

# **Children's safety in shopping carts**

Assessment of parental behaviour that increase  
probability of accidents for toddlers

Jenny Sofia Engström

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Leiðbeinandi: Zuilma Gabriela Sigurðardóttir

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### **Abstract**

This study concerns children's safety in grocery stores and investigates the frequency of adults placing their children in the basket portion of grocery carts during the shopping trip. Such behaviour is a threat to children's safety as it increases the risk of a fall off the cart. It is estimated that 100 children per year are injured by falls from shopping carts in Iceland. The frequency of children standing on the outside of the cart was also assessed. The observations took place in two grocery stores and results show that these types of behaviours were fairly common in the larger store but less frequent in the smaller one, which in turn raises additional questions for future research on the subject.

## Children's safety in Shopping carts: Assessment of parental behaviour that increase probability of accidents for toddlers

Many of us spend most of our daily lives in a man-made surrounding; we work and study in buildings, we play in the parks and walk or drive on the streets. Much of this built environment is designed with our safety in mind. The designs of buildings follow regulations and standards to protect us from hazards, and seat belt systems and speed limit signs and are there to keep us safe and guide us in traffic. The cost of not knowing the risks or the neglect of these safety standards or guidelines would be an increased risk of danger to people around us and to ourselves as well. Children especially could be considered at greater risk of danger since they rely more on the behaviour of adults, rather than signs, to keep them safe. There are many environments that could cause harm to children if parents or caregivers would not be around and aware of these threats.

### **Child-injuries in Iceland**

According to a report by Marta Guðrún Skúladóttir for Hagfræðistofnun Háskóla Íslands og slysavarnarráð, 30 – 35 thousand children in the whole country are injured each year (numbers are from the period 1990-1996) (Marta Guðrún Skúladóttir, 2000). The frequency of fatal accidents is highest among 15 to 18 year old boys which can be related to traffic accidents when missing control of a vehicle. However, the group with the second highest frequency of lethal injuries is boys between the ages zero to four years, involving 2,3 cases per year (Marta Guðrún Skúladóttir, 2000). When comparing this frequency with that in other Nordic countries, Iceland lies a bit higher with 8,9 child-injuries for every 100 inhabitant while the number is 6,8 in Norway; 3,6 in Finland ; 3,4 in Denmark and 3,4 in Sweden (Marta Guðrún Skúladóttir, 2000).

There are many different kinds of costs when a child gets injured. On one side, there is a personal cost which could be loss of income for the parent/s if they have to stay at home from work to care for their injured child. On the other side there is a cost for the society as a whole in form of the utilisation of medical transport and health care institutions. The total price of the health care institutions for child-injuries is approximated to be between 200-275 million ISK per year. The personal cost is somewhat higher and lies between 3.500-18.400 million ISK per year (Marta Guðrún Skúladóttir, 2000). The same report also states that child injuries that take place at home are most common in comparison to injuries that take

place at school, during sports or in traffic (Marta Guðrún Skúladóttir, 2000). In 2012, Embætti Landlæknis released a report supporting this, stating that domestic and leisure accidents constitute 76% of all accidents in the age group 0-4 years (Embætti landlæknis, 2012).

### **Shopping cart related accidents**

The kinds of accidents that fall in the domestic- and leisure accident category vary and do not all take place at the home. Numbers from 2003 show that about 5% of the children that sought assistance at the emergency department did so due to accidents that took place at grocery stores and supermarkets, with falling from the shopping cart as one of the most common accidents (Herdís L. Storgaard, 2005). It is estimated that 100 children per year are injured by falls from grocery carts in Iceland (Embætti Landlæknis, 2005).

In a newscast in 2014, made by Ríkissjónvarpið, it was reported that the frequency of cases of parents who let their children sit or stand in the food section of the cart had increased. Thus, this parental behaviour directly augments the risk of injury (Herdís L. Storgaard, 2014). These news were broadcasted after a child had suffered a head injury following a cart tip-over in 2014 and concerns were raised regarding children's safety when riding in the shopping carts. Instead of letting the children ride in the basket-section of the cart intended for the food, children under 15 kg should be put in the special child safe seat and children exceeding that weight limit should not be allowed in the carts at all (Herdís L. Storgaard, 2005). Other things parents can do to prevent accidents involve not leaving the child in the cart without supervision and to fasten the child with a seat belt on the cart seat. Installing signs that inform parents about the danger of incorrect use of the carts can also be preventive, as well as making sure that the shopping carts function properly to minimise the risk of accidents (Herdís L. Storgaard, 2005).

In the USA, a whole 4% of the accidents related to shopping carts involving children under age of 15 require medical attention. The two most common mechanisms of shopping cart injuries are falls from the cart and cart tip-overs. In one study are more than half of all shopping cart accidents for children younger than 15 years connected to cart falls offs and another 25% related to cart tip-overs (Smith, 2006). In rare cases, falls and cart tip-overs have even resulted in deaths (Smith, 2006; Smith, Dietrich, Garcia and Shields, 1996). Falls from the cart are mostly related to incidents where the child stands in the cart basket (Smith, 2006)

suggesting again that the leading mechanism of injury is the position of the child inside the cart.

Europe and Australia/New Zealand have since the end of the 1990's laid out standards regarding the construction, testing, and safety of shopping carts which now function as the national standards in 21 countries (Smith, 2006). In this technical report, Smith criticises the US Performance Standard for Shopping Carts, established in 2004, for lacking to address the two most common mechanisms related to child-injury, i.e., falls from carts and cart tip-overs. Among other things, he suggests the US Standard for Shopping Carts should include standards for cart stability and criteria for seat belt or other types of child-restraining systems (Smith, 2006). Smith (2006) furthermore reports that in more than 90% of the occasions where a child is injured, a parent is present, suggesting that mere supervision is not sufficient for the child's safety. Indeed, even in cases where parents report keeping a close eye on their children when they are in the shopping cart, records show that 76% of parents lose sight over their children at some point during the shopping trip (Harrell, 2003a).

Numbers from 2005 show that about 24.200 children younger than 15 years required hospital admission after shopping cart-related accidents in the U.S. (Martin, Chounthirath, Xiang, and Smith, 2014; Smith, 2006). One three year old boy suffered life-threatening injuries after falling from a cart and hitting his head, causing a skull fracture and two lacerations in the middle meningeal artery (Smith et al., 1996). Two out of three children that fall from a shopping cart land on a hard surface like asphalt or concrete (15%) and linoleum (53%) (Smith et al., 1996), and factors like the height of the fall and the surface of landing determines to great extent the probability and severity of injury. The impact that a fall from a shopping cart has on a child is equivalent to that of a man of average height falling off a garage roof (Herdís L. Storgaard, 2005). Furthermore, 75% of shopping cart related accidents that require admission to the hospital involves head- and neck injuries, and 45% of all injuries are fractures (Smith, 2006; Smith et al., 1996).

A study published in 2014 concerning the consequences of falling from a shopping cart showed, apart from the finding that the head was the body region most frequently injured, that almost 91% of the head injuries happened to children under four years of age who also were three times more likely to be diagnosed with a concussion than four year old children. The younger children also had the highest

overall injury rates (Martin et al., 2014). The same study also showed a more than doubled increase of registered concussions between the years 1990-2011 for children under the age of 15, or an increase of 254%.

### **Consequences of brain injury at a young age**

Brain insults sustained during early childhood (before or at the age of three) compared to injuries sustained at an older age have been related to both lower IQ scores and poorer executive functions (Anderson et al., 2010). Consequences such as impairment in the executive functions including attentional control, working memory, goal setting, and processing speed seem to be dependent on the age at which the insult was sustained (Anderson et al., 2010). In very young children, the severity of injury is better predicted by the age of the child than of the location of the insult (frontal versus non-frontal brain regions) suggesting a lack of functional specificity in the undeveloped brain. Other findings show that children who sustained early brain injury before age of three showed more global and severe deficits in cognitive skills than children with insults after this age (Anderson et al., 2010). Other research on long term consequences of brain injuries early in life have shown that children that suffer a mild traumatic brain injury before the age of five are considerably more likely to demonstrate symptoms of ADHD (attention deficit and hyperactivity disorder), conduct and/or oppositional defiant disorder, mood disorder, and substance abuse, at the age 15 to 16 (McKinlay, Grace, Horwood, Fergusson, and MacFarlane, 2009). As the consequences of a mild traumatic brain insult (concussion) are most severe for the youngest children and considering that they can lead to disruption in the developmental process of the brain, examining and preventing situations where children are at heightened risk for these types of injuries should be of high interest. Furthermore, mild traumatic brain insults can affect prospect brain maturation as well as have a continual negative outcome on psychosocial development (Anderson et al., 2010, McKinley et al., 2009).

### **Methods of applied behaviour analysis**

Methods of applied behaviour analysis, or behavioural engineering, focus on solving everyday problems by altering the environment in order to improve behaviours that are socially significant (Pierce and Cheney, 2013). The school of behaviour analysis studies the behaviour of organisms and builds upon the concept of selection by consequences as the fundamental principle. Sprung from the idea of evolution by natural selection, selection by consequences as introduced by B.F.

Skinner, is the causal process and explanation of biology, behaviour and culture. As behaviours are selected by their consequences, alterations of these also produce change in that particular behaviour (Pierce and Cheney, 2013).

When we alter our behaviour due to the consequences that follow we learn by a process known as operant conditioning. This type of learning concerns the increase or decrease of a behaviour (or operant) as a result of the consequences that follow that behaviour (Pierce and Cheney, 2013). Hence, how we come to behave depends on our experience of events and other stimuli, in other words, on our conditioning history. Some objects, events or situations that have been followed by reinforcement (a consequence that leads to an increase in that particular behaviour) can obtain a discriminative function. These discriminative stimuli, also called antecedent stimuli, predict reinforcement and set the occasion for, or exert control over the behaviour (Dewey, 2004; Pierce and Cheney, 2013), i.e., increase its likelihood.

A behavioural antecedent intervention is a behavioural strategy to change behaviour by using the laws of operant conditioning to create a discriminative stimulus to increase the probability of a behaviour. A sign prompt could work as such stimulus, and has been shown to be successful in altering behaviours related to seatbelt use (Cox, Cox and Cox, 2000), bathroom graffiti drawing (Mueller, Moore, Doggett and Tingstrom, 2000; Watson, 1996), recycling (Austin, Hatfield, Grindle and Bailey, 1993), and illegal parking in spaces reserved for the physically disabled (Cope, Allred, and Morsell, 1991) to mention a few examples.

The most effective way to prevent accidents is by using strategies that does not involve frequent human action (Smith, 2006). Since the method of antecedent intervention does not always require human action, as the sign itself takes on the function of a controlling stimulus, it seems as a method fairly easy to use. Another advantage with this kind of intervention is that it comes into view as very cost effective since it is a one-time expense (Cox et al., 2000; Watson, 1996). Using sign prompts or other environmental cues does not, when effective, require the delivery of consequences (reinforcement or punishment) to alter the behaviour. The effectiveness of a consequence is determined by many factors, such as the probability of the consequence following said behaviour, its proximity to it in time, and whether or not people learn the behaviour-consequence relation (Michael, Leeming, and Dwyer, 2000). However serious the consequence of a fall from a



shopping cart can be, a fatal outcome is very rare considering how often parents go shopping with their children. A consequence likely to take place more often is that by letting their children in the cart, the shopping trip runs smoother and faster, as the children will be closer to the parents and not run around in the shopping aisles. The lack of negative consequence might keep parents engaging in this unsafe behaviour, not being aware of the risk they might expose their children to. An intervention that does not involve altering the consequences of a behaviour, as in the case of a sign intervention, is more likely to be effective if the prompt is specific, located in the area where the response is expected, and require a response that is not too inconvenient to the responders (Austin, et al., 1993; Geller, Winett, and Everett, 1982).

In a study made by Cox, Cox and Cox (2000) the effect of motivating sign prompts on safety seat belt use among seniors was examined. The researchers observed the frequency of safety belt use before and after signs were installed under a stop sign close to the exit of the senior community, the signs had a positive health related messages such as “Buckle up. Stay safe” written on them. During baseline measuring, none of the drivers that did not have a seatbelt on got buckled at the stop sign however, after the signs were installed, 86% of the seniors approaching the sign without seat belt did buckle up at the sign. Almost the same effect could still be observed at a 6-month follow-up. They also observed a possible learning effect as more seniors had buckled up before approaching the sign at the 6 month follow-up compared to the levels at the baseline, i.e., before the intervention was implemented (Cox et al., 2000).

Another way of using signal prompts to produce change in behaviour was investigated in a study made at the Florida State University. The study examined what effect specific informative prompts had on the university staffs recycling behaviour. The intervention was carried out at two departments at the university and involved installing two different coloured signs labelled “TRASH” (red sign) and “RECYCABLE MATERIALS” (green sign), the signs also displayed samples of items appropriate for each of the two containers and were placed right above them. The study demonstrated that at postinstallation of the signs, both departments had a substantial increase in recycling. The effect of the informational prompts were also higher when the two containers were closer to each other, suggesting that the

intervention worked better when the subjects did not have to go far to throw different types of waste, requesting less effort to recycle (Austin et al., 1993).

### **Rationale and presented research**

Árni Þór Eiríksson (2011) completed a study on children's safety regarding shopping cart related accidents. In his study he examined the effect of a sign intervention on the frequency of adults placing their children in the cart basket of the shopping cart. The sign he used in his intervention had the motive of a red circle with a diagonal line through it, surrounding a pictogram of a child seated in the cart basket, and above the figure the text, "vinsamlega setjið börn ekki ofan í innkaupakörfunum" (Please do not put children inside the shopping cart) in red letters on a yellow background (see appendix A). The intervention used by Árni Eiríksson had a positive outcome and his research showed that it is possible, by simple means to affect this risky behaviour that parents engage in when shopping with their children (Árni Þór Eiríksson, 2011; Árni Þór Eiríksson and Zuilma Gabriela Sigurðardóttir, 2011).

As reviewed above, a number of studies have already been made on shopping cart safety, both on the frequency of accidents and on the effectiveness of prevention. When it comes to prevention strategies, much focus has been on the installation and utilisation of some form of seat belt system. Some stores have so called "greeters" at the entrance to demonstrate to customers how to use the seat belt function and to ask them to buckle the child, had they not already done so, an intervention which has increased the frequency of seat belt use (Harrell, 2003a; Smith, 2006). However, as mentioned in the study of Martin et al., (2014) this would not protect the children from injuries, should the cart tip over, which according to their research is the third most common type of shopping cart accidents. Another solution that the American Academy of Pediatrics has recommended is to use a child-friendly shopping cart that looks like a car (also known as car-cart). The child can be restrained while seated, and as the model car is attached in front of the cart, it keeps the child lower to the ground (AAP, 2006).

One thing related to shopping cart safety behaviour that has not been widely examined is the phenomena of children standing on the outside of the cart, on either the ends or sides of it, the fall might not be as high and thus the risk of injury lower, however it might increase the risk of tipping over the cart and moreover hurting any

child that might be inside the cart (Harrell, 2003b) and the child that might end under the cart.

The purpose of the presented research was similar to the baseline stage of the study of Árni Þór Eiríksson from 2011. That is, observing and measuring the frequency of parents engaging in the behaviour of seating their children in the basket portion of the shopping cart before any intervention was introduced. The observations took place at two grocery stores in the Reykjavík downtown area, and in extension to the former research by Árni Eiríksson, the present study also included observations and measurements of the frequency of children standing on the outside of the carts.

## **Method**

### **Participants**

Participants in this study included all of the adult individuals with children that went to the grocery stores Krónan Grandi and Nettó Grandi at the times of observations between the 4<sup>th</sup> of April and the 7<sup>th</sup> of May 2016. The two stores were chosen by convenience sampling and the time of observation was related to the part of the day that was expected to include the peak of visitors.

### **Materials**

A counting sheet was utilized to record the observations. The sheet included recordings of the sex of the individual/s emitting the target behaviour, along with the registration of the colour of both the child's cap and the colour of his or her jacket/top (see appendix B). This was done to minimize the risk of counting the same instance more than once and for reliability measurements.

### **Design**

The research design of this study was non-experimental and included unobtrusive observations of the frequency of the target behaviour. The target behaviour included the act of placing a child in the basket portion of the shopping cart, i.e., the space intended for food and other products. Placing a child in the special seat designed for children, or to place a portable car seat in the cart basket were not categorized as the target behaviour. Each occurrence of letting a child into the shopping cart basket was recorded and if a child was let down or climbed out of the cart and at a later point was observed to be, again seated in the cart, it would

count as two instances of the target behaviour. The measurements were carried out six days per week from Monday to Saturday, with the first occasion of observation taking place the 4<sup>th</sup> of April and the last one on the 7<sup>th</sup> of May. The six days were divided between the two stores so that measures were taken for three continuous days in one store following three continuous days of observations in the other store. Observations could for example take place Monday, Tuesday and Wednesday at store 1 and then Thursday, Friday and Saturday at store 2, and the other way around the following week. The total number of observations was 24, or 12 observations in each store. Each session of observation and measurement was 90 minutes and took place Monday to Friday from 16.30 until 18.00 and on Saturdays from 13.00 until 14.30. Reliability measurements were carried out on 7 of the 24 measuring days. The rater took part in a couple of practice sessions in two other stores before the real measurements began. No independent variable was treated as the purpose for this study was to measure the frequency of the target behaviour.

### **Procedure**

A request for permission to conduct the research was sent out to managers of different grocery stores in the Reykjavik area. The request included information of the purpose of the research and the procedures were explained. Permission was granted at Krónan Grandi and Nettó Grandi. The rater gave the managers or staff members a notice at arrival. To cover as much space as possible during the measurement rounds, the rater walked in a circular fashion around the store and counted the times the target behaviour occurred among the shoppers. The incidents were recorded on the counting sheet in a way to not cause the visitors to guess the nature of the research or the function of the rater in the store. The sheet had information about the store in which the measurements took place along with the date and time. As the second purpose of the study was to check how often a child stood on the outside of the cart, the frequency of this behaviour was also recorded on the sheet (see Appendix B). All the 24 sessions were carried out by the same rater.

### **Reliability analysis**

Reliability measurements took place at seven of the 24 measurements, or more specifically three times at Nettó Grandi and four times at Krónan Grandi. The rater did not know when or at what store the reliability measurements would be

made, and they were carried out by another rater located in the store. Raters walked separate rounds in the stores recording the target behaviour independently. On one occasion the other rater recorded the target behaviour by watching tapings from that particular measurement session on the store's security cameras, due to illness. The interrater agreement was 93,3% according to the method of total frequency reliability (Caro, Roper, Young and Dank, 1979), this is higher than the 80 to 85% of agreement that is generally accepted as a minimum level of agreement (Frey, 2006).

## Results

The purpose of the research was to measure the frequency of the behaviour of seating a child in the basket portion of a shopping cart during a shopping round. In addition was also recorded how often a child was observed standing on the outside of the shopping cart.

Table 1

*The distribution of the measurement results for both stores.*

|        | Mean | Maximum frequency | Minimum frequency |
|--------|------|-------------------|-------------------|
| Nettó  | 1,17 | 3                 | 0                 |
| Krónan | 7,17 | 17                | 2                 |

The measurement results for the former behaviour can be seen in table 1 for both stores in form of the mean, maximum and minimum frequency. The maximum frequency of the target behaviour was highest at the store Krónan with one measurement reporting 17 observations of the target behaviour. The minimum frequency was lowest at the store Netto with zero observations of target behaviour. The average number of cases of parents involved in this behaviour were almost seven times higher at Krónan, with 7,17 times than at Nettó (see table 1).

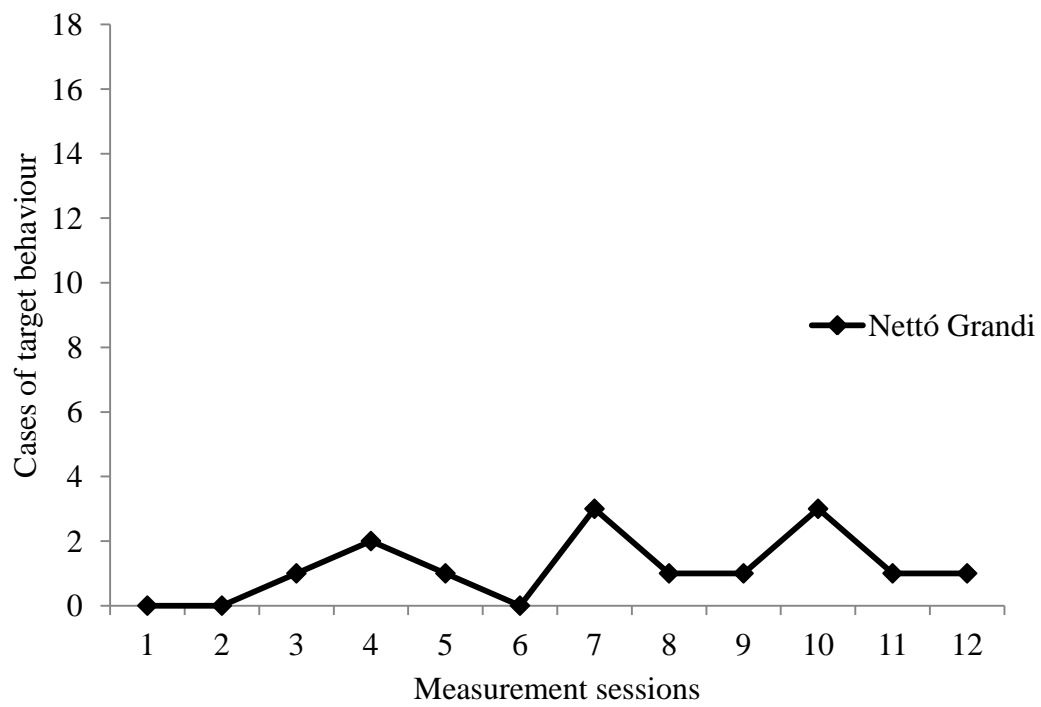


Figure 1 Number of cases of observed target behaviour for each measurement at Nettó Grandi.

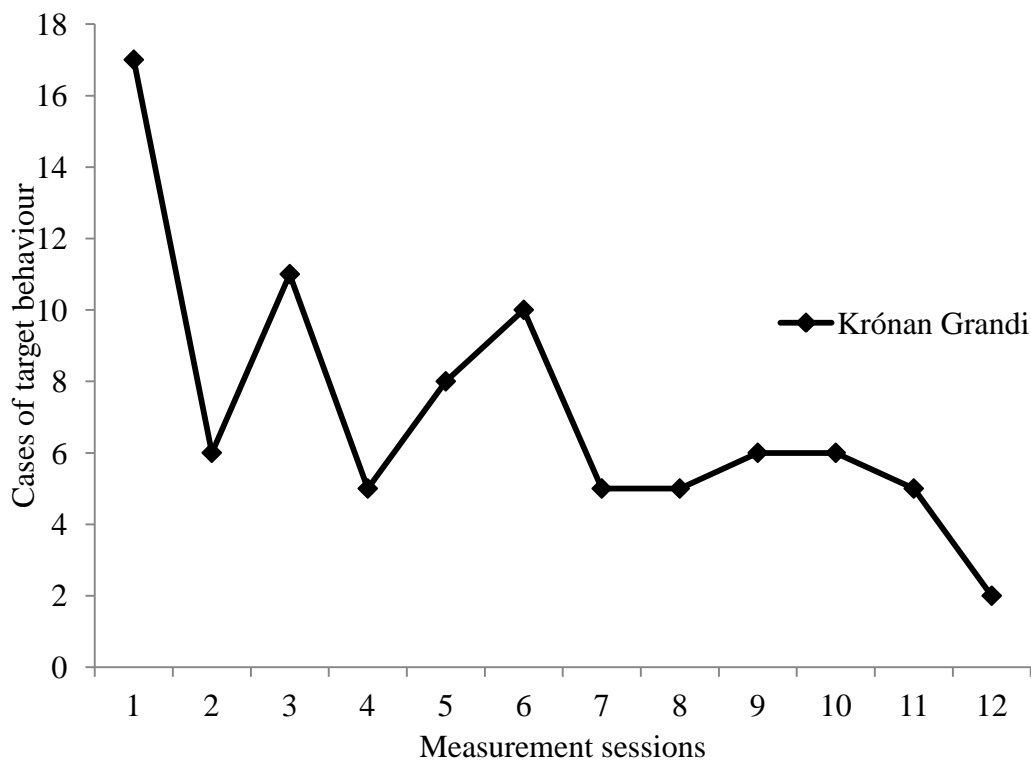


Figure 2 Number of cases of target behaviour for each measurement at Krónan Grandi.

Figures 1 and 2 show the distribution of the target behaviour across all the measurement sessions for each of the two stores. The variation that can be seen in figure 1 is much smaller than in figure 2, that means the number of times the target behaviour was observed at Nettó (see figure 1) was similar across measurements as compared to the more varied results from the measurements at Krónan-store (see figure 2). Days with no incidents of the target behaviour were only measured at Nettó, however it came about in 25% of the measurements. Across all the 24 measurements at the two stores, the target behaviour was observed 100 times, and 86% of these were made at Krónan. As figure 2 shows the highest number of instances of target behaviour was recorded between the session one and six at Krónan. A downtrend can also be seen in figure 2 during the second half of the measurements at Krónan.

Table 2

*Distribution of the frequency of children riding on the outside of the cart.*

|        | Mean | Max. frequency | Min. frequency | Total frequency |
|--------|------|----------------|----------------|-----------------|
| Nettó  | 0,75 | 3              | 0              | 9               |
| Krónan | 6,83 | 13             | 0              | 82              |

The results of the second part of this research, the frequency of children riding on the outside of the cart, are displayed in table 2. The total frequency differed a lot between the two stores and 98% of incidents took place at Krónan. Krónan also had the highest average frequency as well as the highest maximum frequency (max. frequency) with 13 cases of observed behaviour. There were, however, measurement sessions with no target behaviour at both stores, and 88% of these took place at Nettó.

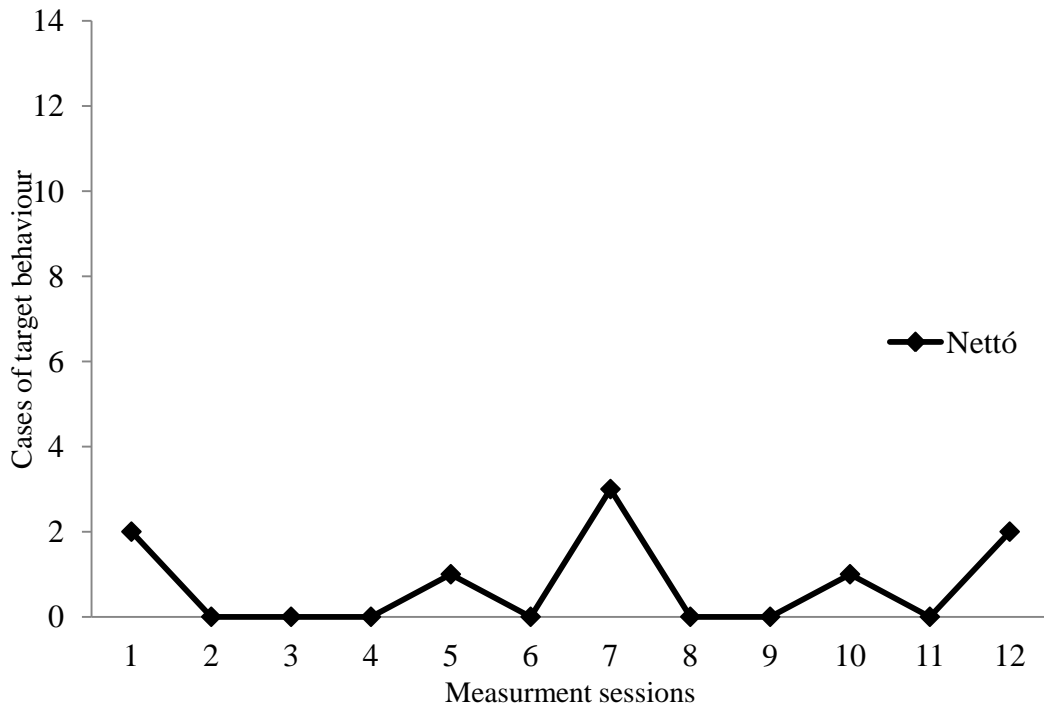


Figure 3 Number of cases of children standing on the outside of the cart for each measurement at Nettó.

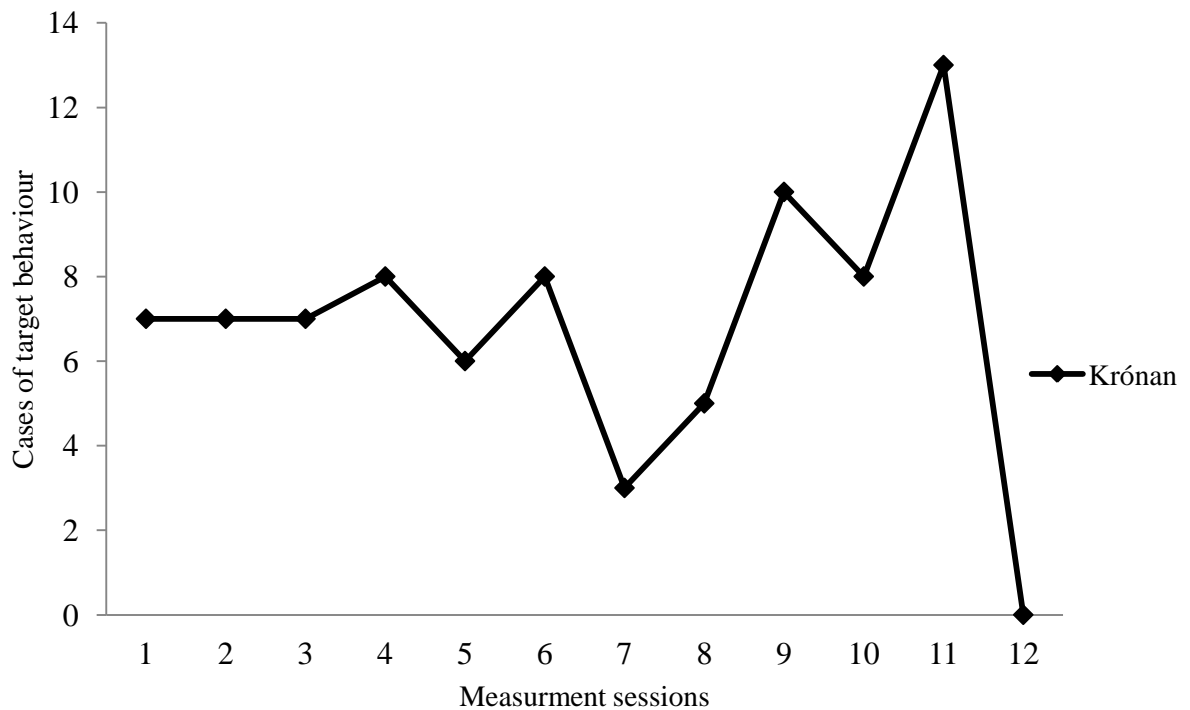


Figure 4 Number of cases of children standing on the outside of the cart for each measurement at Krónan.



The cases of children standing on the outside of the shopping cart at Nettó were fairly stable across all 12 measurements, staying inside the span of none to three instances of target behaviour (see figure 3). A greater variation with a less stable pattern of instances of the target behaviour was observed at the store Krónan, as can be seen in figure 4, spanning from none up to 13 cases. As the graph in figure 4 shows, the largest differences of recorded target behaviour took place in the second half of the measuring period, the graph shows a much greater fluctuation between measurement session 6 and 12 than between session 1 and 6.

### **Discussion**

The main purpose of the presented research was to measure the frequency of the behaviour of seating a child in the basket portion of a shopping cart while shopping. In addition, the behaviour of a child standing on the outside of the shopping cart was also recorded. The observation took place in two different grocery stores in Reykjavik. The two stores were located in the same area i.e., in Grandi but had different opening hours and were of different sizes. The store Krónan is a larger supermarket and has a greater volume of products and more customers than the other store. Nettó is somewhat smaller, less busy and has a slightly higher price level. These differences might cause biases in the clientele as people who shop at the smaller and more expensive store, Nettó, might not go there for shopping large amount of food at once, hence, being less likely to utilise shopping carts, which in turn would have an effect on the outcome.

As the results show, the frequency of the target behaviour was much higher at the store Krónan. The minimum frequency at Krónan was almost the same as the maximum frequency at the store Nettó. As Krónan is a bigger and busier place it might, to a greater extent, dispose people to engage in the target behaviour than the environment at the smaller and less busy Nettó does. Another thing to take into consideration when comparing the results of the two stores is that they differed in number of customers utilising shopping carts, being a much higher frequency at the store Krónan. Another observation was that at the store Nettó many people used a basket or a smaller children-sized shopping cart during the shopping round rather than a regular shopping cart. The frequency of children standing or riding on the outside of the cart's sides varied a lot across the measurements but was also much more common in Krónan.

The decrease of the frequency of parents placing their children in the shopping cart recorded in the end of the measurement period at Krónan could be due to customers being aware of the presence of the rater. Many times the same people were seen shopping in the same store more than once during the measurement period. Before the observations began, the store managers and staff had been asked not to explain the purpose of the rater and the research to the customers, however, this is hard to control. The first measurement sessions took place in early April and the last once in early May, no specific holidays took place during this period that would explain the decrease of children in shopping carts and since no similar trend was observed at the other store it makes sense to exclude any specific seasonal impact on the results. The highest number of incidents was recorded the first day of the measurement period and the lowest number of cases was recorded on the last day, this could point to that customers had become aware of the rater and that this affected their behaviour. However, the measurement period only spanned over one month and for future studies on the subject it could be of interest to extend the measurement period to cover seasonal and/or occasional peaks or low points in the number of store-visitors to be able to generalize the results over to a greater population.

The inter-rater agreement was high, or 93,3%. However, although the rater was circulating around the store during the measurement to cover as much space as possible there might be cases of the target behaviours that might have been missed by the rater, affecting the results. The method of using security recordings to measure inter-rater agreement instead of both raters being located at the store at the same time could have had an effect on the outcome of the reliability measurements. That is because the rater who watched the security recordings had a greater overview over the store-space, and could scan many aisles in a short amount of time, hence, was less likely to miss instances of the target behaviour than the rater who was walking around in the store. However, since the raters both counted only one instance of the target behaviour during that session any adverse effects are not seen here. Future research on the subject may consider using only video recordings to count target behaviour, possibly giving a greater overview over the store-space, and more precise measurements.

When comparing the present research with the former study by Árni Eiríksson (2011), the mean outcome of the result of this present study is at a

somewhat lower level than the outcome of the baseline measurements he made. However, when only considering the average frequency at the store Krónan, this outcome is similar to the mean frequency across all stores in his study. It should be mentioned that Krónan, opposed to Nettó, is more similar in the size and type of store to the ones used in the study by Árnir Eiríksson.

Former research which have dealt with preventing shopping cart accidents, have showed that after adding a sign intervention, like the one used by Árnir Eiríksson (2011) the frequency of observed target behaviour decreased in those stores. Also as was observed at the store Nettó, which had fewer occurrences of parents seating their children in shopping carts, one technique for preventing this kind of risky behaviour could be for the stores to provide the adult caregivers with safer alternatives; like children's sized shopping carts or the so called car-carts, which also is more suitable for older children that are too heavy for the foldable seats available in some carts (Smith, 2006). Another possible solution, though more costly, could be for the stores to provide supervised play areas where the parents could leave their children during the shopping trip.

One thing recurrently observed during the course of the present research was incidents of two children placed in the same shopping cart, or one child in the special seat while another one is standing on the outside of the cart, possibly increasing the risk of accidents. This could be of interest to take into consideration in future research as one study by Smith (2006) reported that 56% of cart tip-overs involved the action of siblings.

This research only included observations in two stores, which makes the sample very small. Also considering the differences mentioned above it could be of importance to consider whether these stores possibly fill different functions. If people seek the two stores for different types of shopping this might affect what type of behaviours they engage in and this could in turn lead to skewed or erroneous interpretations. A more stressed and complicated environment as the one in Krónan might provoke a more risky, however at face value maybe more efficient way of conduct. Moreover, considering the interpretive value of this research, the data should not be interpreted by its own but considered a part of a larger data collection in which identical methods were used to investigate the same behaviours.

## References

- American Academy of Pediatrics. (2006). American Academy of Pediatrics parent page. Shopping-cart safety. *Pediatrics* 118(2), 545–546. doi: 10.1542/peds.2006-1217
- Anderson, V., Spencer-Smith, M., Coleman, L., Anderson, P., Williams, J., Greenham, M. et al. (2010). Children's executive functions: Are they poorer after very early brain insult. *Neuropsychologia*, 48, 2041-2050.
- Árni þór Eiríksson. (2011). *Öryggi barna í innkaupakörfum*. (Unpublished bachelor's thesis). University of Iceland, Reykjavík, Iceland. Retrieved 4<sup>th</sup> of April 2016 from <http://skemman.is/stream/get/1946/7503/19951/1/BS-ritger%C3%B0-tilb%C3%BAin.pdf>
- Árni þór Eiríksson and Zuilma Gabriela Sigurðardóttir. (2011). Öryggi barna í innkaupakerrum : Áhrifarík leið til að forðast slys. *Sálfræðiritið*, 16, 73-79.
- Austin, J., Hatfield, D. B., Grindle, A. C., and Baily, J. S. (1993). Increasing recycling in office environments: The effects of specific, informative cues. *Journal of Applied Behavior Analysis*, 26(2), 247-253.
- Caro, T. M., Young, M., Dank, G. R. (1979). Inter-observer reliability. *Behaviour*, 69(3), 303-315.
- Cope, J. G., Allred, L. J., and Morsell, J. M. (1991). Signs as deterrents of illegal parking in spaces designated for individuals with physical disabilities. *Journal of Applied Behavior Analysis*, 24(1), 59-63.
- Cox, S. C., Cox, A. B., and Cox, D. J. (2000). Motivating signage prompts safety belt use among drivers exiting senior communities. *Journal of Applied Behavior Analysis*, 33(4), 635-638.
- Dewey, R. A. (2004). *Psychology: An introduction*. Retrieved 27<sup>th</sup> of July 2016 from <http://www.intropsych.com/>
- Embætti landæknis. (2012) *Slysaskrá á Íslandi; Fjöldi slasaðra eftir tegund slyss, kyni og aldri*. Retrieved 29<sup>th</sup> of June, 2016, from

[http://www.landlaeknir.is/servlet/file/store93/item21304/2012\\_netskjal\\_EB%C3%9E.xlsx](http://www.landlaeknir.is/servlet/file/store93/item21304/2012_netskjal_EB%C3%9E.xlsx)

Embætti Landlæknis. (2005). *Árlega slasast um 100 börn i innkaupakerrum*. Retrieved 4th of August, 2016, from [http://www.landlaeknir.is/um-embættid/frettir/frett/item17294/Arlega\\_slasast\\_um\\_100\\_born\\_i\\_innkaupakerrum](http://www.landlaeknir.is/um-embættid/frettir/frett/item17294/Arlega_slasast_um_100_born_i_innkaupakerrum)

Frey, B. (2006). *Statistics Hacks. Tips & Tools for measuring th world an beating the odds*. Sebastopol, California: O'Reilly Media.

Geller, E. S., Winett, R. A., & Everett, P. B. (1982). *Preserving the environment: New strategies for behaviour chang*. New York, New York: Pergamon Press.

Harrell, W. A. (1996). The effects of shopping cart design and prior behavioral history on children's standing in cart seats. *Accident Analysis and Prevention*, 28(3), 385-389.

Harrell, W. A. (2003a). Dangerous activities by children in grocery carts. Is adult supervision important? *Psychological Reports*, 92(3), 957-962.

Harrell, W. A. (2003b). Effect of two warning signs on adult supervision and risky activities by children in grocery shopping carts. *Psychological Reports*, 92, 889-898.

Herdís L. Storgaard. (2005). *Börn í innkaupakerrum*. Retrieved 15th of June, 2016, from <http://www.landlaeknir.is/um-embættid/greinar/grein/item14808/Born-i-innkaupakerrum>

Herdís L. Storgaard. (2014, 01.02). *Börn eigi að vetra í beisli í innkaupakerru*. *Ríkisutvarpið*. Retrieved 15th of June, 2016, from <http://ruv.is/frett/born-eigi-ad-vera-i-beisli-i-innkaupakerru>

Marta Guðrún Skúladóttir. (2000). *Kostnaður vegna slysa á börnum á Íslandi*. Reykjavík: Hagfræðistofnun Háskóla Íslands.

Martin, K. J., Chounthirath, T., Xiang, H., and Smith, G. A. (2014). Pediatric shopping cart-related injuries treated in US Emergency Departments, 1990-2011. *Clinical Pediatrics*, 53(3), 277-285.

- McKinlay, A., Grace, R., Horwood, J., Fergusson, D., & MacFarlane, M. (2009). Adolescent psychiatric symptoms following preschool childhood mild traumatic brain injury: Evidence from a birth cohort. *The Journal of Head Trauma Rehabilitation, 24*(3), 221–227. doi:10.1097/HTR.0b013e3181a40590
- Michael, P. G., Leeming, F. C., Dwyer, W. O. (2000). Headway on urban streets: observational data and an intervention to decrease tailgating. *Transportation Research Part F: Traffic Psychology and Behaviour, 3*(2), 55-64.
- Mueller, M. M., Moore, J. W., Doggett, R. A., and Tingstrom, D. H. (2000). The effectiveness of contingency-specific and contingency-nonspecific prompts in controlling bathroom graffiti. *Journal of Applied Behavior Analysis, 33*(1), 89-92.
- Pierce, W. D., and Cheney, C. D. (2013). *Behavior Analysis and learning* (5th edition). New York, New York: Psychology Press.
- Smith, G. A. (2006). Shopping cart-related injuries to children. *Pediatrics, 118*(2), 540-544.
- Smith, G. A., Dietrich, A. M., Garcia, T., and Shields, B. J. (1996). Injuries to children related to shopping carts. *Pediatrics, 97*(2), 161-165.
- Watson, T. S. (1996). A prompt plus delayed contingency procedure for reducing bathroom graffiti. *Journal of Applied Behavior Analysis, 29*(1), 121-124.

**Appendix A: Intervention sign used in the research by Árni Eiríksson.**

Vinsamlegast setjið börn EKKI ofan í innkaupakerrurnar



## Appendix B: Sample of observer's record sheet.

Dagsetning og tími: \_\_\_\_\_

Matsmaður: Áreidanleikamælingar[ ]

Verslun: \_\_\_\_\_

Húfa = litur húfu barns

Yfirhöfn = litur yfirhafnar barns

Umönnun = kyn umönnunaraðila

|    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |
|----|------|----------|---------|----|------|----------|---------|----|------|----------|---------|
| 1  |      |          |         | 11 |      |          |         | 21 |      |          |         |
| 2  |      |          |         | 12 |      |          |         | 22 |      |          |         |
| 3  |      |          |         | 13 |      |          |         | 23 |      |          |         |
| 4  |      |          |         | 14 |      |          |         | 24 |      |          |         |
| 5  |      |          |         | 15 |      |          |         | 25 |      |          |         |
| 6  |      |          |         | 16 |      |          |         | 26 |      |          |         |
| 7  |      |          |         | 17 |      |          |         | 27 |      |          |         |
| 8  |      |          |         | 18 |      |          |         | 28 |      |          |         |
| 9  |      |          |         | 19 |      |          |         | 29 |      |          |         |
| 10 |      |          |         | 20 |      |          |         | 30 |      |          |         |

Dagsetning og tími: \_\_\_\_\_

Matsmaður: Áreidanleikamælingar[ ]

Verslun: \_\_\_\_\_

Húfa = litur húfu barns

Yfirhöfn = litur yfirhafnar barns

Umönnun = kyn umönnunaraðila

|    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |
|----|------|----------|---------|----|------|----------|---------|----|------|----------|---------|
| 1  |      |          |         | 11 |      |          |         | 21 |      |          |         |
| 2  |      |          |         | 12 |      |          |         | 22 |      |          |         |
| 3  |      |          |         | 13 |      |          |         | 23 |      |          |         |
| 4  |      |          |         | 14 |      |          |         | 24 |      |          |         |
| 5  |      |          |         | 15 |      |          |         | 25 |      |          |         |
| 6  |      |          |         | 16 |      |          |         | 26 |      |          |         |
| 7  |      |          |         | 17 |      |          |         | 27 |      |          |         |
| 8  |      |          |         | 18 |      |          |         | 28 |      |          |         |
| 9  |      |          |         | 19 |      |          |         | 29 |      |          |         |
| 10 |      |          |         | 20 |      |          |         | 30 |      |          |         |

Dagsetning og tími: \_\_\_\_\_

Matsmaður: Áreidanleikamælingar[ ]

Verslun: \_\_\_\_\_

Húfa = litur húfu barns

Yfirhöfn = litur yfirhafnar barns

Umönnun = kyn umönnunaraðila

|    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |    | Húfa | Yfirhöfn | Umönnun |
|----|------|----------|---------|----|------|----------|---------|----|------|----------|---------|
| 1  |      |          |         | 11 |      |          |         | 21 |      |          |         |
| 2  |      |          |         | 12 |      |          |         | 22 |      |          |         |
| 3  |      |          |         | 13 |      |          |         | 23 |      |          |         |
| 4  |      |          |         | 14 |      |          |         | 24 |      |          |         |
| 5  |      |          |         | 15 |      |          |         | 25 |      |          |         |
| 6  |      |          |         | 16 |      |          |         | 26 |      |          |         |
| 7  |      |          |         | 17 |      |          |         | 27 |      |          |         |
| 8  |      |          |         | 18 |      |          |         | 28 |      |          |         |
| 9  |      |          |         | 19 |      |          |         | 29 |      |          |         |
| 10 |      |          |         | 20 |      |          |         | 30 |      |          |         |