

Appendix I

Question-by-Question Justification

Post-Install Questionnaire

Section I

Q1-Q3 Participants confidence in their installation

Questions 1- 3 will assess how confident each participant is with their selection of the appropriate Child Restraint System for the assigned child size doll as their ability to secure the CRS to the vehicle and the doll in the CRS.

A recent study by Mirman, et al., 2013, explored the relationship between Child Restraint System (CRS) installation accuracy (CRS is installed properly), security (CRS is securely attached to the vehicle), participant confidence, and perceptions of ease of use. The results showed that participants overestimated their own accuracy and security in installation. In addition, perceived ease of use was positively associated with confidence ratings whereas observed accuracy and security were unrelated to confidence ratings.

While eighty-nine percent of the participants did not install the CRS accurately and/or securely, 30 percent of these individuals reported being confident that the CRS was installed correctly.

The results suggest that caregivers may be overconfident with their installation and not aware of the errors made during installation; thus, making it difficult to correct the behavior. However, a major limitation of the Mirman, et al. study is that only experienced users were included, making it difficult to determine the generalizability to real-world where both experienced and novice users (e.g., expectant parents) are required to install CRSs in order to safely transport children. In order to correct for this limitation, the proposed study will explore the relationship between the installation accuracy and confidence for both novice and experienced users by asking participants to rate their ability to select the appropriate CRS for the child size doll, install the CRS in the vehicle, and secure the doll in the CRS. During the installation, participants will have access to the CRS manual and the vehicle manufacturer's manual, and can choose to use them if they would like. Participants will be asked to complete four installation trials, with four different child size dolls, and four different vehicle types, and they will be asked to rate their experience after each trial. Participant's responses will then be compared to objective measurements recorded by trained CPS Technician to determine whether the CRS was properly installed and secured.

Q4 Rating consistency between information presented on the CRS labels and manual

The CRS manual and labels located on the CRS both provide the following information to the user: weight and height guidelines for the specific CRS, guidelines outlining installation procedures, manufacturing data, and airbag warnings related to the installation. While the information presented on the CRS via various labels is somewhat abbreviated and consolidated, the same information is presented in the CRS manufacturer's manual in a more detailed manner. Although there may be differences in how the information is presented, the guidelines and information should be consistent across the two means. Question 4 in Section I will only be asked if the participant is observed using the CRS manual to complete a given trial (installation). The question is intended to assess whether the parent found the information on the CRS labels to be consistent with the information provided in the manual.⁴

If the participants believe that the information provided in the manual conflicts with that presented on the CRS labels, errors related to selecting the proper restraint for a child of a given weight and height, installing the CRS in the vehicle, and securing the child in the CRS are more likely to occur. Participant's responses to this question will be compared to objective measurements recorded by a trained CPS Technician to determine whether the CRS was properly installed and secured.

Q5 Rating the sufficiency of information provided by the vehicle owner manual

Question 5 in Section I will only be asked of those participants who are observed using the vehicle manual to complete an installation, and assess whether or not the user found the information provided within the manual was sufficient enough so that the participant was able to identify, locate and use the various features to install the CRS.

The vehicle manual provides information related to CRS installation procedures and airbag warnings that are unique to that particular vehicle. For example, the vehicle manual will provide information related to the presence and location of the Lower Anchor and Tethers for Children (LATCH) system. The presence and location of these features often varies across vehicles, and therefore, it is necessary to refer to the vehicle owner manual in order to ensure proper identification and use of the features. The owner's manual will identify which seating positions are equipped with the lower anchors, the location of the lower anchors in the seat bight and the top

tether, as well as provide weight limits for each feature. It may also provide information related to how the tether should be routed and secured.

Each manual needs to provide a sufficient level of information so that the user can successfully identify, locate and use the various features when installing the CRS. If the information presented in the manual is insufficient or lacks clarity it may result in the caregiver making mistakes and errors related to the installation. Participant's responses to this question will be compared to objective measurements recorded by a trained CPS Technician to determine whether the CRS was properly installed and secured.

Q6 Rating consistency between information presented on the CRS manual and vehicle manual

Question 6 in Section I will only be asked of those participants who are observed using both the vehicle manual and the CRS manual to complete the trial, and will assess whether or not the participant felt that the information presented in the CRS manual and vehicle manual were consistent. While both the vehicle manual and the CRS user manual present information related to CRS installation, the information is presented from two different perspectives. If the information provided in the vehicle owner manual conflicts with that presented on the CRS user manual, errors related to installing the CRS in the vehicle are more likely to occur. Participant's responses to this question will be compared to objective measurements recorded by a trained CPS Technician.

Section II

Q1-Q3 Understanding information presented via the CRS manual and CRS labels

While it is always important to select a CRS that is appropriate for a child's weight and height, the best CRS for a given child is one that fits the child appropriately and is the one that the caregivers are most likely to use correctly every time. A critical factor in correctly installing and securing the child in the CRS is understanding the information and instructions provided, and being able to consistently follow these instructions. When installing and securing a child in the CRS the caregiver can obtain and use information from a variety of sources (CRS manual, CRS labels). It is important that this information is presented clearly via visual images (pictures, sketches) or written instructions. If a caregiver has difficulty understanding a set of instructions or images, it might increase the likelihood of their making a mistake when installing the CRS or securing the child in the CRS.

Question 1 in Section II will be asked of all participants for each trial to assess how difficult it was for the participant to understand the information provided on the CRS labels. Questions 2 and 3 will only be asked if the participant is observed using the CRS user manual for a given installation. These two questions are intended to ascertain how easy or difficult it was for the participant to understand the information provided in the product manual with respect to installing the CRS and securing the child in the CRS. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.

Q4 Understanding information presented via the Vehicle owner manual

Question 4 in Section II will only be asked of those participants who are observed using the vehicle manual to complete an installation. This question are intended to ascertain how easy or difficult it was for the participant to understand the information provided in the vehicle owner manual with respect to installing the CRS. As mentioned previously, the vehicle manual provides information related to CRS installation procedures as well as various vehicle features that contribute to correct installation that are unique to that particular vehicle. Therefore, it is necessary to refer to the vehicle owner manual in order to ensure proper identification and use of these features.

Similar to the CRS user manual, the vehicle owner manual needs to provide the information that is clear and comprehensible so that the user can successfully identify, locate and use the various features when installing the CRS. If the information presented in the manual lacks clarity it may result in the caregiver making mistakes and errors related to the installation. Participant's responses to this question will be compared to objective measurements recorded by a trained CPS Technician.

Q5-Q10 Ease of using the Harness system to secure the child size doll on the CRS

There are a various types of harness systems. However, the all harnesses are a system of straps that keep the child within the shell of the CRS, distribute the crash forces, and help the child "ride down" the forces of a crash. The longer the "ride-down," the more time the child's skeleton and organs have to absorb the crash energy. The harness system consists of harness straps, a harness retainer clip, harness adjuster, buckle, and harness slots. The harness straps come over the child's shoulders. The harness retainer clip is a plastic clasp that holds the shoulder straps together over the child's chest at armpit level. The harness adjuster is used to tighten or loosen the harness around the child. The buckle is how the harness locks. The harness and crotch slots are the part of the CRS where

the harnesses and crotch strap pass through. Seats come with up to four sets of harness slot adjustment positions and up to two crotch slot adjustment positions. The harness system is composed of many parts, increasing the number of opportunities to make an error in securing a child in the CRS. As in most cases, ease of use is often directly associated with errors such that the more effort required for use of the system, the more likely errors are to occur.

Questions 5 through 10 in Section II are asked of all participants who are observed using a harness system to secure the child size doll. Each question is directed towards a given component of the CRS harness system and assesses the level of difficulty associated with using the feature to secure the doll in the CRS. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.

Q11-Q12 Ease of using the Seat belt to install the CRS in the vehicle

Users can either use the vehicle's seat belt system or LATCH to install a CRS in a vehicle, each method will ensure that the CRS is locked in place prior to a crash. The objective of each method of installation is to ensure a tight fit where the CRS will not move forward or side to side along the belt path more than 1 inch. When using the seatbelt to install the CRS, the caregiver needs to place the seat belt through the belt path as directed by the CRS manufacturer, then proceed to tighten the belt, and lock the seat belt either using the seat belt's retractor or a built in component in the seat, depending on the CRS.

Questions 11 through 12 in Section II are asked of all participants who are observed using the vehicle's seat belt to install the CRS as well as participants who choose not to use a CRS and secure the child in the vehicle seat and secure using the vehicle's belt system. Responses to both questions will assess how difficult it was for the participant to identify where to route the seat belt through the CRS and how difficult it was to tighten the seat belt. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.

Q13 Ease of using the locating lower anchors to install the CRS in the vehicle

Lower anchors attach the CRS to the vehicle through anchor points installed in the vehicle and through anchor hooks attached to the CRS. The objective in using the lower anchors to install the CRS is similar to that of the seat belt, to ensure that the CRS is locked in place prior to a crash. Each lower anchor set in the vehicle is made up of two lower anchors. The lower anchors are often hidden behind the fabric or a cover in the vehicle with a symbol to

identify the locations. Caregivers can use the vehicle owner manual to locate the anchors.

Question 13 will only be asked of participants who use the lower anchors to install the CRS and is intended to assess how difficult it was for the participant to identify where the lower anchors are located. Participant's responses to this question will be compared to objective measurements recorded by a trained CPS Technician.

Q14-Q15 Ease of using the Top Tether to install a CRS

Questions 14 and 15 will only be asked of participants who use the top tether when installing a CRS. The top tether anchor is a hardware bracket used to secure the tether hook and strap. The top tether strap is a piece of webbing that anchors the top of a CRS to the vehicle structure. While this system keeps the CRS from tipping forward on impact and can provide an extra margin of protection, it is important to note that certain vehicle manufactures impose a weight limit associated with its use.

The top tether anchors are located where the car body is strong enough to withstand the forces of the crash. Locations can vary from ceiling above the rear seating position, rear window shelf, floor of cargo area, or under vehicle seat. Questions 14 and 15 will assess how easy it was for the participant to locate the top tether anchor and attach the CRS tether strap properly. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.

Q16-Q17 Ease of installing a CRS in the rear facing position

When installing a CRS in the rear facing position the caregiver must place the seat at the proper angle which should be no more than 45 degrees from the vertical. Given that the child's head is the heaviest part of their body and infants have poor head control, steep angles may cause an infant to ride too upright and block their airway. However, the recommended angle may differ depending on the manufacturer. The recline angle indicator is part of the CRS, and often CRSs will have an adjustable base that can be used to correct the angle.

Questions 16 and 17 will only be asked of participants who install a convertible CRS rear facing and will assess how easy it was to determine the proper seat angle and then to adjust the CRS angle. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.

Q18-Q19 Ease of installing a Booster Seat

A booster seat is a CRS that raises the child so that the vehicle lap and shoulder belt fits correctly. Booster seats serve as a middle step between a restraint with harness and the vehicle seat belt only. Booster seats are not tightly installed in the vehicle as other CRSs are. Most are held in place by the child's weight and vehicle seat belt. However, some have lower anchor attachments to secure the booster to the car.

Questions 18 and 19 will be asked of participants who installed a booster seat and will assess how difficult it was to install the booster seat and use the seat belt to secure the child size doll. Participant's responses to these questions will be compared to objective measurements recorded by a trained CPS Technician.