CHILD CAR RESTRAINTS: MANDATING TYPE AND SEATING ROW ACCORDING TO AGE WITH POSITIVE EFFECT IN REGIONAL CITY IN QUEENSLAND, AUSTRALIA

MELISSA JOHNS, ALEXIA LENNON AND NARELLE HAWORTH

Corresponding author:
Dr Alexia Lennon
Centre for Accident Research and Road Safety-Queensland
K Block, Queensland University of Technology
130 Victoria Park Road Kelvin Grove QLD 4059
AUSTRALIA
Phone: 61 7 3138 8417
Fax: 61 7 3138 0111
Email: aj.lennon@qut.edu.au

Ms Melissa Johns
Centre for Accident Research and Road Safety-Queensland
K Block, Queensland University of Technology
130 Victoria Park Road Kelvin Grove QLD 4059
AUSTRALIA
Phone: 61 7 3138 8417
Fax: 61 7 3138 0111
Email: melissa.johns@qut.edu.au

Professor Narelle Haworth
Centre for Accident Research and Road Safety-Queensland
K Block, Queensland University of Technology
130 Victoria Park Road Kelvin Grove QLD 4059
AUSTRALIA
Phone: 61 7 3138 8417
Fax: 61 7 3138 0111
Email: n.haworth@qut.edu.au

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ABSTRACT

Road trauma is a leading cause of child injury worldwide. In highly motorised countries, injury as a passenger represents a major proportion of all child road deaths and hospitalisations. Australia is no exception, particularly since there are high levels of private motor vehicle travel to school in most Australian states. Recently the legislation governing the type of car restraints required for children aged under 7 years has changed in Australia, aligning requirements better with accepted best practice. However, it is unclear what effect these changes have had on children's seating positions or the types of restraints used. A mixed methods evaluation of the impact of the new legislation on compliance was conducted at three times: baseline (Time 1); after announcement that changes were going to be implemented but before enforcement began (Time 2); and after enforcement commenced (Time 3). Measures of compliance were obtained using two methods: road-side observations of vehicles with child passengers; and parental self-report (intercept interviews conducted at Time 2 and Time 3 only). Results from the observations suggested an overall positive effect. Proportions of children occupying front seats decreased overall and use of dedicated child seats increased to almost 40% of the observed children by Time 3. However, almost a quarter of the children observed still occupied front seats. These results differed from those of the interview study where almost no children were reported as usually travelling in the front seat, and reported use of dedicated restraints with children was almost 90%, over twice that of the observations.

INTRODUCTION

The invention of child restraint devices has been hailed as one of the most noteworthy public health developments of the 20th century *(1)*. Since their introduction, it has been widely and consistently documented that child restraints, in general, reduce the risk of injury and fatality in traffic collisions *(2-7)*. Recently in the United States, it was estimated that child restraints saved the lives of 309 children under the age of 5 years in 2009, and that an additional 63 would have been saved if restraints had been used by all children in this age group *(6)*. Restrained children involved in crashes typically receive injuries that are only minor in nature *(8-10)*. However, the most common and also the most serious injuries occur to the head *(11)*, usually as a result of contact with the vehicle interior *(4)*. Thus, the primary goal of a child restraint is to minimise head and body excursion to prevent contact and, to do so effectively, the restraint design must be suited to the biomechanical and anthropometric characteristics of the child *(12)*. Such restraints have been shown to reduce the risk of death or injury to the children wearing them by 45-78% *(6, 8, 13-20)*.

In recognition of mounting research evidence about the superior protection offered by appropriate child restraints, in 2009 the Australian Transport Ministers endorsed changes to the Australian Road Rules for child restraints that underpin legislation in each of the states and territories of Australia *(21)*. Accordingly, Queensland, one of the seven Australian states, enacted legislation in 2010 incorporating these changes. This new legislation mandates use of specific types of dedicated child restraints (according to the child's age) as well as rear seating for children aged under 7 years. Details on the requirements can be seen in Table 1.

The earlier legislation only required dedicated child restraints for children aged under 12 months. Thus, use of an adult seat belt with children over 1 year of age represented compliance with legislation in all states and territories of Australia until 2009. Though it was legal to use a seat belt with children as young as 1 year old, fortunately this behaviour was not typical. Previous observational studies *(22-23)* as well as case-based analyses of injured children *(8, 24)* have suggested that use of dedicated restraints in Australia was common for children up to the age of 3 years. However, after this age many children were 'graduating' to adult seat belts, used without belt positioning booster seats (the most appropriate restraint for children once they outgrow the forward-facing child seat). The likelihood of using a booster seat decreased dramatically with each year of child age, with almost no children using them after 6 years old. This was the case even though booster seats are the most appropriate restraint for children until age 8-9 years, when it is more likely that the child has reached an appropriate height for good adult belt fit. A similar pattern of premature use of adult belts among children aged 3-8 years has been reported from the United States *(2, 25-31)* where a nation-wide campaign to encourage booster seat use among booster-aged children has been in place since 2008 *(32)*. In specifying that children aged 4-7 years use booster seats, the new legislation is intended to draw parents' attention to the importance of continuing to use a dedicated restraint until the child becomes large or tall enough to use an adult belt effectively.

INSERT TABLE 1 ABOUT HERE

Thus, while parental compliance with restraining their children under the old legislation was high (around 90-95%), many younger children were restrained using adult belts, a restraint too large to offer optimal protection to them. Moreover, this relatively

widespread use of adult belts rather than child restraints appears to encourage child occupation of the front seats of vehicles, thus exposing them to the additional risk of injury associated with sitting in the front rather than rear seat positions *(14, 31-35)*. For younger children too small for good adult belt fit, travelling in the front seat also presents a risk of slipping out of the adult restraint during a crash and thus being both unrestrained and possibly being struck by a front passenger-side airbag. While in the United States the extent to which children under 8 years travel in the front seats of vehicles has been shown to have decreased in the past decade to between 3% and 20% *(34-35)*, levels of between 25% and 50% have been reported in Australia (*8, 22-24*).

As the previous legislation was silent on both restraint type and seating position, it failed to signal to parents the importance of using the most appropriate restraint for a child's age/size, providing little guidance as to which restraint type(s) are most suited to which age(s) of child. The new legislation addresses these shortcomings, specifying the type of restraint according to age as well as requiring that children under 7 years old travel in the rear seat unless this is already fully occupied with other children aged under 7 years old.

During the period August 2009 to March 2010 the Queensland Department of Transport and Main Roads used print and radio media to notify parents of the impending changes to the legislation and to inform them of the new requirements. Information was available on the Department's website and information brochures were also available. In addition to the planned and funded educational measures, some 'free' television promotion of the changes occurred through current affairs and news coverage.

Positive effect of legislation on appropriate use of child restraints

Legislation and its targeted enforcement have been shown to have a positive effect on the level of use of restraints among adults in the United States *(35)*. Although some parents report using child restraints because they believe them to be effective in reducing injury, child restraint legislation also appears to be important. A state-wide survey of parents in Michigan revealed that their (incorrect) beliefs that booster seats were required by law was a primary determinant of the motivation to use, and usage rates, of booster seats *(36)*. In addition, rates of appropriate restraint use among children aged 4-8 years in the United States have increased threefold in the past decade, an improvement attributed to both national promotion of booster seat use by the NHTSA and to upgrading of restraint laws in many states making booster seats compulsory for children 4 years or older *(35, 37)*. Recent crash data analysis indicates an 18% reduction in crash-related injury among children aged 4-6 years, arguably an indication of the effectiveness of mandating of booster seat use for age-appropriate children *(38)*.

The current study

The legislation has been in place since March 2010 in Queensland, Australia. This paper reports the results of an outcome evaluation of the effect of the new legislation on the types of restraints used with children aged 0-7 years and their seating positions in a regional city in Queensland. A regional area was chosen for two main reasons. Firstly, restraint use for adults is known to be at lower levels in regional than metropolitan areas and it may be that children's use of restraints follows similar patterns. Secondly, although Brisbane, the capital of Queensland is home to around one third of the state's population, large proportions of the population live in regional or rural areas. However, currently little is known about child restraint use in non-metropolitan areas.

The city of Toowoomba was chosen for this study because of its relatively well defined geographical character and because of its size. Toowoomba has a population of around 150,000 people and is situated 125 kilometres west of Brisbane. In 2006, the average annual taxable income for Toowoomba was AU$34,509, somewhat below the average for the state of Queensland (AUD37, 269). Toowoomba's population is primarily Caucasian, with only 3% identifying as Indigenous in the 2006 Census *(39)*.

Two separate but related studies were conducted: an observational study (restraint type; seating position) and an intercept interview (health beliefs; self-reported restraint use and seating positions). Data for the observational study was collected at three time points in order to take advantage of the unique opportunity offered by the way that this legislation was implemented. The Queensland government announced the impending legislation in September 2009, a full six months prior to the date for enactment and enforcement. Effectively this created an 'amnesty' or adjustment period for parents to become familiar with the new requirements and put into place practices for compliance. During the next six months, advertising and promotional activities aimed at raising parental awareness about the changes as well as providing information were undertaken throughout the state. By collecting data in July-October 2008 (Time 1) before the announcement of changes to the legislation the research team was able to establish baseline measures of children's seating positions and restraint use. The second wave of data collection took place in November 2009 (Time 2), between the announcement (September 2009) and enactment (March 2010) of the changes to the legislation. This second set of observations was intended to address the question of the extent to which the announcement alone had led to compliance. The final wave of observations was collected in May 2010 after enactment and enforcement had begun (Time 3) and was designed to provide a measure of the extent to which parents were complying as a result of the legislation.

Based on these time periods and the results of previous research, the following hypotheses were proposed:

H1: Announcement and enactment of the new legislation will decrease the proportion of child passengers occupying front seats.

H2: Announcement and enactment of the new legislation will increase the proportion of child passengers restrained in dedicated child restraints (rather than adult belts).

H3: Announcement and enactment of the new legislation will reduce inappropriate use of adult seat belts by children.

STUDY 1: THE OBSERVATIONS

Method

Road-side observations of vehicles carrying child passengers were taken at the three time periods in Toowoomba (described above), a regional city in Queensland, Australia. The first of these, July to September 2008, was well prior to the proposal for changes to legislation and therefore acts as baseline data for the rest of the observational data. In order to examine the effect of the announcement alone (that is, prior to any enforcement), two further sets of observations were carried out. Announcements and advertising for the new legislation began in September 2009, with a proposed date of March 2010 for enforcement activities to begin. Thus the second set of data was collected at Time 2, November 2009. The third set of observations, at Time 3, May 2010, was collected two months after the enforcement period had begun. Although the target of the legislation is children aged under 7 years, the observational study used a broader age band, 0-12 years. This was because of the difficulty

of establishing a child's age based on observation alone. Seated height was used as a proxy for age and a child passenger was deemed to be one whose seated height was below the top of the vehicle seat head restraint. A second proxy used at the primary (elementary) school sites was the wearing of the school's uniform, as children attending primary school in Queensland are typically aged 5 to 12 years.

Measures

The primary outcomes of interest in this study were the proportions of children using each type of dedicated restraint and the seating positions children occupied. Thus observations were made of the number of child passengers in each vehicle, and the type of restraint and seating position for each child. In the case of adult seat belts, a note was made of whether the belt appeared to fit the child or not: belts were deemed to 'fit' if the sash portion could be seen passing over the child's shoulder and mid-sternum. Where the belt was observed to touch the child's neck or could be seen passing across the child's face, this was recorded as 'not fit'. Restraints were categorised into Rear Facing infant restraint (RF), forward-facing child restraint or booster seat (FFCR/Booster), 'H' harness (a four point, child-specific accessory shoulder harness used with a lap-only adult belt), adult lap-sash belt, and unrestrained. A final category, 'unknown' was used where the observer could not tell whether a child was using a restraint, but it was not obvious that the child was unrestrained. Thus, 'unrestrained' refers only to those circumstances where the observer was certain the child was not wearing a restraint while 'unknown' refers to where it was not clear whether the child was restrained or not. For instance, where a child was seated in the centre rear position and thus may have been using a lap-only belt that the observer could not see, or where the child may have been using a lap-sash belt but have tucked the sash portion behind his/her back, the 'unknown' category was used. Unfortunately, it was necessary to combine the categories of forward-facing child restraint and booster seat due to the difficulties in distinguishing them from each other when the opportunity for observing this is very brief. Other limitations of the method were that, for similar reasons, it was not possible to determine whether the restraint was being used correctly, or whether it was correctly anchored to the vehicle, both important considerations in the effectiveness of the restraint.

Procedure

Trained observers stood at the road-side of sites chosen for their anticipated high volumes of vehicles carrying child passengers. Sites chosen were close to primary schools or shopping areas where traffic was forced to slow down or stop, thus ensuring that observers could see into vehicles clearly. For sites close to schools, observations were conducted at times immediately prior to the start of the school day (8:30-9am) or at the end (2:30-3:30pm). To reduce the possibility of counting the same vehicle/children twice, each road section/direction was used only once. In taking this approach, an assumption was made that parents drop off and collect their children from the same school entrances and exits each day. For shopping areas, observations were conducted during the middle of the day (10am-1pm) and only single directions of travel were used, to reduce the possibility of double counting.

Vehicles were included if they had a rear seat and were judged to have child passengers aged in the target age range (0-12 years) but no adult front seat passengers (as previous research suggests that the presence of an adult or teenaged passenger reduces the possibility for younger children occupying front seat positions to near zero).

Observers worked in pairs but stood at different observation points with responsibility for collecting the details for child passengers in separate sets of vehicles. Where vehicles did

not afford a clear view of the child passengers, observers were instructed to ignore the vehicle and move on to the next. While information about the driver would have been desirable, in practical terms, the demands of the task made collecting this additional information too difficult for reliable collection. Ethics approval for the research was granted by the Queensland University of Technology Human Research Ethics Committee (approval numbers 0800000309 and 1000000235)

Statistical Analyses

Standard descriptive analyses of the data using the Statistical Package for Social Sciences (SPSSv18) were conducted. In addition, chi-square tests of significance were used to make comparisons across time periods (Linear by Linear association; standard chi-square).

Results

Overall, data for 3201 vehicles carrying 4264 children estimated as aged 0-12 years were collected across the three time periods. Table 2 summarises the numbers of vehicles and children by time period, together with the proportions of vehicles carrying 1-4 children and the types of restraints used. About two-thirds of the vehicles with child passengers were carrying only one child. Only 0.2% had four children, and therefore parents may have been forced to seat a child in the front because the rear seat was full.

Seating position

There was a statistically significant trend in the proportion of children travelling in the front seat between Time 1 (31.8%), Time 2 (26.5%), and Time 3 (23.0%) [$\chi^2(1) = 26.62$, $p < .001$, Linear-by-Linear association]. This decrease is more marked for vehicles carrying only one child passenger, where the proportion of front-seated children decreased from 33.6% at Time1 to 21.5% at Time 3 [$\chi^2(1) = 28.13$, $p < .001$, Linear-by-Linear association]. The difference from Time 2 to Time 3 (26.5% to 23.0%) was not significant for the overall sample [$\chi^2(1) = 4.08$, $p = .053$ ns], but it was significant for single child passenger vehicles, (25.7% to 21.5%), [$\chi^2(1) = 4.08$, $p = .043$]. Thus it appears that Hypothesis 1, that announcement and enactment of the new legislation would decrease the proportion of child passengers occupying front seats, is supported regardless of the number of children in the car. However, enactment and enforcement produced additional decreases over announcement alone only where there was only 1 child passenger.

Patterns in types of restraints used

As has been demonstrated in other studies, the restraint of choice for the children observed in this study was overwhelmingly adult seat belts used without a booster. Overall (across all time periods), 61.9% of child passengers were restrained in adult belts, with a further 29.6% using a forward-facing child seat or booster seat, and 2.3% restrained in rear facing infant restraints. Only 2.1% of the sample were clearly unrestrained, and for the remaining 4.0% the observer could not tell if the child was restrained or not ('Unknown').

To test the second hypothesis, that announcement and enactment of the new legislation would increase the proportion of child passengers restrained in dedicated child restraints (rather than adult seat belts), proportions of children in either dedicated restraints (RF, FFCR/Booster) or not-dedicated (seat belt, 'unknown' and unrestrained) were compared across the three time periods (see Table 2).

There was a statistically significant increase in the level of dedicated child restraint use overall between Time 1 (32.4%) and Time 3 (37.2%) [$\chi^2(1) = 6.88$, $p = .009$, Linear-by-

Linear association]. However, the pattern was not that anticipated (that is, consistent improvement). Rather, after an apparent decrease between Time 1 and Time 2, there was a statistically significant increase in the proportion of children in dedicated restraints from Time 2 to Time 3 [$\chi^2(1) = 38.76$, $p < .001$]. This suggests that the enactment and enforcement of the legislation rather than simply announcement was required for observable behavioural change in the type of restraints used.

INSERT TABLE 2 ABOUT HERE

A total of 2641 children used adult seat belts across the three time periods. Table 2 displays results for the fit of seat belts by time period. The proportions of children wearing seat belts that were too big declined for each time period from 65.4% at Time 1, to 44.0% at Time 2 to 38.8% at Time 3 [$\chi^2(1) = 121.6$, $p < .001$, Linear-by-Linear association]. Moreover, there was a statistically significant decrease in the proportion of children wearing seat belts that did not fit them between announcement of the changes (Time 2, 44.0%) and their enactment/enforcement (Time 3, 38.8%) [$\chi^2(1) = 4.72$, $p = .030$].

While a pattern of consistent decline was evident overall, when results were stratified by seating position the results for front seated children were different from those for children seated in the rear. For children in the front seat, the proportion of children in belts that were too big fell by more than half between Time 1 and Time 2 from 69.1% to 34.2% but there was no statistically significant difference in this proportion between Time 2 and Time 3 [$\chi^2(1) = 1.71$, $p = .191$]. However, for children in the rear seat, there was a significant decrease in the proportions that were restrained in seat belts that did not fit between Time 2 (50.0%) and Time 3 (38.6%) [$\chi^2(1) = 13.31$, $p < .001$].

Thus Hypothesis 3, that announcement and enactment of the new legislation would reduce inappropriate use of adult seat belts by children, is supported for children overall. However, it appears that the impact of the enactment and enforcement of the legislation was greater for children occupying the rear seats of vehicles.

STUDY 2: INTERCEPT INTERVIEWS

The second study was designed to obtain more in-depth knowledge of parental awareness and perceptions of the legislation as well as reports about restraint use as a function of child age. In addition, questions were designed to explore the relationship, if any, between parental health beliefs and their self-reported behaviour and to identify potential barriers to compliance with the new requirements. For purposes of comparing the results between this study and the observational one, only the results from the behavioural measures are reported here.

Method

Intercept interviews (duration approximately 10 minutes) were conducted with a convenience sample of 125 parents in Toowoomba during February 2010 (Time 2), after the announcement of the legislation but prior to its enactment, and followed up in May-June 2010 after the enactment (Time 3). Parents were approached at shopping centres or child care centres during the hours of 9am and 3pm. Inclusion criteria were that the parent had at least one child in the target age range (0-8 years), drove that child at least once per week and did so in a vehicle with a rear seat. After explaining the purpose of the study, verbal consent to participate was sought. At the conclusion of the interview, participants were invited to

consent to a brief telephone follow-up three months later (after the legislation enforcement date in March 2010). While most of the 125 parents who were interviewed agreed to be followed-up, only 62 of these could later be contacted. Thus the remaining parents (n = 63) were lost to follow-up.

The questionnaire

The intercept interview (Time 2) consisted of 42 questions. Initial questions related to children in the target age range (0-8 years) and allowed for separate responses for each child up to a maximum of three children (the three oldest in circumstances where parents indicated they had more than three aged under 8 years). Thus child age, shirt size (to gauge if the child is larger, smaller or average for age), seating position (usual, travelled in front at any time during previous 6 months), type of restraint usually used (rear-facing, forward-facing child seat, booster seat, child H harness, adult seat belt used without a booster, unrestrained), as well as the parent's confidence in choosing, obtaining, installing and using the most appropriate restraint for each child were collected for each child aged under 8 years. Later questions asked for parents' more general beliefs about the protection offered by restraints, their awareness of, and perceptions about, the legislation and changes to it, and demographic details. For the follow-up at Time 3 parents were re-interviewed by telephone using the same questions as those from the intercept interview.

Only data related to parents' report of children's seating position, restraint type used and the assessment of whether this fitted the child or not (from the child's size/age and type of restraint) are reported in this paper.

Results

Demographic characteristics of the sample

The majority of participants in the intercept interview were mothers (82%), married (71%) and aged 25-40 years (64.8%). Most (75%) had at least a grade 12 (final year of high school) education with 15% having obtained university degrees or postgraduate qualifications. Income was roughly evenly spread across the income brackets (see Table 2). These parents reported data for 222 children at Time 2. At Time 3, after the enactment/enforcement of the new legislation, 62 of the original 125 parents were able to be contacted for follow-up (63, 50.4% being lost to follow-up). These parents reported on 111 children (111 children being lost to follow-up). Comparisons of demographic characteristics did not reveal any significant differences between the parents who were able to be followed up and parents lost to follow-up on age, gender, education, income, or number of children in the family.

Table 3 displays the age (grouped as specified in the legislation), seating position and type of restraint children were reported as usually wearing, by time period. As can be seen, the sample was fairly evenly distributed for children in the age range targeted by the legislation (under 7 years old). Almost all children were reported to usually travel in the rear seat, and at Time 2 only 7% were reported as having travelled in the front at any time during the previous six month period. According to parental reports, 88.7% of children were usually restrained in a dedicated child restraint at Time 2. The data at Time 3 for the reduced sample showed similar patterns to Time 2.

INSERT TABLE 3 ABOUT HERE

In relation to compliance with legislation on the type of restraint, as shown in Table 3, according to parental reports, 95% of children overall at Time 2 and Time 3 were restrained

in the type of restraint specified for the child's age under the legislation. Almost all of the children aged 1 year and under were reported to be restrained in the required restraint type (i.e. in an infant capsule, rear-facing infant restraint, or forward facing child seat). Rates of reported compliance appeared somewhat lower for 2-3 year olds than other age groups at Time 2, though they still approached 85%.

However, the legislation includes additional clauses that allow children who are large for their age to use the restraint suitable for children of the next age group. In order to more precisely estimate the proportion of children who were restrained in accordance with the legislation, size of the child was taken into consideration. Calculation of the child's size was based on the child's shirt size as reported by the parent, with children who were more than 2 sizes larger or smaller than their year of age (e.g. a 2 year old reported as wearing a size 5 shirt) were coded as larger or smaller for age respectively. Children within 2 sizes of the year of age were coded as normal for age. Restraint status was then coded as 'legal' or 'not legal' based on whether the restraint the child was reported as usually using was that required for the child's coded size. Table 3 shows that this procedure led to an increase in the estimated proportion of children who were legally restrained, from 92.8% to 95.5% at Time 2, though there was no change for the followed up children at Time 3.

DISCUSSION

Data from the observational study suggests that the legislation had a positive effect on children's seating positions and the types of restraints used. The combination of announcement and enactment and enforcement of the new legislation decreased the proportion of child passengers occupying front seats, regardless of the number of children in the car. However, enactment and enforcement produced additional decreases over announcement alone in those vehicles where there was only one child passenger (two-thirds of vehicles), but not in those vehicles where there was more than one child passenger. Perhaps the limited extent of enforcement was not sufficient to overcome barriers to moving the child from the front seat that may have been stronger when there was more than one child in the car. As an example of some of these barriers, some parents have reported in other studies that they choose to seat one child in the front and one in the rear to avoid sibling squabbles, teasing or physical contact *(40)*.

Despite the introduction of the legislation, almost a quarter of the children observed were seated in the front seat. While some of these children may have been old enough to be legally allowed to sit in the front, previous research suggests that their safety would still be improved if they sat in the rear (*31-33*) (although some road safety experts have pointed out that improvements in occupant protection for rear seat occupants may be lagging behind those for front seat occupants).

Notwithstanding an inexplicable fall after the legislation was announced, the proportion of children in dedicated child restraints increased from baseline to after enactment and enforcement of the legislation. However, more than 60% of children were not in dedicated child restraints after enactment and enforcement of the legislation. This is higher than would be expected (even accounting for some children being older than 7) and further supports the need for further investigation of the appropriateness of restraint use by older children.

There appeared to be a discrepancy between the findings for the observational study and those from the parent-reports. While by Time 3 almost 40% of the observed children were restrained in a dedicated restraint, an improvement as noted above, parents in the interview study reported a level of almost 90% for their children, more than twice that in the

observations. Though an overall positive impact from the legislation was discernable for the observations, there was no change in the reported restraint or seating positions for children in the follow-up study, suggesting that the legislation had no impact on the behaviour of these parents. As compliance levels were already over 90% for this sample, this is unsurprising, and should not be interpreted as an indication that the legislation was ineffective.

At least some of this difference is likely due to the inclusion of older children in the observational data (up to age 12 years) and to the greater relative proportions of children aged 1-3 years in the interview study for whom other studies would suggest very high levels of dedicated restraint use *(22-24)*. It may also be that this discrepancy is due to over-representation of more compliant parents in the interview study. Alternatively, parents may be misrepresenting the restraints used with their children or exaggerating the consistency with which they use them. A limitation of the research is that there is no way of gauging the extent to which this is true. It nevertheless supports the need for observational data to validate parental reports regarding where their children are seated and how they are restrained. An additional limitation affecting the observation study is that child ages were not available, and these are difficult to assess based on appearance alone. Future studies could be improved by including a measure of age, preferably an objective one.

CONCLUSIONS

Changing the child restraint legislation led to higher observed levels of rear seat use and use of dedicated child restraints but many children remain inappropriately seated and restrained. Although it is encouraging to note the decrease in the proportion of children in the front seat, there were still a quarter of the observed children occupying front seats, and 40% of these appeared too small for the seat belt, suggesting that at least 10% of children should still be in a dedicated restraint in the rear seat. This would appear to suggest more effort is needed both to inform parents of the benefits of using a dedicated restraint with older children and to encourage them to choose the appropriate restraint for the child's age.

While enforcement is a common method for increasing compliance with traffic legislation in Australia, especially in relation to high-risk behaviours such as drink-driving and speeding, this may not be the most efficient or effective method in relation to child restraints. Such enforcement is high cost and, given that the level of restraint of children has been very high for quite some time, more likely to create ill will among parents who are already demonstrating willingness to keep their children safe. Rather, education and voluntary compliance as well as marketing the desirability of restraints may be preferred. This will involve finding ways to improve parent awareness of the availability of current more advanced child restraint designs and the considerable benefits afforded to older children from using these types of restraints for longer. In addition, attention needs to be paid to making these 'cool' for children to use rather than an odious necessity.

The comparison of observation and parental reports suggest that there may be limitations to the latter method, despite its ability to capture child's age and parental beliefs, and that observation may be a more reliable approach to measuring child seating and restraint behaviours.

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List of Table titles

TABLE 1 Part 16: Rules for Persons Travelling in or on Vehicles - Rule No. 266: Wearing of Seatbelts by Passengers Under 16 Years Old (Australian Road Rules, 2009)

Child Age	Rule
< 6 months	He/she must be restrained in a suitable and properly fastened and adjusted rearward facing approved child restraint
6 months - < 4 years	He/she must be restrained in a suitable and properly fastened and adjusted: ▪ rearward facing approved child restraint; or ▪ forward facing approved child restraint that has an inbuilt harness
4 years – < 7 years	He/she must be: ▪ Restrained in a suitable and properly fastened and adjusted forward facing approved child restraint that has an inbuilt harness; or ▪ Be placed on a properly positioned approved booster seat and be restrained by a seatbelt that is properly adjusted and fastened
< 4 years	He/she must not be in the front row of a motor vehicle that has 2 or more rows of seats
4 years – < 7 years	He/she must not be in the front row of a motor vehicle that has 2 or more rows of seats unless all of the other seats in the row or rows behind the front row are occupied by passengers who are also under 7 years old
7 years – < 16 years	▪ He/she must be restrained in a suitable approved child restraint that is properly adjusted and fastened; or ▪ He/she: o Must occupy a seating position that is fitted with a suitable seatbelt; and o Must not occupy the same seating position as another passenger (whether or not the other passenger is exempt from wearing a seatbelt under rule 267); and o Must wear the seatbelt properly adjusted and fastened

TABLE 2 Child Passenger Numbers, Seating Position, Restraint Use and Inappropriate Seat Belt Use (for seat belt wearers only) by Time Period

	Time 1	Time 2	Time 3	Totals
Number of vehicles	1066	1059	1076	3201
Number of children	1474	1417	1373	4264
Vehicles with *n* child passengers (%)				
1	66.4	71.0	76.2	67.7
2	29.1	24.4	21.0	24.8
3	4.3	4.4	2.1	3.6
4	0.2	0.2	0.3	0.2
Child passengers in front seat % (n)	31.8 (468)	26.5 (375)	23.0 (318)	$\chi^2(1) = 26.62$, $p < .001$[1]
Child passengers in front seat-Single child vehicles % (n)	33.6 (237)	25.7 (193)	21.5 (176)	$\chi^2(1) = 28.13$, $p < .001$[1]
Type of Restraint % (n)				
Rear facing infant restraint	3.7 (55)	1.4 (20)	1.8 (25)	
Forward-facing child seat/Booster seat	28.7 (423)	24.8 (352)	35.4 (486)	
Seatbelt	62.1 (915)	69.1 (979)	54.4 (747)	
Unknown	2.0 (30)	3.7 (53)	6.4 (88)	
Not restrained	3.5 (74)	0.9 (13)	2.0 (27)	
Dedicated child seat totals	32.4 (478)	26.3 (372)	37.2 (511)	$\chi^2(1) = 6.88$, $p = .009$[1]
Type of Restraint (%) in front seat				
Rear facing infant restraint	-	-	-	
Child seat	1.1 (5)	0.8 (3)	0.9 (3)	
Seatbelt	96.2 (450)	98.9 (371)	96.5 (307)	
Unknown	0.4 (2)	0.3 (1)	1.0 (3)	
Not restrained	2.4 (11)	0.0 (0)	1.6 (5)	
Type of Restraint (%) in rear seat				
Rear facing infant restraint	5.5 (55)	1.9 (20)	2.4 (25)	
Child seat	41.6 (418)	33.5 (349)	45.8 (483)	
Seatbelt	46.2 (465)	58.3 (608)	41.7 (440)	
Unknown	2.8 (28)	5.0 (52)	8.1 (85)	
Not restrained	4.0 (40)	1.2 (13)	2.1 (22)	

Children in Seat Belts

Children in seat belts, (fitting and not fitting) n	915	979	747	
Proportion of children with belts not fitting, front and rear seat, % (n)	65.4 (598)	44.0 (431)	38.8 (290)	$\chi^2(1) = 121.6$, $p<.001$[1]
Proportion of children with belts not fitting, front seat, % (n)	69.1 (311)	34.2 (127)	39.1 (120)	$\chi^2(1) = 78.24$, $p<.001$[1]
Proportion of children with belts not fitting, rear seat, % (n)	61.7 (287)	50.0 (304)	38.6 (170)	$\chi^2(1) = 48.19$, $p<.001$[1]

[1] Linear-by-Linear Association

TABLE 3 Characteristics of children in the sample, as reported by parents, for intercept interview (Time 2) and the follow-up telephone interview (Time 3)

	Time 2 n = 222	Time 3 n = 111
Age % (n)		
1 year or younger	27.9 (62)	20.7 (23)
2-3 years	28.8 (64)	33.3 (37)
4-6 years	30.6 (68)	29.8 (33)
7-8 years	12.6 (28)	16.2 (18)
Child's usual seating position % (n)		
Front	.001 (2)	0 (0)
Rear	99.99 (220)	100 (111)
Has travelled in front seat in previous 6 months ('Yes')	7.2 (16)	9.0 (10)
Type of restraint child reported as usually wearing % (n)		
Rear-facing infant restraint	11.3 (25)	3.6 (4)
Forward facing child seat	44.1 (98)	55.9 (62)
Booster (highbacked or backless)	28.8 (64)	23.4 (26)
Child H harness (used without a booster seat)	4.5 (10)	5.4 (6)
Adult seatbelt used alone	11.3 (25)	11.7 (13)
Total dedicated restraint use	88.7 (197)	88.3 (98)
Proportion legally restrained for age (by age group, % (n))		
≤ 1 year	98.4 (61)	100.0 (23)
2-3 years	84.4 (54)	91.9 (34)
4-6 years	92.6 (63)	93.9 (31)
7-8 years	100.0 (28)	100.0 (18)
All ages	92.8 (206)	95.5 (106)
Proportion legally restrained for age/size (by age group, % (n))		
≤ 1 year	96.7 (60)	100 (23)
2-3 years	90.6 (58)	91.9 (34)
4-6 years	97.1 (66)	97.0 (31)
7-8 years	100.0 (28)	100.0 (18)
All ages	95.5 (212)	95.5 (106)