



Use of top tethers with forward-facing child restraints: Observations and driver interviews



Angela H. Eichelberger^{a,*}, Lawrence E. Decina^b, Jessica S. Jermakian^c, Anne T. McCartt^c

^a Insurance Institute for Highway Safety, 988 Dairy Road, Ruckersville, VA 22968, United States

^b TransAnalytics, LLC, Quakertown, PA, United States

^c Insurance Institute for Highway Safety, 1005 N Glebe Rd., Suite 800, Arlington, VA 22201, United States

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ABSTRACT

Objective: Despite the safety benefits, many parents do not use top tethers with forward-facing child restraints. Detailed information was collected about why parents are not using tethers. **Methods:** The sample included 479 drivers who had forward-facing child restraints installed in passenger vehicles equipped with tether anchors. The survey was conducted primarily at shopping centers, recreation facilities, child care facilities, car seat check events, and health care facilities in mostly suburban areas surrounding Philadelphia, Washington, DC, Fredericksburg (VA), and Seattle. Drivers were surveyed about their knowledge and use of tethers and experience with child restraints. Tether use was observed to verify whether tethers were being used correctly. **Results:** Fifty-six percent of forward-facing child restraints were installed with the tether; 39% were installed with the tether used correctly. The tether was used with 71% of LATCH lower anchor installations and 33% of seat belt installations. Drivers who installed child restraints without tethers most often said they did not know about the tether or how to use it. **Conclusions:** Although the tether use rate was slightly higher in the current research than in previous studies, many parents and caregivers still use forward-facing child restraints without attaching the tether. Because the main problem is lack of awareness of the tether or how to use it, public education should focus specifically on the safety benefits of tethers and how to use them. **Practical applications:** Information about why caregivers fail to use top tethers is potentially useful to child restraint manufacturers, child passenger safety technicians, and others who work with parents to improve motor vehicle safety.

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1. Introduction

In the United States, LATCH (Lower Anchors and Tethers for Children) is a system for attaching child restraints to vehicles. Mandated in 1999 by the National Highway Traffic Safety Administration (NHTSA, 1999), LATCH was intended to improve the ease of child restraint installation. LATCH has two distinct components that pertain to forward-facing child restraints with internal harnesses: lower attachments on child restraints that connect to anchors at the vehicle seat bight, and a tether on the top of child restraints that attaches to an anchor located on the rear shelf, seat back, floor, cargo area, or ceiling. The lower attachments are designed to replace the vehicle seat belt as the primary attachment to the vehicle, whereas the tether should be used when installing a forward-facing restraint with either the lower attachments or the vehicle seat belt. Lower anchors were required in all vehicles manufactured on or after September 1, 2002, and lower attachments were required on child restraints manufactured on or after September 1, 2002. Tether anchors were required in all vehicles

manufactured on or after September 1, 2000, and tether straps were required on all forward-facing child restraints manufactured on or after September 1, 1999. In addition, many older vehicles can be retrofitted with tether anchors.

Laboratory studies comparing forward-facing child restraints installed with and without tethers have found that tethers reduce child crash test dummy head excursion in front and side sled tests (Brown et al., 1995; Legault, Gardner, & Vincent, 1997; Lowne, Roy, & Paton, 1997; Lumley, 1997; Menon & Ghati, 2007). Tethers also reduce other injury measures, including head acceleration and neck loads (Brown et al., 1995; Legault et al., 1997; Menon & Ghati, 2007). A computational modeling study found benefits of using a tether in reducing head acceleration, neck loads, and head excursion (Kapoor et al., 2011).

Some studies of forward-facing child restraints suggest that tethers may be beneficial even with common types of misuse. In a series of sled tests, tether use reduced head excursion, head acceleration, and neck loads even when the tether had moderate degrees of slack, although the no-slack condition provided the greatest benefit (Legault et al., 1997). Tether use consistently resulted in lower head excursions and neck loads in conditions with common misuses of LATCH, including loose or misrouted lower anchor straps and improper seat back inclination (Menon & Ghati, 2007). Relative to no tether, tether use also was

* Corresponding author. Tel.: +1 434 985 4600; fax: +1 434 985 2202.

E-mail address: aeichelberger@ihs.org (A.H. Eichelberger).

found to reduce head excursion when the seat belt was loose or improperly routed (Lumley, 1997).

Despite the benefits, many parents do not use tethers with forward-facing child restraints. An observational field study of more than 1500 forward-facing child restraints found that tethers were used 43% of the time (Jermakian & Wells, 2011). Earlier observational studies found that tethers were used with forward-facing child restraints 51% to 58% of the time (Decina & Lococo, 2007; O'Neil, Bull, Talty, & Slaven, 2011). A national study of Safe Kids car seat checkup events conducted in 2009–2010 reported that 28% of the 15,521 forward-facing restraints were tethered upon arrival (Decina, Lococo, Joyce, & Walker, 2011).

Prior research has investigated the reasons tethers are not used with forward-facing child restraints in vehicles equipped with tether anchors. In a 2005 observational survey of the use of LATCH and driver reactions to the system, 55% of forward-facing child restraints in seating positions equipped with tether anchors were observed to have a tether in use (Decina, Lococo, and Doyle 2006). Among drivers who were not using tethers, the most common reasons for not using them were that they did not know how to use tethers (36%) or did not think tethers were important (25%). The survey may have included drivers who did not install child restraints, and it is possible that awareness may have been lower among these drivers compared with drivers who installed the child restraints. In 2007, NHTSA conducted a national telephone survey of 1262 parents and caregivers who transported a child younger than 9 years (Boyle & Lampkin, 2009). Seventy-one percent of the survey respondents said there was a tether strap on their forward-facing child restraint, and 60% of this group said they used the tether on every trip. Among drivers who did not use the tether on every trip, the most common reason (51%) was that there was not a place in the vehicle to attach the tether. Because information on the vehicle model and year was not collected, it was impossible to determine how many of these survey respondents did not have a tether anchor in their vehicle.

In a study designed to identify characteristics of vehicle LATCH systems that increase the likelihood of correct installation of child restraints, 36 volunteer parents performed several child restraint installations in different vehicles (Klinich et al., 2013). The parents used tethers just 48% of the time with forward-facing child restraints, and none of the vehicle characteristics measured in the study was associated with tether use.

It is reasonable to expect that over time, overall awareness of tethers would increase as more vehicles equipped with tether anchors enter the fleet and as educational campaigns focused on LATCH have been implemented. However, no recent studies have investigated parents' reasons for not using tethers, and it is unclear why low tether use persists. The primary objective of the present study was to gather updated, detailed information about why parents and caregivers are not using tethers. Drivers who had forward-facing child restraints installed in their vehicles were surveyed about their knowledge and use of tethers and previous experience with child restraints. Tether use was observed to determine whether drivers were using tethers correctly.

2. Methods

2.1. Participants

Drivers with a forward-facing child restraint installed in their vehicle were approached at selected locations and offered a \$10 cash or gift card incentive for participation in a 10-min car seat survey. Approximately 10% declined to participate due to time constraints, lack of interest, or other reasons. Partial or complete interviews with 515 drivers and observations of all the forward-facing child restraints in the vehicles were conducted. Of the observed vehicles, 462 were identified as models that were manufactured with factory-installed tether anchors, and among unknown models an additional 17 vehicles were observed to have tether anchors. All analyses were based on the 479 vehicles

Table 1
Characteristics of drivers in sample.

	Percent (N = 479)
Age (years)	
16–20	1.3
21–30	24.7
31–40	50.5
41–50	11.3
51–60	4.8
61 and older	4.4
Unknown	3.1
Race/ethnicity	
White	71.8
Black	10.2
Latino	6.3
Asian	4.6
Other/unknown	2.9
Gender	
Female	69.5
Male	28.0
Unknown	2.5
Income (median household income for the driver's residential zip code)	
Less than \$25,000	<1.0
\$25,000 to \$49,999	8.6
\$50,000 to \$74,999	22.8
\$75,000 to \$99,999	47.2
\$100,000 and greater	14.8
Unknown	6.5

Note: Percentages do not always sum to 100% due to rounding.

that had tether anchors. The reported characteristics of the drivers of these vehicles are shown in Table 1. Observations within vehicles tended to be very similar and did not contribute much unique information, and much of the analyses focused on the driver. Therefore, where multiple forward-facing child restraints were present, one restraint was randomly selected for analysis.

A convenience sample was obtained from approximately 50 sites in mostly suburban areas surrounding Philadelphia, Washington, DC, Fredericksburg (VA), and Seattle. The survey was conducted at shopping centers, recreation facilities, child care facilities and schools, car seat check events, health care facilities, residential areas, a service station, and a church. Data collection sites met the following criteria: parents or caregivers were present with child restraints installed; suitable for safe, efficient data collection (e.g., limited entrances and exits, adequate parking spaces, and positions for observers to spot candidate target vehicles and conduct surveys); and permission and cooperation could be obtained from property owners and management.

2.2. Data collection procedures

All data collectors were trained in the interview and observation forms and conducted pilot surveys at car seat check events. Pilot testing was also used to identify confusing questions and refine the wording of the questions. Teams of two certified child passenger safety technicians collected the data. One person handled the greeting, permission, and interview questions, and the other observed use and misuse of the top tether for all forward-facing child restraints in the vehicle. Drivers were asked whether they would be interested in participating in a car seat survey and were informed that at any given time they would be able to stop the interview without giving a reason. Upon affirmation of permission, the interviewer directed the driver to a parking spot where the interview and car seat observations took place. Following the interview, drivers were given informational materials on child restraint safety and locations for car seat check events. Most interviews were completed in 5 min or less.

The interview was a structured questionnaire that included questions regarding drivers' awareness, knowledge, and perceived importance of tethers, why they do or do not use tethers, experience with

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