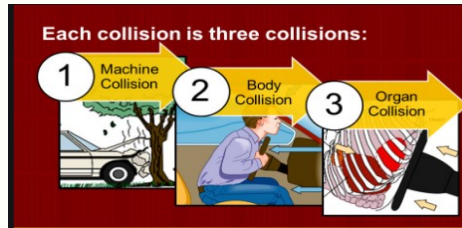


Crashes and Injury in Rear-Facing Car Seats

The 3-Stages of a Crash

Every vehicle crash includes 3-stages. Knowing the different stages of a crash will help to explain the protection a rear-facing car seat provides to an infant child.



- **Stage 1: Vehicle Crash**
 - The vehicle strikes another vehicle or object.
- **Stage 2: Human Crash**
 - The vehicle comes to a stop and the occupant moves toward the point of impact at the vehicle's initial speed.
 - Secured occupant contacts the car seat harness, a seat belt, or an air bag.
 - Unrestrained occupant collides with parts of the vehicle interior.
- **Stage 3: Internal Crash**
 - The occupant's body comes to a complete stop and the internal organs continue to move toward the point of impact striking other organs or bone.
 - A secured occupant slows down with the vehicle, slowing down the internal organs.



Frontal crashes are the most common type of vehicle collision. Rear-facing car seats are designed to support the head and back of an infant and a young child in a frontal crash. When a child is properly secured rear-facing, the head and neck move together with the car seat, allowing the crash force to be spread across the shell of the car seat protecting the child. A harness that is snug and properly placed on the child's body, keeps the child in the car seat and prevents the child from sliding up the back of the car seat.

Crash forces are severe. The force needed to restrain a vehicle occupant is approximately equal to the weight of the child multiplied by the speed of the vehicle. Using a rear-facing seat helps to limit forward movement of a child.



Infants and Toddlers are NOT Small Adults Crash Injuries for Children from Birth to Age 7

The head is the most commonly injured body region.

- Prevent head injuries by preventing head contact with the vehicle interior or other passengers.
- Install car seat tightly with no more than one-inch of side-to-side movement.
- Secure the child correctly in an appropriate car seat for the child's weight and height.



A child's head is proportionally larger than an adult's in both mass and size.

Cervical spine injuries are not common in crashes. When an injury does occur, it is very serious. A child's vertebrae is not fully formed (bone and cartilage) and connecting ligaments are stretchy. Cervical spine injuries can occur in two ways:

- **Non-Contact (Inertial) Injuries**
 - Crash forces pull the child's head toward the point of impact, but the head does not make contact with the vehicle.
 - Risk is higher in children due to larger head, underdeveloped spine, and flexible ligaments.
- **Contact Injuries - More common cause of cervical spine injuries.**
 - Crash forces pull the head toward the point of impact and the neck stretches. This makes the neck more vulnerable to injury when the head makes contact with the vehicle.
- **Rear-facing car seats reduce neck forces.**
 - Encourage rear-facing for as long as possible.
 - Rear-facing car seats are designed to protect a child's head, neck and spine. When a child is secured rear-facing, the head and neck move together with the car seat, allowing the crash force to be spread across the shell of the car seat, reducing the risk for injury.



Lower extremity (leg) injuries are not life-threatening.

- Common concern is injury to legs when child secured rear-facing.
- Limited data is available, but the data shows risk of leg injuries in forward-facing mode too.

Age	Rate of Lower Extremity Injury	
	Rear-Facing	Forward-Facing
0 - 11 months	0.1%	0.3%
12 - 23 months	0.1%	0.3%

McMurry TL, Arbogast KB, Sherwood CP, et al. Rear-facing versus forward-facing child restraints: an updated assessment. *Inj Prev.* 2018;24(1):55-59



The TIPP website has been updated. Visit the website at www.pakidstravelsafe.org for traffic safety messages, available trainings, car seat best practice recommendations and to order educational flyers.

Best Practice Guidelines

All infants and toddlers should ride in a rear-facing car seat until they reach the highest weight or height allowed by the manufacturer of the car seat.



Rear-Facing Car Seats

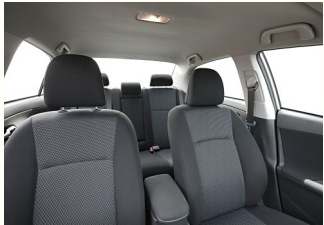
Selection - Direction Rear-Facing Until Age 2!

- Secure infants and toddlers in a rear-facing car seat until they reach the highest weight or height allowed by the manufacturer of the car seat.
- Choose a car seat based on a child's age, weight, height, physical development and emotional needs.
- Select a rear-facing car seat that is safe for the child, allowing the top of the child's head to be at least one-inch (1") below the top of the back of the car seat.
- Traveling rear-facing is safer than forward-facing.



Location

- All children younger than age 13 should ride in a back seat.
- Select a seating position that allows for the correct use of the car seat.
- Securing with the lower anchors or the seat belt may affect the seating position choice.
- **Never place a child in a rear-facing car seat in the front vehicle seat with an active passenger-side air bag.**



Harness Adjustment & Fit

- Place the child in the car seat so there is no gap between the car seat and the child's back.
- Thread the harness through the slots located at or below the child's shoulders following the car seat manufacturer's instructions.
- Secure the child with a snug harness. The harness should lie flat, and fit snug (not uncomfortable) at the child's shoulders and hips.
- Place the harness retainer clip at armpit level.



Where Do The Harness Straps Go?



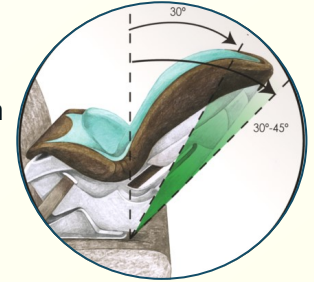
Rear-facing seats

Straps should originate **AT or BELOW** the child's shoulders

Installation

- **Read and follow the car seat manufacturer's instructions for an acceptable rear-facing recline angle.**
- When checking the recline angle, the vehicle must be on level ground.

- Use the recline angle adjuster to determine the correct angle.
- For car seats that do not have an adjustable base, use a tightly rolled towel or pool noodle placed at the seat base, if needed to correct the angle, and permitted by the car seat manufacturer.



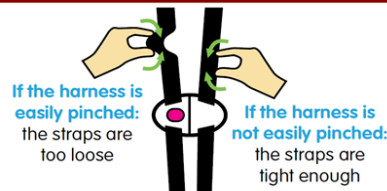
- Secure the car seat rear-facing with the vehicle seat belt or lower connectors of the LATCH system.
- Place the car seat on the vehicle seat and route the seat belt or lower anchor connectors through the correct belt path following the car seat manufacturer's instructions.
- Buckle the seat belt or attach the lower connectors to the anchors and tighten.
- Pull at the belt path to be certain there is no more than one-inch of side-to-side movement.



- **Check the installation every time the car seat is used.**

How Tight Should the Harness Be?

The harness should pass the 'pinch test'; when pinching the harness webbing vertically at the shoulder with the thumb and forefinger, your fingers should slide off easily and you should not be able to pinch any webbing between them.



Pennsylvania Law

All children from birth up to age 4 must be secured in an approved child passenger restraint system anywhere in the vehicle.

Children younger than age 2 must be secured in a rear-facing car seat, until the child outgrows the maximum weight and height limits designated by the car seat manufacturer.

