)	%	%	%	%
Male drivers	0-4 year	85.9	11.1	33.3	
	5-9 year	71.0	29.0		33.0
	10-17 year	62.8		30.9	11.7
Female drivers	0-4 year	37.0	13.0	37.0	
	5-9 year	46.0	26.0		40.0
	10-17 year	38.6		22.8	12.3

Table 4. Frequencies of culpable and non-culpable drivers in different child conditions without adult passengers present. Number of single vehicle crashes in parentheses. Conditions within 0-17 year old passenger overlap.

	Male drivers		Female drivers	
Passenger(s) age	Culpable	Non-culpable	Culpable	Non-culpable
0-4 year	4 (0)	10	23 (6)	11
5-9 year	12 (0)	17	17 (4)	10
10-17 year	19 (3)	16	19 (1)	16

In order to control the possible effects of adult and other child passengers, further logistic regression models were done in order to investigate whether small children aged 0-4 are strongly associated with a higher culpability. It could be assumed that the presence of an adult passenger might have a protective effect as he/she might take care of child passenger instead of the driver. In Model 1. (Table 5.) both the adult and child passenger of 0-17 year old terms are significant (adult: OR=.69, p=.01, 0-17 years old: OR=.66, p=.02). However, the interaction of driver gender and child passenger of 0-17 years is also significant (OR=2.08, p=.008), which suggests that female drivers' higher culpability compared to male drivers cannot be solely explained by a lack of a protective adult passenger.

Model 2. was conducted within the cases involving 0-17 year old passengers in order to specifically compare 0-4 year old passengers to other child passengers while controlling for the adult passenger's protective effect. While the presence of adult passengers is associated with lower culpability (OR=0.52, p=.04), the significant interaction of driver gender and the presence of a 0-4 year old child passenger (OR=3.18, p=.02) furthermore suggests that 0-4 year old child passengers are associated with female drivers' higher culpability compared to male drivers even when controlling for the presence of an adult passenger.

Controlling the Possible Effect of Driving Distance during Past 12 Months

The available data indicated that 17.1% (55/266) of females and 3.8% (24/607) of males drove less than 10.000 km/year. In Model 3. driving distance in the past year had a significant overall protective main effect on culpability (OR=2.40, p=.04). However, this effect did not explain gender differences on culpability rate when either a 0-17 year old passenger or a 0-4 year old passenger is in the car (Model 3. and 4.).

Table 5. Logistic regression models 1.-4. Dependent variable was always driver culpability (culpable (=1) or non-culpable (=0)).

Model 1. All cases (n=1251)**.** Model's overall percentage of ability to group=55.9%, Nagelkerke R Square=.037.

		95% confidence interval	
Explanatory variables	Odds ratio	Lower	Upper
Driver gender (male =0, female=1)	1.10	.79	1.53
0-17 year old passengers (presence=1, absence=0)	**.66**	**.47**	**.92**
Adult passengers (presence=1, absence=0)	**.69**	**.52**	**.92**
Driver gender*0-17 year old passengers	**2.08**	**1.21**	**3.58**
Driver gender*adult passenger	1.41	.85	2.34
Constant	1.06		

Model 2. Within cases involving 0-17 year old passengers (n=348). Model's overall percentage of ability to group=64.9%, Nagelkerke R Square=.128.

		95% confidence interval	
Explanatory variables	Odds ratio	Lower	Upper
Driver gender (male =0, female=1)	1.09	.51	2.35
0-4 year old passengers (presence=1, absence=0)	.63	.35	1.14
Adult passengers (presence=1, absence=0)	**.52**	**.28**	**.96**
Driver gender*0-4 year old passengers	**3.18**	**1.22**	**8.26**
Driver gender*adult passengers	2.16	.81	5.77
Constant	1.04		

Model 3. All cases with information of driving distance in the past year (n=952). Model's overall percentage of ability to group=60.0%, Nagelkerke R Square=.068.

		95% confidence interval	
Explanatory variables	Odds ratio	Lower	Upper
Driving distance in the past year (Over 10000km=0, under 10000km=1)	**2.40**	**1.02**	**5.62**
Driver gender (male =0, female=1)	1.10	.79	1.54
Adult passengers (presence=1, absence=0)	.88	.67	1.16
0-17 year old passengers (presence=1, absence=0)	**.50**	**.34**	**.73**
Driver gender*0-17 year old passengers	**2.79**	**1.49**	**5.22**
Driver gender* Driving distance in the past year	1.24	.42	3.62
Constant	.84		

Model 4. All cases with information of driving distance in the past year within cases involving 0-17 year old passengers (n=270). Model's overall percentage of ability to group=67.8%, Nagelkerke R Square=.165.

		95% confidence interval	
Explanatory variables	Odds ratio	Lower	Upper
Driving distance in the past year (Over 10000km=0, under 10000km=1)	1.33	.13	13.64
Driver gender (male =0, female=1)	1.83	.87	3.83
Adult passengers (presence=1, absence=0)	.66	.38	1.17
0-4 year old passengers (presence=1, absence=0)	.56	.28	1.12
Driver gender*0-4 year old passengers	**3.50**	**1.14**	**10.72**
Driver gender* Driving distance in the past year	1.24	.10	15.88
Constant	.68		

DISCUSSION

Fatal crashes studied in depth in Finland during 1988-2012 were used in this study to test whether a child in the car is related to higher driver culpability. This data showed that male drivers were less often culpable than female drivers when carrying 0-17 year old passengers and this gender difference in culpability was most marked with a small child of 0 to 4 years old in the car. The culpability rate of female drivers was highest when a 0-4 year old child passenger was present, but it was lower for male drivers as compared to drivers without passengers or with only adult passengers.

As far as we know, our study is the first study based on the crash data that examines the possible effect of a child passenger's age on driver culpability by driver gender. The marked gender difference with children of 0-4 years is therefore highly relevant concerning mothers' potential sensitivity to distraction while driving (Koppel et al. 2011; Stutts et al. 2005) when often impaired due to sleep deficit or hormonal changes (Parks et al. 1999; Henry and Shervin 2012). While the present study cannot establish causal link between the crashes and driver distraction or impairment, the results suggest such a link may be present.

Our results are in line with Rueda-Domingo et al. (2004) who also analyzed drivers who were of the same age as the child passengers' parents (neither checked parenthood however). They found that drivers with a 4-15 year old passenger had a lower risk compared to drivers driving alone, the effect being stronger among male drivers. In their study, with larger data of injury crashes, passenger groups were formed so that only vehicles with passengers only belonging to certain age group were included in the analysis, and only collisions between two cars were included. Our data on fatalities in a country of 5M people was necessarily more restricted. However, all crashes were analyzed in depth, which makes culpability assessment more reliable compared to the data where culpability is decided only by a police officer (Jiang et al. 2012). Our main analysis also covered single crashes, and we did not restrict counterpart vehicle type; but in spite of these differences, the same differential gender effect appeared in both studies.

It was more typical for male drivers than female drivers to have an adult passenger in the vehicle at the same time as a child. This is probably a consequence of the fact that when both father and mother are travelling together with children, the father usually drives (see also Koppel et al. 2011). It could be assumed that an adult passenger, spouse (mother or father) or anyone else would take care of children such that they would be less likely to distract the driver and this might explain some of the gender differences in culpability. Our data indeed showed an overall protective effect of an adult passenger when a 0-17 year old passenger is in the car. However, the female drivers had still a higher culpability than male drivers with a 0-17 and also 0-4 year old passenger after this protective effect was controlled for (Table 5, Model 1. and 2.).

Because male drivers in general incur more violations which contribute to the risk of serious crashes, it was necessary to control for this behavior in the analysis on gender effects based on the driver culpability estimation. In our data, male drivers were indeed more likely engaged in risky driving behavior during the crash. However,

risky behavior was very rare with a child in the car, and was nonexistent among female drivers with children, except for driving without a seatbelt. Driving unbelted was at a similar low level for both genders. It is to be noted that, in contrast to very substantial speeding or driving intoxicated, unbelted driving may not be an intended violation, especially for stressed and distracted parents with children who may simply forget to belt themselves. However, as in Finland driving unbelted is illegal and is also related to driver suicides which are suggested to be more typical for males (e.g. Henderson and Joseph 2012), as a conservative approach, these drivers have also been excluded from analyses.

On the other hand, Koppel et al. (2011) reported that male drivers had more overlong glances towards the child passenger compared to female drivers, which might suggest risky behavior. The current results are in contrast with this, because for males child passengers were linked to lower culpability rate. It is also possible that inexperience is linked to being easily distracted by a child passenger, as it is known that inexperienced drivers are not yet practiced in sharing attention and time properly between in-car distractions and road ahead (e.g. Wikman et al. 1998). In our data, females had driven generally fewer kilometers in past year compared to males. A higher amount of kilometers driven per year has been shown to decrease accident risk per driven kilometers and this effect might be a consequence of driving experience, or the risk might be reduced because a higher amount of kilometers driven probably includes proportionally more rural roads with a lower crash risk per kilometer (e.g. Massie et al. 2007). However, our analysis showed that the driving distance during the past year did not explain the gender differences in culpability when a child passenger was in the car.

Limitations of the Data Used in Study

The Finnish accident investigation teams do not explicitly determine guilt or culpability in their case reports. The restriction of the use of the reports explicitly states that the investigation does not address liability for the accident or liability for damages. However, the teams determine the principal or primary party "who had the most crucial effect on the origin of the event", and then secondary, tertiary etc. parties in sequence where the driver contribution to the origin of the accident decreases (VALT 2002 p. 18). In this study we called primary contributing parties briefly as culpable and the others as non-culpable, keeping in mind that the criterion was not juridical, and contribution and responsibility are sometimes shared by the involved drivers.

Our data covered accident data from the last 25 years. During that time, the number of fatal crashes in Finland has decreased from 600 accidents annually to around 200, mainly due to increased vehicle safety. Therefore, the accidents in the early years are over represented in the analysis and the small number of cases in the later years does not make it possible to estimate how the gender difference in culpability is developing. However, according to the results of this study, the culpability rate of female drivers with small child passengers was elevated. If these results are explained by mothers' fatigue and/or possible sensitiveness to distraction caused by small children, it could be argued that these problems are still present today.

In this study, a database of fatal accidents was used because in Finland, data of drivers' culpability in non-fatal crashes including information about the age of the passengers is not available. There is also no dataset

consisting of kilometers driven with information as to the age of child passengers, which would have enabled a comparison of the number of crashes to kilometers driven. Focusing only on fatal crashes may have an effect on driver population selection, as fatal accidents are rare events often including special characteristics such as not using seat belt, drunk driving and speeding (e.g. Shibata and Fukuda 1994). Thus it was necessary to limit drivers who were included into analysis in order to meaningfully compare different groups. In addition, the type of the counterpart motor vehicle was not restricted to cars as it would have limited cases too much due to the fact that a substantial (and increasing) proportion of counterparts in fatal crashes are heavy goods vehicles and buses. This might also affect the selected driver population, since the risk of crashing with heavy vehicles is not equal in all driving environments (e.g. rural v. urban areas). Due to potential gender differences in involvement rates by crash severity (e.g. Massie et al. 2007) these results might not generalize to less severe crashes.

Due to the limited number of fatalities with 0-17 year old passengers, possible influence of number of passengers present, time, weekday and driving environment at the crash occurrence could not been analyzed. Future research with more extensive and larger data, including serious non-fatal crashes, is needed to replicate findings of this study and to study the causal mechanisms.

Conclusion

The results suggest that female drivers' risk of crashes is elevated, whereas male drivers' risk is lowered, when driving with a small child passenger. Based on the current data, it is not possible to state a definite cause of the differences in culpability. However, the difference is not only due to risky driving or age of the driver, because those variables were controlled. The effect of a small child passenger on crash risk needs further investigation.

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APPENDIX

Frequencies and percentages (in parenthesis) of risky behavior by driver gender and passenger condition.

	Male drivers (N=1866)				Female drivers (N=573)			
Passenger conditions	BAC> 0.05	Speeding >50km/h	No driving license	No seat belt	BAC> 0.05	Speeding >50km/h	No driving license	No seat belt
No passengers	381 (37.9)	88 (8.7)	96 (9.5)	540 (53.7)	61 (19.7)	8 (2.6)	7 (2.3)	85 (27.4)
Only adult passengers	254 (43.5)	68 (11.6)	125 (21.4)	266 (45.5)	17 (14.5)	4 (3.4)	9 (7.7)	14 (12.0)
10-17 year	14 (11.0)	3 (2.4)	8 (6.4)	25 (20.0)	2 (2.9)	0	0	10 (14.0)
5-9 year	2 (1.8)	1 (0.9)	3 (2.7)	7 (6.4)	0	0	0	11 (18.0)
0-4 year	4 (3.4)	1 (0.9)	2 (1.7)	14 (12.0)	0	0	0	7 (11.0)

Note: risk behavior categories overlap.