1-1-2006

A longitudinal study of the effectiveness of a multimedia education program to enhance parents knowledge of children's safety in vehicles.

Sarah E. Harvey
University of Windsor

A Longitudinal Study of the Effectiveness of a Multimedia Education Program to Enhance Parents Knowledge of Children's Safety in Vehicles

by

Sarah E. Harvey

A Thesis
Submitted to the Faculty of Graduate Studies and Research
through the Faculty of Nursing
in Partial Fulfillment of the Requirements for
the Degree of Master of Science at the
University of Windsor

Windsor, Ontario, Canada

2006

Your file Votre référence
ISBN: 978-0-494-35915-0
Our file Notre référence
ISBN: 978-0-494-35915-0

ABSTRACT

In Canada, approximately 10,000 children under the age of 12 years are injured annually as a result of vehicle collisions (Transport Canada, 2002). Motor vehicle collisions are the leading cause of death of children under the age of 14 (Safe Kids Canada, 2004). A longitudinal multi-site intervention study using a pre-test/post-test design was conducted in four Ontario cities to test the longitudinal effectiveness of an educational program on parents' knowledge and use of safety system use for children.

At one year post-test parents' knowledge and confidence were significant for the transition from booster seat to seatbelt and the weight to transition from forward facing to booster seat. These findings carry significant implications as it is more likely that parents will safely transition children in safety seats when they are confident in their knowledge of the correct seat based on the height, weight and age of the child.

DEDICATION

To my family, whose love, patience, understanding and support of this endeavour have provided me with the opportunity and the encouragement to succeed.

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my advisory committee members and to the other faculty members who have helped to guide me through this process.

I would also like to acknowledge AUTO21 and the Network Centres of Excellences, who helped make this research possible.

I would like to sincerely thank my parents for all of their encouragement and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Introduction

The leading cause of death for children between the ages of 0 and 14 years is motor vehicle collisions (Safe Kids Canada, 2004). In Canada, approximately 10,000 children under the age of 12 years are injured annually as a result of vehicle collisions (Transport Canada, 2002). The majority of Canadian parents attempt to use child restraint devices to protect their children in vehicles. However, misuse of child restraint devices continues to be the main factor contributing to such high rates of morbidity and mortality (Biagioli, 2002). A study in the United States found that, when used properly, child restraint devices reduce fatal injuries by 71% for infants and by 67% among young children (NHTSA, 2002). Despite the importance of accurate and safe use of safety seats for children traveling in vehicles, fewer than 20% of parents use safety seats accurately and effectively enough to keep their children safe in vehicles (Biagioli, 2002; Safe Kids, 2002).

One of the most effective road safety interventions ever implemented was the use of the seatbelt. Non-use or misuse of seatbelts and child restraint devices have been shown to be a risk factor for the injuries and fatalities that result from motor vehicle collisions (WHO, 2004). As children grow and develop, fewer are appropriately restrained when traveling in a motor vehicle (Weber, 2002). The risk of death and serious injury can be significantly reduced through the proper use of child safety devices (Biagioli, 2002; Weber, 2002).

When children are traveling in motor vehicles they are especially vulnerable to injuries or death during a motor vehicle collision. Child restraint devices are designed to provide specific protection for children whose bodies are still developing (Weber, 2000). To properly protect the child from potential injuries sustained during a motor vehicle collision, the child restraint device must be the correct seat, the correct fit, and must be correctly placed in the vehicle (Berns, 2001; Weber, 2000). A reduction in young children's morbidity and mortality is linked to the proper use of child restraint devices (Weber, 2000; Rivara, Bennett, Crispin, Kruger, Ebel & Sarewitz, 2001).

Purpose

Misuse of child restraint devices continues to be a major risk for children's safety in vehicles. Children traveling in motor vehicles remain unprotected and are left susceptible to serious injuries and even death due to misuse (Biagioli, 2002). How a child is restrained is primarily the decision of the parent or caregiver. While many parents know child restraint devices are important, approximately 80% of seats are being used incorrectly, and parents are often unaware of the risks children face while traveling in vehicles (Biagioli, 2002; Safe Kids, 2002).

The purpose of this research was to investigate the long-term effectiveness of a multi-media intervention designed to increase parents' knowledge of correct use of child restraint devices for children 0 months of age to 12 years of age. This study is an extension of an existing research program that seeks to increase parent knowledge and accurate use of safety systems for children traveling in vehicles. The research hypotheses were as follows: (i) parental knowledge of the correct child restraint device for the child's weight and height will be maintained or be greater than their pre-test knowledge

one year following the intervention program; and (ii) the prevalence of correct use of safety seats for the study participants will be greater at one year following the intervention program than the pre-test rate of correct use.

CHAPTER II

REVIEW OF LITERATURE

Introduction

One of the major causes of illness and death for children in North America is motor vehicle crashes (MVCs). Research has shown that the use of child restraint devices (CRDs) has effectively reduced injuries among children in MVCs (Johnston, Rivara, & Soderberg, 1994; NHTSA, 2000). The proper use of CRDs, such as child car seats and vehicle seatbelts, has the potential to reduce injuries by 67 percent and deaths by 71 percent (American Academy of Pediatrics, 1996; NHTSA, 2004). Weber (2002) has since found that when CRDs are used properly, serious injury and death can be reduced by as much as 74%. Despite parents knowledge that CRDs are important and can reduce injuries during an MVC, more than 80% of car seats are misused (Biagioli, 2002). There continues to be persistent misuse of CRDs in Canada resulting in injuries and deaths due to MVCs, which is the leading cause of death for children in Canada.

Injury Outcomes in Children

Motor vehicle crashes (MVCs) are the leading cause of trauma related hospital admissions in North America (Sahai, Pitblado, Bota & Rowe, 1998). In Ontario, between 2003 and 2004 MVCs were responsible for over 58,780 days in hospital, which is 10% of days in hospital due to injury (CIHI – Ontario Trauma Registry, 2006). For children older than 1 year of age, MVCs are the leading cause of acquired disability and death (Geilen, Erikson, Daltroy & Rost, 1984; Ramsay, Simpson, & Rivara, 2000; Transport Canada, 2004; Winston & Durbin, 2000). Over the past 30 years, childhood trauma from MVCs has remained unchanged, and 50 percent of all childhood deaths are attributed to trauma related injuries (Block, Hanson, & Keane, 1998; Patterson, 1999).

The main goal of vehicle restraint systems is to minimize the risk of injury to the occupant by protecting the central nervous system (Weber, 2000). Injuries such as broken bones and soft tissue damage can heal, but damage to the brain and spinal cord is often irreversible and life threatening (Weber, 2000). The intraabdominal organs of a child are less protected than those of an adult because children are still developing and growing. Furthermore, the protective structures such as the pelvis, bony thorax and iliac crests are not fully developed in children and thus cannot serve as anchor points for seatbelts, like they do for adults. Also, when children use only a seatbelt it tends to ride up over the soft part of their abdomen which can cause injuries to their intra-abdominal organs (Statter & Vargish, 1998). A child does not fit into an adult seatbelt until approximately 8 years of age, and when the child's femur is long enough for the child to properly sit against the back of the seat and the anterior superior iliac spines are sufficiently developed to effectively anchor the seatbelt (Winston et al., 2000). Therefore, children younger than 8 years of age are not anatomically developed to be restrained safely by only a seatbelt.

An additional goal of vehicle restraint systems is to limit and control the rate of overall deceleration of the body during a motor vehicle crash (Weber, 2000). During a motor vehicle collision there are a series of collisions that occur: (i) the primary impact between the vehicle and another object, while the occupants continue to travel forward; (ii) the second collision is between the occupants and their restraint system (i.e. seatbelt, etc.); and (iii) the final collision that occurs is between the occupants body's internal organs and the bony structures enclosing them (Weber, 2000). Controlling the body's movement during motor vehicle crashes reduces the forces acting on the body's surface,

which minimizes the differential motion between the skeleton and the internal organs (Weber, 2000). The rapid deceleration of the body as well as the impact of the motor vehicle structure on the body's surfaces can both be associated with severe injuries during MVCs. The objective of vehicle restraint systems is to create a tight coupling with the crushing vehicle, while distributing the remaining load as widely as possible over the body's strongest anatomical structures (Weber, 2000). When children use CRDs they are restrained by both the vehicle seatbelt as well as the harness of the CRDs. Because of this tight coupling and increased restraint of the child, they are better able to ride down the crash and this decreases their motion and movement during the crash (Weber, 2000).

The effectiveness of vehicle restraint systems is dependent on the appropriate CRD and correct anchorage of the CRD. This ensures the best protection for the child during a MVC. The proper use includes: (a) the correct seat for the child, based on age, height and weight; (b) the correct placement of the seat in the vehicle; (c) the correct installation of the CRD into the vehicle; and (d) the correct use of the restraint system (i.e. buckles, clips, harnesses and straps) (Bull, Stoup, Gerhard, 1988). Educational programs are needed to increase child restraint knowledge and awareness to ensure that parents understand the importance of using child restraint equipment properly (McIlvenny, S., et al., 2004). The force of the crash is spread over the hard bony structures of a child's body when they are fitted correctly to the CRD in the event of an MVC (Morris Arbogast, Durbin, & Winston, 2000; Weber, 2000). A child who is unrestrained is 2.7 times more likely to experience serious or fatal injuries in a MVC than

a child who is properly fitted into a CRD (Berg, Cook, Vernon, Dean, 2000; Weber, 2000).

The misuse of a CRD can lead to devastating injuries for the child occupant during a MVC. Mechanisms that could be considered misuse and potentially cause injuries include: non-use of the harness straps, non-use of the locking clip, non-use of the harness retainer clip, non-use of the tether straps, failure to secure the UAS clip, or improper routing of the vehicle seatbelt through the frame of the CRD. Misuse of any of these mechanisms can result in situations where the child could be thrown from the seat or the child and the seat could become a projectile during the crash (Block et al., 1998, Bull et al., 1988, Morris et al., 2000, Stokes et al., 2000). "Injury to the child is most often caused by secondary impact with the vehicle interior, another passenger, the road or other nearby objects" (Stokes, Martin, Holmes, Jex & Lopreiato, 2000, p.867). Secondary impacts such as "with the vehicle interior, another passenger, the road or other nearby object" (Stokes et al., 2000, p.867), cause the majority of deaths in MVCs. Brain and spinal cord damage in MVCs is the most frequent, serious, non-fatal type of injury (National Safe Kids Campaign, 1997).

The term "seatbelt syndrome" and "jack-knifing" are two terms used interchangeably by health care professionals to describe the serious injuries of children in MVCs. In MVCs, when a child is using an ill-fitting CRD or adult seatbelt, they can suffer from serious abdominal and spinal cord injuries, which is called seatbelt syndrome (Lane, 1994). There are several common and life threatening injuries associated with seatbelt syndrome which include: lacerated liver, lacerated bowel, lacerated spleen, ruptured bladder and internal bleeding (Lane, 1994). Seatbelt syndrome is a direct result

of the child jack-knifing during the crash, hence the two terms are used interchangeably. During an MVC, jack-knifing occurs when the head of the child meets the knees of the child, as the body is thrust forward, this causes very serious intra-abdominal, spinal cord, and head injuries (Winston et al., 2000). When a child is prematurely transitioned into a seatbelt, because of their small stature the child can also "submarine" or tunnel under the lap belt during a crash (Winston et al., 2000).

One of the most common factors associated with serious injury in children is the premature graduation from CRDs to seatbelts. Adult seatbelts alone are considered dangerous for children before they have reached 145 centimeters (or 57 inches tall), a weight of 36 kilograms (or 80 pounds), and a sitting height of 74 centimeters (or 29 inches) (Berns et al., 2001, Klinich, Pritz, Beebe, Welty, & Burton, 1994, Weber, 2002). Injuries that a young child sustains while improperly restrained in an adult seatbelt during an MVC are usually disabling and/or fatal (Berg et al., 2000).

The literature strongly suggests that CRDs provide more effective protection for children than adult seatbelts since a child's physical characteristics that do not fit properly into an adult seatbelt. Researchers have found that children between the ages of 2 and 5 years of age who were only using an adult seatbelt were 3.5 times more likely to suffer significant injuries, and 4 times more likely to endure significant head injury, and significant abdominal injuries, than their properly CRD restrained counterparts (Winston et al., 2000). Decina and Knoebel (1997) observed 5,900 young children in Mississippi, Missouri, Pennsylvania and Washington and found that when children are moved into an adult seatbelt prematurely, there is an increased risk of neck injury and damage to the internal organs.

The Canadian Motor Vehicle Traffic Collision Statistics showed that in 2004 children in the 0 to 4 years of age group had: 13 fatalities, 292 serious injuries and a total of 2,717 injuries; and, children in the 5 to 14 years of age group had: 79 fatalities, 896 serious injuries and a total of 11,729 injuries (Transport Canada, 2004). One of the most compelling features of the Transport Canada (2004) data is the difference in outcomes for younger children (aged 0 to 4 years) versus older children (aged 5 to 14 years). Clearly, children in the 5 to 14 years of age group are approximately four times more likely to be injured in an MVC than their younger counterparts. The children aged 5 to 14 years had the lowest overall appropriate restraint use of all the age groups. In Canada, between 1998 and 2002 there were a total of 402 fatalities of child occupants in vehicles. Of those fatally injured, unsuitable restraint (meaning either an unrestrained child or a child using a seatbelt prematurely) was found to be: 66% of children under 1 year; 50% of children aged 1 to 3 years; 97% of children aged 4 to 8 years and 31% of children aged 9 to 14 years (Chouinard & Hurley, 2005). There were a total of 3,201 major injuries of child occupants in Canada between 1998 and 2002. Of those children suffering major injuries, unsuitable restraint was responsible for the injuries in: 92% of children under 1 year of age; 74% for children aged 1 to 3 years; 96% for children aged 4 to 8 years and 20% for children aged 9 to 14 years (Chouinard & Hurley, 2005).

The leading cause of morbidity and mortality among children continues to be road crashes (Block et al., 1998). A review of the literature suggests that there are several gaps in the knowledge concerning the safety of children riding in vehicles.

Patterns of Utilization

The majority of children who are transitioned early from a rear-facing infant car seat to a forward-facing car seat are inadequately restrained (Morris et al., 2000, Ramsey et al., 2000). The 1997 Canadian national survey revealed that 90% of drivers and occupants use vehicle restraints (Transport Canada, 1998). However, provincially, the data revealed that 73% of children under 1 year of age were properly restrained, 71% of children aged 1 to 4 years were properly restrained, 99.7% of children aged 5 to 9 years were properly restrained, and 100% of children aged 10 to 15 years were properly restrained (Transport Canada, 1998). During Transport Canada's observational survey, children were considered to be properly restrained if: (i) for an infant seat: the harness was in use, the vehicle belt was used to restrain the carrier and the seat was installed facing the rear; (ii) for a forward-facing seat: the harness was in use, the child seat was secured with the seatbelt and the tether strap was used; (iii) for a booster seat: if the seatbelt was used to secure the seat; and finally a child 3 to 4 years of age was considered properly restrained if they were secured by a seatbelt (Transport Canada, 1997). Chouinard and Hurley (2005) have suggested that the rate of unrestrained children in 1997, in Canada's last roadside survey was about 13%. The critical, missing component of the 1997 survey data was that the weight and height of children were not used as an indicator to determine the appropriate restraint type and use, and misuse was based solely on age of the child (Transport Canada, 1998). More recent guidelines suggest that the appropriate CRD used for the child should be measured in accordance with the child's weight and height, rather than chronological age (Ramsey et al., 2000, Winston et al., 2000). Another limitation of the 1997 Transport Canada Survey was their operational

definition of appropriate restraint used for this survey. Children were using the appropriate restraint if children between the age of 3 and 4 were in a child seat, a booster seat or a seatbelt, and for children aged 5 to 9 years of age that they were in a booster seat or a seatbelt (Transport Canada, 1998). This is a limitation because the Ontario Ministry of Transportation recommends that children stay in a forward-facing child seat until they are 40 pounds, regardless of their age, and Transport Canada deemed a child to be appropriately restrained solely on their age (Ontario Ministry of Transportation, 2003). An additional limitation of the Transport Canada (1998) survey data was the method of data collection. A "drive-by" approach which provided very limited accuracy in measures of safety system use, since it only provided the observer with a moment to evaluate CRD use with very limited detail.

Programs need to be developed to increase parents' awareness of injury outcomes when children are not properly restrained in vehicles. More data needs to be collected following an MVC about the type of CRD used or misused for the child, the location of the CRD, etc. Knowing the results of a comprehensive assessment of CRD use during an MVC could assist in developing effective education programs around the proper use of CRDs, common errors made with CRDs, and proper transition times between CRDs.

Data on child restraint use in Canada (1998) revealed that "restraint usage was lowest for the 5 to 9 year olds" (p.3). Of the restraints used by children age 5 to 9 years old, 78.9% were restrained using an adult seatbelt, 15.4% were totally unrestrained, and only 4.5% were using a booster seat (Transport Canada, 1998). The 5 to 9 year old age group is the group that had the lowest appropriate use of restraints of any group and they also have the highest incidence of morbidity and mortality related to MVCs (Transport

Canada, 1998). In Canada, vehicle restraints have been legislated as mandatory since 1976 (Transport Canada, 1995). Until recently CRDs were only required for children by law from birth until they reach 18 kilograms (or 40 pounds). Thus, a child over 18 kilograms (or 40 pounds) according to this criteria was properly restrained in an adult seatbelt (Ontario Provincial Offences, 2000). However, on September 1st, 2005, new legislation in Ontario requires children to travel in a booster seat until they meet one of the following criteria: 1) the child turns eight years old, (2) the child weighs 36 kg (or 80 lbs), or (3) the child is 145cm (or 4 feet, 9 inches) tall (Ontario Ministry of Transportation, 2005). This new booster seat law may help to increase the use of booster seats in Ontario, and ensure that more children are properly restrained until they can sit properly in the vehicle using only a seatbelt.

Misuse

The most prevalent pattern of misuse involves the premature transitioning of a growing child into the next CRD or into an adult seatbelt (Ramsey et al., 2000). The literature suggests that many parents report that they are unsure what the appropriate age and weight is for their child to be in a booster seat, as well as they incorrectly identified the age at which it was safe for a child to use only a seatbelt (Rivara et al., 2001). The most common reason that children were transitioned to an adult seatbelt was that the parent perceived that their child was large enough to not have to use a booster seat (Ramsey et al., 2000). Parents' misconceptions about the appropriate CRD transition times, according to height and weight, is the most common reason why children are inappropriately restrained (Decina & Knoebel, 1997, Morris et al., 2000, Ramsey et al., 2000). Misuse of CRDs is very common for children traveling in vehicles. Types of

misuse include: (a) using the wrong CRD for the child, (b) improper installation of the CRD into the vehicle, and (c) poor use of positioning straps, harnesses, buckles and tethers.

Both parents and health care professionals report uncertainty as to the correct transition time for children from a forward-facing car seat to a booster seat (Berns et al., 2001). Most parents described discontinuing the use of their child's car seat between the age of 3 and 4 years old (Berns et al., 2001). Studies show that as the age of the child increases, or as the number of passengers in the vehicle increases the use of booster seats decrease (Ramsey et al., 2000). A large body of literature indicates that the most common reason that parents transition their child to a seatbelt is because the parents feel their child is the correct size to safely use a seatbelt (Morris et al., 2000, Ramsey et al., 2000; Safe Kids Canada, 2004). Studies have frequently shown that children at very young ages are being transitioned into adult seatbelts. Winston et al. (1999) found that few children between the ages of 4 and 8 years old were properly restrained for their age, and that use of an adult seatbelt started as early as age 2. Although Ontario's rates of CRDs are reported to be quite high, the effectiveness of the CRD may be hindered by the misuse or early transition of a child into an adult seatbelt (Transport Canada, 1998).

Another form of misuse is the incorrect installation of CRDs into vehicles. The findings from Transport Canada's 1997 observational survey estimated that at least 33 percent of child seats are installed incorrectly and that more than 30 percent of toddler seats are installed without a tether strap. In child seat clinics held across Ontario, four out of five child seats were either improperly installed or incorrectly used (Ontario Ministry of Transportation, 2003). Parents' uncertainty and frustration as to the proper installation

of CRDs into motor vehicles stems from the numerous models and styles of CRDs and confusion around how to install the different types into the many different vehicle interiors (Block et al., 1998, Murphy, 1999, NHTSA, 1998).

There are a broad range of available resources for parents to get product information on use of child seats. As an example, they may speak to sales personnel, family or friends who will all offer their own opinions regarding use of CRDs. Research suggests that only 50% of parents actually read the product manual on how to properly install and secure the CRD into the vehicle. However, the comprehension level and vocabulary of product manuals often exceeds the parents' ability to readily understand the information and follow the instructions (Block et al., 1998, Decina & Knoebel, 1997, Gaines, Layne & DeForest, 1996, Huggins, 2003, Margolis, Wagenaar & Molnar, 1992, Wegner & Girasek, 2003). Product manuals are often difficult to comprehend and this may contribute to the misuse of CRDs (Block et al., 1998). Block et al. (1998) also noted that families who acquired a second-hand or used safety seat reported that quite often the product instruction manual was missing. Studies by Bull et al. (1988) and Rivara et al. (2001) both reported that second-hand or used CRDs often did not meet safety standards for use in vehicles.

Installation and fit of the safety seat into the motor vehicle were other factors in parents' misuse. Parents expressed difficulty in fitting the CRD into the vehicle, fitting multiple seats into the vehicle and handling the bulkiness of the seats (Ramsey et al., 2000).

In today's society there is an increase of multi-vehicle families, which in turn requires parents to move CRDs from one vehicle to another. In addition, grandparents or

other caregivers are transporting children on a regular basis, and as such the CRD must be transferred from vehicle to vehicle (Snowdon et al., 2006). Decina & Knoebel (1997) reported that when a CRD is frequently moved between vehicles, there is a higher percentage of misuse. The time and inconvenience of moving a CRD repeatedly from one vehicle to another was also identified as a factor contributing to misuse (Campbell, MacDonald & Richardson, 1997, Ramsey et al., 2000).

Decina & Knoebel (1997) found that parents describe and rationalize not using a CRD because of their child's fussiness and discomfort. Other reasons parents report not using CRDs include: the child did not like the seat, the seat was uncomfortable, the child refuses to ride in the seat, CRDs are inconvenient, CRDs are difficult to use, and CRDs are too expensive (Biagioli, 2005; Geilen et al., 1984, Neumann, Neumann & Cockrell, 1974; Verrealt, Stulginskas & Keyl, 1982).

Another common misuse of CRDs addressed in the literature is that many parents admitted to owning a booster seat however, they also admitted to not using the seat for their children (Ramsey et al., 2000). With so many different brands and makes of booster seats, parents have expressed difficulty in making decisions about which booster seat to purchase (Margolis et al., 1992, Ramsey et al., 2000). However, the research is primarily focused on U.S. populations. In Canada, only 28% of parents with children reported using a booster seat (Safe Kids Canada, 2004). The actual use of booster seats is likely lower than 28%, as the 1997 Transport Canada observational survey found booster seat use to be less than 5% (Safe Kids Canada, 2004; Transport Canada, 1998). In a survey done by Safe Kids Canada (2004) they found that 53% of parents reported that they felt a

child was large enough at age 6 to use a seatbelt. This is a large area of misuse, as a child is too small to fit into a seatbelt properly at the age of 6.

In summary, the barriers to proper use of CRDs include: confusion about the appropriate weight and height for use of safety seats; lack of understanding of when to transition to safety systems; misuse of the CRD components (e.g. not using the tether strap); difficulty installing CRDs; uncertainty and frustration about which CRD to purchase; child's resistance to using the CRD; difficulty finding information on CRD use; the frustration of transferring the CRD from one vehicle to another; and finally parents transitioning their child to an adult seatbelt too early.

The literature demonstrates that lack of parental knowledge may contribute to rates of misuse of CRDs and this continues to be a major challenge. The actual MVC may not be the only cause of injury to the child, injury could also be attributed to the misuse of the CRD as well as the early use of an adult seatbelt. Improper use of CRDs increases the risks of injuries and death for children traveling in motor vehicles (Gaines et al., 1996).

Proper Use

CRDs can vary in their design, the direction they face, the method as to how they restrain the child, as well as their method of installation. However, when the CRD is used and secured properly, serious injury and death can be reduced by as much as 74% (Weber, 2002). The rapid rate of development in children requires the existence of several styles of CRDs to accommodate a child's growth pattern. Based on the literature, there are four specific times when transitioning a child to a new CRD would be appropriate.

According to the Ontario Ministry of Transportation (2003), Transport Canada, the American Academy of Pediatrics (2006) and the Children's Hospital of Philadelphia (2006), the best practice guidelines for transitioning a child in CRDs include: (1) a rear-facing infant seat used for children from birth to one year of age and 9 kilograms (or 20 pounds); (2) a forward-facing child seat for children between 9 kilograms (or 20 pounds) and up to 18 kilograms (or 40 pounds); (3) a booster seat for children from 18 kilograms (or 40 pounds) and up to 36 kilograms (or 80 pounds); and (4) a vehicle seatbelt is used when the child reaches 145 centimeters (57 inches) in height, weighs 36 kilograms (or 80 pounds) or more, and a sitting height of 74 centimeters (or 29 inches) (Berns et al., 2001; Ramsey et al., 2000; Weber, 2000). The next four sections will describe the CRDs use at each transition time: the rear-facing infant seat, the forward-facing seat, the booster seat and the vehicle seatbelt.

Infant Seats

Rear-facing restraint systems are used from birth to a weight of 8 kilograms (or 20 pounds) and the child is at least one year of age. The infant car seat is also referred to as a rear-facing convertible restraint or a rear-facing only restraint (Figure 1A and Figure 1B). The rear-facing only restraint type is designed to be used only as a rear-facing CRD. However, the rear-facing convertible CRD is designed to be turned around and used as a forward-facing convertible CRD when the transition time is appropriate. "Beyond weight, the effective limit for either type is the seated height of the child, the top of the head should not be above the top of the restraint device to minimize the risk of head-contact and neck-compression injury" (Weber, 2000, p. 6). Therefore, if an infant's height exceeds the top of the rear-facing seat, then a rear-facing convertible CRD should

be used until a weight of 8 kilograms (or 20 pounds) is reached. Both types of infant CRDs need to be anchored to the motor vehicle with the vehicle seatbelt or the L.A.T.C.H. (Lower Anchors and Tethers for Children) attachments. The harness straps or strap plus a shield must be properly secured at or below shoulder level and they should fit snugly to accommodate no more than one finger between the harness and the infant's collar bone. If the infant CRD has a chest clip, it should be placed at the level of the infant's armpits. Straps should be adjusted as the infant grows for both safety and for comfort. In a motor vehicle, the infant CRD should be installed in the centre of the back seat, away from air bags and the infant CRD always faces to the rear of the vehicle.

Forward-Facing Seats

Forward-facing CRDs are designed to accommodate children from 9 kilograms (or 20 pounds) to 18 kilograms (or 40 pounds) and a height of 102 centimeters (or 40 inches). There are two types of forward-facing CRDs: (1) combination child restraint booster and (2) forward-facing convertible (Figure 2A and Figure 2B). The forward-facing CRD allows the child to face forward in the vehicle, and there are two main steps to follow when using one: (1) the child needs to be correctly secured by the harness straps and (2) the forward-facing CRD needs to be correctly anchored to the vehicle seat. The harness should be secured at the child's shoulder level or slightly below, harness straps need to lie flat, and all twists and wrinkles should be removed (Infant and Toddler Safety Association, 2001; Transport Canada, 2005; AAP, 2006). The chest clips should sit at the child's auxiliary area level and they should be snug fitting, allowing only one finger to fit between the harness and the child. The forward-facing CRD should always be placed in the back seat of vehicles, and properly anchored to the vehicle. To ensure

the seat is properly anchored, the parent pushes the forward-facing seat down into the vehicle seat and pulls the vehicle seatbelt as tight as possible allowing only 1 inch of movement or less in any direction when the seat movement is tested after installation.

Booster Seats

Booster seats are to be used for children between 18 kilograms (or 40 pounds) and 36 kilograms (or 80 pounds) and at a height of less than 145 cm (or 4 feet, 9 inches). The primary objective of a booster seat is to provide the correct anatomical fit of the seatbelt to the child's physical frame (German, Gardner, Howard, Mackay and Letts, 1999; Winston et al., 2000). Booster seats are a type of CRD that are designed to raise the child up and forward from the vehicle seat to better facilitate the placement of the lap shoulder seatbelt over the top of the thigh and over the mid-clavicle respectively (Decina & Knoebel, 1997; Weber, 2000). There are two types of booster seats: (1) a low back booster and (2) a high back booster (Figure 3A and Figure 3B).

The correct fit of the child to the booster seat is very important. The lap belt must be snugly positioned flat across the child's upper thighs and the shoulder belt must cross the centre of the child's chest passing over mid-clavicle (Weber, 2000). Correct installation of the booster seat into the motor vehicle is a crucial step, and therefore referring to the instruction manual for the booster seat as well as the vehicle manual are necessary for ensuring correct installation.

Vehicle Seatbelts

Vehicle seatbelts are designed to fit 95th adult percentile male passengers (Transport Canada, 2005). Because children's bodies are still developing and growing, children are at greater risk of injury during an MVC as their bodies cannot tolerate the

same force as an adult body (Decina & Knoebel, 1997). A child should not be placed into a vehicle seatbelt until he or she weighs 36 kilograms (or 80 pounds) and has a height of 145 cm (or 4 feet, 9inches) (Ontario Ministry of Transportation, 2003) (Figure 4).

CRDs are not an alternative to a vehicle seatbelt, but rather are designed to fit with the preexisting vehicle seatbelt system to augment safety for child occupants. CRDs provide additional protection for children because of their smaller size and weight. The primary goal of the different types of CRDs is to provide appropriate positioning of the vehicle seatbelt around the child's physical frame in order to minimize occupant displacement and/or ejection during a crash (Berns et al., 2001; Weber, 2000). While it is safer in most cases for a child to ride in an ill-fitting CRD rather than no CRD at all, many injuries have been associated with ill-fitting CRDs (Winston et al., 2000). One of the major benefits of CRDs that Winston et al. (2000) identified was that if a child is prematurely graduated from a CRD to a vehicle seatbelt, it puts the child at greater risk of injury or death during a crash.

The first step in providing sufficient protection for children traveling in vehicles is to identify and follow the appropriate transition times. For the child to be properly protected while traveling in a vehicle, they need to be in the correct seat according to their weight and height. Use of an incorrect CRD, even if it is correctly secured and installed will only provide the child with minimal protection. It is important that children are transitioned at the appropriate times and into the appropriate seats to provide adequate protection when they are traveling in vehicles.

Legislation

In Ontario, mandatory restraint laws in vehicles have been in place and have been enforced since 1976. The law, in effect from 1976 to August 31st, 2005, stated that any child weighing more than 40 pounds (lbs) could be restrained in a vehicle with only a seatbelt (Ontario Provincial Offences, 1999; Transport Canada, 1995), however, this does not provide adequate protection for the child traveling in the vehicle. A new law came into effect, September 1st, 2006 requiring children to meet any one of the following criteria before transitioning to an adult seatbelt: (1) the child turns eight years old, (2) the child weighs 36 kg (or 80 lbs), or, (3) the child is 145cm (or 4 feet, 9 inches) tall (Ontario Ministry of Transportation, 2003). The effectiveness of legislation on use of CRD's has not been studied in Canada. The main limitation with the Ontario booster seat legislation is that guidelines suggest that the appropriate CRD used for the child should be in accordance with the child's weight and height, rather than chronological age (Ramsey et al., 2000, Winston et al., 2000). The new legislation, allows that a child in Ontario can be transitioned from a booster seat to a seat belt at 8 years of age, even though they may not be the correct weight and height to be properly restrained during an MVC.

In the United States, there are two types of enforcement for seat belt laws. The first type of law is primary enforcement which allows law enforcement officers to stop a vehicle and issue a fine based simply on observing an unbelted passenger. Secondary enforcement means that a law enforcement officer can only issue a fine for not wearing a seat belt if the vehicle has been stopped for another infraction, they cannot issue a fine based solely on observing improper vehicle restraint use. States with primary enforcement laws have achieved significantly higher usage rates than States with secondary enforcement laws (U.S. Department of Transportation, 1998). It may be that

enforcement legislation is a positive motivator for use of restraints. Traffic fatalities, in general, peaked in the 1970's, which led to the implementation of seatbelt legislation. A combination of factors over the years have helped to decrease the number of factors, including: interventions to get Canadians to use their seat belt; interventions to get Canadians to not drink and drive; improved safety standards; safer road designs; improved medical services and tougher police enforcement (National Scientific Advisory Committee, 2004). Canadian restraint laws are heavily enforced with fines and demerit points, which in turn can influence the cost of insurance. However, a recent Canadian study revealed that seat belt use among back seat passengers, who are predominately children and youth, was less than 60% (Safe Kids Canada, 2004).

Intervention Studies

In Canada and the United States there have been several different types of interventions and programs such as: car seat clinics, car seat inspection clinics, public health programs, Project Safe Kids, and Boost America, which have targeted education and training for child care providers, teachers, health care providers as well as neighbourhoods and community organizations about vehicle safety for children. However, these types of interventions and programs are very limiting as they focus solely on vehicle inspections and not specifically on increasing parental knowledge of CRDs. Currently there is no unified education program about CRD use, and there is no consistency in public awareness about CRD use from governments, law enforcement, health care providers, and automobile manufacturers.

Intervention Research

To date, there have been several intervention studies which test and develop strategies to promote and teach about the use of restraints for children when traveling in a motor vehicle. One American study looked at CRD use by observing the parents placing the children into the CRD, before traveling in the motor vehicle (Gaines, Layne & DeForest, 1996). A two-day training and education session for health care personnel was required so they could detect use error, and to give information and education about correct utilization (Gaines et al., 1996). The health care personnel set up safety checks at various locations such as: day care centers, shopping malls and health fairs. During the safety checks, health care personnel only described to the parents the errors noted in CRD use as they were not certified to physically correct the misuse themselves (Gaines et al., 1996). The types of errors most commonly reported were: failure to stabilize the seat with the locking clip, misplacement of the vehicle seatbelt across the child's neck or under the arm, child seated in the most hazardous location in the car and, non-use of CRD for their child (Gaines et al., 1996). From this study, researchers learned that parents "will not master all the material after a simple reminder or even after one educational session" (Gaines et al., 1996, p.151). Study findings suggest that CRD use should become part of every health assessment as this may increase parents' awareness of risks and the importance of proper use of CRDs. The findings also suggested that text in any educational materials needs to be simple, clear and accurate, and that illustrations would be very beneficial.

A similar intervention study was recently carried out using home visiting nurses, where the nurses visited a number of both rural and urban homes and assessed CRD

misuse through observation as mothers prepared their infant or toddler for vehicle transport (Block et al., 1998). The study taught the mothers proper CRD use through verbal instruction and demonstrations using the family vehicle (Block et al., 1998). The training for each visiting nurse involved extensive instruction regarding the use of CRDs and on the multiple models of CRDs that are available. The findings from this study found that: the home visits took longer than expected, three-quarters of CRDs were incorrectly used and one third of the mothers were aware of their incorrect use (Block et al., 1998). Neither of these two studies offered longitudinal data to measure the persistence of the learned skills and the retention of information of the mothers (Block et al., 1998, Gaines et al., 1996).

Another study promoted vehicle safety through a five day educational program for preschoolers (Arneson, & Triplett, 1990). Following the study, the researchers found that in general children were more knowledgeable after the education program, however, the use of seatbelts remained unchanged in this study (Arneson & Triplett, 1990). This study demonstrated that an educational intervention on its own is not sufficient to change behaviour (Arneson, Triplett, 1990). Consistent with a study by Hazinski, Eddy and Morris (1995) the study concluded that a comprehensive school-based intervention program targeting Kindergarten to Grade 2 students resulted in an increase in seatbelt use among children and their parents. Most intervention studies to date have been limited to the United States' population. Canadian intervention studies have not yet been documented in the current literature.

Clinical Significance

To date, literature regarding CRDs has focused mainly on use, non-use and misuse. One of the large gaps in the literature is a lack of parental knowledge around the proper CRD transition times and the risks associated with the early transition of children from CRDs to an adult seatbelt. Ramsey et al. (2001) found that transitions out of a CRD to an adult seatbelt can begin as early as one year of age. According to the normal growth and development patterns of children, the average child should not transition to an adult seatbelt until they are nine years of age or older (Wong, 1999). A child should be transitioned from a CRD to an adult seatbelt based on their weight and height as opposed to their chronological age.

The majority of research about CRDs has been based in the United States, and although Canadians share a similar lifestyle to Americans, patterns of CRD use and misuse vary significantly and this limits generalizability of U.S. findings to Canadians (Gaines et al., 1996; Margolis et al., 1992; Transport Canada, 1998). Transport Canada's 1997 Child Restraint survey data is limited due to their operational definition for appropriate restraint and that it was a purely observational, "drive by" survey.

While children are traveling in motor vehicles it is critical that they are traveling in the appropriate CRD based on their height and weight. Ramsey et al. (2000) identified that it was important to promote CRD use to school aged children as well as educate parents about the risks of lap-shoulder belts. Most parents are receptive to learning which car safety seat is best for their children. The first step to providing a safe environment for children while they are traveling in a motor vehicle is that they are properly restrained in the correct seat. The CRD should be chosen based on the child's

height and weight, not solely on their chronological age. Parents/caregivers need to be educated on CRD transition times so they can make an informed decision about when to move their child into the correct seat.

"Motor vehicle crashes are one of the most common causes of preventable childhood injuries and fatalities" (Stokes et al., 2000, p. 875). Health care professionals need to work together to create effective strategies to reduce the number of preventable injuries and deaths of children who are involved in an MVC. Parents and caregivers need to be educated about the correct CRDs as well as the correct times to transition their child to the next CRD. This purpose of this study was to test the longitudinal effectiveness of an education program for parents in relation to children's safety when traveling in motor vehicles. To date, there have been no longitudinal intervention studies in Canada or the U.S.. Yet, "the consistent and proper use of restraint systems by infants and children in passenger vehicles can prevent hundreds of deaths and thousands of injuries each year" (Weber, 2000, p. 20).

CHAPTER III

THEORETICAL FRAMEWORK

Neuman's Systems Model

The theoretical framework that guided the theoretical context for this research was the Neuman Systems Model (Neuman & Fawcett, 2002). When a child is inappropriately restrained or is not using a child restraint device (CRD) in a vehicle, and that vehicle is involved in a motor vehicle crash (MVC), it can potentially lead to injury, trauma or even death. The Neuman Systems model is a model that uses a systems approach to examine health (Neuman & Fawcett, 2002). The model uses a systems approach to examine health challenges such as injury prevention for children (Neuman & Fawcett, 2002). This systems approach to health promotion/injury prevention will be used in this study to try to prevent the potential for injury, trauma and death among children following a MVC, by promoting the appropriate and proper use of child restraint devices.

In this study the child is viewed as a member of the family system whose primary focus is the health, safety and well-being of the child as they grow and develop over time. The purpose of this intervention was to support a child's safety while traveling in vehicles by enhancing parents' knowledge of correct use of child restraint devices for children 0 months of age to 12 years of age. The safety of children when they are traveling in vehicles is related to parents' knowledge of safety seats and their decision to use safety seats for their children. The parent-child interaction is viewed as a dynamic component of the family system, which directly influences a child's safety and well-being. Parents function within the larger family system and make numerous decisions to

engage in health behaviours in order to protect their children from harm and ensure the family system remains healthy and strong.

The family system in this study is viewed as part of the larger community system in that in the community there are resources such as car seat clinics, health professionals (physicians, nurses, health units) which are all valuable resources and excellent sources of information for parents to strengthen the lines of defence against injury within the family system. The community system can also function as a support system for the family should the family system be involved in a motor vehicle collision. The community provides the support necessary to assist the family to strengthen their lines of defence and return to a normal system state, or an enhanced system state (Neuman & Fawcett, 2002).

The community functions within the Canadian health and social system. In the event of a motor vehicle collision, a family will interact with the Canadian health system which will work to strengthen the lines of defence and return the family system to its normal state. The Canadian health system also works to prevent motor vehicle collisions by providing education and information to the family system about child safety seats and the importance of their use, which helps to strengthen the lines of defence. In addition, the Canadian social system supports the enforcement of the child passenger laws to ensure children are properly restrained while traveling in vehicles with the goal of preventing injuries or deaths, thereby strengthening the family's lines of defence. The Canadian social system also supports low income families to obtain safety seats, which in turn can mitigate the environmental stressors related to children who are improperly restrained in vehicles. There are many systems associated with vehicle safety for

children and each contributes to enhancing the family systems' lines of defence to prevent or mitigate the potential for injury, trauma or death.

The Neuman Systems Model describes ten assumptions; six of these assumptions were used to provide the theoretical context for the study. The first assumption states that individuals and groups are unique, and although each system is similar in its basic structure, there are different characteristics to each system (Neuman & Fawcett, 2002). In this study, the system is a family system and although one might be inclined to say that a family is a family, all families are different in that some are single parent families, in some families the grandparents act as the main caregivers, etc. Although the basic structure of the family, i.e. parents and children and their needs are all similar, each family is unique.

The second assumption of the model is that the client is constantly interacting with the environment (Neuman & Fawcett, 2002). In this study, the family is constantly interacting within the vehicle environment as they travel with their children on Ontario roadways. It is assumed that both parents and children interact with each other within the vehicle environment. Specifically, the interactions within the vehicle include what child seat or safety restraint is used for each family member, where the child is seated in the vehicle, and in what type of vehicle they are traveling.

The third assumption is that there are many "known, unknown, and universal environmental stressors" within a system (Neuman & Fawcett, 2002, p. 14), and each can affect the family system in different ways. For example, when the family system interacts with the environment and is involved in a motor vehicle collision, the collision is a negative stressor that impacts on the child and the family system. The stressor of a

vehicle collision is typically unknown to the family system as it was not a planned event and the stressor is universal because any individual traveling in a vehicle is at risk of being involved in a motor vehicle collision. The injuries sustained by the child or parents during the collision are most often serious and disabling injuries that impact the health and well-being of family members for many years. In the event of a death, the psychological and emotional impact often has devastating effects on the family system. The intervention in this study was designed to strengthen the lines of defence by educating parents on the proper transition times for children and perhaps help to prevent the stressors related to an MVC.

The next assumptions can be combined, in that each system has a normal range of responses to the environment, and when the lines of defence can no longer protect the system from the environment, the system will react in a negative way until the system's lines of defence are rebuilt or strengthened (Neuman & Fawcett, 2002). The death of a child or any family member is a life changing stressor that changes the family system, causing a breakdown in the lines of defence, which requires significant time and energy to strengthen and rebuild in order for the family system to regain its functioning. The study aims to educate and raise parents' awareness of the importance of accurate use of restraints for their children when they are traveling in vehicles. Ultimately, the devastating impact of very serious injuries or death of a child may possibly be prevented.

The final assumption of the Neuman Systems Model that is related to this study is "primary prevention relates to...the identification and reduction or mitigation of possible or actual risk factors associated with environmental stressors to prevent possible reaction" (Neuman & Fawcett, 2002, p.14). The risk factors associated with injury and

death due to vehicle collisions include: little awareness of the risk, limited knowledge of correct use of safety seats, and the impact of children's influence on parents' decision to use safety seats while traveling in vehicles. The goal of this study is to better educate the family system in hopes that parents will use the information to properly restrain their children. If children are properly restrained while they are traveling in vehicles, they are less susceptible to serious injuries and death in the event of a motor vehicle collision than their improperly restrained counterparts. This potential for the reduction of the injuries of children and possible death associated with a motor vehicle collision, in relation to the family system can be seen as a reduction or mitigation of a possible environmental stressor.

Limitations of the model include, that the model focuses mostly on the individual and the individual system, "the client as a system represents an "individual", a "person", or "man"" (Neuman & Fawcett, 2002, p.15). The model, as shown in Appendix A, focuses mostly on an individual and how an individual's system is protected by lines of defence and affected by stressors. However, Neuman & Fawcett (2002) do state that the system may also represent more than one person, such as a family, a community or a social issue. Neuman & Fawcett (2002) identify that the systems model can be applied either to a narrowly defined system, such as a family, or to a more broadly defined system, such as a community or a country. In this study, the Neuman model was used specifically to apply to the family system as they travel in vehicles.

In this study the Neuman Systems Model will be used to define the family system. A diagram of the model can be seen in Appendix A. The centre of the diagram in Appendix A is known as the basic structure. Neuman and Fawcett (2002) describe this as

the "basic survival factors common to the species, such as variables contained within it, innate or genetic features, and strengths and weaknesses of the system parts" (p.17). The concept of the basic resources in this study relates to the parents' knowledge of the correct use of child safety seats, as well as the awareness of the risk of injury for children traveling in motor vehicles who experience motor vehicle collisions. Another basic resource of the family system is the community enforcement of the Ontario child safety seat legislation. Enforcement of safety seat laws reinforces correct use through negative consequences such as fines or demerit points for the driver. Another basic resource that the family system has and needs is the financial resources to purchase a safety seat for their child.

Neuman & Fawcett (2002) describe the lines of defence, be it flexible or normal, as a protective element of the system, used to prevent the invasion of stressors to the system. The lines of defence for the family system in this model relate to the information available to parents, such as through the government, from health professionals, car seat clinics, etc. The information that is available to parents provides the family system with the ability to enhance their knowledge and ensure that their child or children are properly seated when they are traveling in a vehicle. The knowledge does not necessarily elicit a change in behaviour but provides the family system with information to support their safe use of safety seats for their children while travelling in vehicles. If parents are aware of the risks of improperly restraining a child in a vehicle, the parents as well as the family system can make an informed, knowledgeable decision.

The Neuman Systems Model views stressors as a "tension-producing stimuli or forces occurring within the internal or external environmental boundaries of the system"

(Neuman & Fawcett, 2002, p.21). The stressor can have either a positive or a negative outcome however this largely depends on the client's perception and ability to manage the effects of the stressor (Neuman & Fawcett, 2002). Stressors in this study relate to the serious injuries sustained by children in MVCs because of misuse of child safety seats. In Canada, approximately 10,000 children under the age of 12 are injured and over 90 children die every year as a result of vehicle collisions (Transport Canada, 2002). In Canada and the United States, motor vehicle collisions are the leading cause of death of children between the ages of 2 and 14 years of age (Transport Canada, 2004; National Highway Traffic Safety Administration (NHTSA), 2002).

The Bobby Shooster educational intervention is designed to educate and provide the family system with the ability to strengthen its lines of defense. In an earlier study, the intervention significantly enhanced parents' knowledge of correct use of safety seats as a strategy to protect the basic structure of the system (High, 2005). Ideally the strengthened lines of defense will assist parents in correctly seating their children when they are traveling in vehicles, and thus help to prevent stressors to the family system such as the serious injuries and death that may occur if children are improperly seated in vehicles during a motor vehicle collision. This study examines the long term effectiveness of the education program on families' knowledge and correct use of safety seats for their children.

CHAPTER IV

DESIGN AND METHODOLOGY

Research Design

A longitudinal, multi-site intervention study that used a pre-test, post-test quasi-experimental design (Polit & Beck, 2004) was conducted in four Ontario cities to test the effectiveness of the Bobby Shooster education program for parents and their children. A one group pre-test, post-test design is a design that involves one set of measurements taken before and after the group receives treatment. This measurement of the group before and after the intervention determines the effectiveness of the treatment (Polit & Beck, 2004), a longitudinal measure of treatment outcomes strengthens this design. This study examined the longitudinal outcomes of the educational intervention with parents in Ontario Early Years programs one year following the implementation of the educational intervention.

Research Hypotheses

The following hypotheses were tested in this study:

Hypothesis 1: Parental knowledge of the correct child restraint device for the child's weight and height will be maintained or be greater than their pre-test knowledge one year following the intervention program

Hypothesis 2: Rate of correct use of safety seats for the study participants will be greater at one year following the intervention program than at the pre-test rate of correct use.

Setting

This research study was conducted in 4 cities across Ontario. Two cities were moderate sized urban cities, Windsor, with a population of 208,402 (Statistics Canada,

2002) and London, with a population of 336,539 (Statistics Canada, 2002). The study also included two small rural communities, Chatham which has a population of 107,341 (Statistics Canada, 2002) and North Bay with a population of 52,771 (Statistics Canada, 2002).

Participants were recruited from community literacy programs (Early Years Centres) that are provincially funded to support early literacy development in Ontario. This setting allowed researchers to access both parents and their child/ren as they were attending the literacy program. Post-test surveys were provided to the parents to be returned by mail, however due to a low rate of returned surveys, parents were contacted via telephone to answer the post-test questionnaire. Again, at the one year post-test parents were contacted via telephone either at home or at the number they provided on the consent form.

Sample

A convenience sample of 450 families was obtained from community literacy programs across 4 cities. A sample size of 418 families with complete data sets reported on use of safety seats for 732 children. To participate in the study, parents had to have one or more children attending the community literacy programs. Permission to approach the parents to participate in the study was requested through the administrator in charge of the community literacy program. Selection criteria included: parents were able to speak and read English, and the parents had to have at least one child.

Parents were approached to participate in the research study first by the staff at the Early Literacy programs to inform the parents that the study was taking place and to ask permission for the parent to be approached by the researcher. Following this

approval, the researcher approached the parent to introduce themselves and obtain consent and collect the pre-test survey data. While obtaining consent for the initial pre-test and post-test, parents were asked to consent to participate in a one year follow-up survey. Parents who had consented to be contacted for one year follow-up were contacted via telephone. The parents' consent to be contacted one year later was reviewed and was completed by telephone interview.

Intervention Program

This intervention program was developed based on earlier survey investigations which were part of the larger AUTO21 study. In the larger survey study, 2,199 children were described by their parents in terms of how parents were using vehicle safety systems and parents knowledge of vehicle safety system use. Based on the previous findings of the early survey phase of the research, four patterns of misuse were clearly identified: (1) incorrect CRD used for the height and weight of the child; (2) poor fit of the child in the CRD; (3) child seated in the inappropriate location of the motor vehicle; and (4) widespread premature transition to new CRD (Snowdon, Polgar, Patrick, Stamler, 2006).

The intervention program was developed around three key concepts: (1) correct use of safety seats in vehicles; (2) accurate decision making regarding transitioning children into new safety seats; and (3) pertinent information regarding injury outcomes for children traveling in vehicles (Snowdon, et al.). These three key concepts provided the framework for the intervention program as well these concepts were incorporated into the learning strategies and materials used for the parent education intervention.

Development of the Intervention Program: Preliminary Focus Groups

Education materials should be meaningful to enhance parents' learning, therefore two pre-intervention focus groups were conducted (High, 2005). The purpose of the parent focus groups was to generate strategies perceived to be most meaningful for parents. Focus groups were used to seek parent input in validating learning strategies in order to select appropriate teaching strategies for the parent education package. Two focus group sessions comprised of parents with young children, grandparents, expectant parents, and health care providers were conducted (High). Each group consisted of ten to fifteen individuals assembled together for a group discussion on the topic of child seat safety in motor vehicles (Polit & Beck, 2004). Information flyers were displayed in hospitals, at drug stores and at churches, inviting individuals to participate in the focus group discussions.

The focus groups were approximately one hour in length. A written set of questions was established to guide the discussion for the focus groups (Polit & Beck, 2004). The following questions were used to guide the discussion: (a) what motivates you to learn? (b) tell us how do you like to learn? and (c) how do you remember important things? Information gathered from the focus group discussions was used in the development of education materials for the parent education package (High, 2005). Some common trends which emerged from the focus group discussions included: "use shock, but not real life situations", "give simple straight facts and statistics that are easily remembered", "use materials that a parent can interact with their child or children with", use "visual reminders", make me feel guilty, "parent guilt" will make me want to know more, and repetition is helpful (High).

Intervention Program

The findings from the focus group guided the design of the intervention. Education materials used to facilitate and support learning included (High, 2005; Snowdon, et al., in press): (a) a storybook titled, "Bobby Shooster Rides Safely in His Booster" intended for the parent and the child to read together and learn about car seat safety. The main plot of the story is finding the correct car seat; (b) a parent learning guide to be used with the storybook "Bobby Shooster Rides Safely in his Booster". The parent learning guide was designed to increase parental knowledge of the safety concepts being taught throughout the storybook; (c) a CD ROM presentation including factual information as well as a slide presentation titled, "What Parents Need to Know About Car Seat Safety." The slide presentation stressed the importance of using appropriate car seat systems, and illustrated the correct seat use for height and weight of the child and video clips demonstrated the proper installation of each type of CRD incorporating key correct fit points for the parent; (d) a "Car Seat Safety Chart" a height and weight chart explaining the concept of transition times to move a child from one CRD to the next CRD; (e) a fact sheet which gave hard facts of pertinent information regarding MVCs as well as injury outcomes; and (f) a "Do's and Don'ts" list which incorporated the most important do's and don'ts regarding child vehicle safety and correct car seat use.

Storybook and Parent Guide:

The storybook entitled, "Bobby Shooster Rides Safely in his Booster" was developed for the intervention. The purpose of reading the storybook was to teach the children about the important concepts of vehicle safety when riding in a motor vehicle. The parent's version of the storybook included pages with additional explanation and

reinforcement of key points of car seat safety described in the story. This additional explanation and reinforcement supported the adult learning principle of motivation. Motivation is enhanced by the way in which material is organized, "best organized material makes the information meaningful to the individual" (Redman, 1993, p. 34). Parents were motivated to keep their children safe; the parent's guide facilitates the parent's ability to connect the concepts of vehicle safety for children with the important messages being communicated in the story. Motivation was also supported by the feedback provided in the focus groups, which said that learning would be facilitated through materials that encourage interaction between the parent and child.

CD ROM:

A CD ROM was provided in the parent education package as an executable file so that parents simply clicked on the file icon and the presentation began automatically. The CD contained a six minute clip of a simulated motor vehicle crash using an anthropometric computer generated child to see what happens during a minor collision. The video clip showed both a rear and forward-facing crash scenario, and clearly depicts the force a child sustains during a crash. The CD also provided video clips with permission from Children's Hospital of Philadelphia (CHOP) that instructed parents on the installation and correct use of safety seats. The powerpoint presentation on the CD included key points such as; motor vehicle crashes are the leading cause of death of children in North America; 82% of child safety seats are not properly used; if not used properly paralysis, irreversible brain damage, and even death can occur due to injuries. One of the most common developments from the focus group was the parent's discussion around the use of shock. Several of the participants within the focus groups stated that,

"shock is a good way to get a parent's attention." By demonstrating the crash impact and injury outcomes for children during an MVC, the principle of stimulation and affect are relevant. Stimulation and affect were strategies used to highlight important factors when an individual experiences a reaction when learning something (Redman, 1993).

The Car Seat Safety Chart:

The "Car Seat Safety Chart" was the same chart that the child and parent read about in the storybook. The "Car Seat Safety Chart" was a tool that the parents used with their children to measure their height and weight as they grow and require different types of safety seats or a seatbelt. The chart is a specialized growth chart that illustrated the concept of safe transition times.

Fridge Magnet:

The fridge magnet displayed the same information as the "Car Seat Safety Chart", however, the fridge magnet transition time information was displayed in more of a quick reference structure. The fridge magnet served as a quick reminder for parents, and parents were encouraged to place the magnet on their fridge. Accurate transitioning of children was a key concept for parents to understand and use to make an informed decision in the selection of the appropriate car seat for their child(ren).

Both the "Car Seat Safety Chart" and the fridge magnet supported the adult learning principle of repetition and reinforcement (Redman, 1993). This was reinforced by the focus group feedback when the participants referred to the importance of visual reminders in adult learning.

Fact Sheet and the "Do's and Don'ts" List:

The fact sheet as well as the "Do's and Don'ts" list displayed the most important information parents needed to remember about child vehicle safety. Both the fact sheet and the list were short and succinct. The fact sheet and the list were used to remind parents of risks associated with motor vehicle collisions (MVC) and the most important points of child car seat use. These educational tools employed the learning concept of reinforcement. Reinforcement is valued by the participants if it is attached to key concepts being learned (Redman, 1993). Both of these education tools were identified by the focus group comments of "give me simple straight facts and tell me what the most important things are to remember" (High, 2005).

The goal of the intervention was to increase parents' knowledge of child vehicle safety relative to knowledge of injury outcomes of MVCs, the correct use of the CRD, and the appropriate transition times for a child from one CRD to the next. This intervention, therefore provided parents with multiple tools to use in their decision-making to ensure children were positioned appropriately in the correct CRD, that the child fits correctly into the CRD, and the correct location of the CRD in the motor vehicle.

Instrument

The questionnaire, used in the pre-test and the post-tests, was developed as part of a larger AUTO21 program of research. The instrument went through extensive validation; and questions were clarified and re-designed to add clarity and to ensure they captured the variables and information being examined. The questionnaire entitled, "Infant and Child Car Seats: A Survey of Parents' Knowledge and Use" contains 5

sections (Appendix C). All questions on the questionnaire were close-ended questions that used Likert type scales and short answer questions. Section 1 examined parents' general knowledge of safety seat use. In the second section parents reported on the safety seats they used for their own children. Section 3 examined the location of the car seat in the vehicle and where the child sits in the vehicle. Section 4 determined what sources of information parents used to learn about safety seats, and section 5 asked general demographic questions. The pre-test questionnaire included all 5 sections listed above, however, both the 6 - 8 week post-test (Appendix D) and the 1 year post-test (Appendix E) used only section one and section two as information from section three, four and five has already been collected at the pre-test. The one year post-test asked parents to identify which safety seat they were using for their children, as well as the current age, weight and height of the child in order to examine changes in correct use during the one year follow up period. Measuring correct use on the one year post-test test allowed for a comparison between the pre-test use and one year post-test use in order to measure the impact the intervention had on the rate of correct use. As this was the final contact with the participants, the one year post-test included an additional section, which examined the participant's opinions and thoughts about the ease of use of the intervention.

Procedure

Initially parents were approached by the staff at the Early Years Literacy programs to inform the parent of the study and to get permission for the researcher to approach them to discuss the study and obtain consent. Following this, the researcher approached the parent and introduced themselves, explained the study and obtained consent and collected the pre-test survey data. In most cases parents completed the pre-

test survey independently, some parents requested the survey be administered for ease of responding to questions. The pre-test survey was developed based on previous research. The survey consisted of five sections, which were as follows: Section 1 examined parent's general knowledge about child safety seat use, in Section 2 parents described their child or children's current use of safety seats, Section 3 determined the location of the car seat in the vehicle and where the child sits in the vehicle, in Section 4 parents described what sources of information they were using to learn about safety seat use, and the final section included general demographic questions. All questions on the survey were closed-ended questions that used Likert type scales or short answers.

Once the parents had completed the pre-test, they were shown a PowerPoint presentation about correct use of safety seats. The presentation specifically addressed: (i) risk of injury outcomes; (ii) weight, height and age requirements for each car seat; (iii) instruction on how to use the growth chart; and (iv) reviewed the story book with the parent information guide. The teaching session was individualized for each parent and lasted approximately 3 to 5 minutes. At the end of the presentation, the researcher reviewed the education package with the parent. The parent was then given an intervention learning package that contained the "Bobby Shooster Rides Safely in His Booster" story book, a children's activity book, an interactive growth chart, a CD rom presentation for parents and a fridge magnet that reviewed correct transition times. Parents were asked to review the materials and within 6 to 8 weeks to mail back the post-test questionnaire that was in the learning package.

The post-test questionnaire was a repeat of section 1 of the pre-test questionnaire. Due to a low response rate (25%) of participants returning the post-test questionnaire by

mail, participants were contacted via telephone to complete the post-test questionnaire. As the participants answered the post-test questions, the researchers recorded their responses onto the post-test instrument. The participant's responses on the pre-test and post-test were compared to evaluate the effectiveness of the intervention.

A research log was maintained of participants' response rates and at the 1 year post-test interval, participants were contacted by research assistants via telephone to complete the 1 year post-test interview. Four research assistants were trained and given the contact information to complete the one year post-test telephone interviews. Calls were tracked, by the research assistants, as to whether the parent participated in the one year post-test, declined to participate in the one year post-test or were unavailable. Any changes to contact information were recorded. Parents who chose to participate were asked the one year post-test questions over the phone and their responses were recorded onto the post-test. To ensure consistency, in follow-up calls, all research assistants were given one training session and one review session prior to collecting data. During the training session the research assistants were given a telephone interview script (Appendix F) and a one year post-test questionnaire (Appendix E) and these were reviewed and practiced several times with the Researcher. The research assistants were instructed to practice reading through the questionnaire a few times prior to attending the review session. At the review session, research assistants met again to review the script, and to address any questions. Research assistants were then given lists of participants to contact to complete the 1 year post-test questionnaire. The research assistants were instructed to record the participant's responses onto the post-test questionnaires. The 1 year post-test questionnaire included section 1 (Parents knowledge about child safety seat use) and

section 2 (Parents describe their child or children's current use of safety seats) from the original pre-test.

Data Analysis

All data analysis procedures in this study were performed using SPSS version 14.0. The demographic data of the participants, both parents and children, includes categorical, ordinal and interval level data. General frequencies and descriptive statistics were performed and used to describe the sample (Polit & Beck, 2004).

To evaluate the effectiveness of the intervention, two approaches were used to ensure that the outcomes of the study were fully examined. The data violated the assumption of normality and thus a nonparametric test was used. The Friedman two-way analysis of variance is a nonparametric procedure used to determine the magnitude of differences between repeated measures samples (Burns & Grove, 2001). The Friedman's two-way ANOVA was used to examine the parents' knowledge as well as their confidence with the age, weight and height to transition a child between safety seats. Parents' responses were coded as either correct or incorrect. The data was from the same sample of participants, tested at 3 different time points (pre-test, 6 week post-test, and 1 year post-test). Friedman's two-way ANOVA identifies significant differences between the 3 time points, however, it does not specifically identify where the differences are. This was a large sample and therefore a Friedman's ANOVA will output a chi-square value as opposed to an F value (for small samples). The chi-square value is the difference between the value obtained in this study and the expected value (which is that there is no difference between the groups). If the difference between the two is a small number the findings will not be significant, however, the larger the difference between

the two values, this will yield a smaller p-value, meaning there is a significant difference. (Polit & Beck, 2004).

A p-value of 0.05 is considered acceptable in most disciplines of research, and was used an an acceptable indication of a significant finding. A small p-value such as 0.001, provides strong evidence that these results did not occur by chance. Having a p-value of 0.001 indicates that 1 out of 1,000 times, the difference in parent knowledge may be due to chance rather than a direct result of the intervention (Polit & Beck, 2004). To determine more specifically where the differences are, the sign test was used to evaluate the change in participants' knowledge concerning safety seat use and the change in parents' confidence with the decision to move the child to the next car seat. The sign test "is a non-parametric test that can be used to compare two paired samples" (Polit & Beck, 2004). The sign test was used because the data is categorical and the groups are dependent (Polit & Beck, 2004). Categorical data is data which is assigned to categories, in this study parents responses were assigned to one of two categories, either correct or incorrect. Because the same participants were used at three different time points, the groups are dependent, which means that participants are acting as their own control group (Polit & Beck, 2004). The parents' scores were examined for both positive and negative changes in parent knowledge indicators from pre-test to six week post-test and pre-test to one-year post-test. If the differences are predominantly of one sign, then that is taken as evidence against the null hypothesis, meaning that the results are significant (Polit & Beck, 2004).

To determine whether safety seats were being correctly used, parents were asked on the pre-test and the one year post-test to identify their child's current age, weight,

height and the current restraint type that their child was using (i.e. rear-facing seat, forward-facing seat, booster seat or seatbelt). To determine whether there was a significant change in correct use from pre-test to one year post-test, the McNemar Test for Significance of Change was used. The McNemar Test is a nonparametric test used with dichotomous variables to determine changes particularly with pre-test-post-test designs (Burns & Grove, 2001). A dichotomous variable is a variable that has only 2 possible values, in this study parents responses were either coded as correct or incorrect. The t-test was not used as a method of analysis in this study as the assumption of normality was violated, however, the McNemar test is does not require the assumption of normality (Burns & Grove, 2001). McNemar's Test was used to examine the extent of change in correct use from pre-test to one year post-test, if the proportion of changed responses in one direction is sufficiently greater than what would be expected by chance, the null hypothesis is rejected, and there is a significant change (Burns & Grove, 2001).

Validity and Reliability

Content validity addresses the appropriateness of the instrument items as they relate to the particular constructs under investigation (Polit & Beck, 2004). The questionnaire utilized for this research study had been previously used in a much larger research study in which the construct of vehicle restraint use was thoroughly examined and supported (High, 2005; Snowdon, et al, in press). Content validity was supported in a series of pilot studies done on the survey instrument. Initially, the instrument was administered to 120 undergraduate nursing students who were asked to identify questions that they felt were difficult to answer or difficult to understand. From this first pilot test, necessary changes that were identified were made to the new survey, it was then again

administered a second time to a different class of 100 undergraduate nursing students. Following this second pilot test, the survey was administered a third time. This third pilot test involved a community group of 25 parents who had children under 9 years of age. The instrument was revised and distributed to an expert panel for evaluation. The expert panel consisted of reviewers who were very familiar with the issues of motor vehicle occupant safety and injury outcomes related to MVCs. The feedback from the expert panel concluded that the instrument content was reflective of the intended construct.

Threats to internal validity of this study include the effect of history, selection effect, maturation, and testing effect. History refers to the occurrence of external events that take place concurrently with the independent variable that can also have an effect on the dependent variable of interest (Polit & Beck, 2004). Since this study commenced in February 2004, various external events have taken place that may have affected parents' knowledge. In April 2005, the Ontario Ministry of Transportation held its 2005 Spring Seatbelt Campaign, which focused on promoting the consistent and proper use of child car seats and booster seats. The 2005 campaign had a particular focus on booster seats as the province tried to inform residents of the upcoming changes to the law. On September 1st, 2005 Bill 73 was implemented, and now requires that before moving a child to a seatbelt, the child must remain in a booster seat until they meet any one of the following criteria: (i) the child turns eight years old, (ii) the child weighs 36 kg (or 80 lbs), or (iii) the child is 145 cm (or 4 feet 9 inches) tall (Ontario Ministry of Transportation, 2005). As well, there have been car seat clinics running on a regular basis in all 4 of the study cities since the intervention study was first implemented. These car seat clinics provide

parents with a consistent source of safety information where they can go to have the installation of their car seats checked as well as receive information about car seats. Parents attending a car seat clinic in any of the four cities may have received additional information, had the proper transition times for children reinforced and the clinic may have served as an important reminder as to whether their child was correctly seated in the vehicle.

Selection effect could also be a threat to internal validity. In this particular research, participants chose to participate or not to participate in the study. That being said, parents who chose to participate may have been more motivated to learn more about car seat safety, and this population may be not reflective of the general population. Parents in this study were highly educated (53.7% have either a College diploma or a University degree) when compared with the 2001 Canadian Census data, which indicated that in Ontario 42.5% of parents have either a College diploma or a University degree (Statistics Canada, 2002). Social desirability may also have influenced the study findings. Participants in the study may have responded to questions relative to what answers they felt the researchers may have been looking for rather than what the participant's actual knowledge of vehicle safety might have been. The questions on the pre and post-test instrument used hypothetical situations in order to minimize social desirability in the participant's answers. For example, parents were asked "at what age, height and weight should you tell your family member that they can move their child to a booster seat?" Since parents did not have to report on their own behaviour relative to their child's use of CRDs, they may have been less likely to be concerned about what the "correct answer" was and have answered honestly. When parents were given instructions

about completing the pre-test they were encouraged to respond to questions based on their own knowledge.

Another threat to internal validity is maturation. Maturation refers to the processes occurring within the subjects during the course of the research study, which is the result of the passage of time rather than a result of treatment or an independent variable (Polit & Beck, 2004). In this research study, the initial time period from pre to post-test was approximately 6 to 8 weeks, and this time period minimized the effect of maturation. During this short time period it was unlikely that a child outgrew their CRD and the potential for parents to learn car seat safety from other external sources was also less likely because of the short time frame. However, this is not the case for the post-test survey at one year. Throughout the year, the child may have outgrown the CRD they were using at the beginning of this study. As well the new Ontario booster seat law announcement may have increased parents' awareness of car seat safety. To examine whether correct use of safety seats changed over time, the participants were once again asked to describe the current weight and height of their child as well as the current seat they were using. Parents were also asked when they last transitioned their child to the current safety seat in order to determine the impact of the educational intervention on parents' decision making during transitions.

Testing effects may have occurred in this research study. Testing effects refer to the effects of taking the pre-test on the participants' performance on a post-test (Polit & Beck, 2004). The questionnaire itself might have caused a change in parental attitudes toward car seat safety or even increased the parent's knowledge base regarding car seat safety without ever having undergone the intervention. By virtue of the parent knowing

that they were participating in a safety research study may have influenced the way they think about their child's safety when riding in motor vehicles.

Ethical Considerations

This intervention study received ethics approval from the University of Windsor, the University of Western Ontario and Nipissing University for the pre-test, the 6 week post-test and the one year post-test. At the beginning of the study, parents were approached to obtain their consent to participate in the initial survey, and if they chose to participate a one year follow-up study. A copy of the consent form can be found in Appendix G. Participation in the study was strictly voluntary and participants were free to withdraw from the study at any time without consequence. All participants were assured that their participation was confidential, and no identifying information was recorded on any study data. The study data was kept confidential and information was accessible by the researcher and the multidisciplinary research team of the study. All information collected for this research study was kept in a locked drawer accessible only by the researcher and the multidisciplinary research team.

CHAPTER V

ANALYSIS OF RESULTS

Results

The purpose of this research was to investigate the long-term effectiveness of a multimedia intervention designed to increase parents' knowledge of correct use of child restraint devices for their children 0 to 12 years of age. First, the effectiveness of the intervention program on parents' knowledge and confidence of correct use of safety seats was examined. Second, an examination of parents' actual use of safety seats for their children based on the child's height and weight was completed. Table 1 defines the operational definitions used to determine if parents' responses to either the situation questions or their actual use of safety seats were correct or incorrect based on Transport Canada Guidelines (2002).

Table 1: Category Definitions and Knowledge Rating Criteria

Category	Variable	Knowledge rating criteria	
		Correct	**Incorrect**
Rear-facing to forward-facing seat	Age	12 to 14 months	≤11 or ≥15 months
	Height	25 to 27 inches	≤24 or ≥28 inches
	Weight	19 to 23 pounds	≤18 or ≥24 pounds
Forward-facing to booster seat	Height	38 to 42 inches	≤37 or ≥43 inches
	Weight	38 to 42 pounds	≤37 or ≥43 pounds
Booster seat to Seatbelt	Height	54 to 60 inches	≤53 or ≥ 61 inches
	Weight	76 to 84 pounds	≤75 or ≥85 pounds

Parent Demographic

A total of n=418 families from four Ontario communities are described in Table 2. The average age of the parent participants was 31 to 40 years. The majority (93%) of the participants were female, married (90.8%) and identified themselves as the children's mother (84.4%). The average income of the participants was evenly distributed across each of the income ranges.

In this study 20.3% of parents had a college diploma or certificate and 33.4% had a University degree. Thus, the participants were more highly educated compared to census data which indicates 23.7% of Ontarians had a University degree and 18.9% of Ontarians had a College certificate or diploma. Given the higher education level of this sample, the generalizability of these findings to the general population may be limited.

Effectiveness of Intervention on Parent Knowledge

Parents' knowledge was examined at three time points: pre-intervention (or baseline), at six to 8 weeks post-intervention and finally at one year post-intervention. On all three tests parents responded to three situations by describing their knowledge of correct seat according to age, weight and height, their confidence with their knowledge, as well as by ranking which factor they felt was most important. The response rate for the six week post-test was 58% because of an initial low return rate on the six week post-test surveys; follow-up telephone interviews were made to complete the post-test surveys. The following is a breakdown of the rate of attrition at the six week post-test: 7.18% (n = 30) did not consent to follow-up; 7.42% (n = 32) were unreachable; 0.48% (n = 2) refused to participate; 3.11% (n = 13) had changed their number; 1.67% (n = 7) were not in service; 22% were for other reasons. There were 243 subjects who completed the six week post-

test, and there were 45 additional subjects who were included in the analysis for the one year follow-up as they missed the opportunity to complete a six-week post-test. The total number of subjects available to complete a one year post-test was 288. All one year post-tests were completed by telephone interview with a response rate of 70%. For the one year post-test: 21% (n = 63) were unreachable; 1.74% (n = 5) refused to participate; 2.77% (n = 8) had changed telephone numbers; 4.17% (n = 12) had a telephone number that was not in service.

Table 3 demonstrates the percentage of correct responses when transitioning a child from: a rear-facing seat to a forward-facing seat; from a forward-facing seat to a booster seat; and from a booster seat to a seatbelt.

When transitioning from rear-facing to forward-facing there was an increase in correct responses from pre-test to six week post-test in the age, weight and height categories. From pre-test to one year post-test there was a slight increase in correct responses for the age and weight to transition from rear-facing to forward-facing. The transition from forward-facing to booster seat demonstrated an increase in correct responses for the correct weight and height at six weeks post-test. At one year post-test when transitioning from forward-facing to booster seat, there was an increase in correct responses for weight. When transitioning a child from a booster seat into a seat belt, parents' knowledge increased at six weeks post-test, as well as one year post-test for both weight and height.

The first hypothesis stated: parental knowledge of correct child restraint use will be greater than their pre-test knowledge one year following the intervention program.

Table 2: Descriptive Statistics of the Sample Population (Percentages)

Variable	Total Sample n = 418	Windsor n = 91	Chatham n = 84	North Bay n = 54	London n = 189
Age					
< 20 years	1.9	1.1	3.6	3.7	1.1
21 – 30 years	29.2	23.1	31	31.5	30.7
31 – 40 years	52.4	58.2	53.6	46.3	50.8
41 – 50 years	7.2	5.5	6	9.3	7.9
51 – 60 years	3.3	7.7	1.2	1.9	2.6
61 – 70 years	1	1.1	1.2	0	1.1
> 71 years	5	3.3	3.6	7.4	5.8
Sex					
Male	6.4	4.4	4.9	9.8	7.1
Female	93.6	95.6	95.1	90.2	92.9
Marital Status					
Single	5.7	4.5	4.9	7.8	6.1
Married/Common Law	90.8	92.1	92.7	88.2	90.1
Separated/Divorced	2.7	3.4	2.4	3.9	2.2
Widowed	0.7	0	0	0	1.7
Relationship to Child					
Mother	84.4	84.3	85.4	86.3	83.5
Father	5.7	3.4	3.7	7.8	7.1
Guardian	0.5	0	1.2	0	0.5
Grandparent	4	7.9	3.7	2	2.7
Other	5.4	4.5	6.1	3.9	6
Population Size of City					
< 1,000	5.1	11.4	8.6	0	1.7
1,000 – 30,000	31	69.3	59.3	20.8	1.7
30,000 – 100,000	20.1	9.1	32.1	79.2	4
100,000 - 300,000	2.8	10.2	0	0	1.1
> 300,000	41	0	0	0	91.5
Income					
< $20,000	8.9	6	9.5	10	9.8
$20,001 - $40,000	16.2	13.1	18.9	14	17.2
$40,001 - $60,000	24.8	25	25.7	28	23.3
$60,001 - $80,000	25.3	32.1	23	26	22.7
> $80,000	24.8	23.8	23	22	27
Education					
Grade School	0.7	1.1	2.4	0	0
Some High School	2.7	1.1	6.1	2	2.2
High School Graduate	11.1	10	15.9	11.8	9.4
Some Post High School	11.6	13.3	11	11.8	11
College Diploma/Certificate	20.3	27.8	42.7	47.1	38.7
University Degree	33.4	36.7	22	27.5	38.7

Note: Total Cases = 418; % = percentage based on total cases reported on rounded to one decimal place.

Table 3: Percentage of Correct Responses

		Pre-Test				6 Week Post-Test				One Year Post-Test			
		n	Correct	Incorrect	%	n	Correct	Incorrect	%	n	Correct	Incorrect	%
Age	RF to FF	367	233	134	63.5	219	170	49	77.6	200	135	65	67.5
Weight	RF to FF	397	298	99	75.1	239	200	39	83.7	201	158	43	78.6
	FF to BS	397	287	110	72.3	240	202	38	84.2	201	162	39	80.6
	BS to SB	368	197	171	53.5	239	171	68	71.5	217	146	55	67.3
Height	RF to FF	298	75	223	25.2	234	93	141	39.7	201	45	156	22.4
	FF to BS	293	82	211	28	183	106	129	57.9	217	59	142	27.2
	BS to SB	272	55	217	20.2	232	106	126	45.7	200	61	139	30.5

RF = Rear-facing; **FF** = Forward-facing; **BS** = Booster Seat; **SB** = Seatbelt

Parents' knowledge increased at both the six week post-test and the one year post-test, when compared to the level of pre-test knowledge. However, knowledge decreased slightly between the six week and one year post-tests (Table 4). There was also a significant increase in parents' knowledge at both six weeks and one year for all child seat transitions ($p<0.05$) (Table 4) which supports that the null hypothesis be rejected. These findings indicate that parents experienced an increase in knowledge of the correct child restraint device based on the child's weight and height, and age in the case of infants following the education intervention.

The Friedman's two-way ANOVA identified that there is a significant difference between the 3 time points, however, it is not able to specifically identify where the differences are (Burns & Grove, 2001). Friedman's ANOVA showed significance in all categories with the exception of rear-facing to forward-facing weight transition. Pair-wise Sign Tests were then completed to determine more specifically where there was an actual significant change in knowledge.

At the six weeks post-test there was a significant change in parents' knowledge for all variables of correct use (Table 5). At the one year post-test there was a significant change in parents' knowledge of the correct weight to transition a child from a forward-facing seat to a booster seat as well as the correct weight and height to transition children

from booster seat to seatbelt. For the knowledge change from booster seat to seatbelt at one year the p-value was 0.001 for both correct height and weight, this provides very strong evidence that these results are a result of the education

Table 4: Knowledge change for pre-test, six week post-test and one year post-test (Friedman's ANOVA)

Transition	Variable	N	Mean	Chi-Square	Df	P
Rear-facing to forward-facing seat	**Age**	138				
	Pre-Test		0.6449			
	6 Week Post-Test		0.7754	9.529	2	0.009
	1 Year Post-Test		0.7101			
	Weight	154				
	Pre-Test		0.8182			
	6 Week Post-Test		0.8636	2.28	2	0.32
	1 Year Post-Test		0.8117			
	Height	122				
	Pre-Test		0.2623			
	6 Week Post-Test		0.4344	10.314	2	0.006
	1 Year Post-Test		0.3033			
Forward-facing to booster seat	**Weight**	154				
	Pre-Test		0.7727			
	6 Week Post-Test		0.8636	7.319	2	0.026
	1 Year Post-Test		0.8506			
	Height	116				
	Pre-Test		0.2672			
	6 Week Post-Test		0.431	7.753	2	0.021
	1 Year Post-Test		0.3793			
Booster seat to seatbelt	**Weight**	145				
	Pre-Test		0.5034			
	6 Week Post-Test		0.7034	37.486	2	0.001
	1 Year Post-Test		0.7931			
	Height	103				
	Pre-Test		0.165			
	6 Week Post-Test		0.4078	19.276	2	0.001
	1 Year Post-Test		0.3786			

N = Sample Size (subjects who completed all 3 time points of the intervention)
df = Degree's of Freedom
P = Significance

Table 5: Knowledge change from pre-test to six week post-test and pre-test to one year post-test (Pair-wise Sign Tests)

Transition	Variable	N	Ratings stratified by time of test		Overall knowledge change			Z	P
			Correct	Incorrect	Knowledge Increase	Knowledge Decrease	Tie		
Rear-facing to Forward-facing Seat	**Age**								
	Pre-test	367	233	134					
	6 Week Post-Test	219	170	49	35	10	158	-3.578	0.001
	1 Year Post-Test	200	135	65	31	22	127	-1.099	NS
	Weight								
	Pre-test	397	298	99					
	6 Week Post-Test	239	200	39	35	19	176	-2.041	0.041
	1 Year Post-Test	201	158	43	22	147	0	0	NS
	Height								
	Pre-test	298	75	223					
	6 Week Post-Test	234	93	141	50	19	114	-3.612	0.001
	1 Year Post-Test	201	45	156	27	27	98	0	NS
Forward-facing to Booster Seat	**Weight**								
	Pre-test	397	287	110					
	6 Week Post-Test	240	202	38	37	14	181	-3.081	0.002
	1 Year Post-Test	201	162	39	31	15	148	-2.212	0.027
	Height								
	Pre-test	293	82	211					
	6 Week Post-Test	183	106	129	54	23	101	-3.419	0.001
	1 Year Post-Test	217	59	142	35	24	85	-1.302	NS
Booster seat to Seatbelt	**Weight**								
	Pre-test	368	197	171					
	6 Week Post-Test	239	171	68	65	16	133	-5.333	0.001
	1 Year Post-Test	217	146	55	56	9	114	-5.706	0.001
	Height								
	Pre-test	272	55	217					
	6 Week Post-Test	232	106	126	58	14	86	-5.058	0.001
	1 Year Post-Test	200	61	139	33	10	88	-3.355	0.001

Z = Sign test statistics; N = Sample Size; NS = Not Significant

intervention and are not likely to have occurred by chance. Thus, parents' knowledge of correct use of booster seats and transitions to seatbelts were significantly increased after one year. Parent knowledge of correct use of rear-facing seats and forward-facing seats was not significant at one year following the intervention when compared to pre-test knowledge.

Parent Confidence

Friedman's ANOVA detected a significant increase in parents' confidence with their knowledge in all three transition situations (Table 6). This analysis was completed to identify the degree to which parents might have been "guessing" the right answers. To determine where there was a significant increase, pair-wise sign tests were computed (Table 7). Parents' confidence levels increased significantly from pre-test to 6 week post-test in all of the child seat transitions (rear-facing to forward-facing, forward-facing to booster, booster to seatbelt). From pre-test to one year post-test parents' confidence continued to increase for knowledge of correct transition from booster seat to seatbelt which indicates that parents were more confident with their knowledge of booster seat and seatbelt use one year following the intervention.

Table 6: Parents' confidence with their knowledge of correct transition times (Friedman's ANOVA)

Variable	N	Mean	Chi-Square	df	P
Rear-facing to forward-facing seat transition	151	6.9007 7.9735 7.0066	20.045	2	0.001
Forward-facing to booster seat transition	138	6.2464 7.6232 6.6667	30.516	2	0.001
Booster seat to seatbelt transition	128	5.5234 7.1641 6.8359	43.616	2	0.001

N = Sample Size
df = Degree's of Freedom

Table 7: Parents' confidence with their knowledge of correct transition times – Pair-wise Sign Tests

Transition	Variable	N	Overall Change in Confidence			Z	P
			Confidence Increase	Confidence Decrease	Tie		
Rear-facing to forward-facing seat	Pre-Test to 6 Week Post-Test	232	126	51	55	-5.562	0.001
	Pre-Test to 1 Year Post-Test	188	69	83	36	-1.054	NS
Forward-facing to booster seat	Pre-Test to 6 Week Post-Test	216	134	41	41	-6.955	0.001
	Pre-Test to 1 Year Post-Test	182	78	68	36	-0.745	NS
Booster seat to seatbelt	Pre-Test to 6 Week Post-Test	192	127	37	28	-6.95	0.001
	Pre-Test to 1 Year Post-Test	161	98	33	30	-5.592	0.001

Z = Sign test statistics; N = Sample Size; NS = Not Significant

Ranking of Transition Factors

Parents were asked to rank the importance of using age, weight or height as a criteria for each transition decision they make (meaning: rear-facing to forward-facing; forward-facing to booster; booster seat to seat belt). Over the three time points parents consistently ranked weight as the most important factor, height the second most important factor and age as the third most important factor when transitioning a child from a rear-facing to a forward-facing seat, as well as from a forward-facing seat to a booster seat. When moving a child from a booster seat to a seatbelt, parents initially ranked weight as the most important factor, however on both the six week post-test and the one year post-test, height was subsequently ranked as the most important factor when making the transition. This analysis was completed to identify which indicator parents relied on most heavily in parents' decision making when transitioning between CRDs. The findings indicate that the most important factors influencing their decision to transition their child is weight and then height.

Parent's Actual Use of Safety Systems at One Year

Parents were asked to provide their children's height, weight and the type of CRD each child was using on the pre-test as well as the one year post-test. The concept of correct use of safety systems in this study was defined as correct seat for the height and weight of the child using Transport Canada (2002) guidelines. Table 1 describes the correct use definitions of each transition category according to height and weight, with the exception of rear-facing to forward-facing which also includes age.

At the time of the pre-test, parents reported on a total of 771 children (Table 9). At pre-test there were: 142 infants (aged less than 12 months), 290 toddlers (less 4 years

Table 8: Impact of the intervention on ranking of transition factors

Transition	Variable	N	Most important factor (1)	Second important factor (2)	Least important factor (3)
Rear-facing to forward-facing seat	**Age**				
	Pre-test	397	85	41	271
	6 Week Post-test	236	56	23	157
	1 Year Post	195	36	21	138
	Weight				
	Pre-test	400	209	159	32
	6 Week Post-test	237	118	94	25
	1 Year Post	195	90	89	16
	Height				
	Pre-test	398	128	189	81
	6 Week Post-test	236	72	118	46
	1 Year Post	195	71	84	40
Forward-facing to booster seat	**Age**				
	Pre-test	386	28	37	321
	6 Week Post-test	228	12	22	194
	1 Year Post	197	5	17	174
	Weight				
	Pre-test	396	231	144	21
	6 Week Post-test	235	134	92	9
	1 Year Post	197	109	79	9
	Height				
	Pre-test	390	156	196	38
	6 Week Post-test	235	100	116	19
	1 Year Post	197	84	99	13
Booster seat to seatbelt	**Age**				
	Pre-test	358	34	39	285
	6 Week Post-test	229	21	10	198
	1 Year Post	195	16	16	162
	Weight				
	Pre-test	366	174	161	31
	6 Week Post-test	237	104	119	14
	1 Year Post	195	77	101	17
	Height				
	Pre-test	363	172	156	35
	6 Week Post-test	237	123	103	11
	1 Year Post	195	103	76	15

N=Sample Size

old), and 264 school aged children (over 4 years of age). Figure 5 describes the pre-test rates of correct use related to each site. Figure 6 describes the rates of correct and incorrect use by age group at pre-test.

At the one year follow-up parents reported on a total of 377 children, however only 250 of those children had complete data sets (Table 9). Also, between the pre-test and post-test there were 21 new children added to the study because of birth, adoption, remarriage, etc.

Table 9: Pre-Test and One Year Child Demographics by City

	Pre-Test			One Year Post-Test		
	Infant	**Toddler**	**School Age**	**Infant**	**Toddler**	**School Age**
	n = 142	n = 290	n = 264	n = 14	n = 59	n = 175
Windsor						
Male	12	33	31	3	3	32
Female	14	34	32	1	10	25
Chatham						
Male	16	25	27	1	4	15
Female	16	41	27	0	11	13
North Bay						
Male	3	19	19	0	1	6
Female	13	16	20	0	1	11
London						
Male	40	63	50	6	16	26
Female	27	58	58	3	13	47

N=Sample Size

The large decrease in children from pre-test to one year post-test can be attributed to attrition and missing data. Of the 250 children included in the one year post-test analysis, there were 14 infants, 59 toddlers, and 175 school aged children.

McNemar's Test was run to determine if there was a significant difference in rates of correct and incorrect use from pre-test to one-year post-test, however there was no significant difference detected ($p = 0.877$). Overall at pre-test, 87.9% (n = 575) of the children in this study were seated correctly, and subsequently 12.1% (n = 79) were reported as being seated incorrectly. At the one year post-test, parents reported that

Figure 5: Pre-Test Rates of Correct Use by City

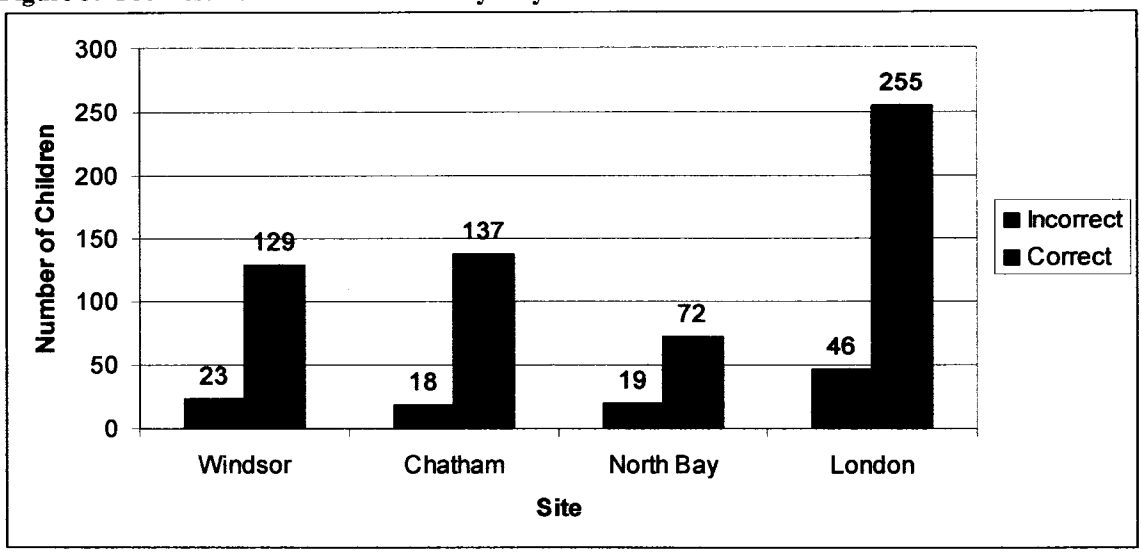
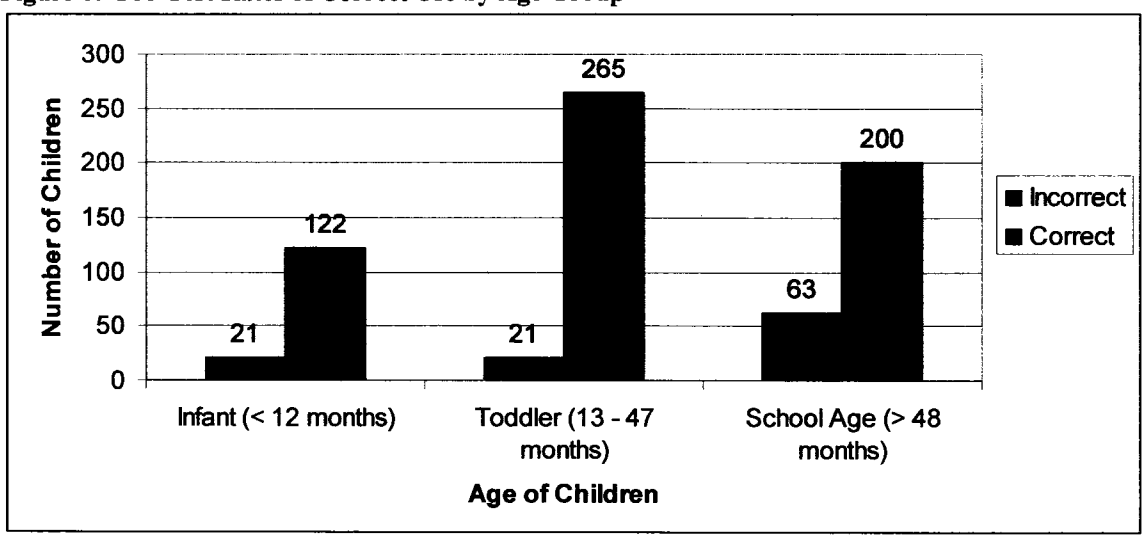


Figure 6: Pre-Test Rates of Correct Use by Age Group



overall 87.2% (n = 218) were seated correctly in the proper restraint device according to height and weight, and 12.8% (n = 32) were reported as being seated incorrectly, having been transitioned too early to the next restraint device. All but one of the children seated incorrectly at one year were in the school aged (> 48 months old) category. Only one child in the entire infant and toddler category remained incorrectly seated at one year.

This is an interesting difference in incorrect use at one year that was not evident at the pre-test.

Figure 7: One Year Post-Test Rates of Correct Use by City

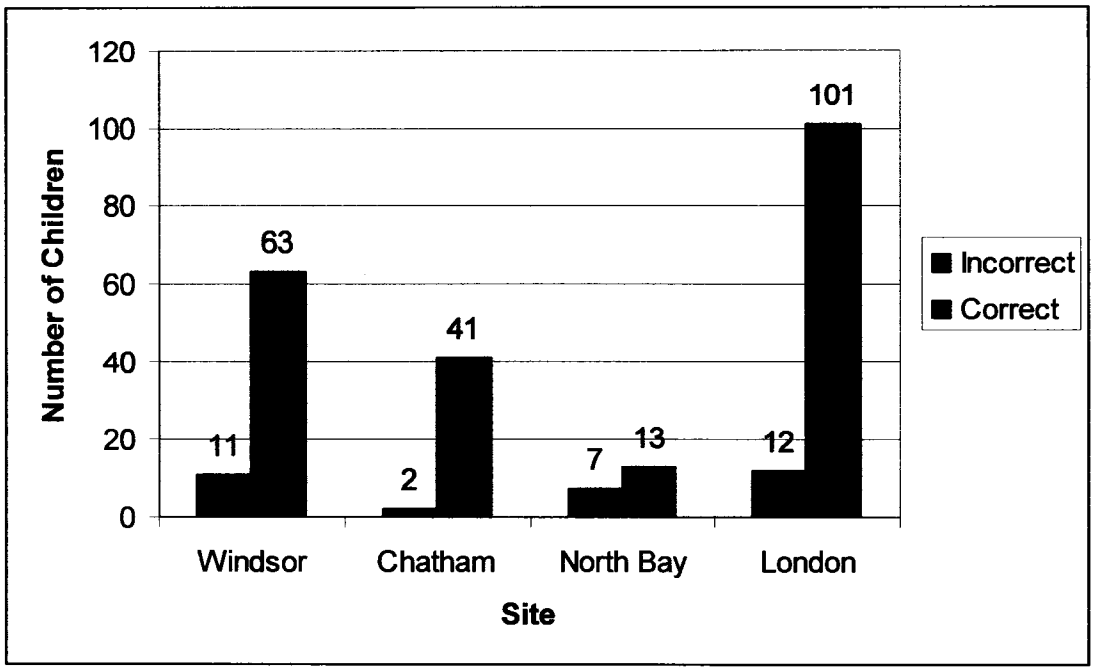
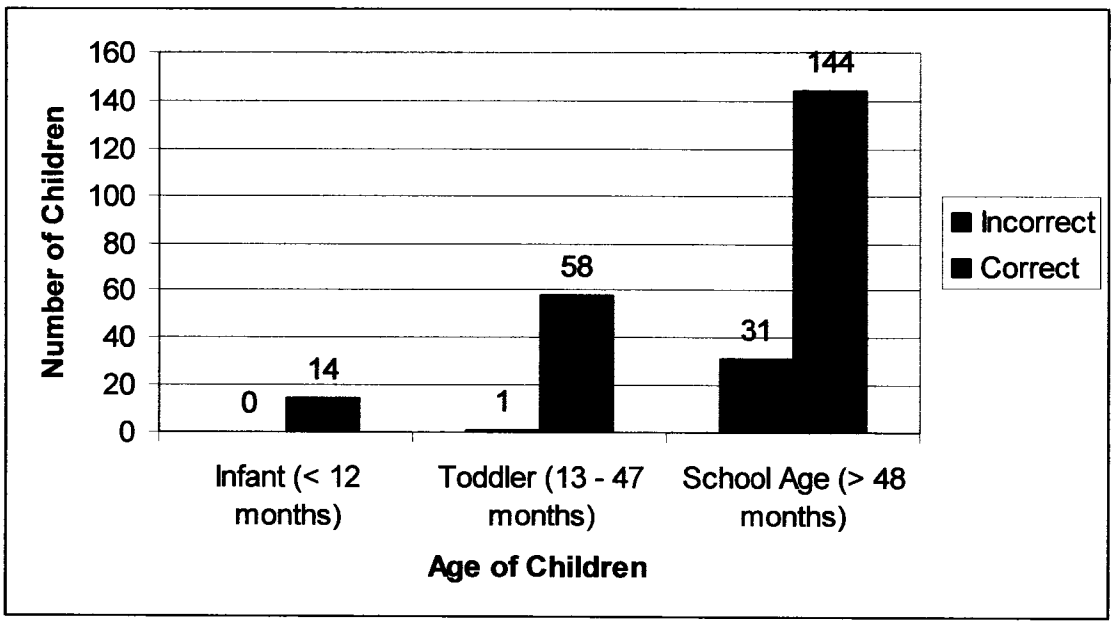


Figure 8: One Year Post-Test Rates of Correct Use by Age Group



In summary, parents' knowledge and confidence were significantly increased for the transition from booster seat to seatbelt and the weight to transition from forward-facing to

a booster seat at one year post-test. When asked which factor was most important (age, weight or height) to consider when transitioning a child to another CRD, parents' ranked weight as being the most important factor. Although there was not a significant change in parents' actual correct use of safety seats, there were a large number (87.9% at pre-test; 87.2% at one year) of children who were seated in the proper CRD. At one year, although the change in actual correct use was not significant, there were changes within age categories that were distinctly different from the pre-test actual use.

CHAPTER VI

DISCUSSION

Discussion

The Bobby Shooster education program was found to demonstrate a significant increase in parents' knowledge from pre-test to 6 week post-test across the majority of transitions for child seats based on correct age, height and weight. At one year, the increase in parent knowledge was sustained in both the forward-facing to booster seat category and the booster seat to seat belt transition. This study is the first longitudinal intervention study of this kind in Canada and offers substantial evidence for the effectiveness of vehicle safety education programs for children and families in Canada. These findings raise a number of issues to consider.

First, why was the intervention so effective at increasing parents' knowledge in the early phases (1 to 2 months) following the intervention and then decreased at one year, but only in specific areas such as knowledge of the correct use of rear-facing seats? Perhaps, in the early months after the educational intervention, parents' knowledge level was still quite recent and perhaps easier to recall. One year following the intervention, however, when more time had passed it was more difficult for parents to retain the information received from the intervention. Yet, parents did retain their knowledge of the correct height and weight for use of forward-facing to booster seat transitions and booster seat to seatbelt transitions one year following the intervention. One explanation may be the age of the parents' children at the time of the one year post-test. Of the 250 children reported on at the one year post-test, only 15 of these were infants who were all born since the pre-test data was collected. Thus, the majority of children remaining in the

study at one year were toddlers (>12 months, 21-40 lbs., n = 145), and school aged children (41-80 lbs., n = 155).

These findings raise a number of issues for the structure of family education programs. First, it is possible that vehicle safety programs for families need to be tailored according to the specific age groups of the children in the target population. Families have busy lives, with both parents often in the workforce and may learn best when information is focused and directly applicable to their own children. The limitation of the Bobby Shooster education program may be that it presented the best practice information about each type of safety seat (rear-facing, forward-facing, and booster seat) and tested parents' knowledge of each rather than presenting only the most pertinent information for the age(s) of the child in each family. Since very few families in the one year data set had infant children, the lack of significance of parents' knowledge of rear-facing seats may be related to parents not needing to remember the information on rear-facing seats, rather than their failure to retain what they learned from the intervention program. Future research may need to examine the amount and extent of information parents are able to learn and motivated to learn and what those needs are specifically based on. To date, there have been very few specific education programs developed for families on vehicle safety, so there are few other studies to compare these findings with. Intervention studies to date have been limited to testing the effectiveness of education on correct use, parent knowledge has not been examined to date (Block, et al., 1998; Rivara, et al 2001).

One of the issues these findings raise is the importance of varied learning strategies in supporting learning. The Bobby Shooster educational intervention provided information for different types of learners. The growth chart for the visual learner, the

CD-ROM for the individuals who learn best when using technology, reading material for those who prefer to learn by reading detailed information, etc. The "Car Seat Safety Chart" and the "fridge magnet" were quick references for parents to use as their child's height and weight changed over time. Education that focuses on finite ranges of information regarding safety information may be less effective, whereas information that "grows" with the child was reported by parents to be effective and helpful in this study. As well, future research needs to involve the parents in deciding what type of media works for them and what information tools will work best for different socioeconomic and cultural groups. This will ensure availability and accessibility to accurate and consistent information on child seats. Many parents in this study commented that information varied depending on the source of that information. When asked if they had any suggestions or things they would change about the study, parents responded, by asking for reminders. Parents had difficulty always remembering the correct information, however liked the fridge magnet, because it was a quick reference, and felt reminder cards, reminding them to measure their child, would help ensure they were using the correct seat.

These findings may suggest that education interventions may need to be more focused, specifically to the age, growth and development needs of children specifically in order for knowledge to be retained. Parents may be less likely to be interested in or retain knowledge about transitions they have already made, and are more likely to retain knowledge of the upcoming transition their children will need to make in the near future. This is an interesting finding for health professionals as perhaps this indicates that parents focused on the stage their child is currently in, as opposed to being overloaded with

information that is not applicable to their own child's safety needs. Perhaps more tailored educational interventions are required, so that parents are receiving more age specific information about where their children are at that moment, and where they will be going. For example a parent who has a child who weighs 30 pounds, and is 33 inches in length would perhaps be most interested in learning the correct time to transition their child from a forward-facing seat to a booster seat, because that is the next transition they will be making. They are perhaps less likely to be interested in learning the correct time to transition their child from a rear-facing seat to a forward-facing seat, as they have already made this transition. A recent study using home visiting nurses, where the nurses visited a number of both rural and urban homes and assessed CRD misuse through observation as mothers prepared their infant or toddler for vehicle transport (Block et al., 1998). The mothers were taught proper CRD use through verbal instruction and demonstrations using the family vehicle and safety seat (Block et al., 1998). The findings from this tailored study found that: the home visits took longer than expected, upon observation three-quarters of CRDs were incorrectly used and one third of the mothers were aware of their incorrect use (Block et al., 1998). A limitation of this study was that CRD use was not re-evaluated following the instruction and demonstration. However, this is an example of parents being taught specifically how to properly use their child's restraint device. Further studies could take this research one step further, and examine if the parents used the seats correctly following the education and demonstration, as well as was there a change in parents' knowledge of correct use, following the education and demonstration.

In today's fast paced environment, when parents are bombarded with information parents are eager for quick information, one parent suggested "mail out reminders when the child should be moving to the next seat", another parent said "the magnet is helpful in quickly remembering information." The parents' desire for quick information could be seen as an opportunity for health care professionals. One possibility would be that during routine visits to the clinic, paediatrician, or the family physician, a screening tool could be used to identify children at risk and then intervene to ensure children are sitting in the correct safety seat, as well as serve as a reminder to parents about any upcoming transitions. The screening tool could be similar to those used to screen for symptoms or disease, however in this case it could be used to screen to verify the child's height and weight and ensure the child is using the correct safety seat for their height and weight. Future research might examine the utility of screening tools for health professionals so that children in day care, school systems, primary health care settings are frequently screened for correct and safe use of safety seats for children of all ages.

Durbin, Elliott & Winston (2003) found that the odds of injury for children involved in an MVC who are between the age of 4 and 7 years is 59% lower for children in booster seats, than children in seat belts. Between December 1998 and May 2002, there were 4,243 children aged 4 to 7 injured in MVCs in the United States, for those children wearing a seatbelt the injury rate was 1.95%, however the rate decreased for children using a booster seat to 0.77%. Children that were injured in MVCs that were using booster seats did not have the injuries to the abdomen, spine or lower extremities as the children using seatbelts did (Howard, Snowdon, Macarthur, 2004). Chouinard and Hurley (2005) found that 4.5% of children five to nine years of age in Canada were using

booster seats, whereas 78.9% were using seatbelts. Safe Kids Canada (2004) reported that "at most, 28 percent of Canadian children aged 4 to 9 regularly use booster seats" (p.4). Every year in Canada more than 35 children aged 4 to 9 are killed in MVCs, as well as another 360 are seriously injured (Safe Kids Canada, 2004). Between 1997 and 2001, the death rate from MVCs dropped by 52% for children under the age of 5 and 25% for children aged 10 to 14, however, there was no change in the number of deaths in children aged 5 to 9, which is primarily the age group who should be using a booster seat. This demonstrates that there is a low rate of children using booster seats, and a large risk for injury and death for those children not properly restrained in a booster seat. These low rates of booster seat use, in both Canada and the United States, reveal an area where there is a need for education. Parents' need to be better educated about booster seats and the risks of not using a booster seat. In this study, at one year, parents' knowledge of the correct times to transition a child from a booster seat to a seatbelt remained significantly increased. These findings, of the parents increase in knowledge at one year post-test for the booster seat to seatbelt transition is an important and powerful longitudinal finding for vehicle safety for children. Longitudinal studies are a vital part of vehicle safety research and provide valuable information about how parents learn, use and apply vehicle safety knowledge as well as how vehicle safety knowledge for children is retained by parents and caregivers. To date, there is no longitudinal data following an educational intervention that this data could be compared to. Thus, there are no benchmark studies with which these findings could be positively or negatively identified. However, this does highlight a very important area for future research, as more longitudinal studies are needed, to better understand how and why parents retain vehicle safety knowledge, how

education should be structured and with what timelines that are optimal for parents' learning outcomes. Future research may examine the long-term effects of educating both the parents and the children about vehicle safety; as well as better ways to teach parents about the importance of vehicle safety that they can apply throughout their children's stages of growth and development.

A Safe Kids Canada (2004) survey found that less than one third (28%) of parents of children age 4 to 9 reported using booster seats, and actual use is likely to be even lower. More than half (53%) of Canadian parents believe that children are large enough by the age of 6 to use only a seatbelt (Safe Kids Canada, 2004). Safe Kids Canada (2004) also found that more than three-quarters of parents don't use booster seats because: they believe their child is too big for a booster seat (42%); that their child doesn't need a booster seat (23%); or they are too old to use a booster seat (19%). On September 1st, 2005 Ontario implemented new booster seat legislation, which now requires children to remain in a booster seat until the child is either: 8 years old, or 80 pounds or 57 inches. This new legislation was implemented and heavily advertised approximately six months after the onset of the study, halfway between the 6 week post-test and the one year post-test. This new legislation may have had an impact on parents' responses at the one year post-test. Now parents are required by law to put their children in booster seats until they meet one of the previously listed requirements. However, the law only stipulates that a child must meet one of the requirements, not all of them. Thus, a child who is 8 years old but is under 80 pounds and under 57 inches, now meets the law's age requirement to sit in a seatbelt. However, best practice suggests the child should stay in a booster seat until they are 80 pounds and 57 inches. Therefore although this child is seated correctly

according to Ontario's legislation, the child is not seated correctly when compared to best practice. When the legislation was implemented there was an information blitz, by the media, health units, and Ontario Ministry of Transportation road signs warned of the new law. The media campaign for the new legislation would have informed most of the public that a new booster seat law was taking effect, however it may have only truly impacted those parents who were affected most by the new legislation. A parent, whose child was in a rear-facing seat at the time, seems less likely in being interested in the exact requirements of the new booster seat law, because there is at least 7 years until they need to make that transition. However, the parent who has a 7 year old child who was using a seatbelt prior to the new legislation, may be much more interested in the new requirements as they need to now ensure their child is seated correctly in a booster seat to avoid penalties such as fines and demerit points. Given the high number of school aged children in the study, the new legislation may have had a greater impact on parents' knowledge than if the children in the sample were younger (infants or toddlers) and less directly affected by the legislation. Legislation and enforcement alone, although they are key components of vehicle safety was not found to be an effective intervention on its own (Zaza et al., 2001). Laws and enforcement strategies, along with education, are credited with achieving high rates of child restraint use (Ehiri, Ejere, Magnussen, Emusu, King, & Osberg, 2006; Safe Kids Canada, 2004; Zaza et al., 2001). In this study, at pre-test and one year post-test, parents reported on actual use of safety seats for their children. At pre-test parents reported on 57 children that were using a seatbelt, 57% (n = 33) of those children using a seatbelt were seated incorrectly. At one year, parents reported on 27 children, of whom 48% (n = 13) of children using a seatbelt were seated incorrectly.

Despite the new legislation, at both pre-test and one year post-test a large percentage of children using seatbelts were seated incorrectly.

Another important issue raised by this study are the findings on correct use. When comparing the pre-test actual use of child safety seats (n = 675), 87.9% of children were seated correctly and 12.1% were seated incorrectly, at one year (n = 250), 87.2% of the children were seated correctly and 12.8% of the children were seated incorrectly in safety seats. From pre-test to one year post-test there was nearly the same rate of correct and incorrect use of safety seats. This difference of .7% was more likely a reflection of the decline in reported children due to attrition and missing data. There were 127 cases with missing data at one year post-test that were not used in the analysis. When pre-test actual use and one year actual use were compared, they were not found to be significantly different ($p = 0.877$). In contrast, in Ontario, correct use data reveals that: 73% of children under 1 year of age were properly restrained; 71% of children aged 1 to 4 years were properly restrained; 99.7% of children aged 5 to 9 years were properly restrained, and 100% of children aged 10 to 15 years were properly restrained (Transport Canada, 1998). However, the critical, missing component of the 1997 survey data was that the weight and height of children were not used as an indicator to determine the appropriate restraint type and use, and misuse was based solely on age of the child (Transport Canada, 1998) and thus this may have affected some of their results.

The current study had an overall correct use rate of 87.9% at pre-test and 87.2% at one year post-test. This could be attributed to this sample being highly educated and having a higher SES, when compared with the 2001 Ontario census data, and thus had the knowledge and resources to ensure their children were seated correctly in vehicles. Thus,

it may be that the findings of this study reflect a selection bias in the sampling. Parents who agreed to participate in the study may have already been aware of the risk of injury in vehicles and were motivated to learn further about safety seats. The rate of correct use in this sample was higher than the majority of more recent studies (Chouinard & Hurley, 2005; Safe Kids, 2004). Thus, it is not surprising that a very high rate of correct use at the pre-test changed very little at the one year post-test. Future testing of the intervention using a randomized sampling strategy would be an important next step in examining the efficacy of this education program on increasing parents' knowledge and use of safety seats.

This high rate of correct use may also be related to the strategy of self-report. In this study, correct use was based purely on self-report by the parents, meaning that parents reported 87.9% and 87.2% of the children were seated in the correct child restraint. However, there is still the possibility that the child may be seated correctly, but because no observations were taken of how the seats were installed or how the straps and buckles were used that the child was not properly restrained in the vehicle. This is consistent with the findings of numerous studies using observational methods to examine correct use. While many parents know that child restraint devices are important, approximately 80% of child safety seats are being used incorrectly (Biagioli, 2002; Safe Kids, 2002). Four out of five child seats were found to be either improperly installed or incorrectly used at safety seat clinics held throughout Ontario (Ontario Ministry of Transportation, 2003). The change in parents' knowledge of correct use following the intervention did not substantially change the rate of correct use, most likely due to the very high rate of correct use at the pre-test stage of the study.

Despite the education intervention, a consistent number of children were incorrectly seated. Perhaps some parents were simply not interested in vehicle safety, or perhaps for some putting their child in a safety seat everyday is perceived as a hassle, or for some perhaps having to transfer the safety seats from vehicle to vehicle is a hassle. Or is it possible that parents have the knowledge but simply choose not to apply it to their children. For those parents who simply can't be bothered to use child safety restraints or who aren't applying the knowledge they have, the age old question emerges, if you have the knowledge, why does this not result in a behaviour change? The lack of change in health behaviour is not only seen in vehicle safety for children, it can be seen in such things as smoking cessation, healthy eating, and physical activity to name a few. Marcus, Dubbert, Forsyth, McKenzie, Stone, Dunn & Blair (2000) stated that "the many benefits of participation in regular, moderate, or vigorous intensity physical activity are well established" (p. 32), yet they found that more than 60% of the population in the US is leading a sedentary lifestyle or are insufficiently active. Physical activity is another example of where individuals have the knowledge that physical activity is important, however, they do not exercise regularly, despite their knowledge that it is important to their health.

If parents have the knowledge, but simply aren't using it, future studies need to examine in greater depth, how parents make decisions about vehicle safety for their children. These findings may support the suggestion that parents' use of safety seats is a reflection on their parenting style (Ramsay, Simpson, & Rivara, 2000). In this study, parenting style was delineated into two typologies, one style whereby parents negotiate with their children and allow them to influence where and how they sit in the vehicle

(Ramsay, et al, 2000). The other parenting style is very strict and non-negotiable whereby children are simply not permitted to be involved in the decision to use safety seats. These parents tended to be very aware of the risks of traveling in incorrect safety seats and were not willing to take that risk. The parents who negotiate with their children were less aware of the risks of injury or death and were thereby less motivated to learn more about safety seats for their children (Ramsay, et al, 2000). Parenting style was not measured in this study, nor were parents asked to describe how they make decisions about safety seats. Parents' ratings of the importance of using age, height and weight, in this study provided a very limited view of what factors parents' considered in transitioning their children into new safety seats. Future research needs to examine how parenting styles differ and how parenting style influences the use of safety seats.

In addition, studies that examine the child's influences on parents' decisions to use vehicle restraints (i.e. a child's refusal to use a seat) and how/if the parent negotiates with the child vs. the parent deciding where the child will sit. This would inform researchers more directly on alternative strategies to enhance parents' knowledge and use of safety seats for their children. Research on how children specifically impact parents' decisions regarding safety seat use may be an important focus in future. Does children's knowledge of vehicle safety directly affect how comfortable a child is using a restraint device? Do children retain vehicle safety information better than adults, and if so, how could this help to educate parents about vehicle safety?

Limitations

The major limitation of this study is that it did not observe actual use of safety seats by parents. The parents were asked to state their child's height, weight and the

current safety seat they were using. However, this was not confirmed, it was completely dependent on self-report. The study did find an increase in knowledge and confidence with that knowledge at six weeks post-test on all transitions and at one year post-test (the transition from booster seat to seat belt) where there was an increase in knowledge and confidence for parents. This study did not measure parental decision making in depth or actual use, therefore, the correct use based on self report cannot be fully attributed to the increases in knowledge and confidence by the parents.

This study did not examine whether or not the children's knowledge of vehicle safety changed during the intervention. There were several pieces of the intervention that children could have used and learned from, such as the growth chart, storybook, coloring book etc., but whether the child learned anything was not evaluated. Also the child's influence on the parents' knowledge was not measured.

The sample could also be limited by its homogeneity. The sample was largely from large, urban centres and consisted of mostly educated Caucasians with the majority of participants having an income above $40,000. This study is limited because it did not have a high degree of variability of ethnic or cultural groups involved, or lower income families, which in turn restricts the representativeness of the sample and limits the generalizability of the findings (Polit & Beck, 2004).

Implications for Nursing Research

Motor vehicle collisions are the leading cause of injury and death for children between the ages of 0 and 14 (Murphy, 1998; Zaza et al., 2001). Motor vehicle collisions are a major health risk for children and are a preventable public health issue that requires attention, education and innovative strategies are needed to disperse information to the

community. Health promotion and injury prevention are two of the major roles of a nurse. Nurses interact with the community at many different time points throughout the lifespan. Nurses as well as health professionals need to advocate for more funding for education.

Children and the general public are not the only individuals who need to be educated about vehicle restraints for children and the proper transition times. Health care professionals need to be educated as well, so they can communicate quickly and effectively the correct information during primary care education. This could also be an area for further research, to determine the knowledge base and gaps of family practitioners and pediatricians around vehicle safety for children as well as proper transition times. More health care professionals need to be educated and trained in injury prevention research, so as to foster well developed research programs that emphasize the importance of injury prevention research. Nurses, physicians, and allied health professionals need to be knowledgeable about vehicle safety and the correct transition times, as to incorporate the information into their daily patient teaching. Nurses working in prenatal classes have done an excellent job of ensuring that when a child is first born, they are properly restrained, however, it is after that first year that children begin to be transitioned too early. Car seat clinics are available in most communities, but tend to only ensure that the child restraint is installed correctly. The car seat clinic is an excellent opportunity to educate the parent about correct transition times and ensure the child is in the correct seat. Advanced practice nurses are well suited to work to develop an education program for parents that they could receive while having their vehicle inspected. An advanced practice nurse is a registered nurse who has an expert knowledge

base, has complex decision-making skills and may have extended clinical competencies (Canadian Nurses Association, 2002). Advanced practice nurses are well suited to design, implement and evaluate vehicle safety programs for children because of or due to their interactions with all age groups and their advanced knowledge base. The current provincial focus on family health teams and the increased number of nurse practitioners being placed in the family health teams provides an ideal opportunity to use an advanced practice nurse to develop vehicle safety initiatives. The new legislation in Ontario, paired with routine screening and education by nurses, may help to ensure parents are knowledgeable about vehicle safety as well as using the correct safety seats for their children.

Children are consistently screened and immunized for communicable disease, the family health team, provides the unique opportunity for advanced practice nurses to screen and educate parents on vehicle safety seat use. Perhaps every time a child is brought to see their physician or to the emergency department, they should be checked for which CRD they should be using and ensuring they are in the correct seat for their height and weight. This small check at each visit may serve as a reminder to parents to use safety seats, but may also help to prevent early transition of children to the incorrect seat. This would be similar to children's immunization schedule, in that parents would be educated and reminded at different intervals throughout the child's development to ensure parents were using the correct safety restraints for their child. This is an excellent opportunity for an advanced practice nurse to develop, test, implement and evaluate a screening tool that could be used to screen for the correct use of vehicle restraints for

children. The advanced practice nurse is well suited to develop this type of tool, as they would have an expert knowledge base in vehicle safety.

There is a significant lack of educational programs targeted towards children in schools around vehicle safety. If children were better educated about vehicle safety and the correct use of child restraint devices during each of the early primary grades they may positively influence their parents relative to correct use of child seats. This is similar to the findings of bicycle helmet use and anti-smoking education. Many children today know the harmful effects of smoking due to all of the education provided to children about smoking. Perhaps if children were better educated about how and where they should sit in a vehicle, they would better understand why they need to use safety restraints.

School boards provide a regulated environment to provide information and access to both parents and students about vehicle safety. The education system does address safety with children, such as fire safety, police safety, etc., however they do not specifically address vehicle safety with children. Using the school as an outlet to better educate children as to why vehicle safety restraints are important, as well as why children need to use vehicle restraints, could help to positively influence a child's knowledge on the use of safety seats. If the child has a positive attitude towards using a safety seat, this could help to ensure the child is seated correctly in a vehicle, because it could help to decrease the child's desire not to use a safety seat. The school also has bulletin boards and newsletters that get sent home to parents that could be used to promote and reinforce vehicle safety and proper transition times. The school boards and schools provide an access route to all parents and caregivers who have children, and this could be better

utilized by health professionals as well as educators to better inform parents of correct use of vehicle restraints.

Summary

It was only a few decades ago that vehicles were not outfitted with seatbelts, however, Western society has come a long way over the last few decades in vehicle safety, roadway infrastructure and safety restraint legislation. Despite all of these advancements in road safety, MVCs continue to be the leading cause of death and serious injury among children 14 years of age and younger (Zaza et al., 2001). In North America alone, 82% of child safety seats are being used incorrectly, thus leaving those children unprotected and susceptible to injury and even death (Safe Kids 2002). This study demonstrated that children are being prematurely transitioned to the improper child restraint device or into an adult seatbelt. Public Health professionals have been effective, through prenatal classes, to ensure that infants are properly restrained in vehicles, however, further knowledge of proper transition times following the first year of the new child's life are equally important and need to be addressed more systematically. The prevention and reduction of injuries to children from motor vehicle collisions and the proper use of child restraint devices are very important topics that need to be better addressed by health care professionals. The knowledge transfer of vehicle safety information and transition times to parents needs to be explored on a longitudinal basis by injury prevention researchers, as it is such a vital area of research and can save so many lives. Motor vehicle safety is a major public health issue for Canadian families. A more systematic and comprehensive approach to vehicle safety education in both the health and education sector may support greater knowledge and use of injury prevention

strategies such as correct use of safety seats for children. This type of approach may also have a powerful influence on preventing thousands of injuries to Canadian children each year.

REFERENCES

American Academy of Pediatrics, (1996). Committee on Injury and Poison Prevention. Selecting and using the most appropriate car safety seats for growing children. Guidelines for counselling parents. *Pediatrics, 97.* 761 - 763.

American Academy of Pediatrics (2006). Car safety seats: A guide for families. Retrieved March, 2006, from www.aap.org

Arbogast, K. B., Durbin, D. R., Morris, S. D., & Winston, F. K. (2000). Assessing child restraint misuse by parental survey. *Injury Prevention, 6(1),* 145-147.

Arneson, S., & Triplett, J. (1990). Riding with bucklebear: An automobile safety program for preschooler. *Journal of Pediatric Nursing, 5(2),* 115-122.

Biagioli, F. (2002). Proper use of child safety seats. *American Family Physician, 65*(10), 2085-90.

Berns, S. D., Vaca, F., Harris, J. S., Tilman Jolly, B., Runge, J. W., & Todd, K. H. (2001). National highway traffic safety administration (NHTSA) notes. *Annuals of Emergency Medicine, 37(4),* 406-410.

Bull, M. J., Stroup., K. B., & Gerhart, S. (1988). Misuse of Car Safety Seats. *Pediatrics, 18(1),* 98-102.

Berg, M., Cook, L., H., Vernon, D., & Dean, M. (2000). Effect of seating position and restraint use on injuries to children in motor vehicle crashes. *Pediatrics, 105(4):* 831-835.

Block , D., Hanson, T., & Keane, A. (1998). Child safety seat misuse: Home visiting assessment and intervention. *Public Health Nursing, 15(4),* 250-256.

Burns, N., & Grove, S. (1997). *The practice of nursing research (3rd ed.).* Philadelphia: W. B. Saunders Company.

Campbell, H., Macdonald, S., & Richardson, P. (1997). High levels of incorrect use of car seats and child restraints in Fife-an important and under-recognized road safety issue. *Injury Prevention 3,* 17-22.

Children's Hospital of Philidelphia. (2006). Installing and using child safety seats and booster seats. Retrieved February, 2006, from http://www.chop.edu/consumer/your_child/condition_section_index.jsp?id=-8092

Chouinard, A. & Hurley, B. (2005). Toward the development of a national child restraint survey. *Transport Canada.*

CIHI – Ontario Trauma Registry. (2006). Analysis in brief: Ontario trauma registry 2005 injury hospitalizations highlights report. Retrieved March 2006, from http://secure.cihi.ca/cihiweb/products/OTR_MDS_Highlights_e.pdf

Decina, L., & Knoebel, K. (1997). Child safety seat misuse patterns in four states. *Accident Analogue and Prevention, 29(1),* 125-132.

Gaines, S., Layne, B., & DeForest, M. (1996). Promoting automobile safety for young children. *The American Journal of Maternal/Child Nursing, 21,* 148-151.

Geilen, Erikson, Daltroy, & Rost. (1984). Factors associated with the use of child restraint devices. *Health Education Quarterly, 11(2), 195-206.*

German, A., Gardner, W., Howard, A., Mackay, M, & Letts, R. (1999). Mechanisms of lap belt and airbag injuries in children. *In Child Occupant Protection in MotorVehicle Crashes: Vol 43. Proceedings of the Association for the Advancement of Automotive Medicine* (pp. 81-93). Ottawa, Canada.

Hazinski, M. F., Edy, V. A., & Morris, J. A. Jr. (1995). Children's traffic safety program: Influence on early elementary school safety program on family seat belt use. *Journal of Trauma, Injury, and Critical Care, 39(6)*, 1063-1068.

High, L. (2005). *An educational intervention for parents transporting children in motor vehicles.* Unpublished master's thesis, University of Windsor, Windsor, Ontario, Canada.

Huggins, C. (2003). Child Car Seat Instructions Hard to Understand. *MEDLINEplus,* 2003.

Johnston, C., Rivara, F., & Soderberg, R. (1994). Children in car crashes: Analysis of data for injury and use of restraints. *Pediatrics, 93(6),* 960-965.

Klinich, Pritz, Beebe, Welty & Burton. (1994). Study of older child restraint/booster seat fit and NASS injury analysis. National Highway Traffic Safety Administration, Vehicle Research and Test Centre. East Liberty, OH.

Lane, J. C. (1994). The seat belt syndrome in children. *Accident Analysis, andPrevention, 26(6),* 813-820.

Margolis, L., Wagenaar, A., & Molnar, L. (1992). Use and misuse of automobile child restraint devices. *American Journal of Diseases in Children, 146,* 361-366.

Millar, W. J., & Last, J. M. (1998). Motor vehicle traffic accident mortality in Canada. *American Journal Prevention Medicine, 4*, 220-230.

Morris, S. D., Arbogast, K. B., Durbin, D. R., & Winston, R. K. (2000). Misuse of booster seats. *Injury Prevention, 6(4),* 281-284.

Murphy, J. (1999). Pediatric occupant car safety: Clinical implications based on recent literature. *Pediatric Nursing, 25(2),* 137-144, 147-148.

National Highway Traffic Safety Administration. (2002). The use of child restraints in 2002. Retrieved February, 2006, from http://www.nhtsa.dot.gov/CPS/ChildRestraints/ChildRestraints.html

National Highway Traffic Safety Administration, National Center for Statistics and Analysis, Traffic Safety Facts, 2000: A compilation of Motor Vehicle Crash Data From the Fatality Analysis Reproting System and the General Estimates System. Washington, DC: US Department of Transportation; 2000.

National Highway Traffic Safety Administration. (1998). Child passenger safety. Retrieved March 2006, from http://nhtsa.gov/portal/site/nhtsa/menuitem.9f8c7d6359e0e9bbbf30811060008a0c/;jsessionid=Cvy6EMozba2wXCp7RTWEhkWkDhy3bMOSRfrENjX32NIcCUwosMAE!-2047803961

National Scientific Advisory Committee (2004). Listening for Direction on Injury: Identifying priorities for research and capacity development as a multi-institute strategic initiative within the Canadian Institute of Health Research. Retrieved March 2006, from www.injurypreventionstrategy.ca/downloads/LFDI_FinalReport.pdf

Neuman, B. & Fawcett, J. (2002). *The neuman systems model* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Nuemman, C. G., Nuemman, A.K., & Cockrell, M. E. (1974). Factors associated with child use of automobile restraining devices. *American Journal Disabled Children, 138,* 469-474.

Ontario provincial offences, 2000 pocket edition, R.R.O. 1990. Reg. 613. (1999). Toronto: Carswell Thompson.

Ontario Ministry of Transportation. (2005). Child car seat legislation and best practices. Retrieved, March 2006, from http://www.mto.gov.on.ca/english/safety/carseat/card.htm

Ontario Ministry of Transportation. (2003). Ontario road safety annual report, 2003. Retrieved March 2006, from http://www.mto.gov.on.ca/english/safety/orsar/orsar03/foreword.htm

Patterson, M. (1999). Prevention: The only cure for pediatric trauma. *Orthopaedic Nursing, 18(4),* 16-20.

Polit, D., & Beck, C. (2004). *Nursing research principles and methods* (7th ed.). Philadelphia: Lippincott.

Ramsey, A., Simpson, E., & Rivara, F. (2000). Booster seat use and reasons for nonuse. *Pediatrics, 106(2),*

Rivara, F. P., Bennett, E., Crispin, B., Kruger, K., Ebel, B., & Sarewitz, A. (2001). *Injury Prevention, 7,* 210-213.

Safe Kids Canada (2004). Booster Seat Use in Canada: A National Challenge. Retrieved February, 2006, from http://www.sickkids.ca/SKCForParents/custom/EnglishReport_BoosterSeats.pdf?s=Safety+Information+by+Topic&sID=10774&ss=Child+Passenger+Safety&ssID=11330&sss=Report%3A+Booster+Seat+Use+in+Canada+%2D+A+National+Challenge&sssID=1156

Sahai, V. S., Pitblado, J. R., Bota, G. W., & Rowe, B. H. (1998). Factors associated with seat belt use: An evaluation from the Ontario health survey. *Canadian Journal of Public Health, 89(5),* 320 - 324.

Snowdon, A. W., Patrick, L., Stamler, L., Polgar, J., Follo, G. (In Press). The Effectiveness of a Multi-media Intervention for Parents on Knowledge and Use of Vehicle Safety Systems for Children.

Snowdon, A. W., Polgar, J., Patrick, L., Stamler, L. (2006). Parents' knowledge about and use of child safety systems. *Canadian Journal of Nursing Research, 38(2),* 98-114.

Statter, M., & Vargish, T. (1998). The spectrum of lap belt injuries sustained by two cousins in the same motor vehicle crash. *The Journal of Trauma, 45(4),* 835-837. Ontario Ministry of Health. Injury admissions in Ontario, 1995. Ontario Trauma Register.

Stokes, S. C., Martin, B. R., Holmes, C. K., Jex, J. W., & Lopreiato, J. O. (2000). an examination of Child safety seat use in a military population. *Military Medicin, 165,* 875-877.

Transport Canada. (2005). Keep kids safe: Car time 1 2 3 4. Retrieved February, 2006, from http://www.tc.gc.ca/roadsafety/tp/tp13511/menu.htm

Transport Canada. (2002). Behavioural evaluation of child restraint system label/warning effectiveness. Retrieved February, 2006, from http://www.tc.gc.ca/roadsafety/tp/tp13987/menu.htm

Transport Canada. (2001). Canadian Motor Vehicle Traffic Collision Statistics.

Retrieved February, 2006 from http://www.tc.gc.ca/roadsafety/tp/tp3322/2004/page2.htm

Transport Canada. (1998). *Child restraint use in Canada: 1997 survey data.* (Leaflet No. CL9804(E) 1998). Retrieved February, 2006, from http://www.tc.gc.ca/roadsafety/STATS/c19804/eng

Transport Canada. (1995). *Occupant restraints and the human collision* (Cat. No. T46 22/1995). Ottawa: Minister of Supply and Services.

U.S. Department of Transport. (1998). Improving the safety of child restraints. Retrieved March 2006, from http://www-nrd.nhtsa.dot.gov/departments/nrd-11/childsafety/exec_summary.htm

Weber, K. (2000). Crash protection for child passengers: A review of best practice. *UMTRI Research Review, 31* (3), 1-27

Wegner, M. V., & Girasek, D. C. (2003). How readable are child safety seat installation instructions. *Pediatrics, 111*(3), 588-591.

Winston, F. K., & Durbin, D.,R. (1999). BUCKLE UP! is not enough: enhancing the protection of the restrained child. *JAMA, 281*, 2070-2.

Wong, D. (1999). *Whaley and Wong's nursing care of infants and children.* (6th ed.). St. Louis: Mosby.

World Health Organization. 2004. World report on road traffic injury prevention. WHO Library Catraloguing-in-publication Data. World Health Organization, 2002. Global Burdent of Disease Project, Version 1.

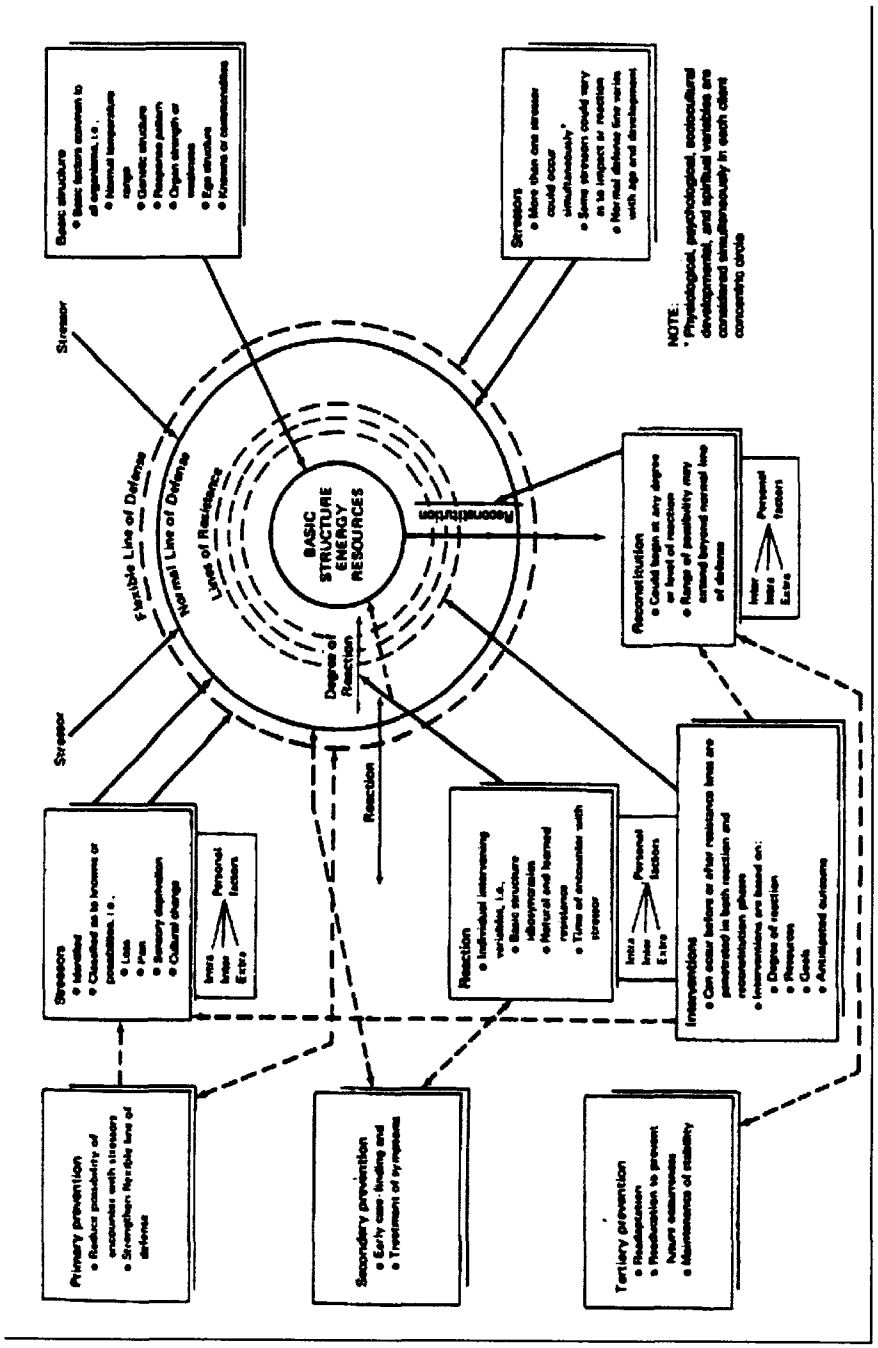
Zaza, S., Sleet, D. A., Thompson, R. S., Sosin, D. M., Bolen, J. C., & the Task Force on Community Preventive Services. (2001). Reviews of evidence regarding

interventions to increase use of child safety seats. *American Journal of Preventative Medicine, 21(4S),* 31-43.

APPENDICES

APPENDIX A

Neuman's Systems Theory Model



APPENDIX B

Appendix B

Average Height and Weight Measurements for Young Children

Average Height and Weight Measurements for Young Children

	Males		Females	
	Height	Weight	Height	Weight
Age 4	101.25 cm 40.5 in.	16.7 kg 36.75 lb	100.0 cm 40.0 in.	16.0 kg 35.25 lb
Age 5	108.1 cm 43.25 in.	18.75 kg 41.25 lb	106.9 cm 42.75 in.	17.72 kg 39.0 lb
Age 6	114.4 cm 45.75 in.	20.68 kg 45.5 lb	112.5 cm 45.0 in.	19.55 kg 43.0 lb
Age 7	120.0 cm 48.0 in.	22.84 kg 50.25 lb	118.8 cm 47.5 in.	21.93 kg 48.25 lb
Age 8	125.0 cm 50.0 in.	25.34 kg 55.75 lb	124.4 cm 49.75 lb	24.89kg 54.75 lb
Age 9	130.0 cm 52.0 in.	28.18 kg 62.0 lb	130.0 cm 52.0 in.	28.52 kg 62.75 lb
Age 10	135.6 cm 54.25 in.	31.47 kg 69.25 lb	136.3 cm 54.5 in.	32.61 kg 71.75 lb
Age 11	141.25 cm 56.5 in.	35.34 kg 77.75 lb	142.5 cm 57.0 in	37.05 kg 81.5 lb
Age 12	147.5 cm 59.0 in	39.89 kg 87.75 lb	149.4 cm 59.75 in.	41.59 kg 91.5 lb

Note. Average measurements=fiftieth percentile. Age noted in years. Adapted from *Whaley & Wong's Nursing Care of Infants and Children* (5th ed.). St. Louis: Mosby.

APPENDIX C

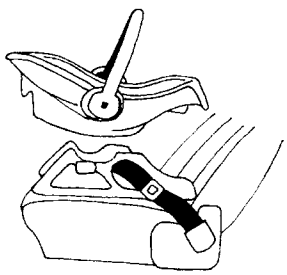
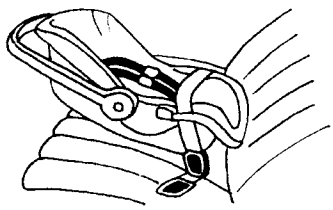
Appendix C: Pre-Test Questionnaire

Infant and Child Car Seats: A Survey of Parents' Knowledge and Use

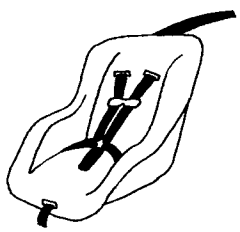
Thank you for agreeing to complete the attached survey designed to assist us in understanding some of your experiences when using car seats. Please answer the questionnaire keeping in mind the vehicle in which you usually transport the child.

Special Instructions: The following are numbered pictures of car seats. You will use these pictures to help you respond to the questions in Section 1 and Section 2. Please feel free to tear this page out to use as a reference when completing the questionnaire. This page does not need to be returned with the survey. **Proceed to Question 1 of Section 1 on page 3.**

Rear Facing Infant Seat (Pictures 1 and 2) – car seat that faces the rear of the car and is designed to be used only with younger or smaller infants

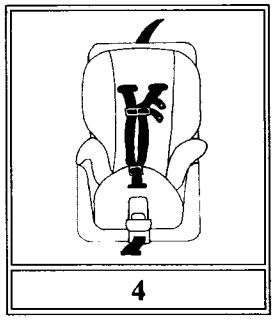
Infant restraint - with base	Infant restraint - no base
	
1	2

Convertible Car Seat (Picture 3) – car seat that can be used either facing the rear of the car for an infant or converted to a seat that faces forward for a larger infant or toddler

5-point harness

3

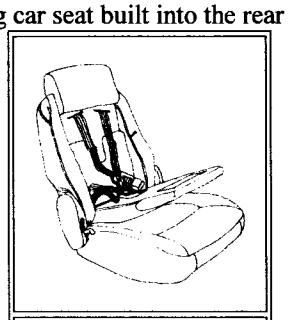
(Over)

Combination Child Seat and Booster (Picture 4) – car seat that can be used forward for a toddler or small child or as a booster seat for a larger child



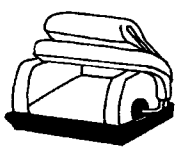
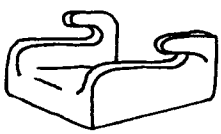
4

Integrated Car Seat (Picture 5) – Forward facing car seat built into the rear seat by the car manufacturer

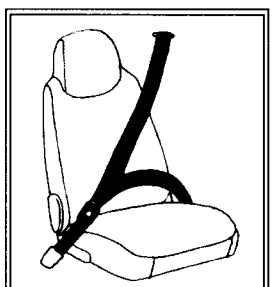


5

Booster Seat (Pictures 6, 7 and 8) – car seat that can only be used for a larger child and that uses the vehicle's seat belt to secure the child

Low back with shield	Low back with no shield	High back
		
6	7	8

Vehicle Seat Belt (Picture 9)



9

ID#_____

Section 1: Use of Infant and Child Car Seats

Please answer the following questions based on the situations described below.

Situation One: One of your friends calls you to ask when their infant should be moved from a **Rear Facing Infant Seat** (see Pictures 1 and 2) to a **Forward Facing Child Seat** either Toddler or Convertible (see Pictures 3, 4 and 5).

1) At what age, height and weight should you tell your friend to move their infant to the larger **Forward Facing Seat**? Please be as specific as possible.

a) Age _____ months
b) Height _____ inches **or** centimetres (circle one)
c) Weight _____ pounds **or** kilograms (circle one)

2) Please rate how confident are you with the responses you gave to your friend by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank (as 1, 2, or 3) which is the most important factor when deciding when a child is ready to move to a Forward Facing seat. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight ____Other_____

4) Your friend then asks you what is the next type of safety restraint after a Forward Facing Child Seat?

You tell your friend: ☐ Use a Booster Seat (proceed to Situation 2)
☐ Use a Seat Belt only (proceed to Situation 3)

Situation Two: One of your family members thinks that it may be time to move their child from a **Forward Facing Child Seat** (see Pictures 3 to 5) into a **Booster Seat** (see Pictures 6, 7 and 8) and asks you when it is safe to do this.

1) At what age, height and weight do you tell your family member that they can move their child to a **Booster Seat**? Please be as specific as possible.

a) Age _____ years and months
b) Height _____ feet/inches **or** centimetres (circle one)
c) Weight _____ pounds **or** kilograms (circle one)

2) Please rate how confident you are with the responses you gave to your family member by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank (as 1, 2, or 3) which is the most important factor when deciding when a child is ready to move to a Booster Seat. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight _____Other_____

Please proceed to Situation 3 on the back of this page.

Situation 3: Your child is asking you when he/she can use a **Seat Belt only** when riding in vehicles (see Picture 9).

1) At what age, height, and weight do you think your child should be using a **Seat Belt only**? Please be as specific
as possible.

a) Age _____ years and months
b) Height _____ feet/inches **or** centimetres (circle one)
c) Weight _____ pounds **or** kilograms (circle one)

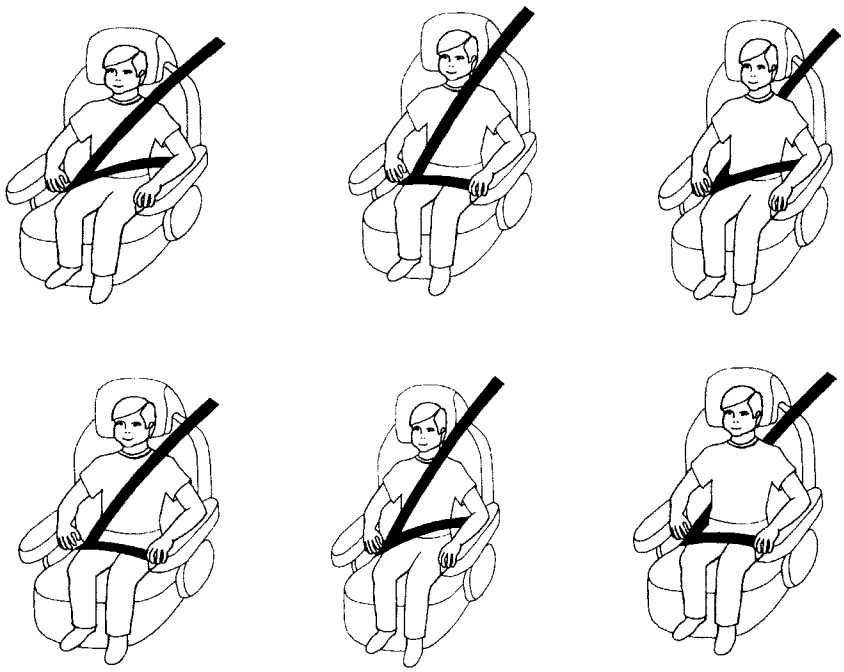
2) Please rate how confident you are with the responses you gave by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank (as 1, 2, or 3) which is the most important factor when deciding when a child is ready to use a Seat Belt only. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight _____Other_____

4. Please circle the illustration that shows the proper position of a seat belt on a child's body.



Section 2: Your Personal Experience of Car Seat Use

Instructions: This section includes questions about the car seats that you are currently using for each of your children. We want to know when each of your children was moved from one car seat to another and why you made that move. We have provided space for you to answer these questions for your **three youngest children**. Pages 5-6 are to be answered keeping in mind your youngest child, pages 7-8 keeping in mind your next oldest child and pages 9-10 keeping in mind your oldest child.

CHILD A (Youngest)

1. What is your child's date of birth? (month/day/year) _____

2. What sex is your child? ☐ Male ☐ Female

3. What is your child's current height and weight? **Please circle the unit of measurement your answer is in.**
Height: ____ feet **or** metres & ___ inches **or** centimetres **Weight**: _____pounds **or** kilograms

4. Please indicate the way in which your child's car seat is now being used. (Check one box only)
☐ Rear Facing ☐ Forward Facing ☐ Booster ☐ Seatbelt only
If your child is using a Booster Seat or a Seat Belt only please skip to Qu. 7 on the back of this page. If your child is using a Rear Facing or Forward Facing Seat please proceed to the next Question.

5. **For Rear Facing and Forward Facing Car Seats Only:** The following statements concern the ease of installing the car seat in your vehicle. Please circle one number on the 6-point scale for each statement.

	Does Not Apply	Very Difficult	Difficult	Moderate	Easy	Very Easy
Positioning the car seat properly	0	1	2	3	4	5
Threading the seat belt through the slot in the rear of the car seat	0	1	2	3	4	5
Tightening the seatbelt	0	1	2	3	4	5
Tightening the tether strap	0	1	2	3	4	5
Placing the child in the car seat	0	1	2	3	4	5
Positioning the harness or straps on the child	0	1	2	3	4	5

Instructions: If your child is using a Rear Facing Seat please skip to Question 7 on the next page. If your child is using a Forward Facing Seat please proceed to Question 6.

6. **For Forward Facing Seats Only:** If you are unsure what a tether strap is please refer to Picture 3 on Page 1.

The tether strap is used... (Circle one)	Never	Rarely	Sometimes	Often	Always

If the tether strap is **not always** being used please indicate the reasons. (You may check more than one reason.) ☐ Don't know what a tether strap is
☐ Don't think the tether strap is important to use
☐ Don't know how to use the tether strap.
☐ The vehicle does not have an anchor for the tether strap.
☐ The car seat is moved from one vehicle to another. How many times **per week**? _____
☐ Other (please specify) _____

(Over)

For questions 7–10, please try to think back to the time when Child A was moved into the current car seat or when the direction of the car seat was changed. For some of you, this may have occurred several years ago and we realize it may be difficult to answer. Please answer the questions to the best of your ability. **Please note: If your child's car seat is Rear Facing please proceed to Question 11.**

7. The most recent change in my child's car seat was:
   ☐ Rear Facing to Forward Facing ☐ Forward Facing to a Booster Seat
   ☐ Forward Facing to a Seatbelt only ☐ Booster Seat to a Seatbelt only
8. What was your child's age and weight when this move occurred?
   Age: _____ years & _____ months **Weight**: _____ pounds **or** kilograms (**circle one**)
9. We are interested in how confident you are about the age and weight you gave in question 8. Using the Confidence Scale below please indicate one number for each of the following:
   Age: Confidence Level _____ **Weight**: Confidence Level _____

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

10. Please indicate how **important** the following reasons were for deciding when deciding to make this move. If you never thought of a particular reason, please circle the 0 in the column labelled Not Considered. Otherwise please circle one number on the 1 to 5 scale for each statement.

	Not Considered	Not Important	A Little Important	Somewhat Important	Fairly Important	Very Important
Child's weight	0	1	2	3	4	5
Child did not like old car seat	0	1	2	3	4	5
Child no longer appeared to fit in the car seat	0	1	2	3	4	5
Child's age	0	1	2	3	4	5
The car seat was required by another child	0	1	2	3	4	5
Child's height	0	1	2	3	4	5

11. My child uses a safety seat(Circle one)

Never	Rarely	Sometimes	Often	Always

If the safety seat is **not always** being used, please indicate the reasons (you may check more than one):
☐ When transported by people other than parents ☐ On short trips in the city
☐ On short trips in the neighbourhood ☐ On the highway
☐ When using another family vehicle ☐ Child uses a seatbelt
☐ Other _____

12. **Instructions: If your child is 4 year old or older please answer this question.**
Do you **own** a Booster Seat for **Child A**? ☐ No ☐ Yes
If Yes, is Child A **currently using** the Booster Seat? ☐ No ☐ Yes
If it is not being **used**, please indicate the reasons (you may check more than one).
☐ The child is not big enough to use it ☐ The child has used it but is now ready to use a seatbelt only
☐ The child should be using it but refuses ☐ The seat belt does not fasten properly when the seat is used
☐ Other _____

<u>If you have another child please proceed to the next page. If not, please go to Page 11, Section 3: Location Of Your Children In Your Vehicle.</u>

CHILD B (Middle)

1. What is your child's date of birth? (month/day/year) _____
2. What sex is your child? ☐ Male ☐ Female
3. What is your child's current height and weight? **Please circle the unit of measurement your answer is in.**

   Height: _____ feet **or** metres & _____ inches **or** centimetres **Weight**: _____ pounds **or** kilograms
4. Please indicate the way in which your child's car seat is now being used. (Check one box only)

   ☐ Rear Facing ☐ Forward Facing ☐ Booster ☐ Seatbelt only

If your child is using a Booster Seat or a Seat Belt only please skip to Qu. 7 on the back of this page.

If your child is using a Rear Facing or Forward Facing Seat please proceed to the next Question.

5. **For Rear Facing and Forward Facing Car Seats Only:** The following statements concern the ease of installing the car seat in your vehicle. Please circle one number on the 6-point scale for each statement.

	Does Not Apply	Very Difficult	Difficult	Moderate	Easy	Very Easy
Positioning the car seat properly	0	1	2	3	4	5
Threading the seat belt through the slot in the rear of the car seat	0	1	2	3	4	5
Tightening the seatbelt	0	1	2	3	4	5
Tightening the tether strap	0	1	2	3	4	5
Placing the child in the car seat	0	1	2	3	4	5
Positioning the harness or straps on the child	0	1	2	3	4	5

Instructions: If your child is using a Rear Facing Seat please skip to Question 7 on the next page. If your child is using a Forward Facing Seat please proceed to Question 6.

6. **For Forward Facing Seats Only:** If you are unsure what a tether strap is please refer to Picture 3 on Page 1.

The tether strap is used... (Circle one)	Never	Rarely	Sometimes	Often	Always

If the tether strap is **not always** being used please indicate the reasons. (You may check more than one reason.)

☐ Don't know what a tether strap is
☐ Don't think the tether strap is important to use
☐ Don't know how to use the tether strap.
☐ The vehicle does not have an anchor for the tether strap.
☐ The car seat is moved from one vehicle to another. How many times **per week**? _____
☐ Other (please specify) _____

(Over)

For questions 7–10, please try to think back to the time when Child B was moved into the current car seat or when the direction of the car seat was changed. For some of you, this may have occurred several years ago and we realize it may be difficult to answer. Please answer the questions to the best of your ability. **Please note: If your child's car seat is Rear Facing please proceed to Question 11.**

7. The most recent change in my child's car seat was:
   ☐ Rear Facing to Forward Facing ☐ Forward Facing to a Booster Seat
   ☐ Forward Facing to a Seatbelt only ☐ Booster Seat to a Seatbelt only

8. What was your child's age and weight when this move occurred?
   Age: _____ years & _____ months **Weight**: _____ pounds **or** kilograms (**circle one**)

9. We are interested in how confident you are about the age and weight you gave in question 8. Using the Confidence Scale below please indicate one number for each of the following:
   Age: Confidence Level _____ **Weight**: Confidence Level _____

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

10. Please indicate how **important** the following reasons were for deciding when deciding to make this move. If you never thought of a particular reason, please circle the 0 in the column labelled Not Considered. Otherwise please circle one number on the 1 to 5 scale for each statement.

	Not Considered	Not Important	A Little Important	Somewhat Important	Fairly Important	Very Important
Child's weight	0	1	2	3	4	5
Child did not like old car seat	0	1	2	3	4	5
Child no longer appeared to fit in the car seat	0	1	2	3	4	5
Child's age	0	1	2	3	4	5
The car seat was required by another child	0	1	2	3	4	5
Child's height	0	1	2	3	4	5

11. My child uses a safety seat(Circle one)

Never	Rarely	Sometimes	Often	Always

If the safety seat is **not always** being used, please indicate the reasons (you may check more than one):
   ☐ When transported by people other than his/her parents ☐ On short trips in the city
   ☐ On short trips in the neighbourhood ☐ On the highway
   ☐ When using another family vehicle ☐ Child uses a seat belt
   ☐ Other _____

12. **Instructions: If your child is 4 year old or older please answer this question.**
   Do you **own** a Booster Seat for **Child B**? ☐ No ☐ Yes
   If Yes, is Child B **currently using** the Booster Seat? ☐ No ☐ Yes
   If it is not being **used**, please indicate the reasons (you may check more than one).
   ☐ The child is not big enough to use it ☐ The child has used it but is now ready to use a seatbelt only
   ☐ The child should be using it but refuses ☐ The seat belt does not fasten properly when the seat is used
   ☐ Other _____

CHILD C (Oldest)

1. What is your child's date of birth? (month/day/year) _____
2. What sex is your child? ☐ Male ☐ Female
3. What is your child's current height and weight? **Please circle the unit of measurement your answer is in.**

   Height: _____ feet **or** metres & _____ inches **or** centimetres **Weight**: _____ pounds **or** kilograms
4. Please indicate the way in which your child's car seat is now being used. (Check one box only)

   ☐ Rear Facing ☐ Forward Facing ☐ Booster ☐ Seatbelt only

If your child is using a Booster Seat or a Seat Belt only please skip to Qu. 7 on the back of this page. If your child is using a Rear Facing or Forward Facing Seat please proceed to the next Question.

5. **For Rear Facing and Forward Facing Car Seats Only:** The following statements concern the ease of installing the car seat in your vehicle. Please circle one number on the 6-point scale for each statement.

	Does Not Apply	Very Difficult	Difficult	Moderate	Easy	Very Easy
Positioning the car seat properly	0	1	2	3	4	5
Threading the seat belt through the slot in the rear of the car seat	0	1	2	3	4	5
Tightening the seatbelt	0	1	2	3	4	5
Tightening the tether strap	0	1	2	3	4	5
Placing the child in the car seat	0	1	2	3	4	5
Positioning the harness or straps on the child	0	1	2	3	4	5

Instructions: If your child is using a Rear Facing Seat please skip to Question 7 on the next page. If your child is using a Forward Facing Seat please proceed to Question 6.

6. **For Forward Facing Seats Only:** If you are unsure what a tether strap is please refer to Picture 3 on Page 1.

The tether strap is used... (Circle one)	Never	Rarely	Sometimes	Often	Always

If the tether strap is **not always** being used please indicate the reasons. (You may check more than one reason.)

☐ Don't know what a tether strap is
☐ Don't think the tether strap is important to use
☐ Don't know how to use the tether strap.
☐ The vehicle does not have an anchor for the tether strap.
☐ The car seat is moved from one vehicle to another. How many times **per week**? _____
☐ Other (please specify) _____

(Over)

For questions 7–10, please try to think back to the time when Child C was moved into the current car seat or when the direction of the car seat was changed. For some of you, this may have occurred several years ago and we realize it may be difficult to answer. Please answer the questions to the best of your ability. **Please note: If your child's car seat is Rear Facing please proceed to Question 11.**

7. The most recent change in my child's car seat was:
   ☐ Rear Facing to Forward Facing ☐ Forward Facing to a Booster Seat
   ☐ Forward Facing to a Seatbelt only ☐ Booster Seat to a Seatbelt only
8. What was your child's age and weight when this move occurred?
   Age: _____ years & _____ months **Weight**: _____ pounds **or** kilograms **(circle one)**
9. We are interested in how confident you are about the age and weight you gave in question 8. Using the Confidence Scale below please indicate one number for each of the following:
   Age: Confidence Level _____ **Weight**: Confidence Level _____

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

10. Please indicate how **important** the following reasons were for deciding when deciding to make this move. If you never thought of a particular reason, please circle the 0 in the column labelled Not Considered. Otherwise please circle one number on the 1 to 5 scale for each statement.

	Not Considered	Not Important	A Little Important	Somewhat Important	Fairly Important	Very Important
Child's weight	0	1	2	3	4	5
Child did not like old car seat	0	1	2	3	4	5
Child no longer appeared to fit in the car seat	0	1	2	3	4	5
Child's age	0	1	2	3	4	5
The car seat was required by another child	0	1	2	3	4	5
Child's height	0	1	2	3	4	5

11. My child uses a safety seat... (Circle one)

Never	Rarely	Sometimes	Often	Always

If the safety seat is **not always** being used, please indicate the reasons (you may check more than one):
   ☐ When transported by people other than his/her parents ☐ On short trips in the city
   ☐ On short trips in the neighbourhood ☐ On the highway
   ☐ When using another family vehicle ☐ Child uses a seat belt
   ☐ Other _____

12. **Instructions: If your child is 4 year old or older please answer this question.**
   Do you **own** a Booster Seat for **Child C**? ☐ No ☐ Yes
   If Yes, is Child C **currently using** the Booster Seat? ☐ No ☐ Yes
   If it is not being **used**, please indicate the reasons (you may check more than one).
   ☐ The child is not big enough to use it ☐ The child has used it but is now ready to use a seatbelt only
   ☐ The child should be using it but refuses ☐ The seat belt does not fasten properly when the seat is used
   ☐ Other _____

Section 3: Location Of Your Children In Your Vehicle

The following questions will help determine where children sit in vehicles and what type of vehicles parents are driving.

1. In what type of vehicle do you most often transport your children?
☐ Sedan (4 door) ☐ Coupe (2 door) ☐ Minivan ☐ SUV (Sport Utility Vehicle)
☐ Pick-Up Truck ☐ Station Wagon ☐ Other _____

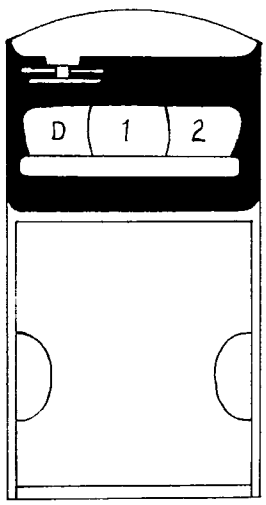
2. What is the make and model of this vehicle? _____

3. What year was this vehicle made? _____

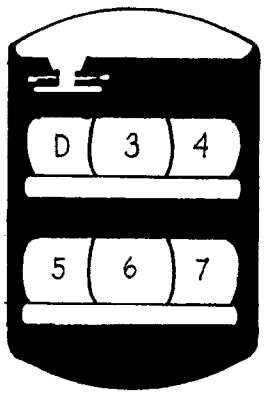
4. Does your vehicle have airbags? ☐ No ☐ Yes
If Yes, does your vehicle have: ☐ Driver air bags only ☐ Driver and front passenger air bags only
☐ Driver, front passenger and side impact air bags

5. The pictures below (under the Roman Numerals) represent different types of vehicles **based on the number of rows of seats**. Please **circle** the picture below (I, II, or III) that corresponds to your vehicle.

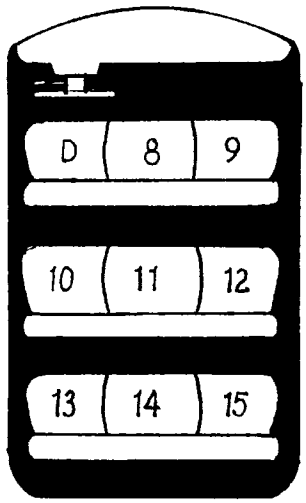
I



II



III



6. On the pictures above, each seat position is labelled with a number. Vehicles often differ in the **number of seats per row**. On the picture you chose, please indicate which seats your vehicle is missing by placing an **X** through the corresponding position on the picture. **For example**, if your vehicle is missing the middle front seat place an **X** through the Number 1, 3, or 8 depending on which picture you circled.

7. Now, please indicate where each of your children usually sits in the vehicle by choosing the number of the seat in which each child sits. Child A, B, and C should refer to the same children as in the previous sections.

Child A is in Seat # _____ **Child B is in Seat #** _____ **Child C is in Seat #** _____

Please proceed to question 8 on the back of this page.

8. The following questions are to be answered for each of your children. Please use Child A, B, and C to refer to the same children as in previous sections.

Child A (Youngest)

My child sits in the front seat...(Circle one)	Never	Rarely	Sometimes	Often	Always

If there are times when **Child A does** sit in the front seat, please indicate the reasons. You may check more than one reason.

- ☐ My vehicle has only one row of seats.
- ☐ My child won't sit anywhere else.
- ☐ My child sits in the front seat when I transport a lot of people.
- ☐ I let my child sit in the front seat as a reward.
- ☐ I like having my child sitting next to me.
- ☐ Other _____

Child B (Middle)

My child sits in the front seat...(Circle one)	Never	Rarely	Sometimes	Often	Always

If there are times when **Child B does** sit in the front seat, please indicate the reasons. You may check more than one reason.

- ☐ My vehicle has only one row of seats.
- ☐ My child won't sit anywhere else.
- ☐ My child sits in the front seat when I transport a lot of people.
- ☐ I let my child sit in the front seat as a reward.
- ☐ I like having my child sitting next to me.
- ☐ Other _____

Child C (Oldest)

My child sits in the front seat...(Circle one)	Never	Rarely	Sometimes	Often	Always

If there are times when **Child C does** sit in the front seat, please indicate the reasons. You may check more than one reason.

- ☐ My vehicle has only one row of seats.
- ☐ My child won't sit anywhere else.
- ☐ My child sits in the front seat when I transport a lot of people.
- ☐ I let my child sit in the front seat as a reward.
- ☐ I like having my child sitting next to me.
- ☐ Other _____

Section 4: Sources of Information

1. Did you receive any information regarding the safe use of car seats prior to the purchase/loan of your car seat?

If so, where did you acquire this information? Please check all that apply.

☐ Family or friends ☐ Car Seat Clinic ☐ Internet ☐ Pamphlets or magazines
☐ Hospital ☐ Prenatal classes ☐ Family doctor, paediatrician, public health nurse etc.
☐ Instructions on the box the seat comes in ☐ Other _____

2. Please indicate on the scale below how easy it was for you to find information about the safe use of car seats.

Very Difficult	Difficult	Moderate	Easy	Very Easy
1	2	3	4	5

Please proceed to Section 5 on the next page.

Section 5: Parent or Caregiver Information

1. Today's date (month/day/year) _____
2. Your Age: _____
3. Sex: ☐ Male ☐ Female
4. Relationship to child: ☐ Mother ☐ Father ☐ Guardian ☐ Grandparent ☐ Other _____
5. Marital status: ☐ Single ☐ Married/Common Law ☐ Separated/Divorced ☐ Widowed
6. Race/Ethnicity: ☐ Caucasian ☐ Native Canadian ☐ African Canadian ☐ Asian
   ☐ Arabic ☐ Hispanic ☐ East Indian ☐ Other _____
7. Language spoken at home _____
8. Country of Birth _____

   If you were not born in Canada, how many years have you lived here? _____
9. Do you live in a: ☐ Large city over 300,000 people
   ☐ Large city between 100,000 and 300,000 people
   ☐ Large town or city between 30,000 and 100,000 people
   ☐ Small town between 1,000 and 30,000 people
   ☐ Rural area less than 1,000
10. Yearly Household Income:
    ☐ under $20,000
    ☐ $20,001-40,000
    ☐ $40,001-60,000
    ☐ $60,001-$80,000
    ☐ Over $80,000
11. Highest level of education completed: ☐ Grade school
    ☐ Some High School
    ☐ High School Graduate
    ☐ Some post-high school
    ☐ College Diploma/ Certificate
    ☐ University Degree
12. How many years have you been driving? _____
13. Did you receive your driver training in Canada? ☐ No ☐ Yes

    If No, where was it received? _____
14. How many children do you have currently using child car seats? _____
15. How many children do you have currently using booster seats? _____
16. How many children do you have currently using seatbelts only? _____
17. How many times per week do you transport the child?
    ☐ less than once a week ☐ once per week ☐ two to three times per week
    ☐ four to six times per week ☐ every day

Thank you for completing this survey.

APPENDIX D

Appendix D: Six Week Post-Test Questionnaire

Post-Test Questionnaire

Date: _____
Subject ID: _____

Parents: Thank you for agreeing to participate in this study and working with us to improve children's safety in vehicles. Once you have reviewed the learning materials you received, please complete the following questionnaire and return it in the enclosed self- addressed envelope. No stamps are necessary. If you have any questions please call Dr. Anne Snowdon, (519) 253-3000 ext. 4812. Thank you again.

Section 1: Use of Infant and Child Car Seats

Please answer the following questions based on the situations described below.

Situation One: One of your friends calls you to ask when their infant should be moved from a **Rear Facing Infant Seat** to a **Forward Facing Child Seat**.

(1) At what age, height and weight should you tell your friend to move their infant to the larger **Forward Facing Seat**?

Age: _____

Height: _____

Weight: _____

(2) Please rate how confident are you with the responses you gave to your friend by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank each of the following as 1, 2 and 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight _____Other_____

4) Your friend then asks you what is the next type of safety restraint after a **Forward Facing Child Seat**. (Please check one only)

☐ **Booster Seat** (If you checked Booster proceed to Question 2)
☐ **Seat Belt only** (If you checked Seat Belt proceed to Question 3)

Situation Two: One of your family members thinks that it may be time to move their child into a **Booster Seat** and asks you when it is safe to use a **Booster Seat.**

1) At what age, height and weight do you tell your family member that they can move their child to a **Booster Seat**?

a) Age in years: _____

b) Height in inches: _____

c) Weight in pounds: _____

2) Please rate how confident you are with the responses you gave your family member by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank each of the following as 1, 2 and 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight

_____Other_____

Situation Three: Your child is asking you when he/she can use a **Seat Belt** only when riding in vehicles.

1) At what age, height and weight do you think your child should be using a **Seat Belt** only?

a) Age in years: _____

b) Height in inches: _____

c) Weight in pounds:_____

2) Please rate how confident you are with the responses you gave by circling one number.

Not Confident 1	2	3	4	5	6	7	8	9	Very Confident 10

3) Please rank each of the following as 1, 2 or 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

_____Age _____Height _____Weight _____Other_____

APPENDIX E

Appendix E: One Year Post-Test Questionnaire

Subject ID: _____ Date of 1 Year Follow-up: _____

ONE YEAR FOLLOW-UP QUESTIONNAIRE

Section One: General Knowledge of Use of Infant and Child Car Seats

Please answer the following questions based on the situations described below.

Situation One: One of your friends calls you to ask when their infant should be moved from a rear-facing infant seat to a forward facing child seat.

(1) At what age, height, and weight should you tell your friend to move their infant to the larger **forward facing seat**?

Age: _____ Weight: _____ Height: _____

(2) Please rate how confident are you with the responses you gave to your friend:

1 Not Confident	2	3	4	5	6	7	8	9	10 Very Confident

(3) Please rank each of the following as 1, 2, and 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

Age: _____ Weight: _____ Height: _____

Situation Two: One of your family members thinks that it may be time to move their child into a booster seat and asks you when it is safe to use a booster seat.

(1) At what age, height, and weight do you tell your family member that they can move their child to a **Booster Seat**?

Age: _____ Weight: _____ Height: _____

(2) Please rate how confident are you with the responses you gave by circling one number:

1 Not Confident	2	3	4	5	6	7	8	9	10 Very Confident

(3) Please rank each of the following as 1, 2, and 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

Age: _____ Weight: _____ Height: _____

Situation 3: Your child is asking you when he/she can use a seat belt when riding in vehicles.

(1) What age, height, and weight do you think children should move to a **Seat Belt** only?

Age: _____ Weight: _____ Height: _____

(2) Please rate how confident are you with the responses you gave:

1 Not Confident	2	3	4	5	6	7	8	9	10 Very Confident

(3) Please rank each of the following as 1, 2, and 3 to show which is the most important factor when deciding to make this move. Please use #1 as the most important and #3 as least important.

Age: _____ Weight: _____ Height: _____

Section Two: Current Use of Infant and Child Car Seats

Child #1:
Date of Birth: _____ Sex:M F
Current Height: _____ inches Current Weight: _____lbs

What type of safety restraint does this child usually use when riding in vehicles?
Type of Restraint:
Rear Facing Infant Seat Forward Facing Child Seat Booster Seat Seat Belt

When did your child start using this seat?
Date: _____ Time of year: _____ Age: _____
Weight: _____ Height: _____

Child #2:
Date of Birth: _____ Sex:M F
Current Height: _____ inches Current Weight: _____lbs

What type of safety restraint does this child usually use when riding in vehicles?
Type of Restraint:
Rear Facing Infant Seat Forward Facing Child Seat Booster Seat Seat Belt

When did your child start using this seat?
Date: _____ Time of year: _____ Age: _____
Weight: _____ Height: _____

Child #3:
Date of Birth: _____ Sex:M F
Current Height: _____ inches Current Weight: _____lbs

What type of safety restraint does this child usually use when riding in vehicles?
Type of Restraint:
Rear Facing Infant Seat Forward Facing Child Seat Booster Seat Seat Belt

When did your child start using this seat?
Date: _____ Time of year: _____ Age: _____
Weight: _____ Height: _____

Section Three: Use of Education Materials

1. Have you used the Bobby Shooster learning materials?

2. Which have you found most useful? Use a 5 point scale.

Material:	Very Useful 5	Useful 4	Somewhat 3	Not useful 2	Didn't Use 1
Growth Chart					
Story Book					
Fridge Magnet					
CD presentation					
Fact Sheets					
Parents Resource Guide					

3. For learning materials that were found to be useful, describe how or in what ways they were useful to your family?

4. Finally is there any other information you believe would have been helpful to have received from the project? Do you have any suggestions for us?

Appendix F: Phone Interview Script

Phone Interview Script

1. I am calling on behalf of Dr. Anne Snowdon who conducted a research study on car seat safety for children at the Early Years Center you attended last year.

   - We are calling today to ask just a few questions about the information you received on car seat safety for that study. It will take about 4 to 5 minutes.

   - "Do you have a few minutes to answer a few questions?

   - If the response is No, "Is there a better time I can reach you? It would be very helpful to complete the final phase of the study.

2. Fill out follow-up test over the phone.

This completes the follow-up, thank you for your time and Thank you very much for participating in this research. Have a nice day/evening/weekend...

APPENDIX G

UNIVERSITY OF
WINDSOR

Consent to Participate in Research

A team of researchers are conducting a research study for parents and children on car seat safety. You are asked to participate in this research study conducted by Dr. Anne Snowdon and Linda Patrick from the Faculty of Nursing at the University of Windsor, Dr. Jan Polgar from the University of Western Ontario, and Dr. Lynnette Stamler from Nipissing University. The sponsoring institute is AUTO21. AUTO21 is a network of over 200 Canadian researchers. AUTO21 is a national program of research funded by the Canadian government.

If you have any questions or concerns about the research, please feel free to contact Dr. Anne Snowdon at 253-3000 ext. 4812. (Chair of Ethics Committee, ext. 3916))

Purpose of the Study

The purpose of this study is to test the effectiveness of an intervention on parents' knowledge and use of safety systems for their young children (aged 1 month to 6 years, less than 40 lbs.) traveling in vehicles. The goal of the study is to inform parents of the appropriate height and weight guidelines for safety seat use and to provide parents with strategies to use in their decision-making to ensure children are positioned effectively in the correct safety seat with the correct fit and placement of the child in the safety seat in the vehicle. The intervention will not directly focus on installation of safety seats in vehicles.

Procedures for Parents attending Early Years program:

If you agree to volunteer to participate in this study, you will be asked to answer questions on a survey about car seat safety that will take about 10 minutes to complete. Then you will receive a package of information about car seat safety that will be reviewed and discussed with you by the researcher. This will take about 10 minutes. During the Early Years program, you and your child will take part in a specialized safety seat learning program conducted by staff. Children will be read and receive a storybook about safety seats, will enjoy crafts with a safety theme, and will learn about the importance of safety seats while traveling in vehicles. Parents will participate in their children's' learning of the safety seat program and will work with their children on the safety seat learning activities. In order to evaluate your child's learning, you may be asked for permission to tape record your child's answers to safety questions during the safety learning activities in the center. This research will be incorporated into the Early Years Program for parents and their children.

Two weeks after the safety information and learning is completed at the Early Years center, you will be contacted by the researcher by telephone to complete another survey of questions to measure and evaluate the information materials you and your child received during the program. At the conclusion of the survey, parents will be invited to participate in a follow-up phone interview with the researcher 6 months and 12 months following the safety information intervention. Parents will be able to ask the researcher questions and obtain further assistance with safety seat concerns or questions at any time during the study. At each follow-up call, the participant will answer a 5 minute telephone questionnaire evaluating what parents remember about the intervention. Your participation is completely voluntary; you may choose to withdraw from the study at any time. Results of this study may be kept and analyzed in future studies to further examine parents' use of safety systems.

Potential Risks and Discomforts

There are no potential risks or discomforts to the participants.

Potential Benefits to Subjects and/or to Society

This intervention will potentially benefit parents by increasing their knowledge and use of child safety seats that may reduce their child's risk of injury in the event of a vehicle collision. Proper use of car safety seats has the potential to save a child's life in the event of a vehicle collision.

Payment for Participation

The subject will receive no payment for their participation in the study.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission.

The participants will be number coded and all data collected will be kept in a locked area with researcher access only.

All audio taped material will be kept in a locked area. The audio taped material is only used to evaluate the language that the children used to express their interpretation of the concepts they have learned through the intervention.

The data collected will be kept for a duration of 10 years.

- o Check here if you agree to have your data used in subsequent studies. You may withdraw them from subsequent use.

Participation and Withdrawal

You can choose whether to be in this study or not. If you volunteer to be in the study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

Rights of Research Subjects

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact:

Research Ethics Co-ordinator Telephone: 519-253-3000, #3916
University of Windsor E-mail: ethics@uwindsor.ca
Windsor, Ontario
N9B 3P4

Signature of Research Subject/Legal Representation

I understand the information provided for the study "Vehicle Safety for Children" as described herein. My questions have been answered to my satisfaction, and I voluntarily agree to participate in this study and for me and my child to be audio taped. I have been given a copy of this form.

_____
Name of Subject

_____ _____
Signature of Subject Date

I agree to being contacted in six months and in 12 months to complete a telephone interview with the researcher.

_____ _____
Signature of Subject Date

If you have agreed to be contacted in 6 months and 12 months, please write down your contact information.

_____

Signature of Investigator

In my judgment, the subject is voluntarily and knowingly giving informed consent to participate in this research study.

_____ _____
Signature of Investigator Date

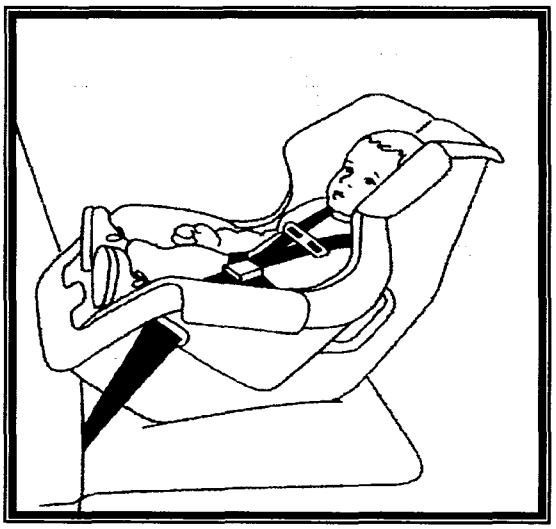


Figure 1A. Rear Facing Convertible

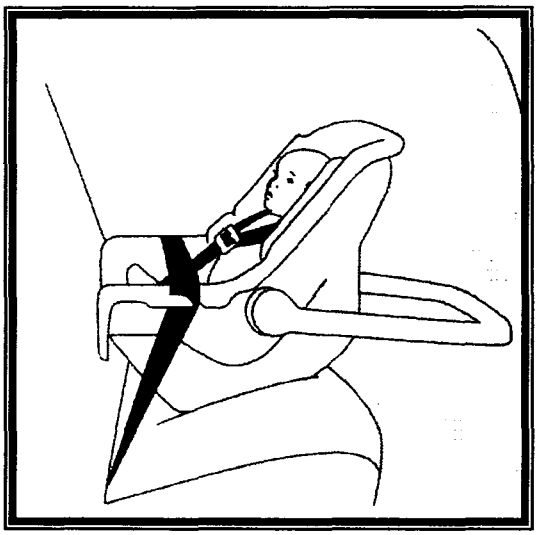


Figure 1B. Rear Facing Only

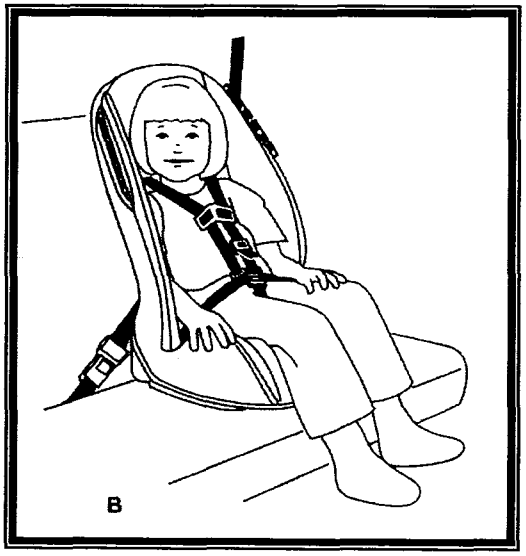


Figure 2A. Combination Child Restraint Booster

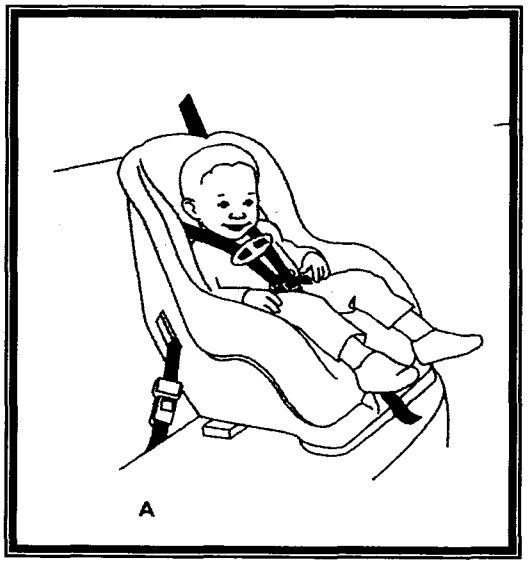


Figure 2B. Forward Facing Convertible

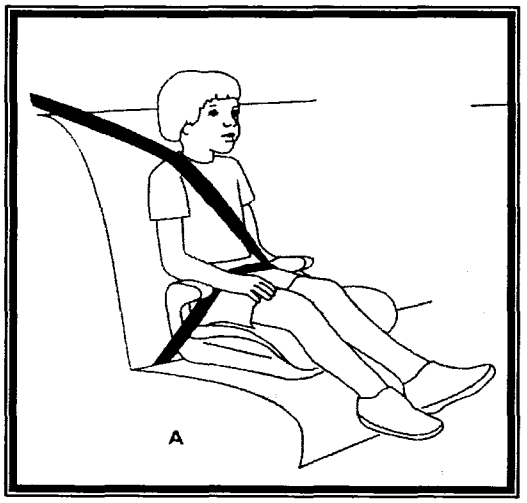


Figure 3A. Low Back Booster

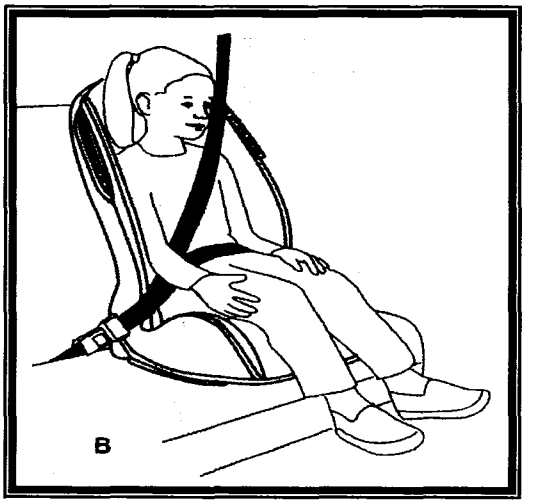


Figure 3B. High Back Booster

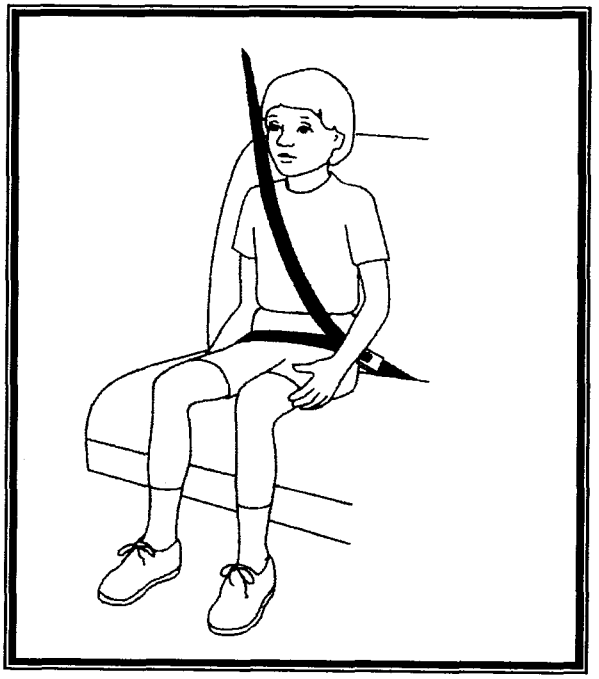


Figure 4. Vehicle Seat Belt

VITA AUCTORIS

Sarah Elizabeth Harvey was born in 1981 in Orangeville, Ontario. She graduated in 2000 from Adam Scott Collegiate Vocational Institute. From there she went on to Queen's University where she obtained her Bachelor of Nursing Science in 2004. Sarah proceeded to the University of Windsor, where she completed her Master's of Science degree in Nursing and hopes to graduate in 2006. In September 2006, Sarah will begin doctoral studies at the University of Toronto.