DEVELOPING GUIDELINES FOR DESIGNING CHILD SAFETY PRINTED EDUCATIONAL MATERIALS: A USER-CENTERED APPROACH

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(Abstract)

Motor vehicle crashes are the leading cause of unintentional injury-related death among children ages 14 and under and of these children who were fatally injured more that 60 % were not using safety restraints at the time of the collision. Children who are too large for child safety seats are often restrained improperly or not at all. In addition, many children are being shifted from child safety seats to adult safety belts prematurely. For proper protection, children who have outgrown child safety seats require booster seats combined with vehicle lap/shoulder belts. A booster seat raises a child up so that the lap and shoulder belts fit properly.

The current research went through a systematic approach, from several perspectives, to develop an effective pamphlet to increase behavioral compliance of purchasing a booster seat. The pamphlet developed throughout these studies had a substantial and positive effect on intention and perceived control as well as a meaningful and substantial impact on actual purchase behavior. In addition, the associated guidelines that were developed allow others to produce effective printed educational materials. This research consisted of five studies described below.

Study 1 consisted of 43 subject matter experts who were used to determine pertinent information that should be included in a complete booster seat pamphlet. Nine of the 20 items showed significance and were included in the first iteration of the pamphlet. Study 2 consisted of 5 parents of children who should be in booster seats and were not at the time of the study,

evaluated the usability of the first iteration pamphlet. A total of 18 items were changed in the pamphlet and a subsequent second iteration of the pamphlet was developed.

Study 3 consisted of 30 parents of children who should be in booster seats and were not at the time of the study, were used to assess the comprehensibility (Cloze test), hazard-risk judgments (carefulness ratings), and understandability (questionnaire) of three booster seat pamphlets. Significance was found for the second iteration pamphlet in both comprehensibility and understandability, but no significance was found in risk perception. Study 4 consisted of 8 human factors graduate students who were used to assess the reading level (SMOG test), instructional design and inclusion of learning principles (BIDS-3 test), and readability (RAINS test) of three booster seat pamphlets. The second iteration pamphlet and two existing industry pamphlets were used in Studies 3 and 4 and significance was found for the second iteration pamphlet in both instructional design and learning principles as well as readability and was the only pamphlet to have a reading level under 8th grade. Subsequent to these studies a third iteration of the new pamphlet was developed.

Study 5 consisted of 45 parents of children who should be in booster seats and were not at the time of the study. Three booster seat pamphlets, two from the child passenger safety industry and the third iteration pamphlet were used as treatments (15 participants per group). Effectiveness of the intervention was tested by assessing three variables, intent to purchase (revealed that when intent was high purchase was high), perceived control of purchasing (revealed that when perceived control was high purchase was high), and actual purchase behavior (third iteration pamphlet showed a significantly higher purchase rate than the industry pamphlets). Of the 19 participants who purchased a booster seat, there were 12 (63%) in the third iteration pamphlet group, 2 (11%) in the alternate 1 pamphlet group, and 5 (26%) in the

alternate 2 pamphlet group, and 100% of those who purchased, reported that they use them each time their child rides in a vehicle.

This research increased our understanding of information design and well as generating general design guidelines for pamphlets. In addition, this research produced a pamphlet for credible sources to use as an education tool for parents who have children who should be in booster seats and are not placed in them when riding in a vehicle.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Rationale

Motor vehicle crashes remain a leading cause of death and injury for US children, despite improved crashworthiness of vehicles and effective restraint systems for children of all ages. According to the Fatal Analysis Reporting System and General Estimates Systems (National Highway Traffic Safety Administration, 2002), 2,658 children aged 0-15 years sustained fatal injuries and 311,000 were non-fatally injured in motor vehicle crashes in 2001. Approximately 1 out of every 3 injury-related deaths among children aged 12 years and younger is the result of a motor vehicle crash, and these crashes are the leading cause of death for children ages 5-12 (Insurance Institute for Highway Safety, 1997). Every day, an average of eight children under age 15 die and nearly 900 are injured in motor vehicle crashes (National Highway Traffic Safety Administration, 1997c).

Among children ages 15 and under who are fatally injured as occupants of motor vehicle crashes in 1997, more than 60% were not using safety restraints at the time of the collision (National Safety Council, 1998). In the past two decades, with implementation of mandatory restraint-use laws, overall death and injury have decreased, yet non-use and misuse of child restraint systems remain the major risk factors for death and injury to children (National Highway Traffic Safety Administration, 1997c).

In motor vehicle crashes, there are three types of collision forces that can have a lethal impact on passengers. The first is the force directly thrust upon the passenger from the collision between the motor vehicle and another object. The second is any collision that may occur between the passenger's body and the interior of the vehicle. The third involves the violent

collision of body organs within the body frame. The latter two forces, in particular, attest to the crucial importance of consistent use of safety restraints in motor vehicles. This is supported by fatality data showing that most people killed in motor vehicle crashes were not using safety restraints, leaving little doubt that the use of seat belts reduces fatalities (Evans, 1986; Sewell et al., 1986).

Children are particularly vulnerable to crash forces, as their bodies cannot tolerate levels of energy equal to that of an adult, and their dimensions can turn them into missiles in the vehicle during a crash. Thus, children should always be in safety restraints when riding in a motor vehicle. The public generally agrees. Survey data show that the overwhelming majority of the public believes infants and toddlers should always be in safety seats, and that children should be required to use seat belts when they outgrow safety seats (Katcher, Bull, Palmer, Rodgers, Smith, Spivak, and Tully, 1996). While observational data indicate that actions do not always follow words, these surveys still show the majority of children using safety restraints (Boyle and Sharp, 1997).

As more and more children use safety restraints, placing children in inappropriate restraint systems becomes an increasingly serious issue. Infants up to about one year old and at least 20 pounds should ride facing the rear of the vehicle in an infant-only or convertible safety seat (these are child safety seats for children ages birth to 4 years old). Children at least one year old, weighing no less than 20 pounds and up to 40 pounds should ride facing forward in a convertible safety seat.

Data from NHTSA's Motor Vehicle Occupant Safety Survey 1996 (Boyle and Sharp, 1997), indicate that many children are being shifted from child safety seats to seat belts prematurely, before their bodies are large enough for the seat belts to fit them properly (Boyle

and Sharp, 1997). Improper fit can lead to injuries in the event of motor vehicle crashes. For example, small children may "submarine" under a loose belt, or lurch forward. Unfortunately, the survey data do not point to any particular reason for the premature shifting to adult safety belts.

Analysis of the National Automotive Sampling System (National Highway Traffic Safety Administration, 1997b) database showed that while children age 6-12 make up 43.1% of the child occupant population, they sustain 55.4% of the injuries. Even when restrained, they are more likely to be injured (37.2% injured compared to 29.2% of younger children). Although the most severe injuries are usually head injuries, restrained older children are more likely to have abdominal or pelvic injuries.

Children who are too large for child safety seats are often restrained improperly or not at all. For this reason, the correct use of occupant protection for children aged 4-9 in particular needs to be addressed. A recent observational study in four states, Mississippi, Missouri, Pennsylvania and Washington indicated that, of children weighing 40-60 lbs., 75% were improperly restrained and 19% were unrestrained (Decina and Knoebel, 1997).

For proper protection, children who have outgrown child safety seats require booster seats combined with vehicle lap/shoulder belts. Lap/shoulder belts usually do not fit children properly until they are 58 inches tall, have a sitting height of 29 inches, and weigh 80 pounds (Klinich, Pritz, Beebe, Welty, and Burton, 1994). Therefore, children less than 10 years old will probably be too small to use a lap/shoulder belt without a booster seat.

As shown in Figure 1 and Figure 2, when smaller children are restrained with only a lap belt or a poorly fitting lap/shoulder belt, the belt tends to ride up onto the abdomen, allowing the pelvis to slide under the belt. This places pressure directly on the abdominal organs and may

lead to the child flexing over the belt above the hips, resulting in abdominal and or spinal injuries (Lane, 1994).

Figure 1 . Close to lower bound for booster-seat use. Four years, 42 pound child, adult seat belt does not fit properly, should be in a booster seat.

Figure 2. Close to the upper bound for use of booster seat. Seven years, 55 pound child, adult seat belt does not fit properly, should be in a booster seat.

The current literature does not address the issues regarding the fact that there are no effective written materials (pamphlets) used for disseminating and educating this life saving information to parents whose children should be in booster seats and are not in them.

The purpose of this research was three-fold: 1) to develop an efficient and effective pamphlet whereby parents and caregivers of children between the ages of 4 and 8 years will read it, understand it, believe it, and then act on it, 2) to evaluate and compare the reading level, readability, comprehensibility, and understandability of two existing booster seat pamphlets as well as the pamphlet developed in this study and, 3) to determine the impact of this pamphlet

intervention by assessing the intent to purchase a booster seat, the perceived control of purchasing a booster seat and the actual purchase behavior.

1.2 Research Objectives

1.2.1 Phase I

The objective of phase one (consisting of Studies 1 and 2) was to design an efficient and effective pamphlet whereby parents and caregivers of children between the ages of 4 and 8 years who should be in booster seats and are not will read it, understand it, believe it, and then act on it.

Printed materials, particularly pamphlets, brochures, or booklets, have the potential to reach specific segments of a target audience and also reach a large number of persons (Sobogal, Otero-Sabogal, Pasick, Jenkins, and Perez-Stable, 1996). These products are designed primarily to increase knowledge, awareness, sensitivity, and intentions to act. Paul, Redman, and Sanson-Fisher (1997) reported that well produced pamphlets could potentially alter knowledge, attitudes, and select behaviors over a wide range of health related issues. Valente, Paredes, and Pope (1998) report similar findings.

For a printed health message to be persuasive, the public must receive an acceptable form, read it, and understand it, believe it, and then act on it (Clark, AbuSabhu, von Eye, and Achterberg, 1999). The appropriate development of effective print material includes, but is not limited to, a review of message content, message construction, and a general awareness of literacy among the target population (National Institutes of Health, 1992). If these factors as well as factors relating to human information processing and information design are incorporated

appropriately, the print material serves more effectively to increase readiness to consider elements of behavior change (McGuire, 1984).

A first iteration of the new pamphlet was designed in Study one and a second iteration of the new pamphlet was designed in Study two. The purpose of this phase was to design a pamphlet that systematically considered the above mentioned factors which was subsequently used in phase two of this research.

1.2.2 Phase II

The objective of phase two was to compare existing booster seat pamphlets to the second iteration of the new booster seat pamphlet developed in objective one, assessing comprehensibility, carefulness ratings, understandability, reading level, readability, and instructional design for each. Once the assessments were completed a third iteration of the pamphlet was developed.

There is evidence to suggest that written information on participants such as medications can improve recall and compliance (Sandler, Heaton, Garner, and Mitchell, 1989; Sandler, Mitchell, Fellows, and Garner, 1989). However, these studies do not make it clear which individuals understand or indeed need the information with which they have been provided, in fact the studies only support the ability of participants to read and recall the information. Written information must be designed with users in mind taking into account such factors as how humans process information when it is being communicated to them. Such factors as reading level, readability, comprehensibility need to be taken into account.

There are numerous tests of readability but they have many common factors. These tests tend to focus on the difficulty of the vocabulary and the average sentence length (Doak, Doak,

and Root, 1985). For example, the Simple Measure of Gobbledegook (SMOG) reading test is considered to be valid as well as quick and easy to use (McLaughlin, 1969). Other tests are available such as the Flesch and Fry formulas (Flesch, 1979; Fry, 1968) and evidence suggests that there is good correlation between these different types of tests when used on the same sample of material (Dollahite, Thompson, and McNew, 1969). Although readability can enhance knowledge transfer, recall of written information and well as a high comprehensibility level are critical. Recall of written information and a high readability score does not necessarily indicate that a person has understood the text. Comprehension is another important factor and there are measures of assessing comprehension of text, such as the Cloze technique (Doak et al., 1985), that are distinct from simply being able to read the text.

The purpose of this phase was to compare reading level, readability, understandability, comprehensibility, carefulness ratings, and the inclusion of instrumental design elements for two existing booster seat pamphlets and the second iteration of the booster seat pamphlet designed in phase one of this research. In addition, a third iteration of the new pamphlet was designed which was subsequently used in phase three of this research.

1.2.3 Phase III

The objective of phase three was to determine the impact of pamphlet intervention by assessing the intent to purchase a booster seat, the perceived control of purchasing a booster seat and the actual purchase behavior.

It seems that the challenge for educators is to find cost-effective and timely ways to deliver a complex mix of engaging, interesting, and high quality information and expertise to a large diverse audience, while still tailoring the content to individual needs and situations. Transmitting information in meaningful ways to divergent groups of people with different

learning styles, prior knowledge, cultures, and language skills is challenging even in more ideal circumstances (Pearce, 1996). There is evidence to support the contention that the format in which information is presented may impact the way in which information is perceived by individuals (Hogbin and Fallowfield, 1989).

The purpose of phase three was to determine the impact of pamphlet intervention by assessing the intent to purchase a booster seat, the perceived control of purchasing a booster seat and the actual purchase behavior.

2 REVIEW OF LITERATURE

2.1 Developmental Aspects of Children Related to Occupant Protection

To understand why seat belts do not fit children properly, as well as the consequences of placing children in them, it is imperative to understand the development of their bodies. Children's anatomy differs from adults in many ways that cannot be overlooked in the proper selection of developmentally appropriate occupant restraint systems. A classic paper by Burdi, Huelke, Snyder and Lowrey (1969) describes the need for specially designed and selected vehicle restraint systems for children.

Salient features of child development relevant to occupant protection include rapid changes in weight, height, and body proportions. Infants and young children have a disproportionately large head size, high center of gravity, relatively poor head support because of weaker neck structures, soft pliable bones of the skull that are less protective of the intracranial contents, and cartilaginous cervical vertebrae that are being replaced slowly by bone. Skeletal and facial injuries can disrupt growth plates, resulting in subsequent abnormal growth (Burdie et al., 1969).

The abdominal organs, liver, spleen, and kidneys of children are less protected by the rib cage compared to adults, and the bladder is less protected by the bony pelvis, thus making these organs susceptible to injury in a crash. The anterior superior iliac spines, the anchor points for the adult seat belt, are not adequately developed in children younger than 10 years old to function in this capacity, therefore, the belt is neither well positioned nor secure (Burdie et al., 1969).

The ratio of sitting height to total height decreases with growth. The curvature of the vertebral spine and the tilt of the pelvis result in children not sitting upright, so adult seat belts designed for upright posture do not fit well. Posture changes with growth, allowing the child to assume an erect posture. However, behavioral characteristics of the child, such as the inability to sit still and perfectly erect for a sustained period of time, often result in the child either maneuvering out of the system or altering the fit (Burdie et al., 1969). Adult belts tend to ride up over the abdomen and place the load directly on the abdomen. The child is at risk for flexing over the belt in a crash and for the pelvis to submarine under the belt. The seat-belt syndrome, a spinal fracture (usually lumbar or sacral) associated with an internal abdominal injury, is related to compression of internal abdominal organs and hyperflexion of the spine over the lap belt system. Lap/shoulder belts may be similarly problematic. The cervical seat-belt syndrome, fractures or fracture-subluxations of the proximal cervical spine with or without head injuries, may result from hyperflexion of the neck over the secured torso. The buckle of the lap/shoulder belt may sit high against the child's abdomen and slide up during a collision, thereby increasing the chance of submarining under the belt. The shoulder portion of the belt does not sit on the average child's shoulder, but rather either lies against the child's neck or is placed behind the child or under the arm, disrupting the optimal function of the integral restraint system. Child restraint systems must be designed to distribute forces over a large portion of the body, protect the organs not well protected by bony skeletal structures, and account for both the sitting posture of the child and the inability of the iliac spines to serve as anchor points for the belt systems (Burdie et al., 1969).

2.2 Consequences of Non-Restraint Use

Johnson, Rivara, and Soderber (1994) noted that although 68% of 5 to 9 year old children were protected in some manner, only 35% were optimally positioned in a booster seat rather than in an adult seat belt. The strongest risk factor for injury was the non-use of restraints, and lap/shoulder harnesses were only 38% effective for 5-14 year olds. The researchers concluded that restraints designed for adults are not as effective for the school-age child as are safety seats for the preschool child (Johnston et al., 1994). Agran, Castillo, and Winn (1992) compared motor vehicle crash injuries of restrained and unrestrained children ages 4-14 years. Analyses were performed separately for ages 4-9 years and 10-14 years because of differences related to the fit of seat belts. The results suggest that lap/shoulder belts may provide less protection for 4-9 year olds than 10-14 year olds (Agran et al., 1992).

Many studies cited in the literature have investigated injury patterns of school- age children involved in motor vehicle crashes as passengers. Some studies have focused on intra-abdominal injuries sustained from belted restraints. Osberg and Di Scala (1992) presented data from 413 children injured severely enough in motor vehicle crashes to require hospitalization. Of the 123 children in this study who were belted, 57.1% had abdominal injuries alone and 42.9% had abdominal and external injuries (Osberg and Di Scala, 1992).

Sivit, Taylor, Newman, Bulas, Gotschall, Wright, and Eichelberger (1991) researched 61 children who were restrained in lap-styled safety belts as passengers in motor vehicle crashes. Each had linear ecchymosis or bruising across the abdomen. After more extensive tests in the hospital, 13 children had lumbar spine injuries and 14 had injured a hollow viscus (bowel or bladder), five children had both spine and hollow viscus injuries (Sivit et al., 1991). Tso (1993) conducted a statewide research effort in Maryland with pediatric abdominal injuries in restrained

(in an adult safety belt) automobile passengers. Forty-two children's records were examined of which 19 sustained belt related abdominal wall bruising or erythema. Twenty-three children had abdominal visceral injuries without external seat belt marks (Tso et al., 1993).

Spinal injuries have been studied in unrestrained and improperly restrained children in motor vehicle crashes. In a study conducted by Givens, Polley, Smith, and Hardin (1996), 20 patients ages 8 years or less who were restrained in lap-shoulder safety belts were investigated. Of the 20 patients, 10 had low cervical spine injures (below C4) and the other 10 had isolated cervical spine injuries. It was concluded in this study that the occurrence of cervical spine injuries despite lap-shoulder belt use suggests that efforts should be focused on refinement of motor vehicle restraint devices in young school-aged children (Givens et al., 1996).

Thirty-five children with lumbar spine injuries were evaluated by Glass, Sivit, Strum, Bulas, and Eichelberger (1994) of which the majority of these children (31) were injured in motor vehicle crashes. Most of them (27 of 35, 77%) were restrained by lap-styled safety belts. These 27 children suffered from linear abdominal or flank ecchymosis, described as lap-belt ecchymosis (Glass et al., 1994). Strum, Glass, Sivit and Eichelberger (1995) identified seven children diagnosed with compression fractures. All seven patients were restrained with adult lap-type seat belts at the time of their injury. Four of the seven patients sustained associated injuries. One child died on the day after admission of a massive closed head injury. All of the six that survived had abdominal wall contusions consistent with lap-belt injuries (Sturm et al., 1995).

Other studies have focused on spinal and intestinal injuries. Ten children in a study conducted by Newman, Bowman, Eichelberger, Botschall, Taylor, Johnson and Thomas (1990) sustained lap-belt injury. In this study there were five children with lumbar spine injury, four

with combined lumbar spine and intestinal injuries and one child with intestinal injuries. All ten children presented with a characteristic transverse abdominal ecchymosis (Newman et al., 1990). In a study conducted by Reid, Letts, and Black (1990) seven cases of "chance" fractures or flexion distraction spinal injury were reported. These chance fractures were particularly noted in the children restrained only by the lap belt of the vehicle (Reid et al., 1990).

Safety belts do reduce morbidity, but a school-age child may sustain abdominal or spinal injury as a result of using a seat belt. Findings from the above mentioned studies indicate that incorrect positioning of lap/shoulder restraints place children at an increased risk of injury. Seat belts are designed for adults, and the younger or smaller child with a stature less than that of the smallest adult may have an inherent injury potential.

Belt fit is seldom good for this age group, according to a study from NHTSA released in 1994 (Klinich et al., 1994). The study examined sizes of children in the 6-12 age group and used a representative sample to test the restraints in three models of vehicles: a mini-van, a compact car, and a mid-sized car. The children's fit in the lap/shoulder belts was best in the compact car and worst in the mini-van.

One significant cause of poor belt fit was the "slouch factor." This occurred because the vehicle seats were deeper than the length of the child's body from buttock to knee, so the child was unable to bend the legs naturally without slumping. When the children tried several models of belt-positioning boosters, the fit of the belts was considerably improved. The study determined that most "adult" belt systems do not fit children under 4'5" (seated height of about 30") and under 80 pounds (Klinich et al., 1994).

2.3 What is a booster seat and how does it work?

Booster seats are a type of child safety seat designed for children who have outgrown their convertible child safety seat. The booster seat raises a child up so that the lap and shoulder belts fit properly. There are two types of booster seats available for children weighing more than 40 pounds and who have outgrown the convertible seats: low-shield (see Figure 3) and belt-positioning (see Figure 4) booster seats. Belt-positioning boosters use the lap/shoulder belt in the vehicle and provide upper torso restraint. Shield boosters are the only option for vehicles that have only lap belts and were once recommended when no shoulder belts were available. They do not meet current federal standards for children over 40 pounds and should not be used, and thus will not be considered further in this study.

Figure 3. Low shield booster seat.

Figure 4. A variety of belt-positioning booster seats.

Booster seats help prevent injuries and correct the incompatibility of fit between the child and the adult seat belt by helping to position the lap and shoulder belts properly across the pelvis and shoulder. Booster seats may also help make safety belts more comfortable for children, decreasing the likelihood that children will place the shoulder belt under their arm, behind their back (see Figure 5), or remove the safety belt altogether (see Figure 6). They are designed to

decrease the potential for the “lap belt syndrome,” which is caused by the belt riding up onto the abdomen of the child and the child hyperflexing over the belt.

As stated in a previous section, one of the reasons that can be inferred for non-use of booster seats is that of perceived risk tied to using booster seats.

Figure 5. Child places the shoulder belt behind their back when it is uncomfortable.

Figure 6. Child removes the safety belt altogether when it is uncomfortable.

Children who have outgrown their convertible seats should ride in booster seats until adult belts fit them properly. The booster seat raises a child up so that the lap and shoulder belts fit correctly. As shown in Figure 7 and Figure 8, seat belts fit when the lap belt stays low and snug across the hips without riding up over the stomach, and the shoulder belt does not cross the face or front of the neck. Even though parents agree that children should be restrained, only 6% of children fitting the weight and size requirements for booster seats use them (Taft, Mickalike, and Taft, 1999). Only 50% of those restrained in a booster seat are properly secured (Taft et al., 1999).

Figure 7. Close to lower bound for booster-seat use. Four years, 42 pound child, booster seat allows for properly fitting adult seat belt.

Figure 8. Close to upper bound for booster-seat use. Seven years, 55 pound child, booster seat allows for properly fitting adult seat belt.

2.4 Child Safety Seat Laws

Low usage rates of booster seats may in part be attributed to gaps in child passenger safety laws and seat belt laws, which often leave children ages 4 through 16 unprotected. For example, under most states' provisions, a 10 year-old can ride legally in the back seat unrestrained because seat belt laws only apply to front seat occupants. Many states fail to address the issue of children as passengers in the cargo area of pickup trucks. Examples of gaps

include laws that do not cover children up to 16 years, and which allow young children to be in seat belts instead of child restraint seats.

During the past year, several states have enacted new laws concerning the age and weight children must be before they no longer require a booster seat. Arkansas, California, New Jersey, Oregon, Tennessee and Washington have all enacted new laws requiring booster seats for all children ages 4 to 6 (some states to age 8) or under 60 lbs (some states 80 lbs).

The state of Virginia, in which the proposed studies took place, has child passenger safety laws that state children less than 4 years old must be in a child safety seat and that a seat belt may be substituted for a child safety seat between the ages of 4 and 16. See Appendix O for a full list of child restraint and safety belt laws, for children under the age of 16, throughout the US. However, these laws do not necessarily mandate child safety seats as the required form of child restraint.

Child passenger safety laws are enacted and enforced at the state level, and all focus on *use* (as opposed to *misuse*). Contrary to their knowledge of correct use specifications, caregivers generally have a fair understanding of child seat-use laws (Eby, Kostyniuk, and Chrisoff, 1997). The first law requiring the use of child safety seats went into effect in Tennessee in 1978. While this law had considerable flaws, such as allowing a parent to hold an infant, it generated widespread media attention and other states followed (National Highway Traffic Safety Administration, 1997a). By 1985, all states, the District of Columbia, and Puerto Rico had passed child passenger safety laws (National Highway Traffic Safety Administration, 1997a). Most child restraint laws currently require children up to 4 years of age and less than 40 pounds to be protected by a child safety seat (National Highway Traffic Safety Administration, 1999). However, the age and weight stipulations, fines for violations, and vehicle placement stipulations

vary widely from state to state (Centers for Disease Control and Prevention, 1999). Unfortunately, several state laws allow the substitution of safety belts for safety seats (National Highway Traffic Safety Administration, 1998a). Currently, national emphasis is placed upon eliminating such loopholes (National Highway Traffic Safety Administration, 1999).

Research has shown that legislation and its enforcement can have a powerful impact upon increasing passenger restraint use (Centers for Disease Control and Prevention, 1993; Centers for Disease Control and Prevention, 1999; Geller, 1998; Guerin and MacKinnon, 1985; Lovelle, Hovell, West, and Wahlgren, 1992; National Highway Traffic Safety Administration, 1997c; Rivara, Thompson, and Cummings, 1999; Seekins, Fawcett, Cohen, Elder, Jason, Schnelle, and Winett, 1988; Stuy, Green, and Doll, 1993; Wagenaar and Webster, 1985). In fact, even adult safety-belt laws can have spillover effects that result in an increased number of children riding restrained (Centers for Disease Control and Prevention, 1993). The National Highway Traffic Safety Administration's Buckle Up America "quarterly planner" designates January through March, as the special interest period when child passenger protection efforts, such as non-use enforcement and police sponsored educational activities, should receive extra attention from police departments nationwide (National Highway Traffic Safety Administration, 1998b). In addition, "National Child Passenger Safety Week" (in February) and "Buckle Up, America! Week" (in May) bring two weeks of intense enforcement and education waves every year (National Highway Traffic Safety Administration, 1998b).

Restraint misuse, however, is not currently enforced. While some state laws use the wording "*properly secured* safety seat," (National Highway Traffic Safety Administration, 1999) officers do not commonly practice writing citations for the incorrect use of restraints (Wall and Bolton, 1999). Rather, child safety enforcement efforts focus on nonuse, while police volunteer

efforts focus on misuse. This is not to dismiss police involvement, as many officers who are trained in the proper installation of safety seats have become advocates of the cause, volunteering at safety seat checkpoints and correcting misuse whenever they encounter it in their daily duties. NHTSA and the International Association of Chiefs of Police have even created a series of special courses called "Operation Kids," ranging in time commitments varying from four hours to two days and aimed at training officers in the correct installation of safety seats (National Highway Traffic Safety Administration, 1998b). Many police departments even sponsor their own safety-seat checks in local business parking lots.

2.5 Risk Perception

According to Wogalter, DeJoy, and Laughery (1999a) risk perception is a term that refers to people's perception, attitude, awareness and knowledge of hazards, including potential consequences, associated with a situation or set of circumstances.

Risk perception is frequently held to be crucial in the understanding and management of risk in policy contexts (Sjoberg, 1987). Conflicting views about risks constitute a social and political problem of considerable magnitude in many contexts (Sjoberg, 1980; Sjoberg, 1998). Furthermore, implied life values in various policy and regulatory decisions have been found to vary enormously (Morrall, 1986; Ramsberg and Sjoberg, 1997) and although the reasons behind such variation are only partly understood, risk perception does appear to be one important factor (Ramsberg and Sjoberg, 1998). Perceived risk, in turn, is not merely a function of probability of harm but many other factors, such as attitudes (Sjoberg, 1996; Sjoberg, 2000).

Attitudes are evaluated beliefs that predispose the individual to respond in a preferential way. That is, attitudes are predispositions to react positively or negatively to some social object.

Most definitions of attitudes suggest there are three major components, the cognitive, affective and behavioral components. The cognitive component involves what a person believes is so whether true or not; the affective component is the feelings about the attitude object which influences its evaluation; the behavioral component reflects the actual behavior of the individual. Although, the behavioral component is a rather unreliable indication of an attitude, for example LaPiere's (1934) study of ethnic attitudes. Therefore, it can be concluded that risk perception is an attitude and consequently must be related to cognitive, affective and behavioral components of risk perception.

Some risk perception research suggests that hazard-risk evaluations are determined by the objective likelihood or probability of encountering potential hazards (Slovic, Fischhoff, and Lichtenstein, 1979). However, other research suggests that objective likelihood plays little or no role in determining hazard-risk judgments. Rather, hazard-risk is primarily determined by a subjective assessment of the severity of injury (Wogalter, Brelsford, Desaulniers, and Laughery, 1991).

Wogalter, Young, Brelsford, and Barlow (1999b) demonstrated that, with consumer products, hazard-risk judgments are determined by how severely one might be injured. In their study, questions were related to hazard-risk, likelihood of injury, severity of injury, cautious intent, likelihood of reading warnings and familiarity. Nine-point Likert-type scales to rate carefulness ranging from zero to eight were used for each question and all even scale values had verbal anchors. The results indicated that severity relates more strongly than injury likelihood with perceived hazardousness.

Many people do not see themselves as being highly vulnerable to the risks they are warned against on products. Several studies have shown that perceived danger is positively

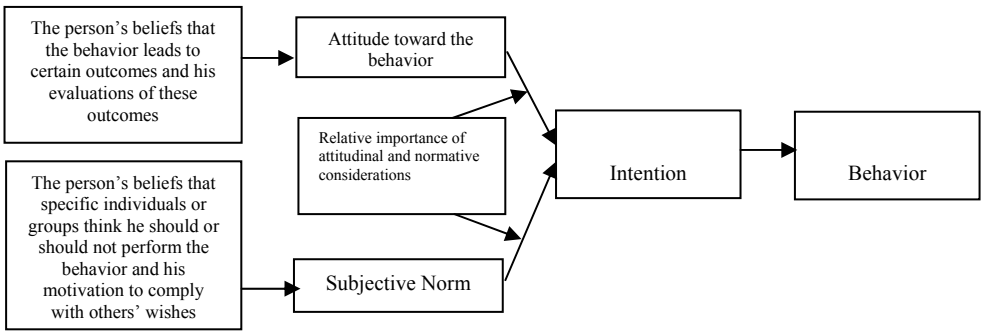
correlated with noticing, or reading, or complying with warnings (DeJoy, 1989). However, perceived danger is a combination resulting from perceptions of the likelihood of injury (vulnerability) and the severity of the injury. The present consensus seems to be that the perceived severity of the injury is a stronger determinant of perceived dangerousness than perceived vulnerability (Freidmann, 1988; Young, Breisford, and Wogalter, 1990; Young, Wogalter, and Brelsford, 1992). Perceived dangerousness is affected by familiarity with the product, and tends to drop with increasing product familiarity. People are much more likely to notice, read and comply with warnings on unfamiliar products which are perceived as dangerous. As they become more familiar with the product or product class, perceived dangerousness drops and noticing, reading and complying drop with it (DeJoy, 1989). However, warnings, especially if they explain the dangers, can sometimes increase perceived risk. Other studies have found that spelling out the dangers in detail increased the perception of risk (Laughery, Vaubel, Young, Brelsford, and Rowe, 1993; Vaubel, 1990; Vaubel and Brelsford, 1991).

There are several factors that are likely to affect compliance with written advice and directions. These include all of the factors discussed above, i.e. noticing; reading; understanding; believing; and (sometimes) recalling. These are necessary conditions for compliance in most situations. It is therefore vital that all of the factors be taken into consideration when designing pamphlets that will be used to educate and raise risk perception about the use of booster seats.

2.6 Information Design and Guidelines

2.6.1 Theory of Reasoned Action and Theory of Planned Behavior

Perhaps the most influential effort to generate and test a general theory of attitude-behavior links is Fishbein and Ajzen's theory of reasoned action (Ajzen and Fishbein, 1980). They suggest that behaviors are not really difficult to predict and that there is a correspondence between intention and behavior. Figure 9 is a representation of the theory of reasoned action as proposed by Fishbein and Ajzen. The theory of reasoned action proposes that behavior is predicted by intention and that intention is determined by attitudes and subjective norms.



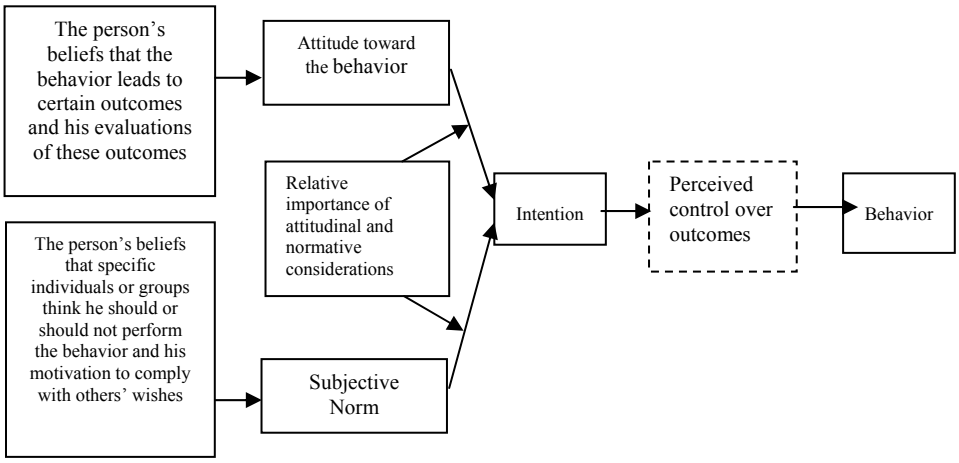
Note: Arrows indicate the direction of influence

Figure 9. The Theory of Reasoned Action Model of factors determining a person's behavior.

It is important to understand how this model flows. According to the theory of reasoned action, a person's intention is a function of two basic determinants, one personal in nature and the other reflecting social influence. The personal factor is the individual's positive or negative evaluation of performing the behavior, this factor is termed *attitude toward the behavior*. It simply refers to the person's judgment that performing the behavior is good or bad, that she is in favor of or against performing the behavior.

The second determinant of intention is the person's perception of the social pressures put on her to perform or not perform the behavior in question. This factor is termed *subjective norm.* Generally speaking, individuals will intend to perform a behavior when they evaluate it positively and when they believe that important others think they should perform it (Ajzen and Fishbein, 1980).

Taylor, Peplau, and Sears (1997) believe that no model is perfect. They conclude that sometimes we do not have the ability or resources to do something we intend to do and good intentions are not enough. Because of this it was suggested that an additional variable, perceived control over outcomes, be added to the model. A review of the Theory of Reasoned Action by Madden, Ellen, and Azjen (1992) confirmed that adding perceived control to the theory improves its ability to predict intentions and behavior. This new model, which includes the new element, is now referred to as the Theory of Planned Behavior (see Figure 10).



Note: Arrows indicate the direction of influence

Figure 10. The Theory of Planned Behavior Model of factors determining a person's behavior.

The theory of planned behavior adds perceived control as a predictor of both behavior and intention. Perceived control is conceptually defined as involving components of self-efficacy (perceived ability to perform behaviors effectively) and response efficacy (perceived effectiveness of the behavior for avoiding negative consequences).

2.6.2 Communication-Human Information Processing

In 1972 Van Cott and Kinkade began doing research in the area of human engineering and equipment design particularly in the area of visual and auditory presentation of information. Wright (1988) states that information design is emerging as a research domain in its own right and more recently Drury and Prabhu (1996) developed a framework and analysis of the information requirements of aircraft inspection. They specifically provided a framework for information design by combining the concepts from the human factors knowledge base with the specific needs of aircraft inspection. There are many examples of human factors methods and research on information design, warning design and risk communications.

A prominent model to understand these methods, from an engineering point of view, is Wogalter, DeJoy and Laughery's (Wogalter et al., 1999a) communication-human information processing (C-HIP) model. Figure 11 is a pictorial version of the model. This model has the basic concepts of the communication model of source, channel, and receiver. The major difference between this model and the standard communication model is that it decomposes the receiver component into the stages of attention, comprehension, attitudes and beliefs, motivation and lastly, behavior. The receiver must notice the information and understand it. The message must be consistent with the person's attitudes and beliefs, or sufficiently persuasive to change them and to motivate the person to carry out the directed behavior (Wogalter et al., 1999a).

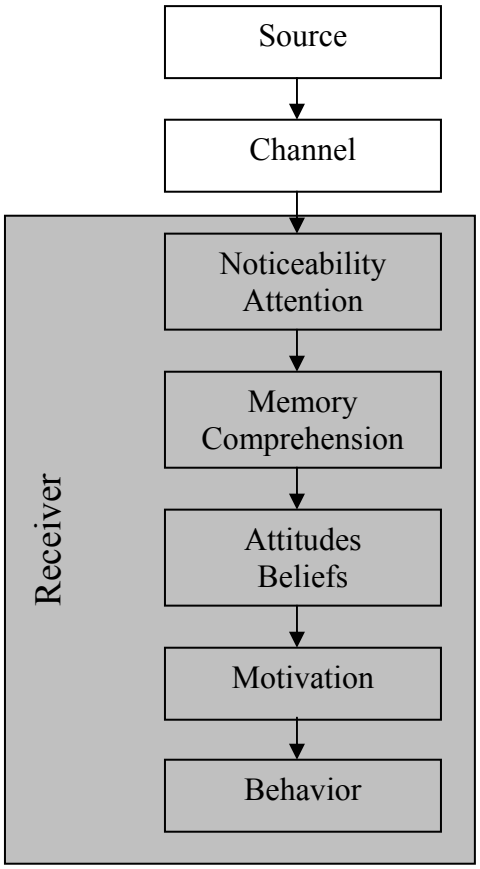


Figure 11. Communication-human information processing (C-HIP) model.

In the C-HIP model, the source is the originator or the initial transmitter of the hazard or risk information. The source must have a perceived sense of credibility, whether it is a manufacturer, the federal government, or a public service or trade organization. People are more persuaded by highly credible communicators than by those low in credibility. The first study of credibility to demonstrate this effect was a classic paper by Hovland and Weiss (1952). Expert sources are typically more persuasive than non-expert sources. Regardless of expertise, it is important that a communicator is perceived as unbiased and trustworthy (Taylor et al., 1997). Taylor, Peplau and Sears also point out that we are also persuaded when a position is adopted by a group of people we like or identify with. Such groups are called reference groups.

In addition to the source or communicator, the communication or channel itself is clearly important. The actual content of the message as well as how it is presented clearly influences whether or not people will accept it. Different media might be more or less effective in different situations (Wogalter et al., 1999a). In addition, Taylor et al. (Taylor et al., 1997) states that discrepancy, strong vs. weak arguments, rhetorical questions, repetition and distorting the message all have to do with how the channel is received by the person it is intended for.

The next group of factors focuses on the processes that occur within the receiver. A sequence of mental operations starts with the information's arrival at the receiver's senses. The receiver's first operation is attention. Wogalter and Leonard (1999) discuss the factors important for capturing and maintaining attention, which include the characteristics of the message itself and its immediate surroundings. Noticeability, including the physical location and other factors are important to the messages saliency.

The next processing stage for the receiver is comprehension and memory. Leonard, Otani and Wogalter (1999) describe the factors that facilitate understanding and retention of messages. They discuss issues such as whether message text and pictorial symbols can be understood by the targeted group.

Individual difference factors may play a key part in the next two stages of the model, attitudes and behaviors and motivation. DeJoy (1999) explains the highly influential factors of perceived hazards and familiarity. Motivation is described by DeJoy as a major factor that energizes users to comply with messages, and these types of factors include cost of compliance, explicit consequences, and anticipated injury severity.

The last stage is the message and how behavior is affected by it. Perceived risk, familiarity, gender, and locus of control are examples of personal factors that play a role in

messages on behavior. In addition three situational variables, time pressure, cost of compliance, and modeling, have been shown to substantially affect the extent to which messages influence behavior (Silver and Braun, 1999).

2.7 Printed Educational Materials

Printed education materials (PEMs) are defined as written or printed materials such as booklets, leaflets, pamphlets or information sheets whose purpose is to provide information about health promotion, disease prevention, treatment modalities, and self care. NIH (1992) advocates that attending to the following select items helps determine the public acceptance and adherence to a printed health message: messages must communicate accurate information in a clear manner with minimal technical, bureaucratic, or scientific jargon. Clarity is especially important since print material communicates critical prevention and treatment information regarding acute, infectious, and chronic diseases. Communicating a message with clarity is also related to presenting information concretely. Clark and his colleagues (1999) found that nutrition-oriented print material with concrete messages was more apt to assist readers in coding, retrieving, and recalling the information than less concrete messages. Tone refers to the manner in which a message is expressed, and pertains to the message's capacity to evoke appropriate emotions and related responses. Appeal refers to the motivation with the target audience that a message strives to encourage or produce. Appeal relates to visual attractiveness, variation in presentation, and appropriate mixes of pictures, graphics, and narrative.

Closely related to the concept of appeal is layout or design. A message should be constructed by moving from general or broad concepts to focused recommendations. The message must draw the reader to core concepts and do this by the use of various graphics positioned in strategic locations (Clark et al., 1999). Finally, the message must be credible. It

should be supported by the most current understanding and research available and must be related to a source that is trustworthy, believable, and reputable.

Addressing target audience needs, including cultural factors, literacy, and other factors, is essential in appealing to consumer preferences and demands (Sobogal et al., 1996). Insuring readable and understandable print material products is also essential. Doak, Doak, and Root (1996) report that well-educated adults learn much more from simply written material than from more difficult material. Unfortunately, researchers have reported that health education print material often has a readability level that is too high (Cardinal and Sachs, 1992; Giordano, 1996; Weiss, 1992).

PEMs are often written by professionals in their respective specialties or by professional health writers. The U.S. Department of Education (1986) has noted that an average person must have an 8th grade reading level to be able to meet the literacy demands of American society. However, over 30 million Americans are functionally illiterate and will not be able to read PEMs even when they are written at the 8th grade reading level. Further, people in the general population often have great difficulty understanding PEMs even when they are written at this reading level (Cooley, Moriarty, Berger, Selm-Orr, Coyle, and Short, 1995; Reed, Connelly, Dorham, and Coxhead, 1993; Slaten, Parrot, and Steiner, 1999). The major reason for difficulty is that while the reading level of these materials may be appropriate, their readability level is not.

Readability is related to writing style, and is the ease with which a reader can understand or comprehend written materials. Reading level, however, is the instructional level of the written materials. These are inherently different concepts, with readability being critical for PEMs. Most readability formulas, for example, Fog (Gunning, 1952), Fry Readability Graph (Fry, 1968) and SMOG (McLaughlin, 1969) measure reading level as opposed to readability per se. The

Readability Assessment Instrument - RAIN (Singh, 1994b) is currently the only instrument that has been designed specifically to measure readability as defined above. The instrument has been used to assess the readability of PEMs in several areas, such as child psychiatry (Singh, 1995), adult psychiatry (Singh, 1999), pharmacy (Kirkpatrick and Mohler, 1999), and HIV/AIDS (Singh, 2000).

A number of text variables have been identified in the research literature as facilitating comprehension including a) coherence – global and local, b) unity, c) audience appropriateness, d) writing style, e) adjunct questions, f) illustrations, and g) typography (Anderson and Armbruster, 1984). According to Anderson and Armbruster, when writers incorporate these variables they produce "considerate" text. Considerate text enhances comprehension because it is clear, and readers can obtain the appropriate information with minimal cognitive effort. Writing that does not incorporate these text variables is called "inconsiderate" text because it is less clear, and readers are required to expend more cognitive effort, which in turn impedes comprehension.

The RAIN was used to determine how easy or difficult written materials are to read and understand (Singh, 1994a). Whereas most readability formulas only use one or two variables (e.g., sentence length, word difficulty, word length) to determine text difficultly, the RAIN uses 14 variables and subvariables which are summarized in Table 1. A scoring criterion for each of these variables and subvariables is used to determine whether the pamphlet incorporated them to an acceptable level. These criteria, together with additional information on the variables and subvariables and steps for conducting the analysis, are provided in the Readability Assessment Instrument manual (Singh, 1994b). The RAIN was used in this research to assess readability.

Table 1.RAIN variables used to assess readability.

RAIN Variables	Definition of Variables
Global Coherence	This is the overall structure and the integration of high-level ideas across the entire text. It is assessed in terms of two subvariables, structure and signaling devices, which include titles and subtitles, and introductory or summary statement.
Local Coherence	This is the integration of ideas and information within and between sentences. It is assessed in terms of three subvariables, pronoun references, substitutions and connectives.
Unity	This is the extent to which the text addresses a single purpose or topic. It is assessed by determining whether the sentences in a section or paragraph are relevant to the title or subtitle of the section or paragraph in which they appear
Audience Appropriateness	This refers to the extent to which a writer has given consideration to the target readers' knowledge of vocabulary. It is assessed by identifying new words and determining whether they are highlighted and if a definition or synonym has been provided.
Adjunct Questions	These are questions which appear at the beginning or end of the text or are interspersed throughout the text. They are assessed in terms of the presence of such questions.
Writing Style	This refers to the use of the active or passive voice. It is assessed in terms of the extent to which writers use active and passive voice.
Illustrations	This refers to pictures, drawings or diagrams but does not include tables, graphs, and charts. They are assessed in terms of the presence of pictures, drawings or diagrams, their relevance to the content of the text, and their appropriateness for the target audience.
Typography	This refers to the style of print and the way the words are arranged on the page. Typography is assessed in terms of four subvariables, print size, print style (e.g., upper and lower case, italics, all capitals), the color of the print in relation to the background, and the highlighting of titles and subtitles.

The literature in patient education indicates that little evaluation of actual learning outcomes is carried out by the developers or users of PEMs. So, although congruence between desired outcomes as specified by PEM developers and the actual learning achieved by the target population represents the ultimate measure of quality in a PEM, Bernier (1993) developed an alternative way to evaluate them, through expert consensus of important characteristics of PEMs. Criteria were selected from the literature, and a convenience sample of 11 individuals with experience in the development of PEMs was used as a consensus group. This study yielded the

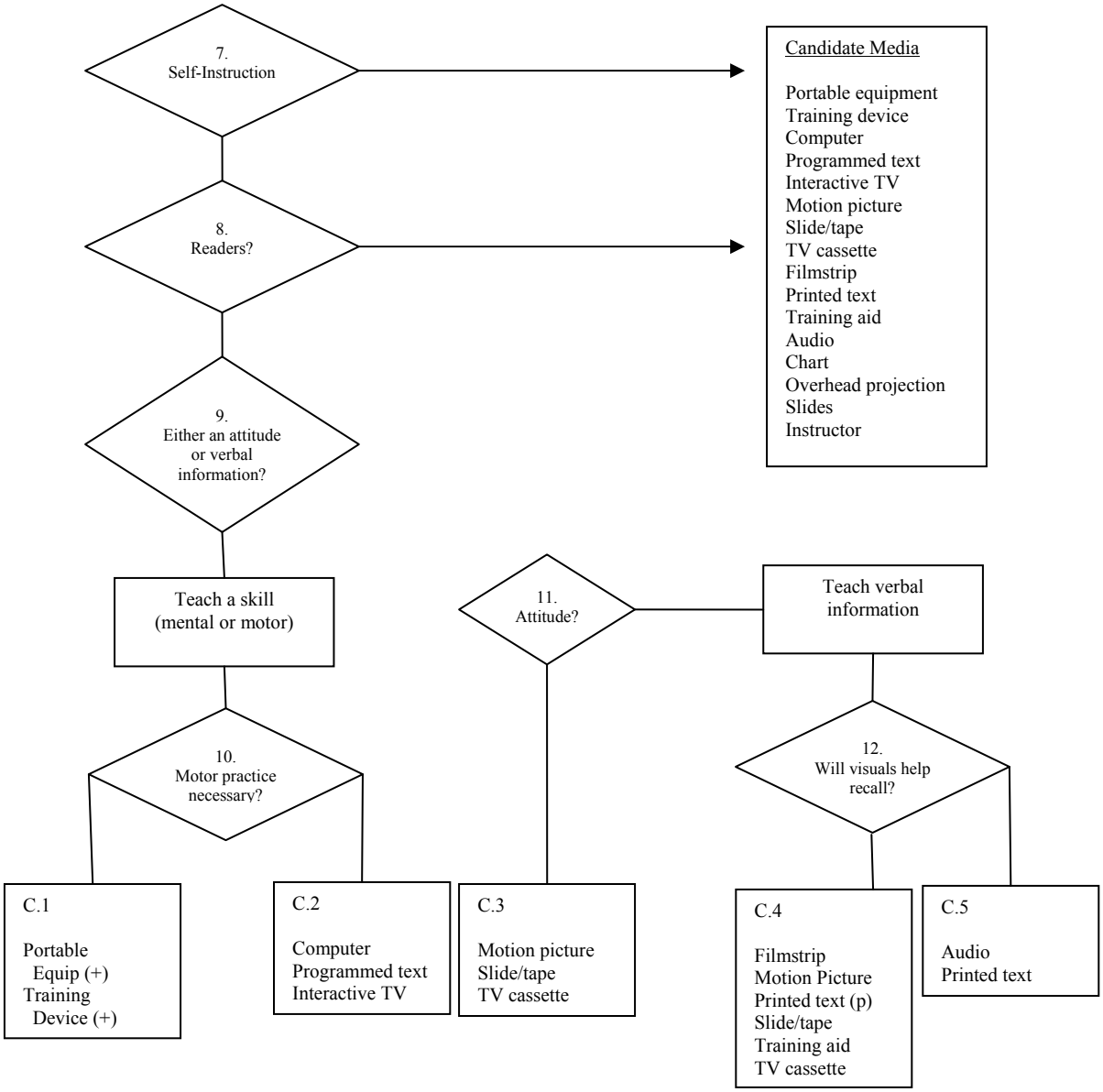
BIDS instrument containing 37 items to evaluate the instructional design and learning principles of PEMs. In 1997, Bernier examined the structure of the 37 items of the BIDS with principle component analysis (PCA). There were 14 items retained following the PCA and were named the BIDS-2 with a Cronbach's alpha internal consistency reliability coefficient of 0.86.

Although Bernier liked the simplicity of the 14-item scale, the author was concerned that some important items were deleted as a result of the PCA. A common factor approach (principal axes factoring) was found to be a more appropriate approach to the extraction of factors and analysis. Using the confirmatory factor analysis (CFA) a 2-factor solution emerged where factor-1 was named *comprehensibility* and contains 13 items and factor-2, named *clarity of purpose*, is composed of 14 items. Thus, a total of 27-items comprise BIDS-3 (Bernier, 2000). The internal consistency was improved in the CFA versions of the BIDS-3 to 0.94. Therefore the BIDS-3 will be used in this research to assess instructional design quality and the inclusion of learning principles.

2.8 Media Selection

Assuming that the media selection decision is to take place at the time of development is to begin, how is the choice made? According to Dick and Carey (1996), there are practical considerations one immediately thinks of in terms of availability of resources and personnel. But there are prior decisions that should be made that relate to the selection of the appropriate media for the various types of learning activities.

Reiser and Gagne (1983) have published a model showing how to select the best medium for instruction. The designer uses the model by answering questions about the skill to be taught, and then follows a flow diagram to the point that several media are suggested. The designer can



(+) supplemented with printed text
(p) supplemented with, or including, pictures

Explanation of Questions
7. Self-Instruction? Are students expected to learn by self-instruction, without an instructor?
8. Readers? Can the students, with reasonable efficiency, gain information from printed text?
9. Either an attitude or verbal information? Is the aim either to influence the student's values (attitudes) or to have the student learn to 'state' (rather than 'do') something?
10. Motor practice necessary? Does the skill to be learned require smooth timing of muscular movements (a 'motor skill')?
11. Attitude? Does instruction aim to influence the student's values or opinions?
12. Will visuals help recall? Is it likely that the use of visuals will help the student establish images that will aid recall of verbal information?

Figure 12. Reiser and Gagne media selection diagram for self-instructional delivery systems.

then consider the practical aspects associated with the use of the candidate media. The difference in learning outcomes are reflected in the media used to deliver instruction. A portion of the actual flow diagram of Reiser and Gagne appears in Figure 12. The Reiser and Gagne' technique is based upon a complete review of the research on the use of media in instruction. While it sometimes appears that you can teach almost anything with any medium, it is advisable to consider the special conditions that foster various types of learning and to try to include media that offer these conditions to the learner. In addition, it is critical to take into consideration the methods of human information processing.

2.9 Summary Discussion

It is evident that there are problems with usage rates of booster seats among parents who have children between the ages of 4 and 8 years old and approximately 40 – 80 pounds. It is apparent that the educational information that is available to the public is insufficient in many aspects including reading level, readability, comprehensibility and overall understandability. In addition, the current tools used to educate parents about booster seats lacks the information that raises the level of awareness regarding the risk one puts their child at when not placing them in a booster seat when necessary.

Stevens (2000) evaluated the impact of such factors as socioeconomics, gender, and education level on the adoption and usage of booster seats and found that none of these factors were associated with the behavior of using a booster seat when needed. In conclusion, Stevens suggested that education and dissemination of printed materials were the key factors that influence the use of booster seats for children who meet the size requirements.

It is clear that what is needed are effective educational tools with which credible sources (i.e. pediatricians, child passenger safety technicians and advocates, maternal and child health social workers, and law enforcement personnel) who are in contact with parents who need this information, have access to it and can distribute it to them. The following studies designed, tested and produced a tool, in the form of a pamphlet, that credible sources will be able to use to educate parents regarding the use of booster seats. In addition, this research was designed to increase our understanding of information design and generate general design guidelines for pamphlets.

A first iteration of the new pamphlet was designed in Study one and a second iteration of the new pamphlet was designed in Study two. The purpose Phase I was to design a pamphlet that systematically considered key factors for a well design pamphlet, which was subsequently used in phase two of this research.

The purpose of Phase II was to compare reading level, readability, understandability, comprehensibility, carefulness ratings, and the inclusion of instrumental design elements for two existing booster seat pamphlets and the second iteration of the booster seat pamphlet designed in phase one of this research. In addition, a third iteration of the new pamphlet was designed which was subsequently used in phase three of this research.

The purpose of Phase III was to determine the impact of pamphlet intervention by assessing the intent to purchase a booster seat, the perceived control of purchasing a booster seat and the actual purchase behavior.

3 PHASE I: DEVELOPMENT

3.1 Study 1: Design a booster seat pamphlet

3.1.1 Method

3.1.1.1 Research Goal

The concept of quality in a PEM is defined in this study as the congruence between desired learning and behavioral outcomes as specified by the PEM developer, and the actual learning and behavioral outcomes achieved by the target group using the PEM. The concept of instructional design quality is defined as the deliberate incorporation of instructional design and learning principles into the design and production of PEMs for the purpose of improving intended learning and behavioral outcome.

The use of subject matter experts, a literature review, as well as ANSI Standards, human factors principles, and marketing research were used to develop a booster seat pamphlet to be used to measure intent to purchase a booster seat, perceived control (self-efficacy) of purchasing a booster seat and actual purchase behavior of booster seats.

3.1.1.2 Participants

Fifty subject matter experts (SMEs) from the child passenger safety industry were asked to participate in the study. A complete list of SMEs who were contacted and their affiliations can be found in Appendix A.

3.1.1.3 Materials

3.1.1.3.1 Questionnaire

The questionnaire consisted of 20 items that were ranked and rated as well as open-ended and demographic questions (see Appendix B). The 20 items were gathered from various child passenger safety educational materials specifically relating to booster seats. The items were ranked from 1 to 20 where 1 was the most important item to be included in a booster seat pamphlet and 20 was the least important item to be included. The items were rated on a scale of 1 to 5 where 1 = Not At All Important and 5 = Extremely Important.

3.1.1.4 Procedure

SMEs were contacted through the mail and asked to participate in the study. Specific questions were asked as to what they believe the key information is that needs to be addressed when relating booster seat information to parents of children who should be in booster seats and are not in them. The participants were asked to rank and rate each of 20 items as to the importance of that particular item being placed in a booster seat pamphlet. The participants were asked, in a letter, to answer all questions on the questionnaire and when finished to mail back the questionnaire, in the enclosed self-addressed stamped envelope.

3.1.1.5 Results and Discussion

3.1.1.5.1 Descriptive Statistics

Out of 50 potential SMEs 43 (86%) volunteered to participate in the study. The acceptance rate was probably higher than in other studies targeting SMEs because of the passion these particular SMEs have for child passenger safety issues. The sample consisted of 35 females and 8 males. Descriptive statistics by NHTSA Certified Technician/NHTSA Certified Technician Instructor/Neither and education level completed are included in Table 2. The majority of the participants were either NHTSA Certified Technicians or Technician/Instructors (86%).

Table 2. Descriptive statistics.

Education Level	NHTSA Certified Technician	NHTSA Certified Technician/Instructor	Neither	Total
Some College	3	3	0	6
College Degree	4	8	1	13
Some Graduate Work	0	2	0	2
Completed Master's Degree	7	6	1	14
Completed Doctorate	2	1	2	5
Post-Doctorate Work	0	0	1	1
Medical Doctor	1	0	1	2
Total (%)	17 (40%)	20 (46%)	6 (14%)	43

3.1.1.5.2 Questionnaire Data

Table 3 shows each item in the questionnaire that was ranked on a scale of 1-20, where 1 was the most important item to include in a booster seat pamphlet and 20 was the least important item to include in a booster seat pamphlet. Each item was divided into one of two categories based on its rank from 1-20. If an item was ranked 1-10 it was labeled "important" and if an item was ranked 11-20 it was labeled "not as important". The assumption was made that if an

item was ranked 1-10 (the upper 50% of ranked items) the SME felt it was "important". Conversely, the assumption was made that if an item was ranked 11-20 (the lower 50% of ranked items) the SME felt it was relatively "not as important". Each item was considered independent of the others.

Once the items were separated into one of the two categories, a Chi-square test of equal proportions was performed on each item to determine if more participants indicated an item to be important or not as important. Those items that had a p-value of less than 0.05 are indicated in Table 3 by an asterisk (*).

Table 3. Frequency of responses after rank data was separated into "important" and "not as important" categories.

Items addressed in questionnaire	Important	Not As Important	χ^2 p-value
what is a booster seat and what is it used for	39	4	<0.01*
photos/drawings of improperly seated children	37	6	<0.01*
photos/drawings of properly seated children	37	6	<0.01*
proper placement of shoulder belt with booster seat	35	8	<0.01*
different types of booster seats	35	8	<0.01*
appropriate weight	33	10	<0.01*
proper placement of lap belt with booster seat	32	11	<0.01*
appropriate height	31	12	<0.01*
medical consequences for non-use	30	13	<0.01*
appropriate age	23	20	0.65
appropriate sitting height	22	21	0.88
proper placement of adult safety belt without booster seat when child reaches the correct size	19	24	0.45
children placing shoulder belt under their arm	15	28	0.05
children placing shoulder belt behind back	14	29	0.02
injury statistics for non-use	12	31	<0.01
fatality statistics for non-use	12	31	<0.01
what kind of booster seat is best	12	31	<0.01
children totally removing safety belt all together	9	34	<0.01
seating position in vehicle	9	34	<0.01
booster seats are fun for kids	3	40	<0.01
* considered significant only if p<=0.05 where important category was > not so important category			

Table 4 shows each item in the questionnaire that was rated on a scale of 1-5, where 5 was extremely important to include in a booster seat pamphlet and 1 was not at all important to include in a booster seat pamphlet. Each item was rated independently from all other items.

A Chi-square test of equal proportions was performed on each item to determine if there was a difference of rating frequency within each item. Those items that had a p-value of less than 0.05 and had a frequency of greater than 26 (60%) participants combined in the "extremely important" and "very important" ratings are indicated in Table 4 by an asterisk (*).

The decision rule for whether an item was or was not included in the first iteration pamphlet, according to the data from both the rankings and ratings, is as follows. An item must be considered significant in both Tables 3 and 4 to be included in the first iteration pamphlet. Using the decision rule, the 9 items that were significant in both ratings and rankings and thus included in the first iteration of the new pamphlet are as follows:

- Appropriate weight
- Appropriate height
- Different type of booster seats
- Medical consequences for non-use
- Proper placement of shoulder belt with booster seat
- Proper placement of lap belt with booster seat
- Photo/drawings of improperly seated children
- Photos/drawings of properly seated children
- What is a booster seat and what is it used for

It should be noted that the items which were not included in the first iteration pamphlet were not necessarily "not important", but rather other items had higher priority of importance and more commonality.

Table 4. Frequency and percent of SMEs rating each questionnaire item "extremely important" or "very important".

Items addressed in questionnaire	frequency (%) "extremely important" (rated 5)	frequency (%) "very important" (rated 4)	χ^2 p-value (across all ratings 1-5 within each item)
what is a booster seat and what is it used for	34 (79)	3 (7)	<0.01*
appropriate weight	30 (70)	3 (7)	<0.01*
photos/drawings of properly seated children	30 (70)	8 (19)	<0.01*
proper placement of lap belt with booster seat	26 (60)	11 (26)	<0.01*
photos/drawings of improperly seated children	25 (58)	14 (33)	<0.01*
proper placement of shoulder belt with booster seat	25 (58)	14 (33)	<0.01*
appropriate height	24 (56)	5 (12)	<0.01*
proper placement of adult safety belt without booster seat when child reaches the correct size	21 (49)	9 (21)	<0.01*
appropriate sitting height	17 (40)	12 (28)	<0.01*
different types of booster seats	11 (26)	20 (47)	<0.01*
medical consequences for non-use	18 (42)	11 (26)	<0.03*
appropriate age	13 (30)	13 (30)	<0.02*
injury statistics for non-use	9 (21)	7 (16)	0.02
children placing shoulder belt behind back	7 (16)	13 (30)	0.04
children placing shoulder belt under their arm	7 (16)	13 (30)	0.04
children totally removing safety belt all together	6 (14)	14 (33)	0.14
fatality statistics for non-use	8 (19)	8 (19)	0.12
what kind of booster seat is best	4 (9)	13 (30)	0.11
seating position in vehicle	11 (25)	9 (21)	0.03
booster seats are fun for kids	5 (12)	5 (12)	0.02
* considered significant only if p<=0.05 where > 26 (.60) of SMEs rated extremely important and/or very important			

3.1.1.5.3 Correlation between rankings and ratings

A Kendalls-Tau correlation was performed and all of the correlation coefficients were highly correlated with coefficients ranging from -0.54 to -0.78 all with p-values of less than 0.05. It can be inferred by the high correlation coefficients that if a participant ranked an item highly important they tended to rate the same item extremely important or very important. Although the correlations were high the decision rule stated in section 3.1.1.5.2 was used to determine if an item would or would not be included in the pamphlet.

3.1.1.5.4 Additional analyses of interest

In an attempt to assess whether there was a difference in level of rankings and ratings between technicians and technician/instructors Fisher's Exact tests were performed. The Fisher's Exact test revealed no difference between technicians and technician/instructors relating to whether they ranked the 20 items important or not so important. Similarly, the Fisher's Exact test revealed no difference between technicians and technician/instructors relating to whether they rated the 20 items 1-5 of importance to put in a booster seat pamphlet.

It is possible to explain the nonsignificance of ratings and rakings between technicians and technician/instructors by understanding that all of these individuals are trained with the same information. The only difference between the technician and technician/instructor is that the instructor spends more hours teaching technicians. No matter the status all technicians and technician/instructors spend the same amount of time in the field actually installing child safety seats in vehicles.

3.1.1.6 Outcome of Study 1

Using the data collected in Study 1 the first iteration of the new pamphlet was developed and subsequently used in Study 2. The first iteration of the new pamphlet can be seen in Appendix J.

3.2 Study 2: Usability of iteration one of new pamphlet

3.2.1 Method

3.2.1.1 Research Goal

The goal of Study 2 was to determine the usability of the first iteration of the new pamphlet (designed in Study 1). The data gathered in this study was used to re-design the new pamphlet, thereby producing pamphlet 2.

3.2.1.2 Participants

Open-ended testing can be performed on as few as five participants from the target population, as research suggests that 80% of usability problems can be identified with five respondents (Virzi, 1990). Five participants were randomly selected from the population of parents whose children should have been using a booster seat but were not using one. Participants were recruited from the local community in Southwest Virginia. The study began after each participant read and signed the informed consent form (see Appendix M).

3.2.1.3 Materials

3.2.1.3.1 Pamphlet

The first iteration of the new pamphlet designed in Study 1 was used for this study (see Appendix J). The pamphlet was an 11" x 8.5" double sided, tri-fold pamphlet. It was printed on glossy white paper with black lettering. All headings were highlighted in yellow and placed in a text box and all photos and drawings were full color. Lastly, the font size used was 14 point and the font type used was comic sans.

3.2.1.3.2 Knowledge Transfer Questionnaire

The knowledge transfer questionnaire consisted of 10 multiple choice questions and one open-ended question (see Appendix P). The questions were intended to assess the participants' basic knowledge of the concepts in the pamphlet.

3.2.1.4 Procedure

Participants were asked to read the pamphlet and were then given a short knowledge transfer questionnaire. The participants were not told that they would be tested or be asked questions about what they had read. Next, the participants were asked to re-read the pamphlet and as they were doing so, they were asked to think aloud, and to verbalize any changes they felt would make the pamphlet more usable and clear.

3.2.1.5 Results and Discussion

3.2.1.5.1 Pamphlet

Changes that were produced from the think aloud process are listed in Table 5. All changes proposed by participants were used in the subsequent pamphlet (second iteration of the new pamphlet).

Table 5. Table of usability changes needed for first iteration new pamphlet.

Pamphlet Panel	Content Analysis	Frequency
Panel 1	• "Booster Seats:" should be bolder	3
Panel 2	• Change "much safer" to "the only" • Add statement about booster seat being more comfortable	3 2
Panel 3 (top section)	• Match "NO" statement from panel 4 to a "YES" statement • Turn statements into questions • Add "(57")" to 4'9" • "safely" is too vague	3 3 4 3
Panel 3 (bottom section)	• Change "prevent" to "protect" • Add the word "can" • Not personal enough, add "your child"	2 3 5
Panel 4	• Add "vehicle's" to specify which seat back • Add quotations around "NO"	3 3
Panel 5	• Remove underline and add italics • Add "-" between "high" and "back"	2 1
Panel 6	• Add "without using a booster seat ONLY" • Not personal enough, add "your child's" to all statements • Add a "," before slouching • Add "not across the stomach"	3 5 1 3

3.2.1.5.2 *Knowledge Transfer Questionnaire*

Of the five participants three answered all 10 (100%) questions correctly and two participants answered 9 (90%) questions correctly. It is interesting to note that the two participants, who answered one question incorrectly, missed the identical question. The question that was missed by both participants can be found in Table 6. In both cases the participants acknowledged that they probably did not read the question carefully enough.

According to the American National Standards Institute-ANSI 535.3 (1991; 1997), a minimum score of 85% correct is considered a level of acceptable comprehension. It is inferred

by the 90-100% correct scores of the participants in this study that comprehension of the material they read in the first iteration of the new pamphlet was achieved.

A high-back booster seat is used when… a) your car's seat back is lower than your child's ears b) your car's seat back is higher than your child's ears c) your child can see out the window d) a or b Note: the correct answer is "d". A high-back booster seat can be used either when your child's ears are higher or lower that the car's seat back.

Table 6. Knowledge question that was missed by two participants.

3.2.1.6 Outcome of Study 2

Using the data collected in Study 2 the second iteration of the new pamphlet was developed and subsequently used in Studies 3 and 4. All of the items that were changed in the pamphlet from iteration one to iteration two are described below and may be seen in their respective figures.

Panel 1 of the pamphlet only required one modification. The words "Booster Seats:" were bolded. This change that was made from iteration one to iteration two can be seen in Figure 13.

The changes from iteration one to iteration two in panel 2 can be seen in Figure 14. The words "much safer" were changed to "the only" and the statement "Your child will be more comfortable using a booster seat" was added.

Multiple changes were needed from iteration one to iteration two on panel 3. These modifications are illustrated in Figure 15. The "YES" statement on panel 4 was duplicated into a

"NO" statement on panel 3. All of the statements on the top portion of this panel were changed to questions. The height measurement of 57" was added in parentheses next to 4'9". In addition the word "safely" was felt to be too vague so the sentence "Your child is not big enough to use the car's safety belt safely" was changed to "Is your child not big enough for the vehicle's safety belt to protect them in a crash". The word "prevent" was changed to "can protect". And lastly, it was felt that "deaths and serious injuries" was not personal enough and was changed to "your child from death and serious injury".

In order to provide clarification and the proper emphasis two changes were made to panel 4 and are shown in Figure 16. The word "vehicle's" was added to differentiate between the vehicle seat back and the child safety seat back and quotation marks around the word "NO" were added.

Iteration two of panel 5 required two changes and can be seen in Figure 17. The underlining of the words "High back booster seat and platform booster seat" was distracting so it was removed and replaced with italics. In addition, a dash was placed in all three instances where the words "high-back" were used.

Lastly, the following items were changed from iteration one to iteration two (panel 6) and can be seen in Figure 18. The statement "Your child can safely use a safety belt when ALL of these are true" was changed to "Your child can safely use a safety belt without using a booster seat ONLY when ALL of these are true". The words "your child's" were added to all bulleted items to personalize the statements. Lastly, a comma was added before the words "without slouching".

Figure 13. New pamphlet - panel 1: first iteration (left), second iteration (right).

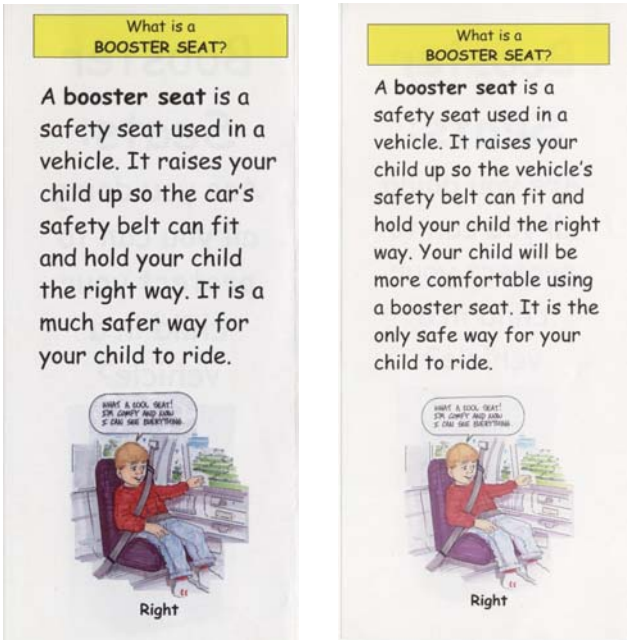


Figure 14. New pamphlet - panel 2: first iteration (left), second iteration (right).

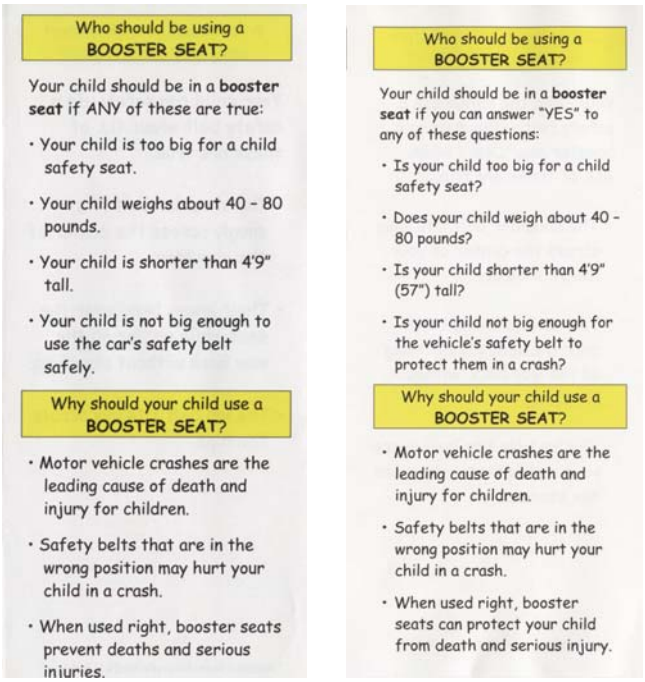


Figure 15. New pamphlet - panel 3: first iteration (left), second iteration (right).

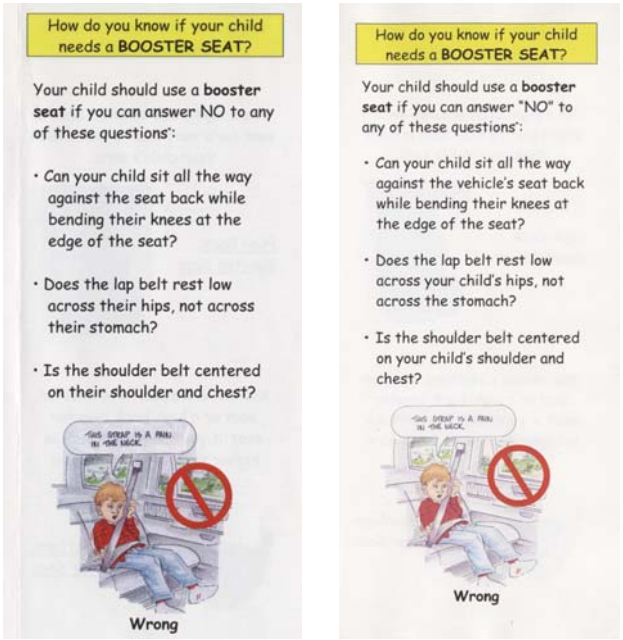


Figure 16. New pamphlet - panel 4: first iteration (left), second iteration (right).

Figure 17. New pamphlet - panel 5: first iteration (left), second iteration (right).

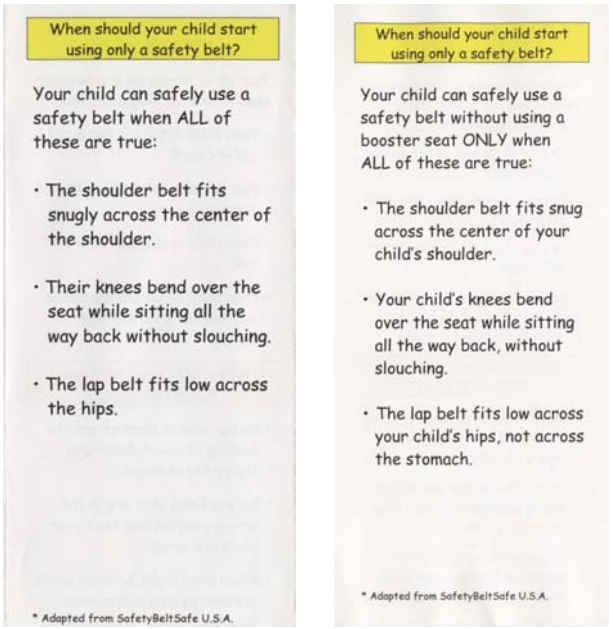


Figure 18. New pamphlet - panel 6: first iteration (left), second iteration (right).

4 PHASE II: EVALUATION AND COMPARISON

4.1 Study 3: End-users – Comparison of Pamphlets

4.1.1 Method

4.1.1.1 Research Goal

The goal of Study 3 was to determine the comprehensibility, carefulness ratings, and overall understandability for each of the three pamphlets, written specifically about booster seats. Two of the pamphlets already exist and are widely used in the child passenger safety domain. The third pamphlet was designed in the second study.

4.1.1.2 Participants

Thirty parents (29 females and 1 male) with children between the ages of 4 and 8 years old and 40 to 80 pounds who were not currently using a booster seat while riding in a vehicle were recruited to participate in this study. Participants were recruited from the local community in Southwest Virginia. The design of Study 3 was a between subjects design whereby each participant received only one of the three pamphlets. Participants were randomly placed into one of three pamphlet groups. The study began after each participant read and signed the informed consent form (see Appendix M).

This study was administered in the following order, 1) Cloze Test, 2) Participant read the pamphlet, having as much time to read as they felt necessary, 3) Carefulness Ratings, and 4) Questionnaire. Participants were asked not to raise any questions regarding the pamphlet as they were reading it or during any of the questions or instruments following. In addition, the

participants were not told that they would be tested or be asked questions about what they had read.

Each participant had an opportunity for clarification of any part of the pamphlet at the end of the study, ensuring they did not leave the study with any questions regarding the importance or use of booster seats. Each participant was given a copy of the signed informed consent as well as the pamphlet they received during the study.

4.1.1.3 Materials

4.1.1.3.1 Pamphlets

Three pamphlets, written specifically about booster seats, were selected for this study. These included: the second iteration pamphlet designed in Phase I (see Appendix J); the Ford Motor Company's Boost America Pamphlet, herein referred to as "Alternate 1" pamphlet (see Appendix K); and the General Motors' Safe Kids Buckle-Up Pamphlet, herein referred to as "Alternate 2" pamphlet (see Appendix L).

These pamphlets were selected because they are the most frequently used in the child passenger safety industry when only booster seats are the targeted product for education, as opposed to child safety seats in general. Ford Motor Company (alternate 1) and Safe Kids Coalition (alternate 2) developed there own pamphlets and disseminate them through their respective child safety seat programs. Ford's Boost America program targeted all schools in the United States having grades with children who should be in booster seats, and Safe Kids pamphlets are targeted to all child safety programs across the country. The primary use for each

of these pamphlets is education for caregivers of children who should be placed in a booster seat while riding in a vehicle.

4.1.1.3.2 Cloze Test

To assess reading comprehension, Cloze tests were constructed for each of the 3 pamphlets used in this study. The Cloze test determines, directly, the fit between reader and material. The material may or may not be familiar to the reader. The test brings the reader and the material together with the task of filling in a series of blanks. Developed by Taylor (1953), the test is designed to that every fifth word is deleted from a passage, and the reader's task is to fill in the blanks with the exact replacements. The ability of readers to fill in missing words correctly is a valid indicator of how well they understand the passage.

The Cloze test measures comprehension in two ways, 1) it tests how much knowledge was obtained from the information surrounding the blanks, and 2) it determines how well this information was used to obtain additional information (McKenna and Robinson, 1980). A partial sample of a Cloze test can be found in Figure 19.

Booster seats: Are you doing all you can to protect your child in a vehicle?

What is a booster _____? A booster seat is _____ safety seat used in _____ vehicle. It raises your _____ up so the vehicle's _____ belt can fit and _____ your child the right _____. Your child will be _____ comfortable using a booster _____. It is the only _____ way for your child _____ ride. Who should be _____ a booster seat? Your _____ should be in a _____ seat if you can _____ "yes" to any of _____ questions: Is your child _____ big for a child _____ seat? Does your child _____ about 40 to 80 _____? Is your child shorter _____ 4'9" (57") tall? Is _____ child not big enough _____ the vehicle's safety belt _____ protect them in a _____?

Figure 19. Partial sample of a Cloze test.

4.1.1.3.3 Carefulness Ratings

Wogalter, Young, Brelsford and Barlow (1999b) demonstrated that, with consumer products, hazard-risk judgments are determined by how severely one might be injured. In their study, questions were related to hazard-risk, likelihood of injury, severity of injury, cautious intent, likelihood of reading warnings, and familiarity. This questionnaire was comprised of two questions related to these topics but were slightly reworded from the original study to accommodate the specific target product (booster seats), thus allowing the same questions to be used regardless of which pamphlet is administered to the participant. Nine-point Likert-type scales to rate carefulness ranging from zero to eight were used for each question and all even scale values had verbal anchors (see Appendix E).

4.1.1.3.4 Questionnaire

A structured questionnaire elicited the participants understanding and knowledge acquisition of 10 key points (see Appendix C) from the pamphlet. The 10 key points were selected based on the topics addressed in all three pamphlets (second iteration of new pamphlet, alternate 1, and alternate 2). The aim was to evaluate two aspects of the pamphlet under test:

1. can they find information in the pamphlet quickly and easily;
2. having found it, do they understand it?

4.1.1.4 Procedure

4.1.1.4.1 Cloze Test

To assess reading comprehension, a Cloze test (Appendix D) was constructed for each pamphlet and administered to the participants. The participant only received the test for the treatment group to which he/she was assigned. Participants were asked to identify every fifth word deleted from a passage from the treatment pamphlet and was not given the pamphlet to read prior to taking the Cloze test.

4.1.1.4.2 Carefulness Ratings

Each participant was given a 9-point Likert Type scale based on Wogalter, Young, Brelsford, and Barlow's (Wogalter et al., 1999b) carefulness rating scale. All participants, regardless of which treatment group they were in received the same scale (Appendix E). In the test booklet, each question was printed on a separate page and the pages were randomly ordered. Participants were given the question booklet after reading the pamphlet and asked to rate each item one page at a time. They were also asked not to preview forthcoming questions or to review earlier answers.

4.1.1.4.3 Questionnaire Procedure

A structured questionnaire elicited the participants' understanding of 10 key points (see Appendix C) from the pamphlet. The criterion used was that proposed in the European Commission's Guidelines on testing, where the aim is for 80% of the participants tested to be able to both find the information and put it accurately in their own words.

Each participant was interviewed individually and after reading the pamphlet, they were asked three questions about each of the 10 key points. The first question tested whether the participant could determine if a key point was discussed in the pamphlet. The second question tested whether the participant could locate the relevant information. This was followed by a third question: "Can you tell me what it says, in your own words?" Each point generated three possible correct responses: one for successfully determining whether a topic was discussed, one for successfully locating the information, and the third for interpreting it correctly. A blind judge (NHTSA certified technician/instructor in child passenger safety) was used to grade the test to alleviate any weakness or biases of having the experimenter analyze whether a participant interpreted the information correctly. Any general comments solicited by open questions were also recorded.

4.1.1.5 Results and Discussion

4.1.1.5.1 Cloze Test

The participant's score is the percentage of words filled in correctly. The ability of an individual to identify missing words suggests how well they comprehend the material. The results of the ANOVA for differences between pamphlets based on the Cloze response are included in Table 7. The ANOVA revealed a significant overall difference of comprehension between pamphlets, $F(2,27) = 22.19$, $p<0.0001$. Differences between pamphlets were determined by Tukey's HSD with a significance level of $\alpha = 0.05$.

Table 7. Pamphlet means for Cloze test.

Pamphlet	Mean Cloze
Second iteration pamphlet	0.746 a*
Alternate 1	0.516 b
Alternate 2	0.545 b
*means followed by the same letter are not statistically different by Tukey's HSD.	

The Tukey's HSD revealed a difference between the pamphlets where the second iteration pamphlet was different from both alternate pamphlets; the alternate pamphlets were not different from each other. Criteria are used to assess comprehension: readers with scores of greater than 56% comprehend material independently without guidance; readers with scores from 44% to 56% need additional instruction to understand major ideas; and readers with scores less than 44% are frustrated by the material because it is too difficult to understand (Taylor, 1953).

Numerically only the second iteration pamphlet had a mean cloze response greater than 0.56. T-tests were used to compare the mean cloze response for each pamphlet to determine if any were significantly greater than the 0.56 Cloze criteria value. Only the second iteration pamphlet had a mean Cloze response that was significantly greater than 0.56 ($p<0.0001$). The same tests were used to compare the mean pamphlet Cloze responses to 0.44 and all pamphlets were significantly greater ($p<0.05$).

The result of the above analyses supports the effect of the pamphlets on comprehension. The second iteration pamphlet was in the "comprehend material independently without guidance" category (greater than 56%) while both alternate pamphlets were in the "need additional instruction to understand major ideas" category (44%-56%).

4.1.1.5.2 Carefulness Ratings

In an attempt to assess risk perception, a carefulness rating (Wogalter et al., 1996) instrument was developed asking the following two questions:

- How careful would you be if you were driving in a vehicle with your child who is 4-8 years old and 40-80 pounds?
- How careful would you be if you were driving in a vehicle with any child who is 4-8 years old and 40-80 pounds?

Fisher's Exact tests revealed no difference between pamphlets in how careful participants would be with their own child 4-8 years old and 40-80 pounds (p=0.6221), and no difference between pamphlets in how careful participants would be with any child 4-8 years old and 40-80 pounds (p=0.7609). In addition, a T-test was used to assess the relationship between the two situations (the participants' child versus any child). No difference was found within pamphlets in how careful participants would be with their own child versus any child (p=0.3256).

It is possible to explain the nonsignificance of risk perception between pamphlets by understanding that parents may have not answered in a truthful manner, possibly for fear of embarrassment. In addition, it would seem from looking at the data that participants automatically rated the same in both categories so as not to say that they would be safer with their child than with any child.

4.1.1.5.3 Questionnaire Procedure

The structured questionnaire tested understandability and knowledge acquisition for all three pamphlets, although the second iteration pamphlet was the only pamphlet that was evaluated for redesign. The three questions for each of 10 items were as follows:

- Is the topic discussed in the pamphlet? (referred to as "discuss" with a yes/no answer)

- Can participant find the information in the pamphlet quickly and easily? (referred to as "find" with a yes/no answer)
- Can participant explain the information in their own words? (referred to as "explain" with a correct/somewhat correct/wrong answer)

To test whether there was a difference between pamphlets using the measures of "discuss", "find", and "explain", analyses were conducted using the Fisher's exact test. Significance in the "discuss" measure can be found in Table 8, the "find" measure in Table 9, and the "explain" measure in Table 10. Significance is indicated by an "*" next to the items with significant differences.

Table 8. Frequency of correct answers for "Is the topic discussed" question.

Did the pamphlet discuss…?	Second Iteration (yes)	Alternate 1 (yes)	Alternate 2 (yes)
What booster is used for	10	9	9
When to use booster	10	9	8
Kind of booster	10	7	10
Seat belts and boosters *	4	10	6
Child needs booster *	10	7	4
Only lap belts	10	8	9
When child fits in seat belt	10	9	9
Does child fit in seat belt	10	7	7
Child not in booster	10	7	6
More information	10	10	10

Table 9. Frequency of correct answers for "Can participant find information" question.

Could they find…?	Second Iteration (yes)	Alternate 1 (yes)	Alternate 2 (yes)
What booster is used for *	10	8	5
When to use booster	10	7	6
Kind of booster	10	7	9
Seat belts and boosters	4	6	5
Child needs booster *	10	5	2
Only lap belts	10	6	9
When child fits in seat belt	10	6	7
Does child fit in seat belt *	10	5	7
Child not in booster *	10	6	4
More information	10	10	10

Table 10. Frequency of correct answers for "Can participant explain" question.

Could they explain…?	Second Iteration (correct)	Alternate 1 (correct)	Alternate 2 (correct)
What booster is used for	10	7	6
When to use booster *	10	1	4
Kind of booster	10	7	9
Seat belts and boosters *	4	3	5
Child needs booster *	10	5	1
Only lap belts *	10	3	8
When child fits in seat belt *	10	4	6
Does child fit in seat belt *	10	4	6
Child not in booster *	10	5	4
More information	10	10	10

The second iteration pamphlet was the only pamphlet that was evaluated for revision. Given that, it is clear from the data above that the fourth item in the structured questionnaire (Does the pamphlet discuss seat belts and how they are used with booster seats?) needed to be restated in a clearer format. The following passage was added to the second panel of the pamphlet, "Booster seats must be used with both lap and shoulder safety belts. Never use a booster seat with a lap safety belt only."

In addition, the structured questionnaire asked, "Is the information in this pamphlet easy to follow?" To test whether this measure was significantly different between pamphlets, analyses were conducted using the Fisher's exact test. A 2 (ease of use) x 3 (pamphlet) Fisher's exact test, using "ease" and treatment revealed a significant chi-square value, χ^2 (2) = 13.30, $p <$ 0.001, indicating there were significant differences across groups (see Table 11). It is inferred from this data that the second iteration pamphlet is the only pamphlet that was considered easy to follow.

Table 11. A 2 x 3 contingency table of ease and treatment.

	Second Iteration	Alternate 1	Alternate 2	
Easy	10	2	5	17
Not easy	0	8	5	13
	10	10	10	30

4.1.1.6 Outcome of Study 3

Using the data collected in Study 3 the third iteration of the new pamphlet was developed and subsequently used in Study 5. These data were combined with the following Study 4 data and the final outcome of Studies 3 and 4 can be found in section 4.2.1.6.

4.2 Study 4: Human Factors Experts – Comparison of Pamphlets

4.2.1 Method

4.2.1.1 Research Goal

The goal of Study 4 was to determine the reading levels, readability, and the inclusion of instructional design qualities and learning principles for each of the three pamphlets.

4.2.1.2 Participants

Eight Human Factors graduate students from the Industrial and Systems Engineering Department at Virginia Tech participated in this study. The design of Study 4 was a within subjects design whereby all participants received all levels of pamphlets thereby reducing potential individual difference issues. A random number generator was used to counterbalance the pamphlet order. In addition, the participants evaluated each of three pamphlets on separate days (i.e. day 1 is pamphlet 1, day 2 is pamphlet 2, etc.) in order to keep participants from carrying over a schema from one pamphlet to the next which in turn reduced asymmetric carryover and/or transfer effects. In addition, having 8 participants increased the level of reliability of ratings for each pamphlet instead of having only one independent rater. The study began after each participant had read and signed the informed consent form (see Appendix M).

4.2.1.3 Materials

4.2.1.3.1 Pamphlets

Three pamphlets written specifically about booster seats were selected for this study. These include: the second iteration pamphlet designed in Phase I (see Appendix J); the "alternate 1" pamphlet (see Appendix K); and the "alternate 2" pamphlet (see Appendix L). These are the same three pamphlets used in Study 3 described in section 4.1.1.3.1.

4.2.1.3.2 SMOG Formula

The SMOG formula was used to determine the reading level of each of the booster seat pamphlets. This formula was selected because it is designed to evaluate the reading level of educational materials that can be read independently by a parent or family in the absence of assistance from a teacher or instructor (Richardson and Morgan, 1994). The SMOG can be used to derive a reading grade level of the materials being evaluated. For a more detailed explanation of the instrument see Appendix F.

4.2.1.3.3 BIDS-3 Scale

The Bernier Instructional Design Scale (BIDS-3) is a comprehensive instructional design standard, the BIDS-3 delineates instructional design and learning principles that have been judged by experts to be essential to quality in PEMs. The instructional design principles contained in the BIDS-3 were presented in the format of a rating checklist to facilitate the rating of the PEMs that are used with parents and families. The checklist is a rating for the presence (or

absence) of instructional design and learning principles contained in PEMs. For a more detailed explanation of the instrument see Appendix G.

4.2.1.3.4 RAIN Instrument

The Readability Assessment Instrument - RAIN (Singh, 1994b) was developed for assessing the readability of PEMs. The RAIN has been found to be an easy-to-use instrument for this purpose (Kirkpatrick and Mohler, 1999). The instrument includes eight text variables and several subvariables in its definition of readability. For a more detailed explanation of the instrument see Appendix H.

4.2.1.4 Procedure

4.2.1.4.1 SMOG

The investigator chose three sets of ten sentences from the beginning, middle, and end of each pamphlet. The experimenter then counted all the words that have three or more syllables, then calculated the square root of this number, and then added 3 to this square root. See Appendix F for a more detailed explanation of special rules for SMOG testing. The criterion for this study was a reading level of no more than an 8^{th} grade level as determined by the U.S. Department of Education (1986).

4.2.1.4.2 BIDS-3

The rating procedure began by having the participant read the instructional design principles contained in the BIDS-3. The PEM was then read. The BIDS-3 rating scale was used to record the rating of the level of the instructional design and learning principles that are present in the PEM by making a check in the appropriate column. The participant was able to re-read the PEM as many times as necessary to complete the rating. The following rating scale was given to the participant: 0 = NOT MET, 1 = PARTIALLY MET, 2 = MET, AND NA = NOT APPLICABLE.

While reliability (0.94) of the BIDS-3 has been determined (Bernier, 1996), no established criteria had been set by Bernier as far as cut off levels for what would be considered acceptable or not acceptable levels of instructional design and the inclusion of learning principles for PEMs. Bernier (2002) was in agreement with this investigator that the following levels of cut off would be appropriate for evaluating whether there was the presence or absence of instructional design and learning principles:

- Met criteria = Greater than 80% of the items in the pamphlet scored in the "met" criteria category
- Partially Met criteria = Greater than 80% of the items in the pamphlet scored in the "met" or "partially met" criteria categories
- Not Met criteria = A pamphlet scoring less than 80% of the items in the "met" or "partially met" criteria categories

4.2.1.4.3 RAINS

Following the guidelines established in the RAIN manual (Singh, 1994b), a scoring criterion of 80% was considered as acceptable for these variables: global coherence, local coherence, unity, and relevant and appropriate illustrations. To be considered acceptable, a minimum of 80% of paragraphs had to have evidence of structure; 80% of pronoun references, substitutions, and connectives had to be rated "clear;" and 80% of sentences had to be relevant to the topic for local coherence to be considered acceptable. A scoring criterion of 80% was used for overall acceptance readability (Kirkpatrick and Mohler, 1999).

4.2.1.5 Results and Discussion

4.2.1.5.1 SMOG Test

The SMOG formula was used to determine the reading level of each of the booster seat pamphlets. Using the established procedure to assess reading level set by the SMOG test the following reading levels were determined for each pamphlet:

- Second Iteration Pamphlet – 6th grade reading level
- Alternate 1 Pamphlet – 11th grade reading level
- Alternate 2 Pamphlet – 8th grade reading level

The above data indicates that based on the criteria cutoff of an 8^{th} grade reading level, the second iteration and alternate 2 pamphlets are acceptable as determined by the U.S. Department of Education (1986).

4.2.1.5.2 BIDS-3

To test whether there was a difference between the pamphlet regarding whether each met or partially met the BIDS-3 criteria, analyses were conducted using the Fisher's exact test. A 2 (met, partially met) x 3 (pamphlet) Fisher's exact test, using treatment and met or partially met criteria revealed a significant chi-square value, χ^2 (2) = 24.00, $p < 0.001$, indicating there were significant differences across groups (see Table 12).

Table 12. A 2 x 3 contingency table of treatment and BIDS-3 criteria levels.

	Second Iteration	Alternate 1	Alternate 2	
Met	8	0	0	8
Partially Met	0	8	8	16
	8	8	8	24

To test whether there was a difference between the qualities of each pamphlet; analyses were conducted using the Fisher's exact test. A 3 (good, fair, not good) x 3 (pamphlet) Fisher's exact test, using treatment and quality revealed a significant chi-square value, χ^2 (4) = 25.40, $p <$ 0.001, indicating there were significant differences across groups (see Table 13). It is clear by the data reported in Table 13 that the second iteration was the only pamphlet to meet the "good" criteria, according to the BIDS-3 criteria.

Table 13. A 3 x 3 contingency table of treatment and quality of pamphlet.

	Second Iteration	Alternate 1	Alternate 2	
Good	6	0	1	7
Fair	2	2	7	11
Not Good	0	6	0	6
	8	8	8	24

4.2.1.5.3 RAINS

To test the readability of the three pamphlets, analyses were conducted using the ANOVA with a significance level of $\alpha = 0.05$. A one-way ANOVA on the three levels of treatment was conducted on the readability measure. The ANOVA revealed a significant overall difference of readability between pamphlets, $F(2,7) = 128.40$, $p<0.0001$.

Post hoc analyses (Tukey's HSD) revealed a difference between all pamphlets with respect to readability (see Figure 20), where all pamphlets were significantly different from each other. This result, shown in Figure 20, clearly reveals that the second iteration pamphlet is the only pamphlet that meets the minimum overall RAINS score of 80% to be considered having acceptable readability.

Figure 20. Comparison of means of pamphlets.

Pamphlet	Mean RAINS
Second iteration	0.90 a*
Alternate 1	0.56 c*
Alternate 2	0.68 b*

* Means followed by the same letter are not significantly different at $p<0.05$.

4.2.1.6 Outcome of Studies 3 and 4

Subsequent to the above analyses in Studies 3 and 4, a third iteration of the new booster seat pamphlet was developed. The revised pamphlet was used in Study 5. All of the items that were changed in the pamphlet from iteration two to iteration three are described below and may be seen in their respective figures.

No changes to panel 1 were necessary (see Figure 21). Two additions were made to panel 2 and are shown in Figure 22. Specifically, the statements "Booster seats MUST be used with BOTH lap and shoulder safety belts" and "Never use a booster seat with a lap safety belt only" were added. Only one modification was made to panel 3. The word "yes" was changed from uppercase to lowercase (see Figure 23). Similarly, the word "no" was changed from uppercase to lowercase in panel 4 (see Figure 24). A different booster seat photo, as compared to that used in panel 1, was inserted in iteration three of panel 5 to emphasize the availability of more than one type of high-back booster seat (see Figure 25). Lastly, as shown in Figure 26, there were no changes from iteration two to iteration three on panel 6.

Figure 21. New pamphlet - panel 1: second iteration (left), third iteration (right).

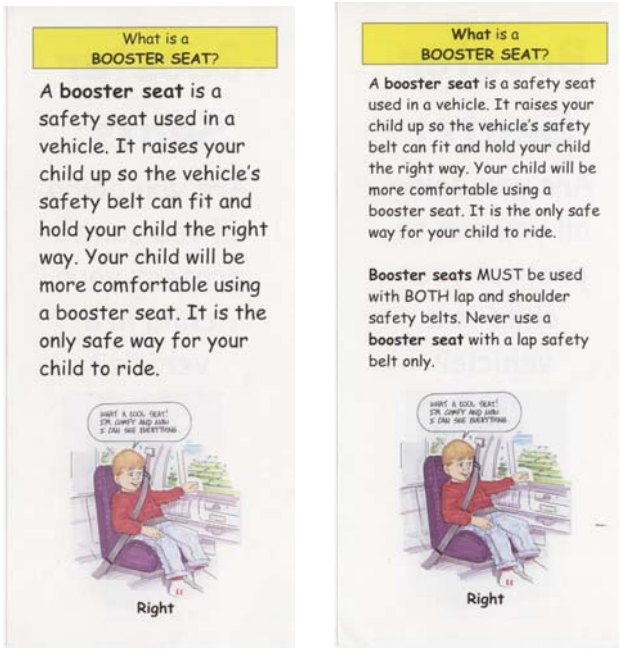
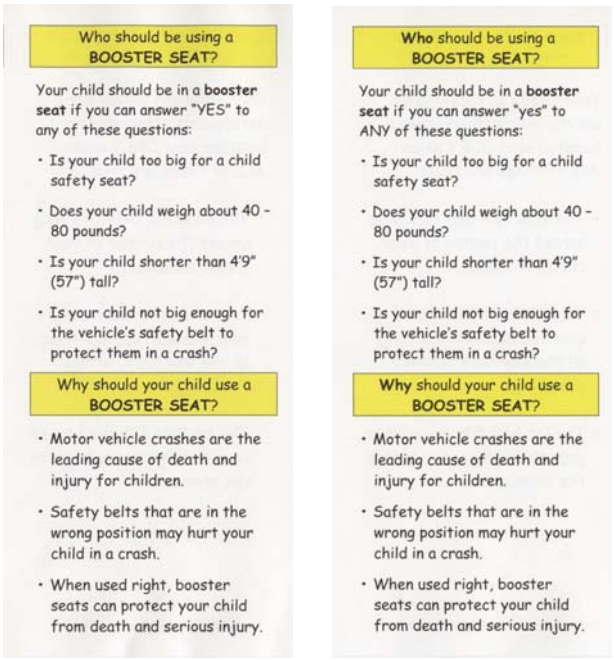


Figure 22. New pamphlet - panel 2: second iteration (left), third iteration (right).



Who should be using a BOOSTER SEAT?

Your child should be in a **booster seat** if you can answer "YES" to any of these questions:

- Is your child too big for a child safety seat?
- Does your child weigh about 40 - 80 pounds?
- Is your child shorter than 4'9" (57") tall?
- Is your child not big enough for the vehicle's safety belt to protect them in a crash?

Why should your child use a BOOSTER SEAT?

- Motor vehicle crashes are the leading cause of death and injury for children.
- Safety belts that are in the wrong position may hurt your child in a crash.
- When used right, booster seats can protect your child from death and serious injury.

Who should be using a BOOSTER SEAT?

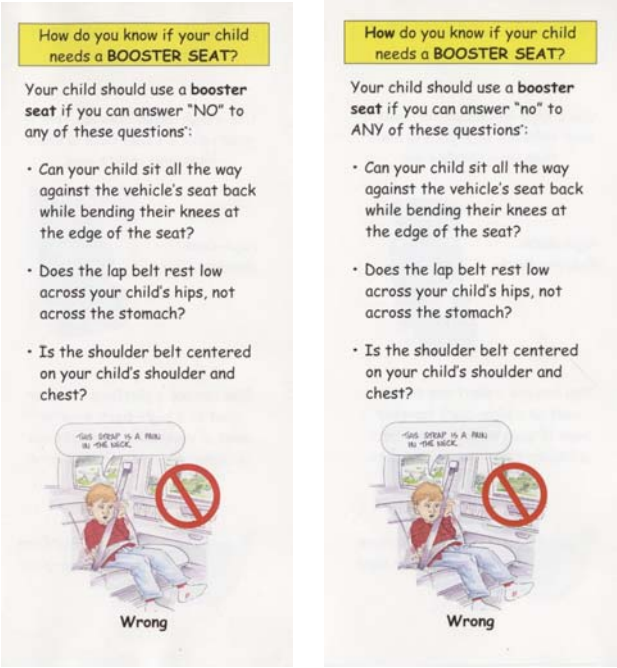
Your child should be in a **booster seat** if you can answer "yes" to ANY of these questions:

- Is your child too big for a child safety seat?
- Does your child weigh about 40 - 80 pounds?
- Is your child shorter than 4'9" (57") tall?
- Is your child not big enough for the vehicle's safety belt to protect them in a crash?

Why should your child use a BOOSTER SEAT?

- Motor vehicle crashes are the leading cause of death and injury for children.
- Safety belts that are in the wrong position may hurt your child in a crash.
- When used right, booster seats can protect your child from death and serious injury.

Figure 23. New pamphlet - panel 3: second iteration (left), third iteration (right).



How do you know if your child needs a BOOSTER SEAT?

Your child should use a **booster seat** if you can answer "NO" to any of these questions":

- Can your child sit all the way against the vehicle's seat back while bending their knees at the edge of the seat?
- Does the lap belt rest low across your child's hips, not across the stomach?
- Is the shoulder belt centered on your child's shoulder and chest?

Wrong

How do you know if your child needs a BOOSTER SEAT?

Your child should use a **booster seat** if you can answer "no" to ANY of these questions":

- Can your child sit all the way against the vehicle's seat back while bending their knees at the edge of the seat?
- Does the lap belt rest low across your child's hips, not across the stomach?
- Is the shoulder belt centered on your child's shoulder and chest?

Wrong

Figure 24. New pamphlet - panel 4: second iteration (left), third iteration (right).

Figure 25. New pamphlet - panel 5: second iteration (left), third iteration (right).

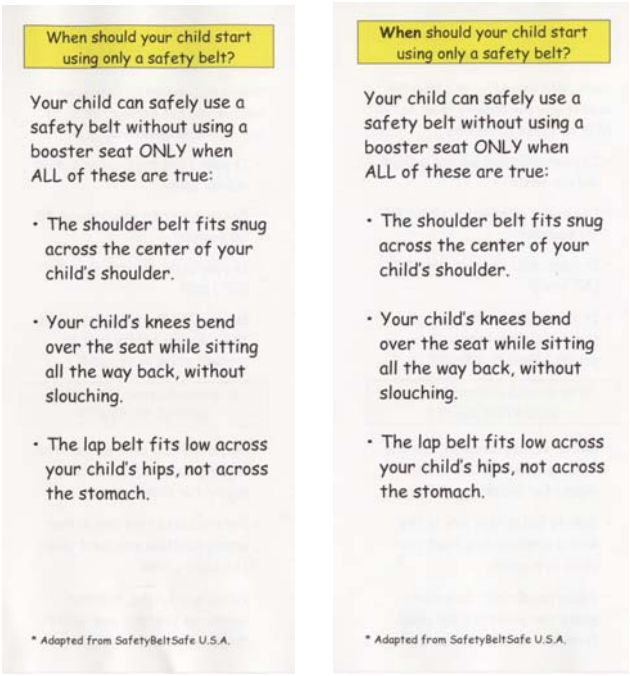


Figure 26. New pamphlet - panel 6: second iteration (left), third iteration (right).

5 PHASE III: ADOPTION AND IMPACT

5.1 Study 5: Effectiveness of Intervention

5.1.1 Method

5.1.1.1 Research Goal and Hypotheses

The goal of Study 5 was to determine which pamphlet, one of the two alternative pamphlets or the third iteration of the newly developed pamphlet, would be most effective in changing participants' attitudes toward adopting the concept (intention) of purchasing a booster seat for their child, the level of self efficacy (perceived control) toward purchasing a booster seat, as well as assessing actual purchase behavior.

Ajzen and Fishbein's (1980) theory of reasoned action proposes that behavior is predicted by intention and Madden, Ellen, and Azjen's (1992) theory of planned behavior proposes that adding perceived control to the theory of reasoned action improves the model's ability to predict intentions and behavior. Additionally, Wogalter, DeJoy and Laughery's (1999) communication-human information processing (C-HIP) model addresses these issues from an engineering point of view. The C-HIP model has the basic concepts of the communication model of source, channel, and receiver where the receiver component has been decomposed into the stages of attention, comprehension, attitudes and beliefs, motivation and lastly, behavior. The receiver must notice the information and understand it. The message must be consistent with the person's attitudes and beliefs, or sufficiently persuasive to change them and to motivate the person to carry out the directed behavior.

Using the above three models the three hypotheses for Study 5 were as follows: 1) The experimental treatment group receiving the third iteration of the newly developed pamphlet will have high ratings of intent to purchase a booster seat compared to all other groups, 2) the experimental treatment group receiving the third iteration of the newly developed pamphlet will have high ratings of perceived control over the behavior of booster seat purchase compared to all other groups, and 3) the experimental treatment group receiving the third iteration of the newly developed pamphlet will have a higher rate of purchase behavior compared to all other groups.

5.1.1.2 Participants

Forty-five participants were selected from the population of parents whose children should have been using a booster seat but were not using one. Participants were recruited from a local mall in Southwest Virginia and were prescreened to assess eligibility. If eligible they were asked if they would like to participate in a study having to do with child safety.

Each participant reported having a vehicle in which they transported the above-mentioned child; their vehicle had lap/shoulder safety belts, they reside in the area, and they had no plan on relocating within the next month. The design of Study 5 was a between subjects design whereby each participant received only one of the independent variables. The dependent variables that were measured were intention to purchase, perceived control over booster seat purchase and actual purchase behavior.

5.1.1.3 Materials

5.1.1.3.1 Pamphlets

Three pamphlets written specifically about booster seats were selected for this study. These include: the third iteration pamphlet designed in Phase II (see Appendix J); the alternate 1

pamphlet (see Appendix K); and the alternate 2 pamphlet (see Appendix L). The alternate 1 and 2 pamphlets are identical to the ones used in Phase II of this research.

5.1.1.3.2 Questionnaire

A questionnaire was used to assess intention to purchase a booster seat as well as perceived control over booster seat purchase (see Appendix Q). The questionnaire consisted of two questions, the first assessing intent and the second assessing perceived control. Each of the questions used a bipolar scale using likely/unlikely and easy/difficult, respectively. Both questions had seven spaces between the ends of the scale. The participant placed a check mark over the word and to the side of the scale which best represented their belief of either intent or perceived control, see Figure 27 for an example of the bipolar scale used. Azjen and Fishbein (1980) state in their research, regarding assessing intent and perceived control, that the strength of each belief should be measured by means of a bipolar scale consistent with the one in Figure 27. In addition, a 14-day follow-up questionnaire (over the telephone) was used to assess actual purchase behavior (see Appendix I).

likely_____:_____:_____:_____:_____:_____:_____unlikely
extremely quite slightly neither slightly quite extremely

Figure 27. Sample of bipolar scale used in questionnaire assessing intent and perceived control.

5.1.1.4 Procedure

Participants were randomly assigned to one of the three pamphlet treatment groups (15 per group). They were asked to read the pamphlet in front of the experimenter and were given the pamphlet to take home. Once the pamphlet had been read, they were asked to answer a short questionnaire and were paid $5.00 upon completion. At the completion of the questionnaire they were asked if they could be contacted if there was any other information needed regarding this study. Their name and phone number were recorded.

After a 2-week period each participant was called and asked a short follow up questionnaire including if they purchased or did not purchase a booster seat. If no, they were asked, "why not?" At this point the experiment was complete. If the participant did not purchase a booster seat, they were offered a free booster seat if they came to the experimenter to pick it up.

5.1.1.5 Results and Discussion

5.1.1.5.1 Descriptive Statistics

Out of 75 potential participants approached by the experimenter, 45 (59%) volunteered to participate in the study, 15 (19%) refused participation and 17 (22%) had children who were already in booster seats. The major factor for refusal was time constraints. The sample consisted of 21 (47%) males and 24 (53%) females.

At the conclusion of the questionnaire, each participant gave permission for the experimenter to call them in 14 days to ask some follow up questions. As many as four call backs per participant were made because participants were unavailable at the time of the initial

call. A 100 percent response rate was obtained for the 14-day follow up questionnaire, which was conducted over the telephone. This is a high response rate in survey research, and is a result of the four callbacks that captured participants who were not available at the time of the initial call.

5.1.1.5.2 Hypothesis 1: Effect of treatment on intent to purchase a booster seat

To test the first hypothesis, that the treatment group receiving the third iteration of the newly developed pamphlet will have a higher rate of intention of purchasing a booster seat, analyses were conducted using the ANOVA with a significance level of $\alpha = 0.05$. A one-way ANOVA on the three levels of treatment was conducted on the intent to purchase measure. The rating question to assess intent to purchase can be found in Figure 28. The ANOVA revealed a significant overall difference of intent to purchase between the pamphlets, $F(2,42) = 14.94$, $p<0.0001$.

I intend to purchase a booster seat for my child after reading this pamphlet

likely_____:_____:_____:_____:_____:_____:_____unlikely
extremely quite slightly neither slightly quite extremely

Figure 28. Rating question to assess intent to purchase a booster seat.

Post hoc analyses (Tukey's HSD) revealed a difference between all pamphlets with respect to intent to purchase (see Figure 29), third iteration ($M = 5.87$, $SD = 1.55$), alternate 1 ($M = 2.53$, $SD = 1.64$), alternate 2 ($M = 4.13$, $SD = 1.81$), where all pamphlets were significantly

different from each other. This result supported the effect of the intervention on intent to purchase.

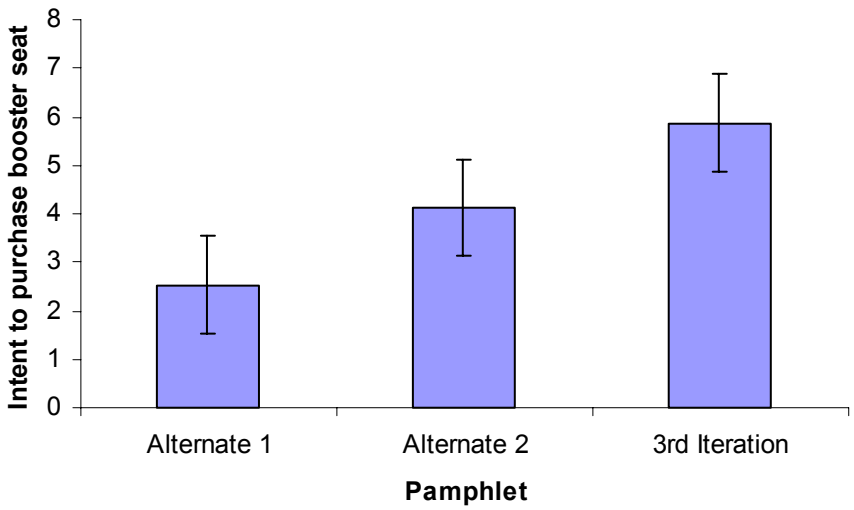


Figure 29. Pamphlet effect on intent to purchase a booster seat

5.1.1.5.3 Hypothesis 2: Effect of treatment on perceived control to purchase a booster seat

To test the second hypothesis, that the experimental treatment group receiving the third iteration of the newly developed pamphlet will have a higher rate of perceived control of purchasing a booster seat, analyses were conducted using the ANOVA with a significance level of $\alpha = 0.05$. A one-way ANOVA on the three levels of treatment was conducted on the perceived control to purchase measure. The rating question to assess perceived control to purchase can be found in Figure 30. The ANOVA revealed a significant overall difference of perceived control to purchase between treatments, $F(2,42) = 11.53$, $p<0.0001$.

For me to purchase a booster seat for my child would be

easy_____:_____:_____:_____:_____:_____:_____difficult
extremely quite slightly neither slightly quite extremely

Figure 30. Rating question to assess perceived control of purchasing a booster seat.

Post hoc analyses (Tukey's HSD) revealed a difference between all pamphlets with respect to perceived control to purchase (see Figure 31), third iteration ($M = 6.07$, $SD = 1.62$), alternate 1 ($M = 3.53$, $SD = 1.19$), alternate 2 ($M = 4.67$, $SD = 1.50$), where all pamphlets were significantly different from each other. This result supported the effect of the intervention on perceived control to purchase.

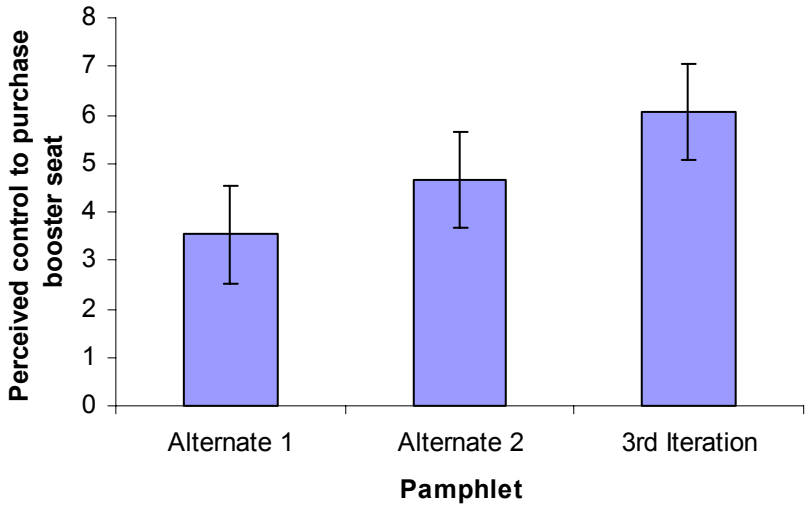


Figure 31. Pamphlet effect on perceived control to purchase a booster seat.

5.1.1.5.4 Hypothesis 3: Effect of treatment on purchase behavior

To test the third hypothesis, that the experimental treatment group receiving the third iteration pamphlet will have a higher rate of purchase behavior, analyses were conducted using the Chi-square test. A 2 (purchased, did not purchase) x 3 (pamphlet) Chi-square test, using treatment and purchase revealed a significant chi-square value, χ^2 (2) = 14.39, $p < 0.001$, indicating there were significant differences across groups (see Table 14).

Table 14. A 2 x 3 contingency table of treatment and purchase behavior.

	3rd Iteration	Alternate 1	Alternate 2	
Purchased	12	2	5	19
Did not purchase	3	13	10	26
	15	15	15	45

5.1.1.5.5 Descriptive statistics on purchase behavior

Of the 19 participants who purchased a booster seat, there were 12 (63%) in the third iteration pamphlet group, 2 (11%) in the alternate 1 pamphlet group, and 5 (26%) in the alternate 2 pamphlet group (see Figure 32).

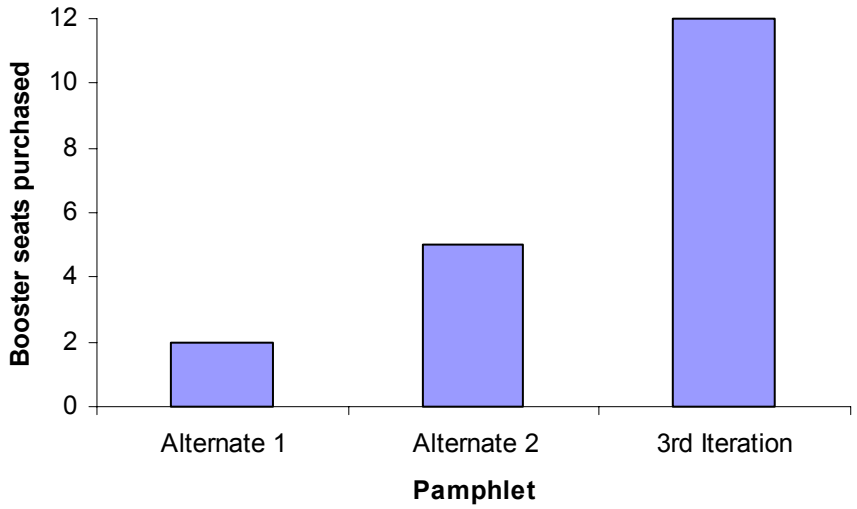


Figure 32. Number of participants who purchased a booster seat within each treatment.

5.1.1.5.6 *Self reported results of 14-day post intervention questionnaire*

The following is a content analysis on responses to the 14-day post intervention questionnaire. Of the participants who purchased booster seats, it was self reported that 100% of them were using the booster seat each time their child rode in the vehicle. However, only 13 (68%) of the participants who purchased seats had not yet sent in their registration card to the manufacturer. Each participant was urged to do so; since that is the only way the manufacturer can apprise the purchasers of a product recall and how to remedy the recall. In addition, each participant was asked if anything unusual had happened in the past 14 days, such as a car crash involving a family member or a friend. This question was asked in an attempt to verify that the purchase of booster seats was due to the intervention and not a recent incident that happened to the participant. Two participants who had purchased booster seats reported that a family member or friend was in a crash. The following are the two incidents that were reported:

- Family member in a crash, no injuries, no children in vehicle
- Friend in a crash, fatally injured, no children in vehicle

Both of the participants who reported vehicle crashes involving family members or friends had purchased their booster seats before these crashes. It can be inferred that these crashes did not affect their purchase behavior. Twenty-six of the 45 participants who did not purchase a booster seat were asked why not. See Table 15 for the reasons given for not purchasing a booster seat.

Table 15. Reasons given for not purchasing a booster seat.

Reasons for not purchasing a booster seat (N=26, participants who did not purchase a booster seat)	Frequency
Did not feel it was necessary for their child to sit in a booster seat	24
Feels the seat belt fits the child well	19
It is not a law for my age child	16
Feels the child is too big to sit in a booster seat	7
Not willing to make their child sit in a booster seat	5
Too Expensive	2
My child is so large now, she wouldn't be able to use one long enough to make it worth my while	1

Note: More than one response may have been self-reported by the same participant.

Two participants reported that the reason for not purchasing a booster seat was that the seats were too expensive. Although this may be a representative sample, it should be noted that participants were recruited from a shopping mall during the middle of the day. Without further information it cannot be assumed that the socioeconomic distribution of these participants matches that of the United States population. Twenty-four of the participants self-reported that they did not feel it was necessary for their child to sit in a booster seat and 19 of those participants also self-reported that the safety belt fit their child well. These responses were similar in the sense that they were contrary to the information provided in the pamphlets.

The Communication-Human Information Processing model proposed by Wogalter et al. (1999a) may allow speculation of what might have been occurring when participants reported the above feelings. It might have been that the participants did not feel that the source of the information being given to them was from a credible source (i.e. from a student at a university versus from their pediatrician or a law enforcement officer), or that the information medium was not presented to them in a manner conducive to their learning style. In addition, it is possible that the participant did not read the pamphlet carefully enough and thus, did not receive the full impact of the information.

Sixteen participants self-reported that they did not buy a booster seat because it was not a law for the age of their child. The ages of the children of these participants were between 6 and 8 years old. The current Virginia state law (where this research took place) includes children up to the age of 6 years. It is possible that these participants merely have a resistance to behavior change. Although the pamphlets contained actual injuries their child could sustain by only being protected by an adult safety belt, there is a possibility that because it was not a personal event to the participants it did not have as much impact on changing attitudes. It is suspected that these participants did not have an accessible personal event in their memory that might have given them a direct experience to help them form a different attitude toward behavioral change (Taylor et al., 1997).

According to Geller (1999) and Watson and Tharp (1993), there are three types of behaviors: other-directed, self-directed and automatic. Other-directed behavior occurs from following someone else's instruction (e.g. an operation manual or a law). Once a person has internalized the appropriate instructions or laws, the behavior becomes a self-directed behavior. Finally, after some behaviors are performed frequently and consistently over a period of time,

they become automatic behaviors. It seems that the participants who responded with, "it is not a law for my age child" are exhibiting other-directed behavior. Because of the above self-reported response, it is imperative that legislation be changed to include children up to and including the age of 8 years in the child safety seat laws.

In addition to legislation, it is clear from the above results that 26 of the 45 participants did not purchase a booster seat, that education continues to be a vital issue and still requires further research. Of the 26 participants who did not purchase a booster seat, 19 of them came to the experimenter after the study was completed and picked up a free booster seat.

5.1.1.5.7 *Further analyses of interest*

Ajzen and Fishbein's (1980) theory of reasoned action states that intent predicts behavioral action. To test whether intent predicted purchase behavior, analyses were conducted using the Fisher's exact test. A 2 (purchase/did not purchase) x 6 (levels of intent) Fisher's exact test, using purchase behavior and intent to purchase (only six of the seven levels had responses) revealed a significant chi-square value, χ^2 (5) = 45.00, p<0.0001 (see Table 16), indicating that if

Table 16. A 2 x 6 contingency table of intent to purchase and purchase behavior.

	Intent to purchase						
	1	2	3	5	6	7	
Purchase	0	0	0	0	10	9	19
Did not purchase	5	5	15	1	0	0	26
	5	5	15	1	10	9	45

participants rated high on intent to purchase a booster seat there was significance on actual purchase behavior and if participants rated low on intent to purchase a booster seat there was low actual purchase behavior (see Figure 33). The results from this data support and validate the Ajzen and Fishbein (1980) theory of reasoned action that intention predicts behavior.

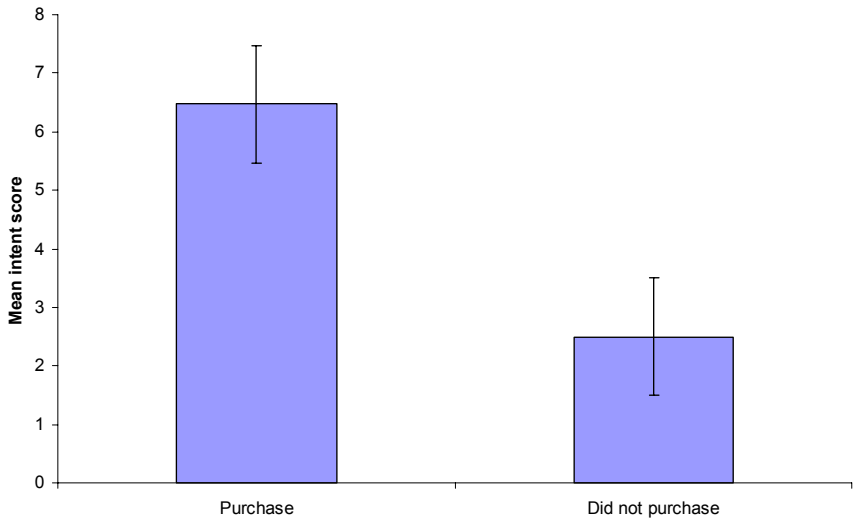


Figure 33. Mean intent to purchase scores compared to purchase behavior.

Furthermore, Madden, Ellen, and Azjen's (1992) theory of planned behavior states that not only does intention predict behavior, but that perceived control of behavior predicts actual behavior. To test whether perceived control predicted purchase behavior, analyses were conducted using the Fisher's exact test. A 2 (purchase/did not purchase) x 5 (levels of intent) Fisher's exact test, using purchase behavior and intent to purchase (only five of the seven levels had responses) revealed a significant chi-square value, χ^2 (4) = 45.00, p<0.0001 (see Table 17),

Table 17. A 2 x 5 contingency table of perceived control to purchase and purchase behavior.

	Perceived control to purchase					
	2	3	4	6	7	
Purchase	0	0	0	6	13	19
Did not purchase	2	13	11	0	0	26
	2	13	11	6	13	45

indicating that if participants rated high on perceived control to purchase a booster seat there was significance on actual purchase behavior and if participants rated low on perceived control to purchase a booster seat there was low actual purchase behavior (see Figure 34). The results from this data support and validate the Madden, Ellen, and Azjen's (1992) theory of planned behavior that perceived control predicts behavior.

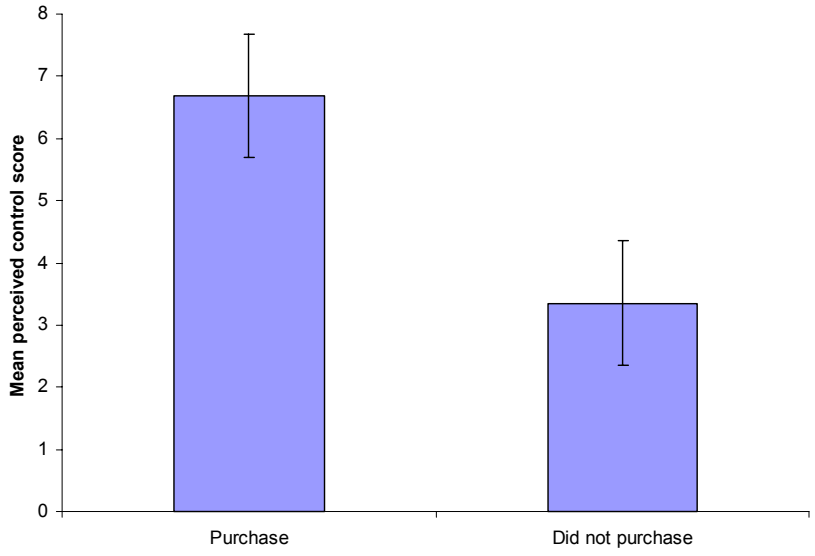


Figure 34. Mean perceived control to purchase scores compared to purchase behavior.

Additionally, a Spearman's Rho correlation was performed and it is interesting to note that regardless of pamphlet, as participants rated intent high, they in turn rated perceived control high (see Figure 35, $r_s(43)= 0.88$, $p<0.0001$). The results support and validate, at least on a descriptive level, the Madden, Ellen, and Azjen's (1992) theory of planned behavior that level of intent predicts level of perceived control.

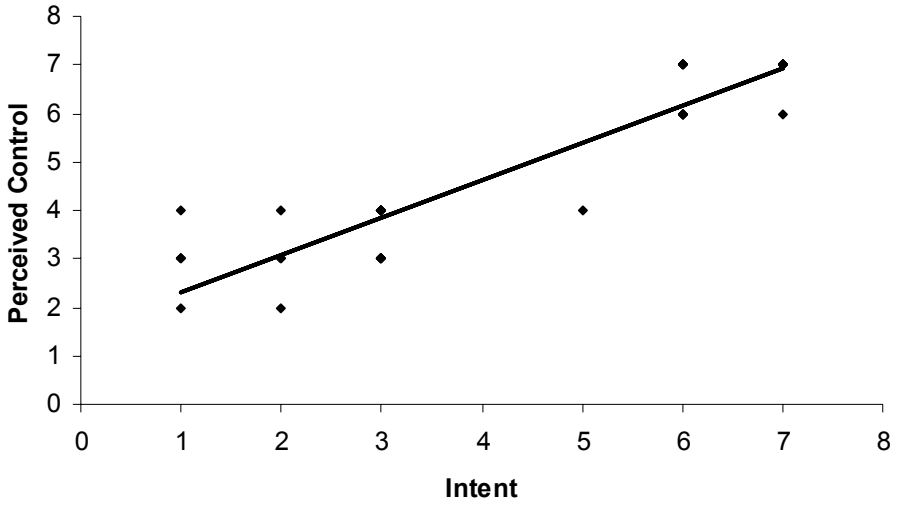


Figure 35. Spearman Rho correlation between intent to purchase and perceived control to purchase.

6 CONCLUSIONS

Motor vehicle crashes remain the leading cause of death among children aged 4-8 years (Centers for Disease Control and Prevention, 2000). Booster seats have been demonstrated to be an effective injury prevention strategy. Although advocates have promoted booster seat use to protect children who are involved in motor vehicle crashes (Winston, Durbin, Kallan, and Moll, 2000), booster seat use remains low. In fact, 6% to 19% of 4- to 8-year-old children currently ride in booster seats, while the majority uses only an adult safety belt (Centers for Disease Control and Prevention, 2002; Cody, Mickalike, Paul, and Colella, 2002). This inappropriate restraint places children at a 3.5-fold increased risk of childhood injuries as a result of motor vehicle crashes (Winston et al., 2000). An important step in reducing the risk of childhood injuries as a result of motor vehicle crashes involves encouraging parents to adhere to best practice child restraint system use. The National Highway Traffic Safety Administration has made promotion of booster seats for 4-8 year old children a national priority. Unfortunately, little is known about reasons for their lack of use or about effective means to promote use.

As it currently stands, the educational material available to the public regarding the use of booster seats in vehicles is not only limited, but seems to be written at a level that is far above what the average American can read and comprehend. In addition, because of the current low 6% compliance rate of booster-seat usage, it is assumed that the existing materials accessible to the public do not effectively target the level of risk for not using booster seats. It was the goal of this research to develop, test, and produce a pamphlet that will be directed towards the average American in an effort to portray the high level of risk associated with the nonuse of booster seats

and to increase the intent to purchase a booster seat, the perceived control of purchasing a booster seat as well as increase the actual rate of booster seat purchase.

The current research went through a systematic and methodological approach, from several perspectives, to develop an effective pamphlet to increase behavioral compliance of purchasing a booster seat. The pamphlet developed throughout these studies had a substantial and positive effect on intention to purchase, perceived control to purchase and actual purchase behavior. In addition, the associated guidelines that were created allow others to produce effective printed educational materials. Figure 36 illustrates the methodology used to develop and evaluate the booster seat pamphlet designed in this research.

The first of the five studies used to create this pamphlet employed subject matter experts to develop a booster seat pamphlet that would contain the most important and pertinent information that needs to be communicated to parents who should be using booster seats but are not using them. Lack of knowledge is one of many barriers that parents face when attempting to restrain their children optimally (Simpson, Moll, Kassam-Adams, Miller, and Winston, 2002).

The SMEs determined the items that were necessary to produce an educational booster seat pamphlet. The nine items, out of the original 20 items selected from the literature, that were ranked and rated highest by the SMEs and included in the first iteration of the booster seat pamphlet, seem to be in agreement with existing literature. In a study conducted by Rivara, Bennett, Crispin, Kruger, Ebel, and Sarewitz (2001) it was concluded that most parents were confused about the age and size of children who should use booster seats. The plethora of information about child occupant safety added to the confusion because the messages were often thought to be conflicting. Materials used in a study conducted by Ebel, Koepsell, Bennett, and Rivara (2003) included images of different types of booster seats, because many parents

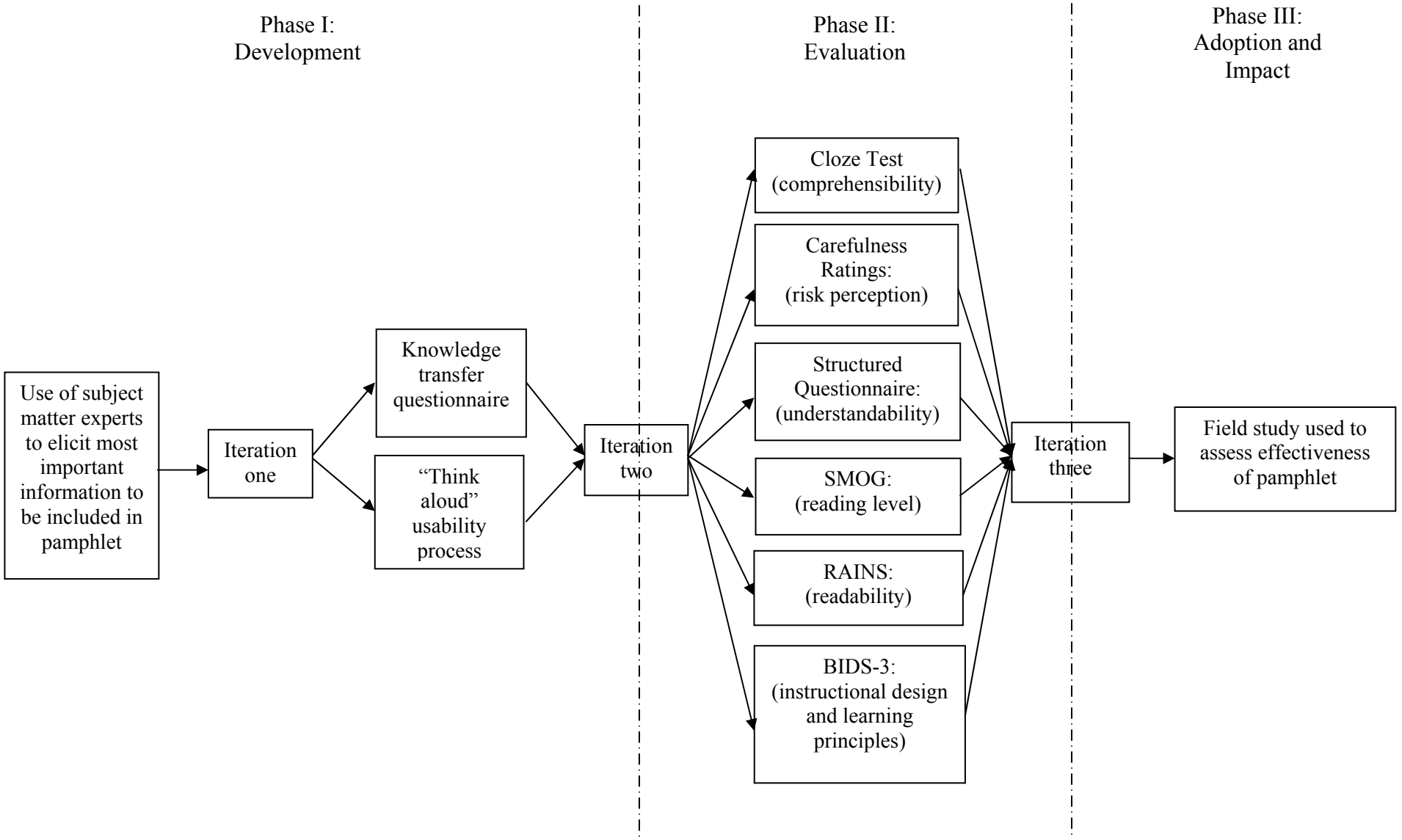


Figure 36. Methodology used to develop and evaluate an effective pamphlet to increase behavioral compliance.

indicated that they were confused by the varying styles. The first iteration of the booster seat pamphlet was developed based on the information provided by the SMEs.

An initial usability study of iteration one of the booster seat pamphlet was conducted in Study 2. The goal was to find obvious problems with the pamphlet and correct them prior to a wider distribution and more formal assessment of usability in Studies 3 and 4. A knowledge transfer test combined with a verbal critique of the pamphlet was completed by five parents whose children should be using booster seats and were not currently using them.

The knowledge transfer test was based on recognition of items that were in the pamphlet, using a multiple-choice format. This method of testing seemed to be sufficient for an initial assessment, realizing that it is different from assessing knowledge transfer from a recall point of view. The test consisted of ten multiple-choice questions, with three participants scoring 100% and two scoring 90%. While a high level of difficulty may not have been achieved, existing literature supports the use of this type of test for the purposes of this study.

The difficulty of multiple-choice questions is uncertain because it is possible to get items correct without knowing much or doing any real thinking. The answer to the question is presented to the reader, requiring only recognition as opposed to recall. It is harder to recall an answer than to recognize it, making multiple-choice items easier than open-ended questions asking the same thing. While most researchers agree that multiple-choice items are poor tools for measuring the ability to synthesize and evaluate information or apply knowledge to complex problems, multiple-choice items are an inexpensive and efficient way to check factual knowledge and routine procedures (Northwest Regional Educational Laboratory, 1988). Once the knowledge transfer test was completed, participants re-read the pamphlet and performed a "think-aloud" verbal critique of the pamphlet.

Based on the finding of a study done by Virzi (1992), using the "think-aloud" concept of verbal critique, 80% of the usability problems are detected with four or five subjects. In the current research 18 usability issues were identified and all 18 of these items were modified in the second iteration of the new pamphlet. Integrating the information gained from the knowledge transfer test and the verbal critique, a second iteration of the pamphlet was generated. Using this version of the pamphlet, a more formal usability assessment was the combined goal of both Studies 3 and 4. Formal usability assessments were performed using end-users and human factors professionals.

Study 3 used 30 participants who were parents of children who should be using booster seats while traveling in a vehicle and were not. These participants assessed comprehensibility, risk perception, and understandability using the Cloze test, carefulness ratings, and a structured questionnaire, respectively. The three pamphlets that were assessed were the second iteration pamphlet from Study 2 and two booster seat pamphlets that are used in the child passenger safety industry.

Comprehensibility was tested using the Cloze test. Examining the results of the Cloze test for the three booster seat pamphlets, the second iteration pamphlet designed in the previous study was the only pamphlet of the three to have a comprehensibility rating where the reader needed no additional information to understand what they had read. Taylor (1957) concluded that Cloze is a valid measure of how well students understand material they had not previously seen. Jenkinson (1957) showed that the high school teacher can use the Cloze procedure for measuring comprehension of literary material. Bormuth (1964) found that Cloze tests can be used in the intermediate grades to predict scores on tests designed to measure several types of reading comprehension in literature, social studies, and science materials.

In an attempt to assess risk perception, a carefulness rating (Wogalter et al., 1996) instrument was developed asking two questions regarding the participants' level of carefulness when driving in a car with their child and driving in a car with someone else's child. The was no difference revealed between pamphlets in how careful participants would be with their own child nor with how careful participants would be with any child. It is possible to explain the non significance of risk perception between pamphlets by understanding that parents may have not answered in a truthful manner, possibly for fear of embarrassment. In addition, it would seem from looking at the data that participants automatically rated the same in both categories so as not to say that they would be safer with their child than with any child.

The possibility that the participants incorrectly perceived the level of risk, therefore inappropriately assessing how careful they would be with children in a vehicle is one reason why it is important to study perceptions of risk (Wogalter, Desaulniers, and Brelsford, 1987). Additionally, the non-significance found in risk perception may be attributed to the false uniqueness effect similar to that found in Marks (1984) where by participants tended to overrate their own intent/likelihood to comply compared to others. The false uniqueness effect provides some indication of the tendency of individuals to overestimate their positive attributes or qualities (Smith-Jackson and Durak, 2000). Research conducted by Slovic, Fishhoff, and Lichtenstein (1979) suggests that people may misperceive the number of deaths associated with a variety of consumer products by overestimating infrequent causes and underestimating frequent causes. An underestimation might lead an individual to be less inclined to engage in precautionary behaviors such as using a booster seat when necessary. A further component possibly involved in the perception of risk is that of understanding the literature about a certain product.

To assess the understandability of the three pamphlets, a structured questionnaire was developed using the European Commission's Guidelines on testing. The aim is for 80% of the participants tested to be able to decide if a particular topic was addressed in the pamphlet, find the information and put it accurately in their own words. The second iteration pamphlet was the only pamphlet that rated acceptable in participant's understanding of the pamphlet based on the criterion that was proposed in the European Commission's Guidelines on testing. Beyond assessing comprehensibility, risk perception, and understandability it is important to ensure that printed educational material is written at the proper reading level, that the pamphlets are readable and that there are learning principles included in the material. These three assessments were performed in Study 4.

Eight Human Factors graduate students where used in Study 4 to assess the reading level, readability, and inclusion of learning principles in the three pamphlets. The three pamphlets that were assessed are the same pamphlets used in Study 3. Data in current research indicate that pamphlets in the United States are currently written at a reading level that is too high (Wegner and Girasek, 2003).

To assess the reading level of the three pamphlets the SMOG test. The average reading level of the industry booster seat pamphlets that were tested in this study were between a 9^{th} and 10^{th} grade and the reading level of the second iteration pamphlet was 6^{th} grade. Experts in the arena of health literacy recommend that material be targeted to the fifth- or sixth-grade reading level (Conrath, Doak, and Root, 1996; Weiss and Coyne, 1997). Researchers in a Louisiana study found that approximately two thirds of parents tested in an outpatient clinic could not read at more than a ninth-grade reading level (Davis, Mayeaux, Fredrickson, Bocchini Jr., Jackson, and Murphy, 1994). Because parents would be expected to be the main target audience for

booster seat pamphlets, this lends additional evidence that the pamphlets may not be reaching the people most likely to benefit from the message. This suggests that authors of booster seat pamphlets are not targeting these printed educational materials to different market segments, at least with regard to reading level. There has been much discussion in the literature regarding the reading level and readability of materials produced for the general public, mainly because the general public is increasingly illiterate (Horner, Surratt, and Juliusson, 2000).

Readability, which is grounded in writing style, is the ease with which a person can understand or comprehend written materials. Reading level and readability are related by inherently different concepts, with readability being critical for education materials. The Readability Assessment Instrument, RAIN (Singh, 1994b), designed specifically to measure readability as defined above, is currently the only instrument that has been used to assess the readability of patient education materials in health and mental health (Adkins and Singh, 2001; Kirkpatrick and Mohler, 1999; Singh, 1999; Singh, 2000).

The current research revealed that the two industry pamphlets that were assessed for readability did not reach the acceptable readability score and the second iteration pamphlet from this study did. The findings of this research were in accord with those of previous investigations on the readability of mental health leaflets, suggesting that most of them are likely to be written at a level that is beyond the comprehension of mental health consumers (Humfress and Schmidt, 1999). Furthermore, in a recent study, Singh (1999) assess the readability of 13 randomly selected behavior treatment plans and none of them reached an acceptable readability score. Singh suggested that these behavior plans were difficult to comprehend by those who were supposed to implement them. In addition to assessing readability of PEMs it is important to assess the instructional design and inclusion of learning principles.

The Bernier Instructional Design Scale, BIDS-3 was used in Study 4 to assess the instructional design and inclusion of learning principles of the three booster seat pamphlets. Using the BIDS-3 criteria for whether a pamphlet had acceptable instructional design and learning principles the participants rated 27 items (met, partially met, or did not meet) in terms of acceptability. The second iteration pamphlet was the only pamphlet of the three to be rated in the "met" category, while the other two pamphlets rated in the "partially met category". In a study conducted by Husted, Miller and Brown (1999) BIDS was used to assess and develop an educational brochure on advanced directives designed for well-elderly people. The findings of the current research are in accord with those of Husted, et al. (1999) that most PEMs do not possess instructional design and learning principles. Subsequent to the six above tests in Studies 3 and 4, a third iteration of the new pamphlet was produced. The two industry pamphlets and the latest version of the new pamphlet were used in Study 5.

Forty-five participants, who were parents of children who should be riding in booster seats and were not, were recruited for Study 5. This goal of this study was to assess whether the three pamphlets could predict perceived control of purchasing a booster seat from intention to purchase a booster seat, as well as, if actual purchase behavior could be predicted. The literature in patient education indicates that little evaluation of actual learning outcomes is carried out by the developers or users of PEMs (Bernier, 1996; Redman, 1998). So, although congruence between desired outcomes as specified by PEM developers and the actual learning achieved by the target population represents the ultimate measure of quality in a PEM, this research sought to use more comprehensive evaluation tools to assess the effectiveness of booster seat pamphlets.

Development of interventions guided by theories that examine concepts such as attitudes and intentions (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), self-efficacy, (Bandura,

1977; Bandura, 1986), perceived susceptibility (risk perception) (Rosenstock, Strecher, and Becker, 1988), and stages for readiness for action or change (Weinstein, 1988; Weinstein, Lyon, Sandman, and Cuite, 1998; Weinstein and Sandman, 1992) may provide a more comprehensive and targeted approach to meet the needs of parents who are challenged in newly adopting or maintaining the practice of optimal child restraint through the use of booster seats.

The third iteration pamphlet was able to significantly increase intention to purchase a booster seat, increase perceived control over purchasing a booster seat, and in turn increase actual booster seat purchase behavior. The data would suggest validation of the two models used in this research regarding intention, perceived control and behavior change, Azjen and Fishbein (1980), Madden and Azjen (1992). In addition to validating the above two models, the data suggests the validation of the C-HIP model developed by Wogalter et al. (1999a) as well. Figures 37 through 39 illustrate the various components of the C-HIP model compared to components of the third iteration of the new pamphlet. The actual content of the message as well as how it is presented clearly influences whether or not people will accept it (Wogalter et al., 1999a). The four factors from the C-HIP model that occur within the receiver of the information are, attention, memory, attitudes, and motivation, which all lead up to the actual behavior itself.

The receiver's first mental operation with the information's arrival is attention. Capturing and maintaining attention, including physical location of key words are important to the messages saliency. As shown in Figure 37 key words and pictorials are in noticeable locations throughout the pamphlet and well as the words "booster seats" are always bolded for increased saliency. The next processing stage for the receiver is comprehension and memory. It is important that the message text and pictorials be understood by the targeted group. One way to increase the opportunity for memorization is repetition. Figure 38 illustrates how information

is repeated several times in several different ways. In addition, the pictorials are simple and straightforward.

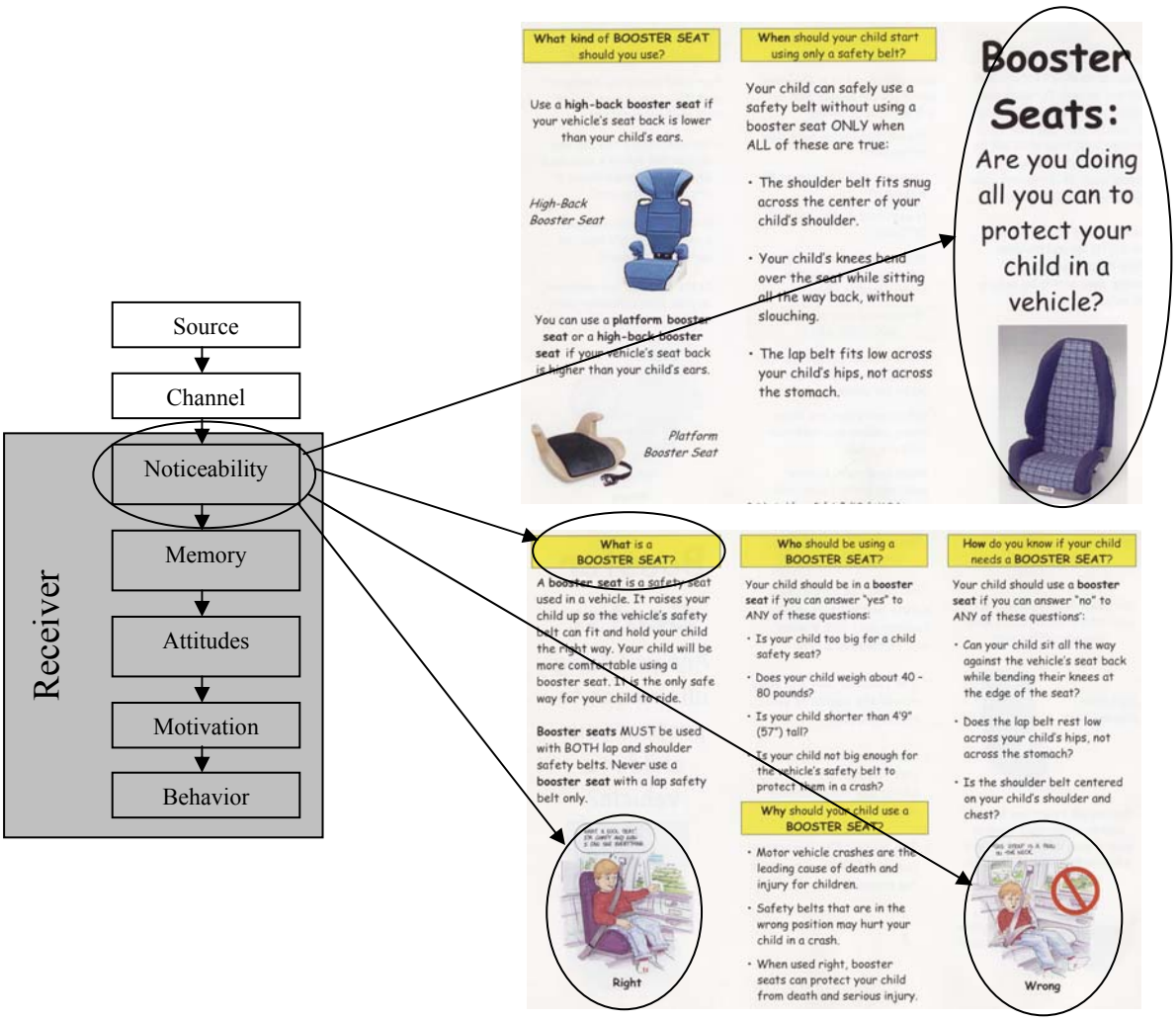


Figure 37. Comparison of the noticeability component of the C-HIP model to the third iteration of the new pamphlet.

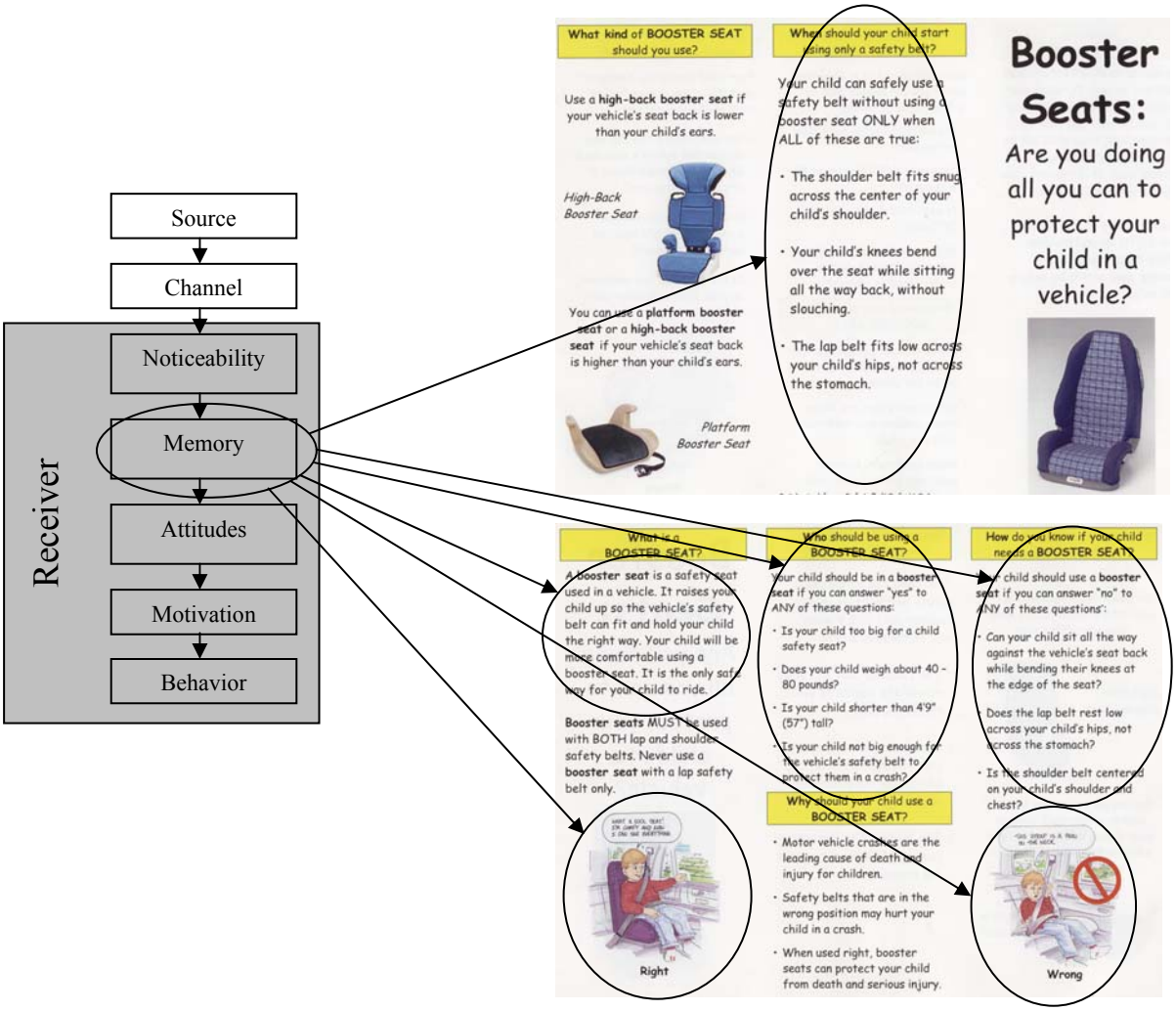


Figure 38. Comparison of the memory component of the C-HIP model to the third iteration of the new pamphlet.

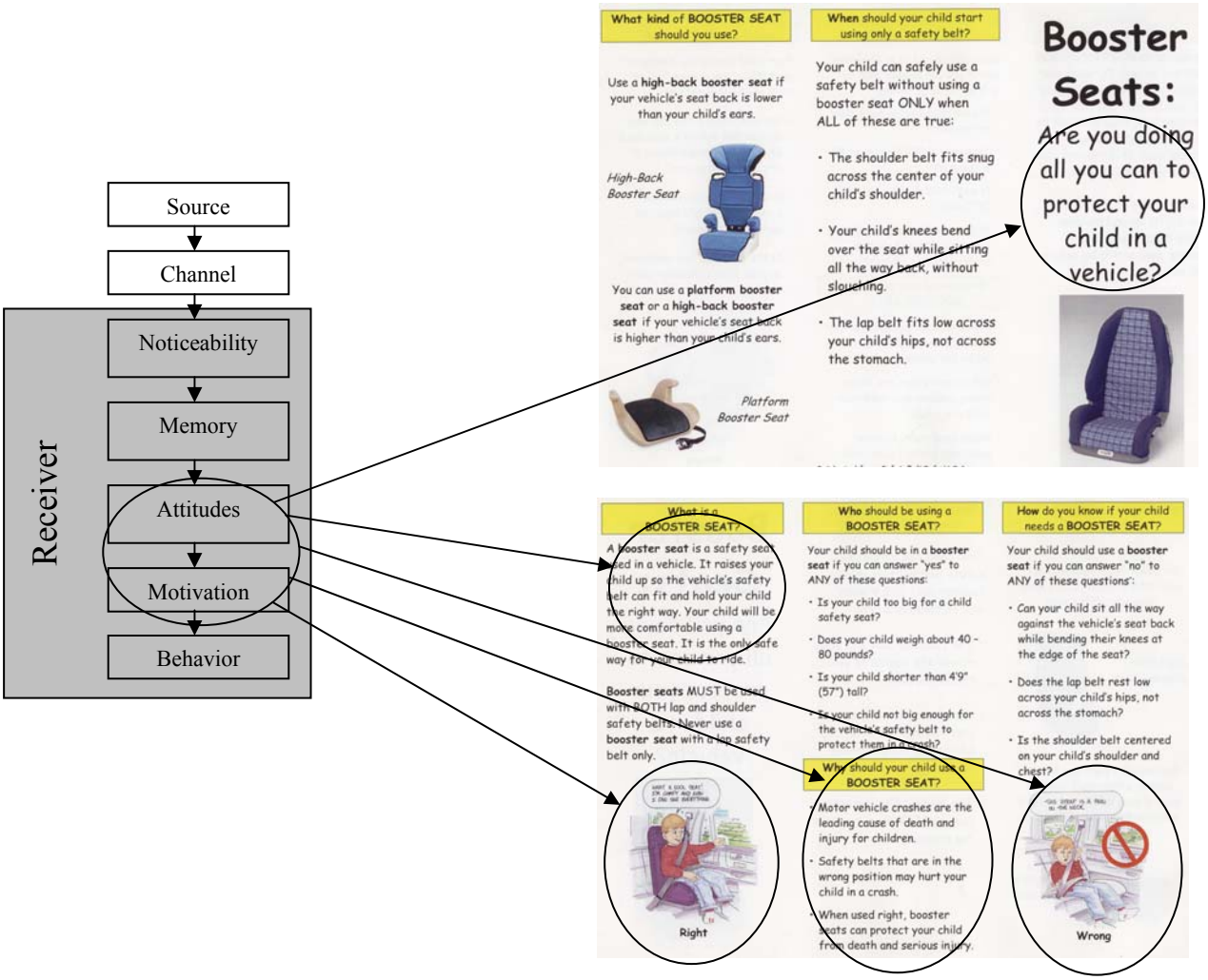


Figure 39. Comparison of the attitudes and motivation components of the C-HIP model to the third iteration of the new pamphlet.

Attitudes and motivation are the next two stages of the model and are described as major factors that energize users to comply with messages. These types of factors include explicit consequences and anticipated injury severity and need to be sufficiently persuasive to change and motivate the person to carry out the directed behavior. Examples of these factors can be seen in Figure 39. The last stage is the message and how behavior is affected by it. Perceived risk, familiarity, gender, and locus of control are examples of personal factors that play a role in messages on behavior. The current research did not assess all of these factors, however, risk

perception, and locus of control (perceived control) were assessed and discussed earlier in this section.

Table 18. Guidelines for the design of an effective pamphlet.

Guideline	Description and/or example
Write pamphlet at a 6th grade reading level	Three syllable words make the pamphlet harder to read. Words such as "correctly", "collision", "automobile" and "remedied" should be replaced by "right", "crash", "car" and "fixed".
Highlight words that may be new to the intended population	See Figure 39, #1
Incorporate clear drawings or pictures	See Figure 39, #2
Personalize statements	Instead of "protect a child" use words like "protect your child".
State and then re-state instructions or checklists in different ways	See Figure 39, #3
Incorporate checklists in question format	Replace statements like "your child is too big for a child safety seat" with "Is your child too big for a child safety seat?"
Incorporate different choices of products if applicable to pamphlet	See Figure 39, #4
Separate pamphlet into clear headings for different topics	See Figure 39, #5
Use signaling devices	Include titles, subtitles and an introductory or summary statement.
Use a minimum of 14-point type	Replace all fonts less than 14-point type so more populations can see the type.
Use plain print type using lower and uppercase letters	Do not use all lowercase or all uppercase lettering.
Incorporate items that are noticeable	See Figure 37
Incorporate items that promote memorization	See Figure 38
Incorporate items that change attitudes and motivate behavior	See Figure 39

In summary, the overall goal of this research was to increase our understanding of information design as well as generate general design guidelines for the design of effective pamphlets. To this end, Table 18 is a list of the guidelines that were produced throughout this

research in an effort to produce an effective pamphlet for booster seats. Figure 40 illustrates the different guidelines in the pamphlet designed in these studies and can be cross-referenced with Table 18. These guidelines can be transferred to other domains when printed educational materials are being used to produce behavior adoption or change.

It is important to note that these studies had a number of limitations. When parents were used as participants the studies relied on a brief and noninvasive screening questionnaire and therefore we were not able to physically measure the children but relied instead on parental report of age, weight, and height. The parents for Study 5 were recruited in a Southwest Virginia mall during the middle of the day. Although the participants were fairly equally split between males and females there is a possible threat to internal validity in that these participants are not representative of the entire population. This may have affected the results of this study regarding the level of purchase behavior, although it should be restated that the pamphlet created in this research effort was the only pamphlet to have a significant purchase rate as compared to the other two pamphlets. The ages of the parents in Studies 3 and 5 were not collected and therefore not knowing what the distribution of the age of the participants could have biased the results of these studies in that older parents have certain characteristics as compared to younger parents.

Figure 40. Third iteration of booster seat pamphlet with references to design guidelines from Table 18.

In addition, self reporting was used to assess actual purchase behavior as well as usage patterns and therefore we cannot be sure that all reported purchased booster seats were actually purchased, and that the reported 100% figure that each booster seat was used every time a child rode in a vehicle cannot be verified. The knowledge transfer test used in Study 3 was a multiple-choice test and although it seemed sufficient for this particular study, in future research a more in depth test of knowledge transfer should be assessed. This test used recognition as opposed to recall and future research should explore knowledge transfer from a recall point of view.

Results from this research create a foundation from which readable, comprehensible, and understandable printed educational materials can be further developed. These materials may increase the association between intent and perceived control of purchasing a booster seat with that of actual purchase behavior. While studies such as that conducted by O'Loughlin, Paradis, and Meshefedjian (1997) revealed an 8.1% adoption rate of one or more heart healthy behaviors after receiving PEMs, this current research revealed a 42% purchase rate after being exposed to PEMs. This high purchase rate indicates that well designed PEMs are an effective tool to increase behavioral compliance.

The magnitude and significance of this problem accentuated the timeliness of this research and revealed the need for well written printed educational materials targeting the increase of acceptability and sustainability of booster-seat use on both a short-term and long-term basis. This research provided a foundation that can be taken to address these and other issues.

Furthermore, this research produced a pamphlet for credible sources, e.g. law enforcement officers, doctors, nurses and welfare/social workers, to use as an education tool for parents who have children who should be in booster seats and are not in them. If the above

recommendations are put into practice in the short term and design improvements are widely adopted in the long-term, then the prevalence of proper booster-seat usage may increase to a level befitting the importance of this effective injury prevention tool.

7 TOPICS FOR FUTURE RESEARCH

Different approaches that may be useful in guiding future research and the development of targeted interventions for varying constituencies of parents needs to be evaluated. A few of these interventions may include interactive multimedia delivered through the Internet, CD-ROM, or computer kiosks which may offer the potential for vastly improved efficacy in communicating risk.

Evaluations of computer based health education programs in medical and educational settings suggest that these programs can be effective in changing behavioral intentions, influencing health behaviors, and improving the management of disease (Glasgow, La Chance, Toobert, Brown, Hampson, and Riddle, 1997; Rubin, Leventhal, Sadock, Letovosky, Schottland, and Clemente, 1986). According to Strecher, Greenwood, Wang, and Dumont (1999), there are several advantages of using interactive multimedia. Three notable advantages are interactivity, adaptiveness, and assessment, which are all relevant to the communication of risk information.

The availability of new computer technology has resulted in substantial interest in interactive computer based patient education, which has the potential to improve health status in several major areas of care. Jones, Nyhof-yound, Friedman and Catton (2001) provided a detailed description of the goals, structure, and content of an innovative computer based education program developed for patients and families facing cancer. Preliminary formative evaluation suggests that the web-site they developed is easy to use, informative, and enjoyable for patients and families.

Future research needs to be directed to include both quantitative and qualitative research looking at comparisons of computer based education programs to traditional forms of education and at the impact on various patient outcomes such as knowledge level and behavior change. Interactive patient education software has evolved in the last 5 years from being presentation software programs on CD-ROM to integrated health information systems on kiosks and Web sites. Such systems use touch screen technology to present general medical information, practice-specific information, and electronic surveys. Medical practices are increasingly relying on interactive health information (Ajam, 2001). It seems that the benefits of the technology are as varied as the needs of the institutions implementing them.

Another form of multimedia that needs to be assessed is video based interventions. By using video based interventions such as those tested by O'Donnell, Doval, Duran and O'Donnnell (1995), it is possible to provide multiple culturally sensitive interventions in public sexually transmitted disease clinics (Valdiserri, West, Moore, Darrow, and Hinman, 1992). The diversity of the clinic population to be served, coupled with the limited time staff have available for education, makes video based interventions an appealing strategy for tailoring educational programs to the needs of different patient groups (O' Donnell et al., 1995). While multimedia research must be conducted it is important to continue the research efforts of those who are attempting to increase certain behaviors using printed educational materials.

Further research is needed in the child passenger safety domain regarding printed educational materials having to do with installation of child safety seats and choosing the proper child safety seat. While there are many pamphlets addressing these issues used in industry, the readability and understandability has not been assessed and needs to be. Furthermore, it is

essential that this further research be conducted having a more diversified sample of the overall population of parents using child safety seats.

It is imperative that future research such as that described above continues to be conducted in many domains including the child passenger safety domain to increase the use of booster seats nationwide. One of the biggest needs for the field is to determine how to get people to use effective prevention strategies and not engage in risk taking behavior; this requires a great deal more investigation.

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APPENDIX A – SUBJECT MATTER EXPERTS

Subject Matter Expert	Organization Affiliation
Phyllis Agran	Pediatric Injury Prevention Research Group
Ann Athey	Heathcare Vision
Esha Bhatia	Trauma Link-Childrens Hospital of Philadelphia
Stephanie Bryn	Injury & Violence Prevention Program
Dr. Marilyn Bull	Automotive Safety Program
Vincent Burgess	Transportation Safety Services-DMV
Joseph Colella	National SAFE KIDS Coalition
W. Lawrence Daniels	Chesapeake Health Department
Janet Dewey	Air Bag and Seat Belt Safety Campaign-National Safety Council
Jack Edwards	Ford Motor Company
Jacqueline Elder	U.S. Consumer Product Safety Commission
Kelli England	Certified Child Passenger Safety Technician
Susan Ferguson	Insurance Institute for Highway Safety
Laurie Flaherty	Emergency Nurses Association
Marcia Franchok-Hill	Virginia Department of Health
Carol Guzzetta	National Safety Council
Philip Haseltine	American Coalition for Traffic Safety, Inc.
Charles Hirata	Maui Police Department
Chuck Hurley	National Safety Council
Belinda Jackson	National Highway Traffic Safety Administration
Sue Johnson	Air Bag and Seat Belt Safety Campaign-National Safety Council
Hal Karp	The Reader's Digest Association
Cheryl Kim	SafetyBeltSafe U.S.A.
Alan Korn	National SAFE KIDS Campaign
Dr. Leah Raye Mabry	American Academy of Family Physicians
Larry McMahon	Certified Child Passenger Safety Technician Instructor
Chief Ronald Neubauer	International Association of Chiefs of Police
Steve Oesch	Insurance Institute for Highway Safety
Susanne Ogaitis-Jones	John Hopkins Center for Injury Prvention
Heather Paul	National SAFE KIDS Coalition
Deidra Pennington	Certified Child Passenger Safety Technician Instructor
Annemarie Shelness	Shelness Productions
Deborah Stewart	Safe Ride News Publications, Inc.
Judith Lee Stone	Advocates for Highway and Auto Safety
Pam Stottman	EMSA-Emergency Medical Services Authority
Margaret Sweeney	National Transportation Safety Board
Stephanie Tombrello	SafetyBeltSafe U.S.A.

Subject Matter Expert	Organization Affiliation
Bob Wall	IACP/ Fairfax County Police
Kathleen Weber	University of Michigan Medical School
Dr. Lucille Weinstein	Long Island Regional Poison Control Center
Dr. Flaura Koplin Winston	Partners for Child Passenger Safety-CHOP

APPENDIX B – SME QUESTIONNIARE

1. In Column A rank the following items in order of importance of information you feel is imperative to be included in a booster seat pamphlet. Use numbers 1-20 where 1 is the most important item to include and 20 is the least important item to include. If there are any items not addressed in the list that you feel are imperative to be included in a booster seat pamphlet add them at the bottom in one of the "other" lines and include these items in your ratings and rankings. For example, if you add 2 items in the "other" lines then you will rank the list from 1-22.

2. In Column B rate the following items, individually, from 1 to 5, as to how important each item is to be included in a booster seat pamphlet, where 1 = Extremely Important, 2 = Very Important, 3 = Important, 4 = Somewhat Important, and 5 = Not At All Important .

Item	Column A: Rank	Column B: Rate
appropriate weight		
appropriate height		
appropriate age		
appropriate sitting height		
different types of booster seats		
medical consequences for non-use		
children placing shoulder belt behind back		
children placing shoulder belt under their arm		
children totally removing safety belt all together		
proper placement of shoulder belt with booster seat		
proper placement of lap belt with booster seat		
proper placement of adult safety belt without booster seat when child reaches the correct size		
injury statistics for non-use		
fatality statistics for non-use		
photos/drawings of improperly seated children		
photos/drawings of properly seated children		
what kind of booster seat is best		
what is a booster seat and what is it used for		
seating position in vehicle		
booster seats are fun for kids		
other:		
other:		
other:		
other:		

2. Are you a NHTSA certified child passenger safety technician?
Yes No If yes, for how long ____

3. Are you a NHTSA certified child passenger safety technician/instructor?
Yes No If yes, for how long ____

4. Do you work in the Child Passenger Safety industry?
Yes No If yes, in what capacity _____

5. Are you ❍Male ❍Female

6. What is the highest grade or year of school you have completed?

❍Some High School
❍Completed High School or GED
❍Some college
❍College Degree
❍Some Graduate Work
❍Completed Master's Degree
❍Completed Doctorate
❍Post-Doctorate Work
❍Medical Doctor

7. Would you like to receive the results of this questionnaire?
Yes No If yes, where would you like to information to be sent:

APPENDIX C – STRUCTURED QUESTIONNAIRE

Principle Questions

1. Using the pamphlet, can you tell me what a booster seat is used for?

   Can you tell me what it says, in your own words?

Subsequent questions using the same format as above:

2. Does the pamphlet tell you about when you should use a booster seat?
3. Does the pamphlet tell you what kind of booster seat to use?
4. Does the pamphlet discuss seat belts and how they are used with booster seats?
5. Does the pamphlet discuss how to check to see if your child needs a booster seat when riding in a car?
6. Does the pamphlet tell you what to do if you only have lap belts in the rear seat of you vehicle?
7. Does the pamphlet tell you when your child should fit into the adult safety belt?
8. Does the pamphlet tell you how to check to see if your child fits into the adult safety belt properly?
9. Does the pamphlet tell you what could happen to your child if they do not ride in a booster seat and they should be in one?
10. Does the pamphlet tell you where to call for more information?

Concluding questions:

11. Is the information in this pamphlet easy to follow?
12. Overall, what do you think of the pamphlet and the instructions?
    a. Any particular good points?
    b. Any particular bad points?
13. Is there anything else about this pamphlet that we haven't talked about which you'd like to mention?

APPENDIX D – CLOZE TEST

Cloze Test – General Motors' Safe Kids Buckle-Up Pamphlet

95 Percent of kids 4-8 are riding at risk.

Could yours be one _____ them? Kids should be _____ car booster seats if _____ are too big for _____ car seat or weigh _____ 40-80 pounds. Booster seats _____ be used with lap _____ shoulder belts. Car booster _____ lift the child up _____ the safety belt fit _____, snug across the center _____ the shoulder, not across _____ neck or face and _____ over the upper thighs, _____ riding up on the _____. Without booster seats kids _____ be uncomfortable in an _____ fitting safety belt. Don't _____ kids put shoulder belts _____ their arms or behind _____ backs. Kids who misuse _____ this way receive no _____ body protection.

There are _____ types of car booster _____ to use depending on _____ car. Use a high _____ booster seat if your _____ seat back is lower _____ your child's ears; use _____ high back booster seat _____ help protect your child's _____ and neck. Use a _____ booster seat if your _____ seat back is higher _____ your child's ears. If _____ child is over 40 _____ and you only have _____ belts in your back _____, you may: buy a _____ car seat that is _____ kids who weigh more _____ 40 pounds, correctly restrain _____ child in a booster _____ in the front seat _____ a lap/shoulder belt and _____ the vehicle seat as _____ back as possible; or, _____ an auto dealership about _____ shoulder belts.

Answers:

95 Percent of kids 4-8 are riding at risk.

Could yours be one **of** them? Kids should be **in** car booster seats if **they** are too big for **a** car seat or weigh **about** 40-80 pounds. Booster seats **must** be used with lap **and** shoulder belts. Car booster **seats** lift the child up **making** the safety belt fit **correctly**, snug across the center **of** the shoulder, not across **the** neck or face and **low** over the upper thighs, **not** riding up on the **abdomen**. Without booster seats kids **can** be uncomfortable in an **improperly** fitting safety belt. Don't **let** kids put shoulder belts **under** their arms or behind **their** backs. Kids who misuse **belts** this way receive no **upper** body protection.

There are **two** types of car booster **seat** to use depending on **your** car. Use a high **back** booster seat if your **car's** seat back is lower **than** your child's ears; use **the** high back booster seat **to** help protect your child's **head** and neck. Use a **platform** booster seat if your **car's** seat back is higher **than** your child's ears. If **your** child is over 40 **pounds** and you only have **lap** belts in your back **seat**, you may: buy a **special** car seat that is **for** kids who weigh more **than** 40 pounds, correctly restrain **your** child in a booster **seat** in the front seat **using** a lap/shoulder belt and **move** the vehicle seat as **far** back as possible; or, **contact** an auto dealership about **installing** shoulder belts.

Cloze Test – Ford Motor Company's Boost America Pamphlet

A child's growing years are an exciting time for parents.

But they can also _____ a time of added _____, especially on America's streets _____ highways. Studies have found _____, after age three, children _____ an extra risk of _____ in car crashes because _____ of them ride without _____ safety seats, ride unbelted, _____ are improperly using safety _____. Nearly one-third of children _____ 4 to 8 ride _____ unbelted, while fewer than 7 _____ use booster seats. And _____ failure to properly buckle _____ plays a large part _____ the fact that traffic _____ are the leading cause _____ death for children in _____ age group, claiming more _____ 500 young lives each _____.

Children outgrow a typical _____ or toddler seat when _____ weigh 40 pounds and are around 4 _____ of age. But they _____ still too small for lap-shoulder _____ to fit properly. Properly _____ a safety belt is _____ better than NOT using _____, but if used improperly; _____ safety belt may not _____ any protection. For example, _____ who put the shoulder _____ behind them or under _____ arm can suffer serious _____ to the head, internal _____, or spine in a _____. The solution? When children _____ their forward facing toddler _____, they need to graduate _____ seats for "big kids," _____ as booster seats until _____ grow big enough (usually _____ 80 pounds) for the _____ seat and for adult _____ belts to fit correctly.

Answers:

A child's growing years are an exciting time for parents.

But they can also **be** a time of added **risk**, especially on America's streets **and** highways. Studies have found **that**, after age three, children **run** an extra risk of **injury** in car crashes because **most** of them ride without **proper** safety seats, ride unbelted, **or** are improperly using safety **belts**. Nearly one-third of children **ages** 4 to 8 ride completely unbelted, while fewer than 7 **percent** use booster seats. And **this** failure to properly buckle **up** plays a large part **in** the fact that traffic **crashes** are the leading cause **of** death for children in **this** age group, claiming more **than** 500 young lives each **year**.

Children outgrow a typical **convertible** or toddler seat when **they** weigh 40 pounds and are around 4 **years** of age. But they **are** still too small for lap-shoulder **belts** to fit properly. Properly **using** a safety belt is **always** better than NOT using **one**, but if used improperly; **a** safety belt may not **provide** any protection. For example, **children** who put the shoulder **belt** behind them or under **their** arm can suffer serious **injuries** to the head, internal **organs**, or spine in a **crash**. The solution? When children **outgrow** their forward facing toddler **seats**, they need to graduate **to** seats for "big kids," **known** as booster seats until **they** grow big enough (usually **over** 80 pounds) for the **vehicle** seat and for adult **safety** belts to fit correctly.

Cloze Test – New Pamphlet

Booster seats: Are you doing all you can to protect your child in a vehicle?

What is a booster _____? A booster seat is _____ safety seat used in _____ vehicle. It raises your _____ up so the vehicle's _____ belt can fit and _____ your child the right _____. Your child will be _____ comfortable using a booster _____. It is the only _____ way for your child _____ ride. Who should be _____ a booster seat? Your _____ should be in a _____ seat if you can _____ "yes" to any of _____ questions: Is your child _____ big for a child _____ seat? Does your child _____ about 40 to 80 _____? Is your child shorter _____ 4'9" (57") tall? Is _____ child not big enough _____ the vehicle's safety belt _____ protect them in a _____?

Why should your child _____ a booster seat? Motor _____ crashes are the leading _____ of death and injury _____ children. Safety belts that _____ in the wrong position _____ hurt your child in _____ crash. When used right, _____ seats can protect your _____ from death and serious _____. How do you know _____ your child needs a _____ seat? Your child should _____ a booster seat if _____ can answer "no" to _____ of these questions: Can _____ child sit all the _____ against the vehicle's seat _____ while bending their knees _____ the edge of the _____? Does the lap belt _____ low across your child's _____, not across the stomach? _____ the shoulder belt centered _____ your child's shoulder and _____?

Answers:

Booster seats: Are you doing all you can to protect your child in a vehicle?

What is a booster **seat**? A booster seat is **a** safety seat used in **a** vehicle. It raises your **child** up so the vehicle's **safety** belt can fit and **hold** your child the right **way**. Your child will be **more** comfortable using a booster **seat**. It is the only **safe** way for your child **to** ride. Who should be **using** a booster seat? Your **child** should be in a **booster** seat if you can **answer** "yes" to any of **these** questions: Is your child **too** big for a child **safety** seat? Does your child **weigh** about 40 to 80 **pounds**? Is your child shorter **than** 4'9" (57") tall? Is **your** child not big enough **for** the vehicle's safety belt **to** protect them in a **crash**?

Why should your child **use** a booster seat? Motor **vehicle** crashes are the leading **cause** of death and injury **for** children. Safety belts that **are** in the wrong position **may** hurt your child in **a** crash. When used right, **booster** seats can protect your **child** from death and serious **injury**. How do you know **if** your child needs a **booster** seat? Your child should **use** a booster seat if **you** can answer "no" to **any** of these questions: Can **your** child sit all the **way** against the vehicle's seat **back** while bending their knees **at** the edge of the **seat**? Does the lap belt **rest** low across your child's **hips**, not across the stomach? **Is** the shoulder belt centered **on** your child's shoulder and **chest**?

APPENDIX E – CAREFULNESS RATINGS

How careful would you be if you were driving in a vehicle with your child?

0----------1----------2----------3----------4----------5----------6----------7----------8

Not at All Careful	Somewhat Careful	Careful	Very Careful	Extremely Careful

How careful would you be if you were driving in a vehicle with a child who is 4-8 years old and 40-80 pounds?

0----------1----------2----------3----------4----------5----------6----------7----------8

Not at All Careful	Somewhat Careful	Careful	Very Careful	Extremely Careful

APPENDIX F – SMOG FORMULA

Determination of reading level of a PEM using the SMOG formula (Doak et al., 1985).

A total of 30 sentences are examined when the SMOG formula is applied, as follows.

1. 10 consecutive sentences are selected from the beginning of the PEM, 10 from the middle, and 10 near the end.
2. The number of syllables for each word in the 30 sentences is determined. (Example: The word 'cough' contains one syllable, the word 'mucus' contains two (mu/cus), the word 'polio' contains three (po/li/o), and 'pneumonectomy' contains five syllables (pneu/mon/ect/o/my).)
3. The number of words containing three or more syllables is counted, including repetitions.
4. The nearest perfect square root of the total number of words with three or more syllables is determined and the number '3' (a constant in the formula) is added to the square root to obtain the grade level. (Example: A PEM having 53 words with three or more syllables in the 30 selected sentences would have a square root of 7 since 7 x 7= 49. By adding the constant 3, the reading grade level for the PEM would be designated at the 10^{th} grade (7+3=10).)

Special Rules for SMOG Testing

- Hyphenated words are counted as one word.
- For numerals, pronounce them aloud and count the syllables pronounced for each numeral (e.g., for the number 573, five = 1, hundred = 2, seventy = 3, and three = 1, for a total of 7 syllables).

- Proper nouns should be counted.
- If a long sentence has a colon, consider each part of it as a separate sentence. However, if possible, avoid selecting that segment of the passage.
- Words for which abbreviations are used should be read aloud to determine their syllable count (e.g., Oct. = October = 3 syllables).

SMOG on Shorter Passages

Sometimes it may be necessary to assess the readability of a passage of fewer than 30 sentences. You can still use the SMOG formula to obtain a approximate grade level by using a conversion number from Table B and then using Table A to find the grade level.

First count the number of sentences in your material and the number of words with three or more syllables. In Table B, in the left-hand column, locate the number of sentences, and locate the conversion number in the right column. Multiply the word count found earlier by the conversion number. Use this number to obtain the corresponding grade level.

Table A. SMOG Conversion Table

Word Count	Grade Level
0-2	4
3-6	5
7-12	6
13-20	7
21-30	8
31-42	9
43-56	10
57-72	11
73-90	12
91-110	13
111-132	14
133-156	15
157-182	16
183-210	17
211-240	18

Table B. SMOG Conversion for Samples with Fewer Than 30 Sentences

Number of Sentences In Sample Material	Conversion Number
29	1.03
28	1.07
27	1.1
26	1.15
25	1.2
24	1.25
23	1.3
22	1.36
21	1.43
20	1.5
19	1.58
18	1.67
17	1.76
16	1.87
15	2.0
14	2.14
13	2.3
12	2.5
11	2.7
10	3

APPENDIX G – BIDS-3 SCALE

The Bernier Instructional Design Scale 3 – BIDS-3, (Bernier, 1996)

The BIDS-3 is a checklist for rating the presence (or absence) of instructional design and learning principles contained in printed education materials (PEMs) for use with patients and families.

1. Begin the rating procedure by reading each principle on the BIDS-3.
2. Next, read the PEM to be evaluated.
3. Use the Rating Scale listed below to record the level of instructional design and learning principles contained in the PEM.
4. Re-read the PEM as many times as you need to complete the rating.

Rating Scale
0 = NOT MET
1 = PARTIALLY MET
2 = MET
NA = NOT APPLICABLE

Example: Instructional design principle #1 states, 'the font or print size can be easily read by the target group.'

A PEM that is written in a print size as small as this (9 point) would not be appropriate for a general target audience since the readers would be of many age groups and some would have difficulty reading this print.

The appropriate rating for PEM text written in 9 point print would be 0 = NOT MET if the PEM was intended to be used by a general audience which would include elderly persons. You would place a check mark in the column labeled 0 for principle #1.

The 27 instructional design principles of the BIDS are listed in Table C.

Table C

Instructional design principles of the BIDS-3

	Principles Related to Clarity of Purpose: Scale:	**0**	**1**	**2**	**NA**
1.	Titles and subtitles are clear and informative.				
2.	The purpose of the PEM is made clear to the target group.				
3.	The relevance of the educational content to the target group is clearly stated.				
4.	The learning objectives (either stated or implied) and the educational content of the PEM relate to one another.				
5.	The learning objectives (either stated or implied) relate to the intended learning outcome.				
6.	The content presented is accurate.				
7.	The content is current.				
8.	The content is presented in concrete terms rather than as abstract concepts.				
9.	The content is presented is a style that is 'patient-centered' so that the needs of the patient is foremost.				
10.	The content focuses on what the target group should *do* as well as *know*.				
11.	The main ideas of the PEM are divided into meaningful content units.				
12.	The content of the PEM builds from the familiar to the unfamiliar.				
13.	Specific, precise instructions are given if the target group is expected to carry out some self-care activity.				
14.	The ideas in the PEM are logically related and present a coherent structure for the information being conveyed.				
	Principles Related to Comprehensibility: Scale:	**0**	**1**	**2**	**NA**
15.	The font or print size can be easily read by the target group. (This is a 14 point font recommended for the elderly; this is a 12 point font recommended for the general audiences, and this is 10 point font.)				
16.	Drawings/illustrations represent racial and ethnic groups.				
17.	The vocabulary of the PEM is one that reflects words commonly used by the target group.				
18.	Necessary health terms are defined.				
19.	Only the most essential information about the topic is presented, using not more than 3-4 main points.				
20.	The content is presented in a way that relates and				

	integrates the new information to what is already known and understood by the target group.				
21.	Examples are used to bridge the gap between what the target group knows and the content to be taught.				
22.	The content is presented in a manner that is respectful of the customs and traditions of the target group.				
23.	The information load of the material is appropriate to the target group. (Information load=amount +obscurity or novelty of information. Content that is unfamiliar represents a larger information load than content that is familiar to the target group.)				
24.	Important ideas and points of content are repeated as reinforcement throughout the PEM.				
25.	Sentences are kept in logical order.				
26.	Accurate, coherent summaries and synopses of the message being delivered are included throughout the PEM.				
27.	The PEM is written at a readability level that is appropriate to the target group. (Material intended for the general public should be written at the 6^{th}-8^{th} grade level).				

Comments by reviewer:

In your opinion, what is the general quality level of the PEM you just evaluated? (Please check one)

_____ Good and I would recommend its use

_____ Fair, but I would have some concerns about using it

_____ Not good

APPENDIX H – RAIN INSTRUMENT

The following procedure for assessing readability in pamphlets was taken from the RAIN Manual (Singh, 1994b).

1. Complete the top section of Data Sheet 1 (included in Appendix H), this will be done by the experimenter.
2. View the brochure to see if the author has used titles and subtitles, and included an introductory and a summary statement. Answer the three questions on Signaling Devices by indicating either **Yes** or **No** on the data sheet.
3. Read the first paragraph of the brochure and respond to the questions regarding each variable:
    a. Structure. Under Structure, record the title of the section (Section Title), the page number (P#), the paragraph number (Para #), and the name of the structure (Name) if one was used by the author.
    b. Pronoun Reference. Record the number of pronoun references (#), and indicate whether they are clear (CL) or unclear (UNCL).
    c. Substitutions. Record the number of substitutions (#), and indicate whether they are clear (CL or unclear (UNCLR).
    d. Connectives. Record the number of connectives (#), and indicate whether they are clear (CL) or unclear (UNCLR).
    e. Unity. Record the total number of sentences in the first paragraph (# Sent) and indicate the number of sentences that are relevant to the title of the section (#R) and the number that are irrelevant (#IR) to the section title.

f. Audience Appropriateness. Record the number of new words in the first paragraph (#NW) and indicate the number that are highlighted, the number that are defined, and the number for which there are synonyms.

g. Adjunct Questions (Data Sheet 2, included in Appendix H). Record the number of adjunct questions (#), and indicate the number that appear before the body of the text (#E). (The column #A is for recording the number of questions that appear at the end of the brochure after the body of the text. This is completed after reading the last paragraph in the brochure.)

h. Writing Style. Indicate whether the paragraph is written in the active and/or passive voice.

i. Illustrations. Indicate whether there are any illustrations directly above, beside or below the first paragraph (Yes/No); record the number that are relevant to the content of the text (Rel #Y/N); and the number that are appropriate for the adult audience (App #Y/N).

4. Repeat 3. for each paragraph in the brochure.
5. Typography. Record the font size of the text (Font Size), the type of print (Type of Print), the color of the print in relation to the background (Color), and indicate how the titles and subtitles have been highlighted (Titles & Subtitles).
6. After the participant completes the evaluation of the pamphlet, the experimenter will total the columns on the Data Sheets and enter these figures on the Summary Sheet (included in Appendix H).
7. Scoring the Pamphlet
    a. Calculate the % for the following variables

i. Global Coherence. Divide the number of paragraphs with structure by the total number of paragraphs in the brochure and multiply by 100.

ii. Local Coherence. For pronoun references, divide the number of clear pronoun references, by the total number of pronoun references and multiply by 100. Repeat this for substitutions and connectives.

iii. Unity. Divide the number of relevant sentences by total number of sentences and multiply by 100.

iv. Audience Appropriateness. Divide the number of highlighted new words by the total number of new words and multiply by 100. Divide the number of new words with definitions or synonyms by the total number of new words and multiply by 100.

v. Writing Style. Divide the number of paragraphs using the active voice by the total number of paragraphs and multiply by 100. Repeat this for paragraphs using the passive voice.

vi. Illustrations. Divide the number of illustrations that are relevant to the content by the total number of illustrations and multiply by 100. Repeat this for illustrations appropriate for the audience.

b. For Signaling Devices, Adjunct Questions, and Typography, refer to the criterion for each of these variables on the Scoring Criteria sheet.

8. Using the criteria provided on the Scoring Criteria Sheet (included in Appendix H), score each variable as **Yes** or **No** depending on whether or not it met criterion.

Explanation of variables that contribute to readability of written materials:

1. Global coherence – this variable refers to the overall structure and the integration of ideas across the entire text, and is comprised of two subcategories: text structure and signaling devices.
2. Local coherence – this variable refers to the integration of ideas and information within and between sentences, and is comprised of three sub-variables: Pronoun references, substitutions and connectives.
3. Unity – this variable refers to the fulfillment of purpose. It identifies sentences that are relevant and irrelevant to the topic of the paragraph. A sentence is not considered relevant if it does not relate to the topic or subtopic.
4. Audience appropriateness – audience appropriateness refers to the degree of the writer's consideration of the target readers' knowledge of vocabulary and subject matter. It is assessed by counting the presence of new vocabulary, and highlighting of new vocabulary, definitions of new vocabulary, and synonyms for new vocabulary.
5. Adjunct questions – this variable denotes the usage of questions at the beginning, embedded in, or appearing at the end of text. It is scored in two sub-variables: 1) Is the question present? And 2) Is it placed appropriately within the text?
6. Writing style – this variable refers to the use of active or passive voice within a paragraph. Active voice is defined as a style in which the subject performs the action of the verb. Passive voice, however, is defined as a style in which the subject is acted on. The preferred style is active voice.
7. Illustrations – illustrations refer to photographs, sketches, cartoons, diagrams, and line drawings; however, they do not include tables, graphs, or charts. An illustration is scored on two dimensions: 1) relevance to content – the illustration should represent

information in the text and 2) appropriate for audience – illustrations must be age-appropriate for adults.

8. Typography – This variable refers to print size, print style, color, and highlighting of titles and subtitles. Sub-variables are scored on a yes/no basis. Print size must be 14-point and print style must include both upper and lowercase letters. Print color should be dark on a light background, and titles and subtitles must highlight in some technique referred to previously.

RAIN Scoring Criteria

VARIABLE	CRITERION
A. GLOBAL COHERENCE	
1. Structure	A minimum of 80% of the paragraphs in a pamphlet must have evidence of structure.
2. Signaling Devices	A pamphlet must have Titles and Subtitles and either an Introductory Statement or a Summary Statement.
B. LOCAL COHERENCE	
1. Clear Pronoun References	A minimum of 80% of the Pronoun References in a pamphlet must be clear.
2. Clear Substitutions	A minimum of 80% of the Substitutions in a pamphlet must be clear.
3. Clear Connectives	A minimum of 80% of the Connectives in a pamphlet must be clear.
C. UNITY	A minimum of 80% of the sentences in a pamphlet must be relevant.
D. AUDIENCE APPROPRIATENESS	
1. Highlighted	All new words must be highlighted.
2. Definition present	All new words in a pamphlet must have either a definition or a synonym.
3. Synonym present	All new words in a pamphlet must have either a definition or a synonym.
E. ADJUNCT QUESTIONS	A pamphlet with adjunct questions is scored as being more readable than one without questions.
F. WRITING STYLE	In a pamphlet, 80-100% of the paragraphs should be written n the Active Voice and less than 20% of the paragraphs should be written in the Passive Voice.
G. ILLUSTRATIONS	
1. Relevant to Content	80% of the illustrations must be relevant to the content and 80 % must be appropriate for the audience.
2. Appropriate for Audience	80% of the illustrations must be relevant to the content and 80 % must be appropriate for the audience.
H. TYPOGRAPHY	
1. Style of Print	A pamphlet must be written in 14-point type.
2. Style of Print	A pamphlet must be written in plain print using upper and lower cases.
3. Color	The color of the print must be black and the color of the paper must be white or some other light background.
4. Highlighting of Titles and Subtitles	The titles and subtitles in a pamphlet must be highlighted.

RAIN DATA SHEET 1

Name of Pamphlet :_____

Name of Publisher: _____

Date of Publication: _____

Signaling Devices: (a) Titles and Subtitles: Yes No **(b) Introductory Statement:** Yes No **(c) Summary Statement:** Yes No

Structure				**Pronoun Refs**			**Substitutions**			**Conn**			**Unity**			**Audience Appropriateness**			
Section Title	P#	Para #	Name	#	# CL	# UNCL	#	# CL	# UNCL	#	# CL	# UNCL	# SENT	# R	# IR	# NW	High-lighted	Defined	Synonym

RAIN DATA SHEET 2			**Adjunct Questions**				**Writing Style**		**Illustrations**			**Typography**			
Section Title	Page #	Para #	#	# B	# E	# A	Active Yes/No	Passive Yes/No	Yes/ No	Rel Y/N	App Y/N	Font Size	Type of Print	Color	Titles & Subtitles

RAIN SUMMARY SHEET

Name of Pamphlet: _____
Name of Publisher: _____
Date of Publication: _____

GLOBAL COHERENCE										
Total # of paragraphs:										
Total # with structure:										
Structure								**Signaling Devices**		
Cause effect	Temporal sequence	Compare/ contrast	Problem solution	Simple listing	Definition/ Examples	Description	Narrative	Titles & Subtitles	Introductory statement	Summary statement

LOCAL COHERENCE			**UNITY**		**AUDIENCE APPROPRIATENESS**			
Clear Pronoun References	Clear Substitutions	Clear Connectives	Relevant Sentences	Irrelevant Sentences	New Words/ Terms Present	Highlighted	Definition Present	Synonyms
CL= UNCL= Total=	CL= UNCL= Total=	CL= UNCL= Total=	Total=					

ADJUNCT QUESTIONS				**WRITING STYLE**		**ILLUSTRATIONS**		
		Placement						
Question Present	Before	Embedded	After	Active Voice	Passive Voice	Present	Relevant to content	Appropriate for audience

TYPOGRAPHY			
Size of Print	Style of Print	Color	Highlighting of Titles & Subtitles

RAIN
KEY TO ABBREVIATIONS USED IN DATA SHEETS 1 & 2

Structure

P#	=	Page number
Para#	=	Number of paragraph
Name	=	Name of structure

Pronoun References/Substitutions

CL	=	Clear pronoun references/substitutions
UNCL	=	Unclear pronoun references/substitutions

Unity

#Sent	=	Number of sentences
#R	=	Number of relevant sentences
#IR	=	Number of irrelevant sentences

Audience Appropriateness

#NW	=	Number of new words

Adjunct Questions

#B	=	Number of BEFORE questions
#E	=	Number of EMBEDDED questions
#A	=	Number of AFTER questions

Illustrations

Rel	=	Relevant illustrations
App	=	Appropriate illustrations

Typography

Type of Print

U&L	=	Upper and lower case letters (not fancy)
AU	=	All upper case letters
F	=	Fancy

Color

B on W	=	Black ink on white paper
B on T	=	Black ink on tinted paper
O	=	Other

Highlighting of Titles and Subtitles

U	=	Underlined
B	=	Boldfaced
I	=	Italicized
DC	=	Different Color
O	=	Other

RAIN SCORING SHEET

NAME OF PAMPHLET: _____

NAME OF PUBLISHER: _____

DATE OF PUBLICATION: _____

VARIABLE	MET CRITERION	
	Yes	No
A. GLOBAL COHERENCE	-	-
1. Structure		
2. Signaling Devices		
B. LOCAL COHERENCE	-	-
1. Clear Pronoun References		
2. Clear Substitutions		
3. Clear Connectives		
C. UNITY		
D. AUDIENCE APPROPRIATENESS		
E. ADJUNCT QUESTIONS		
F. WRITING STYLE		
G. ILLUSTRATIONS		
H. TYPOGRAPHY	-	-
1. Size of Print		
2. Style of Print		
3. Color		
4. Highlighting of Titles and Subtitles		

APPENDIX I – 14 DAY FOLLOW-UP QUESTIONNAIRE

1. Did you purchase a booster seat for your child in the past 14 days?
   ❍ Yes ❍ No If no, why not?

   _____
   _____
   _____

2. Does your child ride in the booster seat each and every time they ride in your vehicle?
   ❍ Yes ❍ No

3. Is the booster seat transferred to other vehicles each and every time your child rides in a vehicle other than your primary vehicle?
   ❍ Yes ❍ No

4. Have you sent in the registration card for the booster seat?
   ❍ Yes ❍ No

5. Has anything unusual happened in the past 14 days, such as a car crash involving a family member or friend?
   ❍ Yes ❍ No If yes, what were the circumstances?

   _____
   _____
   _____

APPENDIX J – PHASE I AND II PAMPHLETS

Phase I - Study 1: Pamphlet (side 1)

What kind of **BOOSTER SEAT** should you use?

Use a **high back booster seat** if your car's seat back is lower than your child's ears.

High Back Booster Seat

You can use a **platform booster seat** or a **high back booster seat** if your car's seat back is higher than your child's ears.

Platform Booster Seat

When should your child start using only a safety belt?

Your child can safely use a safety belt when ALL of these are true:

- The shoulder belt fits snugly across the center of the shoulder.
- Their knees bend over the seat while sitting all the way back without slouching.
- The lap belt fits low across the hips.

* Adapted from SafetyBeltSafe U.S.A.

Booster Seats:

Are you doing all you can to protect your child in a vehicle?

What is a BOOSTER SEAT?

A **booster seat** is a safety seat used in a vehicle. It raises your child up so the car's safety belt can fit and hold your child the right way. It is a much safer way for your child to ride.

Right

Who should be using a BOOSTER SEAT?

Your child should be in a **booster seat** if ANY of these are true:

- Your child is too big for a child safety seat.
- Your child weighs about 40 – 80 pounds.
- Your child is shorter than 4'9" tall.
- Your child is not big enough to use the car's safety belt safely.

Why should your child use a BOOSTER SEAT?

- Motor vehicle crashes are the leading cause of death and injury for children.
- Safety belts that are in the wrong position may hurt your child in a crash.
- When used right, booster seats prevent deaths and serious injuries.

How do you know if your child needs a BOOSTER SEAT?

Your child should use a **booster seat** if you can answer NO to any of these questions*:

- Can your child sit all the way against the seat back while bending their knees at the edge of the seat?
- Does the lap belt rest low across their hips, not across their stomach?
- Is the shoulder belt centered on their shoulder and chest?

Wrong

What kind of **BOOSTER SEAT** should you use?

Use a **high-back booster seat** if your vehicle's seat back is lower than your child's ears.

High-Back Booster Seat

You can use a **platform booster seat** or a **high-back booster seat** if your vehicle's seat back is higher than your child's ears.

Platform Booster Seat

When should your child start using only a safety belt?

Your child can safely use a safety belt without using a booster seat ONLY when ALL of these are true:

- The shoulder belt fits snug across the center of your child's shoulder.
- Your child's knees bend over the seat while sitting all the way back, without slouching.
- The lap belt fits low across your child's hips, not across the stomach.

Booster Seats:

Are you doing all you can to protect your child in a vehicle?

What is a BOOSTER SEAT?

A **booster seat** is a safety seat used in a vehicle. It raises your child up so the vehicle's safety belt can fit and hold your child the right way. Your child will be more comfortable using a booster seat. It is the only safe way for your child to ride.

Right

Who should be using a BOOSTER SEAT?

Your child should be in a **booster seat** if you can answer "YES" to any of these questions:

- Is your child too big for a child safety seat?
- Does your child weigh about 40 – 80 pounds?
- Is your child shorter than 4'9" (57") tall?
- Is your child not big enough for the vehicle's safety belt to protect them in a crash?

Why should your child use a BOOSTER SEAT?

- Motor vehicle crashes are the leading cause of death and injury for children.
- Safety belts that are in the wrong position may hurt your child in a crash.
- When used right, booster seats can protect your child from death and serious injury.

How do you know if your child needs a BOOSTER SEAT?

Your child should use a **booster seat** if you can answer "NO" to any of these questions*:

- Can your child sit all the way against the vehicle's seat back while bending their knees at the edge of the seat?
- Does the lap belt rest low across your child's hips, not across the stomach?
- Is the shoulder belt centered on your child's shoulder and chest?

Wrong

Phase II – Studies 3 & 4: Pamphlet (side 1)


What kind of **BOOSTER SEAT** should you use?

Use a **high-back booster seat** if your vehicle's seat back is lower than your child's ears.

High-Back Booster Seat

You can use a **platform booster seat** or a **high-back booster seat** if your vehicle's seat back is higher than your child's ears.

Platform Booster Seat

When should your child start using only a safety belt?

Your child can safely use a safety belt without using a booster seat ONLY when ALL of these are true:

- The shoulder belt fits snug across the center of your child's shoulder.
- Your child's knees bend over the seat while sitting all the way back, without slouching.
- The lap belt fits low across your child's hips, not across the stomach.

Booster Seats:

Are you doing all you can to protect your child in a vehicle?

What is a BOOSTER SEAT?

A **booster seat** is a safety seat used in a vehicle. It raises your child up so the vehicle's safety belt can fit and hold your child the right way. Your child will be more comfortable using a booster seat. It is the only safe way for your child to ride.

Booster seats MUST be used with BOTH lap and shoulder safety belts. Never use a **booster seat** with a lap safety belt only.

Right

Who should be using a BOOSTER SEAT?

Your child should be in a **booster seat** if you can answer "yes" to ANY of these questions:

- Is your child too big for a child safety seat?
- Does your child weigh about 40 - 80 pounds?
- Is your child shorter than 4'9" (57") tall?
- Is your child not big enough for the vehicle's safety belt to protect them in a crash?

Why should your child use a BOOSTER SEAT?

- Motor vehicle crashes are the leading cause of death and injury for children.
- Safety belts that are in the wrong position may hurt your child in a crash.
- When used right, booster seats can protect your child from death and serious injury.

How do you know if your child needs a BOOSTER SEAT?

Your child should use a **booster seat** if you can answer "no" to ANY of these questions:

- Can your child sit all the way against the vehicle's seat back while bending their knees at the edge of the seat?
- Does the lap belt rest low across your child's hips, not across the stomach?
- Is the shoulder belt centered on your child's shoulder and chest?

Wrong

APPENDIX K – FORD MOTOR COMPANY PAMPHLET

Boost America!
Raising Kids With Safety in Mind

Is Your Child Safe?

A child's growing years are an exciting time for parents. But they can also be a time of added risk, especially on America's streets and highways.

Studies have found that, after age three, children run an extra risk of injury in car crashes because most of them ride without proper safety seats, ride unbelted, or are improperly using safety belts.

Nearly one-third of children ages 4 to 8 ride completely unbelted, while fewer than 7 percent use booster seats. And this failure to properly buckle up plays a large part in the fact that traffic crashes are the leading cause of death for children in this age group, claiming more than 500 young lives each year.

RIGHT

The Booster Age

Children outgrow a typical convertible or toddler seat when they weigh 40 pounds and are around 4 years of age. But they are still too small for lap-shoulder belts to fit properly. Properly using a safety belt is always better than NOT using one, but if used improperly, a safety belt may not provide any protection. For example, children who put the shoulder belt behind them or under their arm can suffer serious injuries to the head, internal organs, or spine in a crash.

The solution? When children outgrow their forward-facing toddler seats, they need to graduate to seats for "big kids," known as booster seats. And they need to use their belt-positioning booster seats until they grow big enough (usually over 80 pounds) for the vehicle seat and for adult safety belts to fit correctly.

Boosters Are Fun For Kids

Booster seats position a child so that adult safety belts fit properly. They lift the child up so that the lap belt rests low across the hips and the knees bend comfortably. Booster seats also make the shoulder portion of the belt fit correctly and more comfortably for growing children, and make it easier to see out the car window. They make it fun for youngsters to ride.

Most importantly, booster seats can help save lives.

When does my child need a booster seat?

Children need to use booster seats until they weigh about 80 pounds (about 8 years old). That's when adult lap-shoulder belts are more likely to fit correctly. Small children tend to scoot forward until their legs hang down and they slouch against the seat back. In this position, the belts will not be effective and the child may be seriously injured. Properly installed, booster seats position the lap belt low and snug across the hips and the shoulder belt snug across the middle of the chest and raise the child for better sitting posture and comfort.

Booster seats should be used until you can answer YES to ALL of these questions*:

- ✔ Can the child sit all the way back against the seat back with knees bent comfortably at the edge of the seat?
- ✔ Does the lap belt rest low across the hips?
- ✔ Is the shoulder belt centered on the shoulder and chest?
- ✔ Can the child stay seated like this for the whole trip?

What kind of booster seat is best?

There are two types of booster seats: those with high backs and those that are backless. Both can be used in any vehicle in a seating position equipped with lap-shoulder belts if your child is over 40 pounds. If your backless booster seat has a removable shield, remove it and use the lap-shoulder belt. Never use a booster seat with a lap belt only unless permitted by the booster seat manufacturer.

However, if a seating position has a low seat back and no head restraint, a backless booster may place your child's head above the top of the seat. In this case, move the backless booster to another seating position with a higher seat back and lap-shoulder belts. If that's not possible, a high back booster would be the better choice to help support your child's head.

Are shoulder belts important?

Shoulder belts are critical to your child's safety, especially when he or she rides in a booster seat. Using a booster without a shoulder belt increases the risk of a child's head hitting a hard surface in a crash. For this reason, you should *never use a booster seat with a lap belt only* (unless permitted by the booster seat manufacturer). It's best to use a booster seat with lap-shoulder belts in the back seat – the safest place for children to ride. Make sure children ride with the shoulder belt across their chest, not behind them or under their arm.

WRONG

Boost America!
Raising kids with safety in mind
www.boostamerica.org

*From SafetyBeltSafe USA.

Car Safety Tips to Grow On

★Get Seated

Infants should ride in a rear-facing seat as long as possible but at least until they are BOTH one year of age AND weigh at least 20 pounds. After that, they should ride facing forward in a toddler seat until they weigh 40 pounds (about age 4 or when their ears reach the top of the toddler seat) and then "graduate" to a belt-positioning booster (BPB).

★Get a Boost

Children who have outgrown their convertible/toddler seats (usually around 40 pounds and 4 years old) belong in a BPB. BPBs help ensure that adult lap-shoulder belts fit properly. They also give children a more comfortable seating position, help them see out the window, and make it more fun to go for a ride. A comfortable child is more likely to stay buckled up.

★Get Belted

BPBs require BOTH lap AND shoulder belts to provide protection. Never use a booster with a lap belt alone unless permitted by the booster seat manufacturer. Remember, the back seat is the safest place for children of every age. If the back seat has lap belts only, shoulder belts can be installed in some vehicles.

Other options would include using a tether anchored vest, or using a BPB in the front seat with lap and shoulder belts **if your vehicle does not have a passenger air bag or if the air bag is turned off.** Or, if a booster seat is not immediately available, then, as a last resort, sit the child in the back seat without a booster and buckle the lap belt low and snug across the hips — because a belted child, even in a lap belt, is not as likely to be ejected.

The safest place for a child 40 to 80 pounds is in the back seat with a BPB because booster seats help position a child so that adult safety belts fit properly.

★Get Help

Read BOTH your booster instructions AND your vehicle owner's manual before using the booster seat. For more information on choosing the right booster seat and using it properly, check these websites:

- Boost America! - www.boostamerica.org
- National Highway Traffic Safety Administration - www.nhtsa.dot.gov
- American Academy of Pediatrics - www.aap.org

Ford Motor Company Fund

This program is made possible by Ford Motor Company Fund.

Boost America!
Raising kids with safety in mind
www.boostamerica.org

Boost America! is a highway safety campaign designed to send the message to parents and children that booster seats are the safe and fun way to ride in a vehicle.

With the support of Ford Motor Company Fund and its safety partners, Boost America! will carry this message to every preschool and elementary school in the United States, and provide one million booster seats to families in the coming year.

American Academy of Pediatrics — Dedicated to the health of all children · American Trauma Society · International Center for Injury Prevention · Emergency Nurses CARE — Emergency Nurses Association, Injury Prevention Institute · U.S. Department of Health and Human Services HRSA — Health Resources and Services Administration, Maternal and Child Health Bureau · Hertz · NAGHSR · NASN — National Association of School Nurses · NASRO · NFPA International · NHTSA People Saving People · National Urban League · SAE International · STIPDA · United Way

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Raising kids with safety in mind
www.boostamerica.org

Parents: Here's An Important Message About Your Child's Safety

Ford Motor Company Fund

APPENDIX L – SAFE KIDS PAMPHLET

95 Percent of Kids 4-8 Are Riding at Risk.

Could Yours Be One of Them?

SAFE KIDS BUCKLE UP

Program Sponsor General Motors

www.safekids.org

1-800-441-1888

Updated May 2000

Kids should be in car booster seats if they:

- Are too big for a car seat
- Weigh about 40-80 pounds

Booster seats must be used with lap and shoulder belts. Car booster seats lift the child up making the safety belt fit correctly.

Snug across the center of the shoulder, not across the neck or face.

Low over the upper thighs, not riding up on the abdomen.

Without booster seats kids can be uncomfortable in an improperly fitting safety belt.

Don't let kids put shoulder belts under their arms or behind their backs. Kids who misuse belts this way receive no upper body protection.

There are two types of car booster seats to use depending on your car . . .

1 High-back booster seat. If your car's seat back is lower than your child's ears, use this high back booster seat to help protect your child's head and neck.

2 Platform booster seat. If your car's seat back is higher than your child's ears, you can use a platform booster seat.

If your child is over 40 pounds and you only have lap belts in your back seat, you may:

- Buy a special car seat that is for kids who weigh more than 40 pounds;
- Correctly restrain your child in a booster seat in the front seat using a lap/shoulder belt and move the vehicle seat as far back as possible; or,
- Contact an auto dealership about installing shoulder belts.

Children over 80 pounds may be ready for the adult safety belt.

Children fit properly into a safety belt when:

The shoulder belt fits snugly across the center of the shoulder.

Their knees bend over the seat while sitting as far back as possible without slouching.

The lap belt fits low across the upper thighs.

For more information, call the NHTSA Auto Safety Hotline at 1-888-327-4236 (1-888-DASH 2 DOT)

Car Booster Seats Can Protect Kids from Severe Spinal Cord Injuries, Abdominal Injuries and Ejection in a Crash.

APPENDIX M – INFORMED CONSENT

INFORMED CONSENT FORM

Title of Project: Design guidelines for child safety media
Principal Investigators: Suzanne L. Stevens, M.S.; Tonya L. Smith-Jackson, Ph.D.

PURPOSE OF PROJECT

You are invited to participate in a research project examining self-ratings and understandability of printed material having to do with child safety issues.

INFORMATION

If you are participating in **Study 2** you will participate in 1 session lasting approximately 1 hour. You will be given material to read and asked to complete a questionnaire as well as thinking aloud regarding your opinion of the material.

If you are participating in **Study 3** you will participate in 1 session lasting approximately 1 hour. You will be given material to read and asked to complete 3 questionnaires.

If you are participating in **Study 4** you will participate in 3 sessions lasting approximately 1 hour each. During each session you will be given material to read and asked to complete an evaluation tool.

RISKS

Participation in this study does not place you at more than minimal risk.

BENEFITS

At the end of this session, you will be provided with a copy of this form. At the bottom of this form, you will find contact information that can be used to contact the principal investigator after the research has been completed in order to receive information about the results.

CONFIDENTIALITY

The information gained in this research project will be kept strictly confidential. At no time will the researchers release the results of the study to anyone other than individuals working on the project without your written consent.

You will be identified only by a 3-digit study code. Data will be stored securely and will be made available only in the context of research publications and discussion. No reference will be made in oral or written reports that could link you to the data nor will you ever be identified as a participant in the project.

COMPENSATION

Your participation will benefit our understanding of safety. Personal satisfaction can result from knowing you have contributed to a worthwhile effort. In addition, you will receive $7.50 per hour for your time.

FREEDOM TO WITHDRAW

You are free to withdraw from this study at any time without penalty.

APPROVAL

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University and by the Department of Industrial and Systems Engineering.

PARTICIPANT'S RESPONSIBILITIES

It is very important that you keep the activities and information discussed confidential, since others will be participating in this research.

QUESTIONS

If you have questions, or do not understand information on this form, please feel free to ask them now.

PARTICIPANT'S PERMISSION

I have read and understand the Informed Consent and conditions of this project. I have had all questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project.

If I participate, I may withdraw at any time without penalty.

Signature _____

Date _____

CONTACT

If you have questions at any time about the project or the procedures, you may contact Dr. Tonya Smith-Jackson at 231-4119, smithjack@vt.edu (519-H Whittemore).
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant have been violated during the course of this project, you may contact Dr. D. Moore, Chair of the Institutional Review Board Research Division at 231-4991.

APPENDIX N – IRB

Investigation of Design Guidelines for Child Safety Media
Principal Investigators: Suzanne L. Stevens and Tonya L. Smith-Jackson

Justification of Project

Motor vehicle crashes are the leading cause of unintentional injury-related death among children ages 14 and under and of these children who were fatally injured more that 60 % were not using safety restraints at the time of the collision. As more and more children use safety restraints, placing children in inappropriate restraint systems becomes an increasingly serious issue.

Children who are too large for child safety seats are often restrained improperly or not at all. In addition, many children are being shifted from child safety seats to adult safety belts prematurely, before their bodies are large enough for the safety belts to fit them properly. For proper protection, children who have outgrown child safety seats require booster seats combined with vehicle lap/shoulder belts. A booster seat raises a child up so that the lap and shoulder belts fit properly.

The purpose of this research is three-fold: 1) to develop an efficient and effective pamphlet whereby parents and caregivers of children between the ages of 4 and 8 years will read it, understand it, believe it, and then act on it, 2) to evaluate and compare the reading level, readability, comprehensibility, and understandability of two existing booster seat pamphlets as well as the pamphlet developed in this study and, 3) to determine the impact of this pamphlet intervention by assessing the expected increase in adoption and usage rates of booster seats.

Method

Phase I – Development

Study 1: Development and design of new pamphlet

Participants

Seventy (70) participants who are subject matter experts in the field of child passenger safety will be selected from across the country.

Procedure

Participants will be sent a questionnaire in the mail and asked to complete rankings and ratings having to do with items they feel are important to be included in a booster seat pamphlet. They will then send the questionnaire back to the investigator in the provided self addressed stamped envelope.

Study 2: Evaluation of new pamphlet designed in Study 1

Participants

Ten (10) participants will be selected from the local community in the New River Valley. They must have a child between the ages of 4 and 8 and must weigh between 40 and 80 pounds. The child must not use a booster seat when riding in a vehicle.

Procedure

Participants will be given a copy of the pamphlet designed in Study 1 to read. After they have completed reading the pamphlet they will be asked to complete a questionnaire. Following the questionnaire, participants will be asked to "talk aloud" regarding their opinion of the pamphlet. This will be recorded by hand by the experimenter.

Phase II – Evaluation and Comparison

Study 3: Evaluation of existing pamphlets

Participants

Eighty (80) participants will be selected from the local community in the New River Valley. They must have a child between the ages of 4 and 8 and must weigh between 40 and 80 pounds. The child must not use a booster seat when riding in a vehicle.

Procedure

Participants will be given a copy of a pamphlet and asked to read it. Once the pamphlet has been read the participant will be asked to complete 3 questionnaires assessing comprehensibility, understandability and risk perception.

Study 4: Evaluation of existing pamphlets

Participants

Ten (10) participants will be selected from the Human Factors option in the Industrial and Systems Engineering Department of Virginia Tech.

Procedure

Participants will be given a copy of three different pamphlets and asked to read them. Once the pamphlets have been read the participant will be asked to complete 2 assessment tools assessing readability and the inclusion of pamphlet design elements.

Phase III – Adoption and Impact

Study 5: Effectiveness of intervention

Participants

Forty (40) participants will be selected from the local community in the New River Valley. They must have a child between the ages of 4 and 8 and must weigh between 40 and 80 pounds. The child must not use a booster seat when riding in a vehicle.

Procedure

Each participant will be handed one of three pamphlets and asked to read it. They will be given the pamphlet to take home. At the bottom of each pamphlet it will read "for more information about booster seats please call (800) XXX-XXXX." When the participant calls the number they will be offered a free booster seat. When they come to pick up the booster seat they will sign the informed consent and be given a free booster seat (in its original packaging from the manufacturer with all instructions and warranties). They must also agree to a 30 day follow-up call to answer a few questions regarding usage of the booster seat.

Risks and Benefits

There are no foreseeable risks related to participation in this research.

Confidentiality/Anonymity

Subjects will be informed that confidentiality of all results will be maintained throughout the data collection, analysis, and publication of any results. No data will be in a form that would allow for the identification of the subject. Neither audio- nor videotaping will be performed. Only a number will identify all subjects and experimental data.

Informed Consent

Study 1: Since experts will be given a questionnaire to provide information to the experimenter and no other information will be gained from the expert, no informed consent sheet will be required.

Study 2: See attached sheet.

Study 3: See attached sheet.

Study 4: See attached sheet.

Study 5: See attached sheet.

Biographical sketch

Suzanne L. Stevens

Suzanne Stevens is a fifth year graduate student at Virginia Polytechnic Institute and State University in the Industrial and Systems Engineering Department, concentrating in Human Factors/Safety Engineering. During the past five years, she has taken several human factors courses that have helped her prepare her for research in the area. Some of these classes include Research Design, Systems Design, System Safety, Industrial Health and Injury Epidemiology, and Occupational Safety and Hazard Control. Her primary interests include child passenger safety and effective design of child restraint systems for vehicles. She has been certified by the National Highway Safety Traffic Administration as a Certified Child Passenger Safety Technician. She is a member of the Human Factors and Ergonomic Society, the American Society of Safety Engineers, the American Association of University Woman, the Society of Woman Engineers, and Alpha Pi Mu.

Tonya L. Smith-Jackson

Dr. Smith-Jackson is an assistant professor of Human Factors Engineering in the Industrial and Systems Engineering Department. For the past 11 years, she has conducted research using human subjects in the areas of warning and compliance, safety information design, focused attention, and cognitive ergonomics. Most of her research was conducted within Departments of Psychology. She has also conducted usability testing at various corporations such as Ericsson, IBM, and PC&InfoSystems Consulting.

In the graduate courses she teaches, she discusses ethical guidelines that relate to the use of human subjects in research. Also, students are given scenarios of ethical dilemmas to discuss. They must apply the guidelines to determine the appropriate course of action.

APPENDIX O – CHILD SAFETY SEAT LAWS

STATE HIGHWAY SAFETY LAWS – CHILD PASSENGER PROTECTION Adopted with permission from the National Highway Traffic Safety Administration		
State	Must be in child restraint	Adult safety belt permissible
Alabama	3 yrs. and younger	4 through 5 yrs.
Alaska	3 yrs. and younger	4 through 15 yrs.
Arizona	4 yrs. and younger	Not permissible
Arkansas	5 yrs. and younger and less than 60 lbs.	6 yrs. or 60+ lbs. through 14 yrs.
California	5 yrs. and younger or less than 60 lbs.	6 yrs. through 15 yrs. or 60+ lbs.
Colorado	3 yrs. and younger and less than 40 lbs.	4 through 15 yrs. or 40+ lbs.
Connecticut	3 yrs. and younger and less than 40 lbs.	4 through 15 yrs. or 40+ lbs.
Delaware	3 yrs. and younger	4 through 15 yrs.
Dist. Of Columbia	2 yrs. and younger	3 through 15 yrs.
Florida	3 yrs. and younger	4 through 15 yrs.
Georgia	4 yrs. and younger	Not permissible
Hawaii	3 yrs. and younger	Not permissible
Idaho	3 yrs. and younger and less than 40 lbs.	Not permissible
Illinois	3 yrs. and younger	4 through 14 yrs.
Indiana	3 yrs. and younger	Not permissible
Iowa	2 yrs. and younger	3 through 5 yrs.
Kansas	3 yrs. and younger	4 through 13 yrs.
Kentucky	40” or less	Not permissible
Louisiana	2 yrs. and younger	3 through 12 yrs. (children 3+ yrs. must be in rear seat if available)
Maine	Less than 40 lbs. in a child safety seat; 40-80 lbs. in a booster seat	8 yrs. through 17 yrs. or less than 18 yrs. and more than 4’7”
Maryland	3 yrs. and younger or 40 lbs. or less	More than 40 lbs. through 15 yrs.
Massachusetts	4 yrs. and younger or 40 lbs. and less	5 through 11 yrs.
Michigan	3 yrs. and younger	Not permissible
Minnesota	3 yrs. and younger	Not permissible
Mississippi	3 yrs. and younger	Not permissible
Missouri	3 yrs. and younger	Not permissible
Montana	Younger than 2 yrs.	2 through 3 yrs. or less than 40 lbs.
Nebraska	5 yrs. and younger (eff. 7/20/02)	6 through 15 yrs. (eff. 7/20/02)
Nevada	4 yrs. and younger and less than 40 lbs.	Not permissible
New Hampshire	3 yrs. and younger	4 through 17 yrs.
New Jersey	7 yrs. and younger and less than 80 lbs seated in rear seat if available	Not permissible
New Mexico	Younger than 1 yr. in a rear-facing infant seat, seated in the rear seat if available; 1 through 4 yrs. or less than 40 lbs.	5 through 17 yrs.
New York	3 yrs. and younger in all seats	4 through 15 yrs.
North Carolina	4 yrs. and younger and less than 40 lbs.	5 through 15 yrs.
North Dakota	3 yrs. and younger	4 through 17 yrs.
Ohio	3 yrs. and younger and less than 40 lbs.	Not permissible

STATE HIGHWAY SAFETY LAWS – CHILD PASSENGER PROTECTION Adopted with permission from the National Highway Traffic Safety Administration		
State	Must be in child restraint	Adult safety belt permissible
Oklahoma	3 yrs. and younger and 60 lbs. or less	4 through 12 yrs.
Oregon	3 yrs. and younger and 40 lbs. or less in a child safety seat; 4 through 5 yrs. or 40-60 lbs in a booster seat	6 through 15 yrs. and 60+ lbs.
Pennsylvania	3 yrs. and younger	Not permissible
Rhode Island	6 yrs. and younger and less than 54" and less than 80 lbs.	6 yrs. and younger and 54"+ and 80+ lbs.
South Carolina	Younger than 1 yr. or less than 20 lbs. in a rear-facing infant seat; 1 through 5 yrs. and 20-40 lbs. in a forward facing child safety seat; 1 through 5 yrs. and 40-80 lbs. in a booster seat secured by lap-shoulder belt—lap belt alone is impermissible	1 through 5 yrs. and 80 lbs. or more OR any child 5 yrs. and younger if the child's knees bend over the seat edge when sitting up straight with his/her back firmly against the seat back
South Dakota	4 yrs and younger and less than 40 lbs.	5 through 17 yrs.; all children 40+ lbs; regardless of age
Tennessee	3 yrs. and younger in a child safety seat; 4 through 7 yrs. and less than 40 lbs. in child safety seat	4 through 7 yrs. and 40+ lbs.; 8 through 14 yrs.
Texas	3 yrs. and younger or less than 36"	Not permissible
Utah	4 yrs. and younger	5 through 15 yrs.
Vermont	4 yrs. and younger	5 through 12 yrs.
Virginia	5 yrs. and younger (eff. 7/1/02)	6 through 15 yrs. (eff. 7/1/02)
Washington	Younger than 1 yr. or less than 20 lbs. in a rear-facing infant seat (eff. 7/1/02); 1 through 3 yrs. or 20-40 lbs. in a forward-facing child safety seat; 4 through 5 yrs. or 40-60 lbs. in a booster seat	6 through 15 or 60+ lbs. (eff. 7/1/02)
West Virginia	2 yrs. and younger	3 through 8 yrs.
Wisconsin	3 yrs. and younger	4 through 7 yrs.
Wyoming	4 yrs. and younger and 40 lbs. or less	Not permissible

APPENDIX P – KNOWLEDGE TRANSFER QUESTIONNAIRE

Using the information you have just read in the pamphlet, please complete the following questions by choosing the answer you feel is the **MOST** correct.

1. A booster seat is a child safety device used in a …
a) restaurant
b) motor vehicle
c) bicycle
d) home

2. Which of the following is NOT a reason to put your child in a booster seat?
a) your child weighs approximately 40-80 pounds
b) your child is shorter than 4'9" tall
c) your child is too big for a child safety seat
d) your child is big enough to use the car's safety belt safely

3. What is the leading cause of death and injury of children?
a) childhood disease
b) unintentional injuries
c) motor vehicle crashes
d) bicycle accidents

4. Safety belts that are in the wrong position …
a) may hurt your child in a crash
b) may help secure your child in a vehicle crash
c) may keep your child from sliding out of the bottom of the lap belt
d) will sit properly on the shoulder

5. When used right, booster seats …
a) increase probability of ejection from the vehicle in a crash
b) place the safety belt in an unsafe position
c) prevent deaths and serious injuries
d) make the shoulder belt rub on your child's neck

6. Your child should NOT use a booster seat …
a) if they cannot sit all the way against the seat back while bending their knees at the edge of the seat
b) if the lap belt rests on your child's stomach area
c) if they fit in a vehicle's safety belt correctly
d) if the shoulder belt rubs your child on the neck

7. A platform booster seat is used when …
a) your car's seat back is lower than your child's ears
b) your car's seat back is higher than your child's ears
c) your child can see out the window
d) a or b

8. A high back booster seat is used when …
a) your car's seat back is lower than your child's ears
b) your car's seat back is higher than your child's ears
c) your child can see out the window
d) a or b

9. For your child to safely use a safety belt **without** using a booster seat, all of the following MUST be true, **except** …
a) the shoulder belt fits snugly across the center of the shoulder
b) their knees bend over the seat while sitting all the way back without slouching
c) your child is shorter than 4'9"
d) the lap belt fits low across the hips, not the stomach

10. Do you have a child that should be in a booster seat?
a) Yes
b) No
c) I don't know

… and why?

_____
_____
_____
_____

11. Which part(s) of the pamphlet stood out most clearly in your mind?

_____

APPENDIX Q - POST INTERVENTION QUESTIONNAIRE

In the questionnaire you are about to fill out we ask questions which make use of rating scales with seven places; you are to make a check mark in the place that best describes your opinion.

For example:

If you think the weather in Christiansburg is "extremely good", then you would place your mark as follows:

The weather in Christiansburg is

good__✓_____:_____:_____:_____:_____:_____:_____bad
extremely quite slightly neither slightly quite extremely

If you think the weather in Christiansburg is "quite bad", then you would place your mark as follows:

The weather in Christiansburg is

good_____:_____:_____:_____:_____:__✓__:_____bad
extremely quite slightly neither slightly quite extremely

Please answer the following questions:

I intend to purchase a booster seat for my child after reading this pamphlet

likely_____:_____:_____:_____:_____:_____:_____unlikely
extremely quite slightly neither slightly quite extremely

For me to purchase a booster seat for my child would be

easy_____:_____:_____:_____:_____:_____:_____difficult
extremely quite slightly neither slightly quite extremely

VITA

Suzanne Lynn Stevens was born on August 12, 1964, in Los Angeles, California. She received a B.E.D. in Environmental Design from the University of Colorado, in Boulder, Colorado in August of 1986. For a short period she designed hotel casinos and then worked for the Design and Construction Department for the largest Savings and Loan on the West Coast, designing over 100 banking facilities. She entered the Human Factors Engineering program (safety engineering option) at Virginia Tech in the fall of 1997 and received her M.S. in May of 2000. Her research interests include child passenger safety, risk perception, the design of effective child safety seats, and child safety in general. Suzanne has served as President of the Human Factors and Ergonomic Society (HFES) Student Chapter and has served as both President and Vice President of the American Society of Safety Engineers (ASSE) Student Section. Additionally, she is an active member of the American Association of University Woman (AAUW), Society of Women Engineers (SWE), and Alpha Pi Mu (APM). She has earned many scholarships including 2 years of NIOSH funding, ASSE National Foundation Graduate Scholarship, ASSE Kenneth J. Deurmier Scholarship, AAUW Career Development Grant, AAUW/YMCA Women's Leadership Award, and the SWE Lynn Salembier Re-entry Scholarship, National Alpha Pi Mu Scholarship, P.E.O. Jean B. Duerr Memorial Scholarship, and the P.E.O. National Scholar Award.