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# Young Driver Education Programs That Build Resilience Have Potential to Reduce Road Crashes

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## KEY WORDS

driver education, resilience, motor vehicle crashes, traffic offences, cohort study

## ABBREVIATIONS

RR—relative risk  
CI—confidence interval  
SES—socioeconomic status  
RCT—randomized, controlled trial  
NSW—New South Wales

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**WHAT'S KNOWN ON THIS SUBJECT:** No link between young driver education and motor vehicle crash reductions has been established. Existing infrastructure to support effective programs once determined is declining, yet popular high-speed maneuvering courses that have been shown repeatedly to increase crashes are increasing.



**WHAT THIS STUDY ADDS:** In this study of 20 822 young drivers, a 44% reduced adjusted RR for crash was observed for participants of a “best practice” program that focused on building resilience. An RCT is urgently needed to confirm findings and ensure evidence-based education.

## abstract

**OBJECTIVE:** The research aimed to explore associations between participation in 2 education programs for school-based learner drivers and subsequent road traffic offenses and crashes among a large cohort of newly licensed drivers.

**METHODS:** DRIVE is a prospective cohort study of 20 822 first-year drivers aged 17 to 24 in New South Wales (NSW), Australia. Participants completed a detailed questionnaire and consented to data linkage in 2003–2004. Questionnaire items included year of participation in 2 specific education programs: a 1-day workshop-only program focusing on driving risks (“driver-focused”) and a whole-of-community program also including a 1-day workshop but also longer term follow-up activities and a broader focus on reducing risk-taking and building resilience (“resilience-focused”). Survey data were subsequently linked to police-reported crash and offense data for 1996–2005. Poisson regression models that adjusted for multiple confounders were created to explore offenses and crashes as a driver (dichotomized as 0 vs  $\geq 1$ ) after program participation.

**RESULTS:** Offenses did not differ between groups; however, whereas the driver-focused program was not associated with reduced crash risk, the resilience-focused program was associated with a 44% reduced relative risk for crash (0.56 [95% confidence interval: 0.34–0.93]).

**CONCLUSIONS:** The large effect size observed and complementary findings from a comparable randomized, controlled trial in the United States suggest programs that focus more generally on reducing risks and building resilience have the potential to reduce crashes. A large, representative, randomized, controlled trial is urgently needed to confirm road safety benefits and ensure evidence-based spending and practitioner recommendations in this field. *Pediatrics* 2009;124:1287–1292

Motor vehicle crashes are the single leading cause of death of youth both in Australia and throughout much of the developed world, with young people significantly overrepresented in crash fatalities compared with adults.<sup>1-3</sup> Parents and young people of driving age often seek road safety and medical practitioners' advice regarding driver education programs that they can attend to improve safety; however, to date, few benefits of these programs in terms of crash or casualty reductions have been demonstrated.<sup>4</sup> Despite this, a wide range of programs continue to operate in Australia.<sup>5</sup> Several have sought to incorporate best-practice recommendations but have not yet been evaluated or adequately evaluated in terms of road safety benefits. Likewise, few high-quality evaluations of such developments can be found internationally.<sup>6,7</sup> Limitations include cross-sectional designs, poor participant response rates, inclusion of non-randomized groups, lack of control groups, and a focus on knowledge and attitudes or a specific driving skill and not on actual behavior change or crash and injury outcomes.<sup>7-13</sup>

The DRIVE Study is a large prospective cohort study of 17- to 24-year-olds on their first independent (provisional) license in New South Wales (NSW), Australia.<sup>14</sup> Data available in this study allowed exploration of the relationship between involvement in driver education and various study outcomes. The objective of this article is to report on the associations between participation in 2 specific education programs that target school-based learner drivers and subsequent road traffic offenses and crashes as a driver.

## METHODS

Detailed methods of the DRIVE Study, including sampling, response rates, and the range of variables recorded, have been previously reported.<sup>14</sup> Briefly,

all drivers who were a resident in NSW, were aged 17 to 24, and held their first provisional driver license between June 2003 and December 2004 were invited to complete an online survey and give consent for their survey data to be linked prospectively to routinely collected data held by state jurisdictional authorities. Participants received a movie voucher after completing the survey. A total of 20 822 young drivers completed the survey and gave consent for data linkage. Records including traffic offenses and crashes as a driver were subsequently obtained from the Roads and Traffic Authority of NSW for the 10-year period January 1996 to December 2005, representing an average 2-year follow-up from the DRIVE survey for the majority of participants. In NSW, crashes that occur on public roads are required to be reported to police and recorded when a person is killed or injured, when drivers did not exchange particulars, when  $\geq 1$  driver was reported to be driving under the influence of alcohol, or when any vehicle was towed away. The University of Sydney Human Research Ethics Committee and the NSW Health Ethics Committee approved the study.

## Driver Education Programs

The DRIVE questionnaire included items relating to young drivers' participation and year of participation in 2 specific education programs conducted with secondary school students. The first program comprises a 1-day workshop and focuses on issues related to safe driving ("driver-focused"). It is a community-based initiative to address young driver crashes, injuries, and fatalities through the delivery of practical road safety education at a local level and, where possible, using local resources. It is supported by community members and involves local police and driving instructors, drug and alcohol educators,

financial services, and individuals who are recovering from crashes. The program commenced in urban regions near the NSW capital city (Sydney) but has since expanded to several other regional and rural areas of NSW (as well as to other states). The program is conducted in 6 sessions during a full school day at an off-site location with year 11 students, who are typically learner drivers nearing the age of independent licensing. (The minimum learner age in NSW is 16 years, and minimum independent license age is 17.) The program targets increased awareness of road safety issues and the fostering of positive attitudes, with speed, fatigue, alcohol, and seatbelts key topics, as well as the privilege and responsibilities of owning and driving a vehicle. Particular attention is paid to risk-taking and peer relations, including both driver and passenger empowerment strategies. Additional details can be found on the program Web site ([www.ryda.org.au/html/the-program.html](http://www.ryda.org.au/html/the-program.html)).

The second program is a whole-of-community program that includes attention to driver education issues but is more broadly focused on reducing youth risk-taking and building resilience ("resilience-focused"). It is managed by an intersectorial committee in a regional area of NSW with representatives from the local health service, education sectors, and road safety officers from local councils. The program also receives strong support from the local university, police, ambulance and state emergency services, state motoring and road safety organizations, and the national public radio broadcaster. A 1-day seminar targeting year 11 students is also at the core of the program. Approximately 500 students from various schools meet at an off-site location to participate in the workshop together. The program aims to empower young people with the

knowledge, attitudes, and skills to make informed decisions about driving but also about drug and alcohol use generally, including safe celebrating and looking after friends, thereby also focusing on resilience generally, not only in relation to driving. The program incorporates a range of learning strategies including factual presentations, drama, peer education, and real-life experiences relevant to the social life, developmental stage, and interests of adolescents. Furthermore, several activities in addition to the 1-day program are included: peer-facilitator training workshops for students; fact sheets for parents in school newsletters; professional development sessions for teachers, health workers, and community members; and the involvement of local media. The range and the timing of additional activities implemented depend on each of the participating schools, with a nominated coordinator and students involved in planning and presentations. Additional details can be found on the North Coast Area Health Service Web site ([www.ncahs.nsw.gov.au/drug-alcohol/index.php?pageid%20=%20495&siteid%20=%20176](http://www.ncahs.nsw.gov.au/drug-alcohol/index.php?pageid%20=%20495&siteid%20=%20176)).

### Analyses

Sample demographics and characteristics were calculated for the total cohort and by participation in the driver-focused and the resilience-focused programs. The main outcome variables of offenses and crashes as a driver were dichotomized as 0 vs >1 offense or crash.

Poisson regression models were created to determine relative risks (RRs) and 95% confidence intervals (CIs) of offenses and crashes on the basis of program participation compared with the remainder of the cohort; that is, participation in the driver-focused program versus nonparticipation, and participation in the resilience-focused

program versus nonparticipation. Both univariate (crude) and multivariate (adjusted) models were created, with the latter controlling for a number of potential confounders. Confounding variables were identified from the literature and included in adjusted models when associated with the outcome at the univariate level ( $P < .2$ ). These included demographics, learner and provisional driving experiences, license tests, driving exposure, risky driving behavior, and sensation seeking. Analyses also included adjustment for the period between when the driver participated in the education program and participation in the DRIVE Study. Only offenses and crashes that occurred from the year of participation in the education programs were included with previous offenses and crashes controlled for as an exposure. All analyses were conducted using SAS 8 (SAS Institute, Cary, NC).

### RESULTS

Table 1 presents overall sample demographics and characteristics for the total cohort of 20 822 young drivers, as well as by participation in the driver-focused and resilience-focused programs. Almost half of the study population was aged 17, 55% were female, and three quarters resided in urban centers, with an even distribution among the 4 socioeconomic status (SES) quartiles. The vast majority (93%) of participants had no police-recorded crashes as a driver. A total of 8% ( $n = 1676$ ) had participated in the driver-focused program and 3% ( $n = 540$ ) in the resilience-focused program. More driver-focused program participants were in the highest SES quartile, and most lived in urban areas, whereas more resilience-focused program participants were in lower SES quartiles and lived in inner regional areas, reflecting the populations targeted by the respective programs.

Both univariate and multivariate analyses of offense data showed no significant differences associated with participation in either the driver-focused program (crude RR: 1.00 [95% CI: 0.97–1.13]; adjusted RR: 1.10 [95% CI: 0.99–1.19]) or resilience-focused program (crude RR: 1.00 [95% CI: 0.83–1.09]; adjusted RR: 1.00 [95% CI: 0.82–1.15]) relative to nonparticipation. Regarding crashes as a driver, both univariate and multivariate results also indicated that participation in the driver-focused program was not associated with a reduced RR for crash (crude RR: 1.07 [95% CI: 0.89–1.28]; adjusted RR: 1.00 [95% CI: 0.81–1.23]). In contrast, participation in the resilience-focused program was associated with a 35% reduced RR (0.65 [95% CI: 0.44–0.96]) in univariate analyses, increasing to a 44% reduced RR (0.56 [95% CI: 0.34–0.93]) after adjusting for the significant confounders (variables summarized in Table 1).

### DISCUSSION

This analysis of data from the DRIVE Study showed no association between participation in either of 2 education programs, 1 driver-focused and 1 resilience-focused, and risk for accumulated traffic offenses; however, a substantial reduction in crash risk as a driver was found for participants of the resilience-focused program relative to the remainder of the cohort. Previous pretest–posttest evaluation of the resilience-focused program found significant increases in a range of self-reported recent behaviors, termed protective “meta-behaviors,” including some directly and indirectly related to driving safety, such as planning a safe return from parties, making sure friends are not too drunk or high, and always checking that the driver is not drunk before getting into a car, that were sustained at a 5-month follow-up.<sup>13</sup> Conversely, although a similar pretest–posttest evaluation of

**TABLE 1** Sample Demographics and Characteristics by Education Program Participation

Measure	Total (N = 20 822), n (%)	Education Program, n (%)	
		Driver-focused (n = 1676)	Resilience-focused (n = 540)
Gender			
Male	9457 (45.4)	894 (53.3)	263 (48.7)
Female	11 365 (54.6)	782 (46.7)	277 (51.3)
Age at time of survey, y			
17	10 138 (48.7)	1128 (67.3)	350 (64.8)
18–19	7747 (37.2)	512 (30.6)	173 (32.0)
20–24	2937 (14.1)	36 (2.1)	17 (3.2)
SES			
First quartile	5141 (24.7)	1027 (61.3)	36 (6.7)
Second quartile	5142 (24.7)	256 (15.3)	98 (18.1)
Third quartile	5453 (26.2)	235 (14.0)	285 (52.8)
Lowest quartile	5086 (24.4)	158 (9.4)	121 (22.4)
Area of residence			
Metropolitan/urban	15 477 (74.3)	1384 (82.6)	86 (15.9)
Inner region	4401 (21.1)	277 (16.5)	437 (80.9)
Outer region/remote	944 (4.5)	15 (0.9)	17 (3.2)
Average weekly driving hours			
>10	4002 (19.6)	335 (20.0)	117 (21.7)
≥5 but <10	3787 (18.6)	383 (22.9)	127 (23.5)
>2 but <5	6011 (29.5)	507 (30.3)	158 (29.3)
≤2	6609 (32.4)	448 (26.8)	138 (25.6)
Risky driving behavior			
Low	6859 (32.9)	462 (28.4)	143 (27.3)
Medium	6465 (31.1)	448 (27.6)	174 (33.3)
High	6463 (31.0)	716 (44.0)	206 (39.4)
Sensation seeking			
Low	6267 (31.9)	466 (28.8)	143 (27.7)
Medium	6400 (32.5)	553 (34.2)	176 (34.1)
High	7006 (35.6)	599 (37.0)	197 (38.2)
Length of time on learner license, y			
>2	7844 (37.9)	690 (41.3)	251 (46.7)
1–2	7369 (35.6)	743 (44.4)	217 (40.3)
<1	5471 (26.5)	239 (14.3)	70 (13.0)
Penalties main supervisor			
0	15 460 (90.5)	1302 (90.7)	449 (93.0)
≥1	1619 (9.5)	134 (9.3)	34 (7.0)
Driving test attempts			
1	13 493 (65.0)	1068 (63.8)	384 (71.2)
2	4965 (23.9)	419 (25.0)	114 (21.2)
≥3	2291 (11.0)	188 (11.2)	41 (7.6)
Time on independent license, mo			
<6	12 912 (62.4)	1164 (69.7)	337 (62.9)
6–12	4862 (23.5)	372 (22.3)	132 (24.6)
>12	2907 (14.1)	135 (8.1)	67 (12.5)
No. of traffic offenses			
0	12 099 (58.1)	989 (59.0)	323 (59.8)
1	4826 (23.2)	415 (24.8)	138 (25.6)
2	2073 (10.0)	162 (9.7)	41 (7.6)
3	908 (4.4)	61 (3.6)	16 (3.0)
≥4	916 (4.4)	49 (2.9)	22 (4.1)
Crashes as a driver			
0	19 327 (92.8)	1553 (92.7)	514 (95.2)
1	1422 (6.8)	119 (7.1)	24 (4.4)
2	70 (0.3)	4 (0.2)	2 (0.4)
3	3 (0.01)	0 (0.0)	0 (0.0)

consistent with the current findings of long-term benefits of the resilience-focused program but not the driver-focused program. The exact date of participation in the education programs was not requested in the DRIVE questionnaire; however, year of participation responses indicated that the comparative time lapse from program participation to completion of the DRIVE questionnaire ranged between 6 and 12 months for 85% of the cohort. Given that crashes were then explored up to an additional 2 years after questionnaire completion, this suggests a sustained benefit of the resilience-focused program.

The finding of no differences in traffic offense risk, however, is inconsistent with the results of a recent randomized, controlled trial (RCT) of a school-based drug abuse prevention program in the United States that similarly focused on reducing risk and building resilience.<sup>15</sup> Self-reported data in 7th, 10<sup>th</sup>, and 12<sup>th</sup> grades were subsequently linked to licensing data among >2000 students, two thirds of whom had completed the program. Despite not including a focus on driving risks, fewer traffic violations and demerit points were recorded against the licenses of program participants compared with nonparticipants (crashes were not explored, and the relative contribution of alcohol or drug offenses among violations and points could not be determined). Traffic offense records, however, can vary depending on the different laws and sanctions that apply in various regions and particularly as a result of different levels of police enforcement of those laws. Exposure to enforcement cannot be determined in either study; therefore, additional investigation is needed to clarify this issue.

the driver-focused program demonstrated a short-term reduction in risky driving behaviors, changes were not

sustained at 3 months.<sup>8</sup> Although these evaluations did not explore traffic offenses or crashes, these results are

The reduced relative risk for crash that was observed for resilience-focused program participants was

substantial and questions the previous conclusions of a lack of road safety benefits of young driver education. The findings suggest that programs that incorporate best practice and focus more broadly on reducing risk-taking and building resilience have the potential to be effective, despite requiring caution given the observational and nonrepresentative nature of the DRIVE Study. Representative study populations are not necessary to obtain unbiased and generalizable estimates of exposure–outcome relationships<sup>16–18</sup>; however, a fundamental issue with observational studies is that, even with large participant numbers, results can lack reliability, as clearly demonstrated in a range of medical studies reviewed in a seminal article by MacMahon and Collins.<sup>19</sup> As is true for all voluntary studies, it is not possible to determine whether there is inherent bias in the self-selected sample. In this study, it cannot be determined whether drivers who benefited from involvement in the resilience-focused program were more likely to participate in the DRIVE Study compared with those who did not benefit. MacMahon and Collins highlighted, however, that confidence in observational study findings is greater when observed effect sizes are large and when there are supporting findings from RCTs. This is true in this case, with a large association observed between participation in the resilience-focused program and subsequent crash reduction (44%), and sustained road safety benefits determined in the aforementioned US RCT of a school-based drug abuse prevention program also focused on resilience.<sup>15</sup>

Nonetheless, there is still an important need for a large RCT of programs, such as the resilience-focused program, that have incorporated best-practice recommendations. It is possible that there are features of the program other than the focus on resilience that

contributed to the observed crash reduction. The need is also urgent given that funding of such programs has been in decline since the poor evaluation outcomes of previous driver education programs.<sup>4</sup> Urgency is also imperative because of the many currently operating programs that focus on driver education only, which may not only be costly and lack effectiveness but also have the potential to increase crash risk. For example, time concessions to licensure on the basis of driver education participation have been repeatedly associated with increased exposure and crash risk<sup>4,11,20–22</sup> yet continue to exist in 28 US jurisdictions at the time of writing.<sup>23</sup> Skid recovery maneuvering also continues to feature in young driver programs both in Australia and the United States despite clear counterproductive outcomes in evaluations.<sup>7,24–26</sup> Nonetheless, these evaluations are also somewhat dated and advanced skill-based programs may also have changed in recent years; therefore, ideally, a definitive RCT would compare best-practice programs with these advanced skills programs. Such a high-quality evaluation would ensure that current programs are having the desired and not adverse effects, and, importantly, findings could be used to support policy changes and responsible spending of the limited resources that are available in this field.

## CONCLUSIONS

Previous driver education literature has long theorized the need for integrated community-based programs that extend beyond the traditional 1-day duration and focus on knowledge and attitudes only, to targeting actual behavior change to have an impact on crashes and casualties.<sup>4,7,27–29</sup> Building resilience has become the cornerstone of prevention programs in other fields of adolescent risk-taking<sup>30–32</sup> and has been declared vital for public health interventions to succeed.<sup>30</sup> All of these recommendations

are true of the resilience-focused education program that was observed to reduce motor vehicle crash risk; therefore, these findings lend considerable support for the possibility that young driver education programs have the potential to reduce crash risk when incorporating best practice. Clarification of the possible mechanisms underlying the effect is needed to enhance the implementation and effectiveness of similar programs elsewhere. This might relate to specific components of the program but is likely also to relate its holistic, multifaceted nature. As suggested by Groeger,<sup>33</sup> additional research in this field need not seek a new “silver bullet.” If current best practice is combined into a comprehensive program that is correctly implemented and evaluated, then the true benefits of modern young driver education programs can be realized. This will allow evidence-based spending in this field and evidence-based recommendations to youth and their families, by both medical practitioners and the wider road safety community.

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