How Could This Have Happened? Unintentional Injuries of Young Children at Home

Rani Lueder

Humanics Ergonomics Inc.
10202 La Costa Drive
Austin, TX 78747-1103, USA
rani@humanics-es.com

Abstract. Unintentional injuries of young children at home are preventable. The causes often relate to a range of factors that interact with inadequacies in design. Two examples of court cases involving an entrapment injuries are reviewed.

Keywords: Ergonomics for children, unintentional injuries in children, forensics, product liability, asphyxiation injuries, toddlers, ergonomic design, nursery product safety, residential elevators, LULA low volume elevators, human factors expert witness cases.

1 Overview

Unintentional injuries related to product design are more than “accidents”, given their preventable nature. While participating in a variety of legal cases that followed devastating product-related injuries to children at home, this contributor saw a continuing pattern of factors that led to unnecessary tragedy. Although many manufacturers demonstrate a consistent and exemplary concern for "doing the right thing", unintentional injuries in children often result from the interaction of one particular manufacturer's defective design with other factors.

1.1 Some Manufacturers Commonly Assume That Parents Assume Primary Responsibility for Their Children's Safety

Yet caregivers cannot reasonably be expected to compensate for hazards resulting from defective products; it is unreasonable to expect parents to constantly be vigilant against the actions of their children when design solutions exist that would make such efforts unnecessary.

Parents Are Often Overworked, Under Stress and Lack Sleep. They are often distractible as they attempt to marshal competing demands from their several children while managing their other life responsibilities.

They get sick. As Garfield (1983) reminded us three decades ago, “accidents are more likely when the family routine has been upset by illness or another stress. More accidents happen just before mealtime, when parents are busiest”.

V.G. Duffy (Ed.): DHM/HCII 2013, Part I, LNCS 8025, pp. 348–354, 2013.

Parents Have a Poor Understanding of Risk. Health Canada (1996) described the "optimism bias" among parents that hinders health-risk behaviors. "Perhaps the most consistent finding in research on parents' attitudes and practices related to childhood injury prevention is that parents overestimate the capabilities of their children to act in safe ways and their children's knowledge of how to handle emergency situations" (Health Canada, 1997).

Pollack-Nelson and Drago (2002) emphasized that because 95% of parents perceive that their children are at little or no risk, manufacturers must assume responsibility for ensuring their products are safe[1].

Warnings and Instructions Are Often Inadequate. The research community has long recognized that warnings and training provide inferior and far less alternatives to designing out risk through good product design.

Yet parents and other caregivers rely on such content to ensure their child is safe. Such product-related content often fails to adequately communicate safe behaviors.

1.2 In Cases Reviewed, the Manufacturer and Their Associated Industry May Display a Strong Reliance on Standards and Guidelines to Justify any Questions Regarding Their Responsibility for Good Design

Ostensibly, the aim of safety standards is often to establish guidelines for their industry to protect its users from harm. Not ironically (such as in the second case described below) these same manufacturers may undermine the effectiveness of these standards by aggressively blocking standards committees and enforcement agencies at every step to prevent the promulgation of appropriate standards. In doing so, the manufacturers sometimes establish a juggernaut subverting the appropriate development of a standard.

1.3 During Depositions, Some Manufacturers May Demonstrate an Astonishing Array of Circular Arguments

The parents are to blame because they did not use a product properly even though the manufacturer provided a complete lack of guidance regarding the associated risks. The parents are at fault because they failed to supervise the child while he/she slept during the night.

[1] Pollack-Nelson and Drago (2002) continued, "half of the children got out of bed in the morning always or often before a parent. Ninety-five percent of parents perceived that their child was at no risk or slight risk of injury when getting up in the morning before them."

2 Case Examples

2.1 The "Crib tent" Product for Very Young Children

One example of such a case involves a "crib tent" product that was supposedly designed to keep young children from climbing from their cribs. This manufacturer's materials described as a "safety product" that promises "peace of mind" with their "safety tested device"[2].

A 23-month old child sustained severe injuries while attempting to climb out of his crib. His efforts caused the pole supporting the frame of the crib tent to invert, trapping his neck between the rail of the crib and the reversed pole. His head was trapped inside and his torso outside the crib while his neck hung across the top side rail of the crib.

His severe chronic disability was worsened by evidence that young children under the age of three are at particular risk of asphyxiation / airway occlusion at low pressures. Stevens et al (2000) reported that young children could only sustain very low levels of force to prevent risk of strangulation (see also Garros et al, 2003; Shepherd 1990; Tarrago, 2000).

Deposition Transcripts Indicate That the Manufacturer Never Actually Performed Safety Testing on Their Product. Further, They Had No Evidence to Suggest That the Product Was Safe for a Child as Young at the Age of Three.
Court documents suggest that this manufacturer based their guidance to parents on only a single consideration. That is, the 0-36 moth age restriction for users of their products reflected the Consumer Product Safety Commission (CPSC)'s 1997 guidance that children be moved from their crib to a bed when they reach the age of three[3] reflected their conclusion that when children reach a height of 35 inches (890 mm) they become at risk of falling out of the crib.

Such circular arguments point to an Alice in Wonderland logic. The crib tent keeps children safe by preventing their climbing from their crib. On the other hand, at the age of three children should be moved to a bed because they will begin to climb out of their crib. Clearly, at least one of these arguments is false.

Deposition Transcripts Indicate That the Crib Tent Manufacturer Never Safety-tested Their Product. They Claimed Otherwise, Despite a Complete Lack of Evidence to Suggest That the Product Was Safe for a Child as Young as Three.
When asked why the executive did not take any of the prior incidents of child entrapment seriously with their product, he indicated it was because no one had died before that time.

---

[2] It might be of interest that the manufacturer provided only a 60-day warrantee from the date of purchase for a product that was intended to be used by children until they reach the age of three.

[3] Of note, the CPSC's guidance was disproved (despite remaining in place) when researchers such as Ridenour (1997, 2002) provided extensive documentation of the very young children's crib-climbing behavior (see Figure 1).

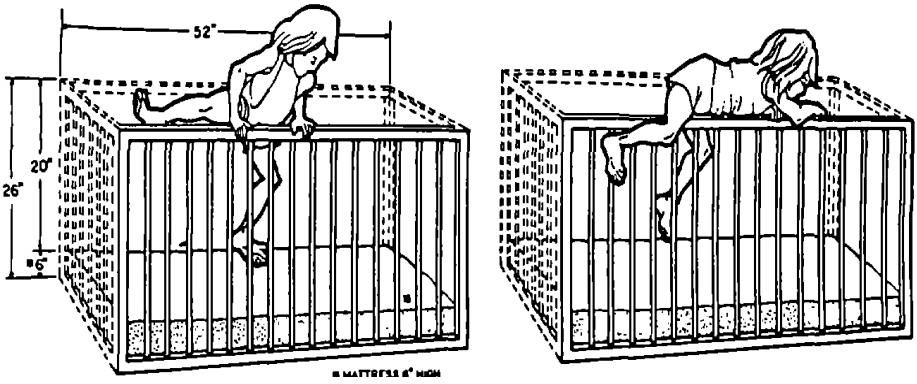

Fig. 1. Ridenour (2002) reported that 90% of the 16 to 32 month old children observed climb from cribs after moving to a corner of crib. (Source: Ridenour, 2002, p 365).

Deposition Transcripts Indicate That the Manufacturer / Executive Maintained That the Parents Were Ultimately Responsible, because It Involved the Use of a "Safety Product".

Such arguments make no sense. As Ridenour (1997) pointed out "the crib is the only infant product in which a consumer, such as a parent or caretaker, is encouraged to leave the infant unattended, usually alone in the bedroom, while the infant is sleeping or going to sleep or waking."

2.2 Entrapment Hazards in Residential Elevators

While his mother was doing the laundry on the third floor, her three-year-old boy was trapped between the outer hoistway and inner (accordion) car doors of the family's home elevator. While upstairs doing the laundry, the mother heard her son say that he wanted to come up to her. She called to him to wait for her and that she was coming down.

She pushed the elevator button and heard its motor move. The elevator started and then stopped and all was silent. She ran screaming down the stairs, broke the lock to the outer hoistway door of the elevator and saw her son's head on the floor, with his chest jammed under the bottom of the elevator car. He arrived at the hospital in a coma, immobilized and requiring ventilation. He was in critical condition, undergoing full respiratory / cardiac arrest.

Entrapment Risk in Young Children Increases When the Gap Is Greater Than the Size of Their Head. This family's tragedy resulted because the effective clearance between the outer/hoistway door and the accordion door of their elevator was excessive. The American Society of Mechanical Engineers (ASME) A17.1 Sec 5.3 standard for residential elevators that was in force at the time of installation specified that

elevators could not exceed the "3 and 5 rule"[4]. In order to exclude children from the space between elevator doors, the design must prevent even the smallest child from fitting.

Young children's heads are larger than their torsos. To prevent entrapment, the maximum dimension between doors must be less than their minimum head breadth.

Research sponsored by CPSC (Schneider et al, 1986; Snyder et al., 1975a, 1975b, 1977) provided the following data for minimum and 5th percentile values for young children.

Head Breadth measure	Minimum value	5th percentile value
Age range: 2 – 3½		
Female	11.9 cm (4.69 in)	12.5 cm (4.92 in)
Male	12.0 cm (4.72 in)	12.7 cm (5.0 in)
Male and female	11.9 cm (4.69 in)	12.5 cm (4.92 in)
Age range: 3½ - 4½		
Female	12.4 cm (4.88 in)	12.6 cm (4.96)
Male	12.8 (5.04 in)	13.0 (5.12 in)
Male and female	12.4 cm (4.88 in)	12.8 (5.04 in)

Fig. 2. Research by CPSC suggests that entrapment risk may be prevented when the gap between elevator doors are less than 4.6 inches (Source: Schneider et al, 1986; Snyder et al, 1975a, 1975b, 1977)[5]

Entrapment Risk Varies by Opening Size and Shape. The V-shape of accordion doors increases entrapment risk (Schneider et al 1986) by providing an area that supports the shape of young children's head.

Similar Entrapment Hazards for Young Children Are Evident with Other Products as Well. Stephenson (1988, 1991) found risk in children increased when exposed to then-allowed six-inch (15.24 cm) clearances between guardrail openings, writing, "It's now quite clear that the maximum dimension of openings in guardrails at locations accessible to the public should not exceed 4 in (10.16 cm) or even a lesser dimension".

- Virtually all children less than six years of age can pass through a 6 in. (15.24 cm) wide opening.

[4] The clearance between the hoistway doors and hoistway edge of the landing sill could not exceed three inches. ASME also mandated that the space between the hoistway door and elevator car door may not exceed five inches.

[5] Data are presented for the head breadth of children of ages that they might be strong enough to close the hoistway door behind them, enabling the elevator door to move. The activation of standard designs of residential and low volume elevators requires that the users close both the outer/hoistway and inner/accordion doors. However it should be noted that defective elevator doors have been known to open anyway.

- Almost no child one year or older can pass completely through a 4½ in (11.53 cm) wide opening.
- Approximately 50 percent of all children 13 to 18 months old can pass completely through a 5-inch (12.7) wide opening.
- The breadth of a child's head is the key to determining if he or she can pass completely through an opening.

3 Discussion

The intent of the above discussion was to provide one writer's perspective with examples about how things go wrong with unintentional injuries in young children. Such situations often involve the interaction between inadequate design and a range of colliding factors. In such cases, the responses between manufacturers are in stark contrast. Further, these tragedies would have been prevented if the manufacturer had implemented design solutions practiced by others in the industry.

Acknowledgements: I would like to express my gratitude to Andrew Scherffius Esq. of Scherffius, Ballard, Still & Ayres, LLP and David Krugler, Esq. of Cash, Krugler & Fredericks, LLC, Atlanta, Georgia for allowing me to participate in their efforts.

References

1. Garfield, E.: So Your Children Will Not Be Victims. Child Safety. Part 1. Current Contents 486, 396–403 (1983); Stevens, R.R., Lane, G.A., Milkovich, S.M., Stool, D., Rider, G., Stool, S.E.: Prevention of accidental childhood strangulation: Where is the site of obstruction? Int. J.1 Pediatr. Otorhinolaryngol. 49(suppl. 1), S321–S322 (1983)
2. Health Canada, For the Safety of Canadian Children and Youth: From Injury Data to Preventive Measures. Health Canada, Ottawa (1997)
3. Health Canada, Parental attitudes towards unintentional childhood injuries. Prepared for the Family and Child Health Unit. Health Canada by SAGE Research Corporation, 67 pages (1996)
4. Pollack-Nelson, C., Drago, D.: Supervision of children aged two through six years. Injury Control and Safety Promotion 9(2), 121–126 (2002)
5. Stevens, R.R., Lane, G.A., Milkovich, S.M., Stool, D., Rider, G., Stool, S.E.: Prevention of accidental childhood strangulation: A clinical study. Ann. Otol. Rhinol. Laryngol. 109(9), 797–802 (2000)
6. Garros, D., King, W.J., Brady-Fryer, B., Klassen, T.P.: Strangulation with intravenous tubing: a previously undescribed adverse advent in children. Pediatrics 111(6 Pt.1), e732–e734 (2003)
7. Shepherd, R.T.: Accidental self-strangulation in a young child–a case report and review. Med. Science Law. 30(2), 119–123 (1990)
8. Tarrago, S.B.: Prevention of choking, strangulation, and suffocation in childhood. WMJ 99(9), 43–46 (2000)
9. Ridenour, M.V.: Age, side height, and spindle shape of the crib in climbing over the side. Percept. Mot. Skills. 85(2), 667–674 (1997)

10. Ridenour, M.V.: How do children climb out of cribs? Percept. Mot. Skills 95(2), 363–366 (2002)
11. Schneider, L.W., Lehman, R.J., Pflueg, M.A., Owings, C.L.: Size and shape of the head and neck from birth to four years. Final report. University of Michigan, Ann Arbor, Transportation Research Institute (UMTRI). Report Number: UMTRI-86-2. Contract Number: CPSC-C-831250. 485 ps. (1986)
12. Snyder, R.G., Spencer, N.L., Schneider, L.W., Owings, C.L.: Physical Characteristics of Children as Related to Death and Injury for Consumer Product Design and Use. Ann Arbor. Ml: Highway Safety Research Institute, University of Michigan, Prepared for the U.S. Consumer Product Safety Commission. Final Report UM-HSRI-BI-75-5. May 31, 240 ps. (1975a)
13. Snyder, R.G., Spencer, N.L., Owings, C.L., Schneider, L.W. Physical Characteristics of Children as Related to Death and Injury for Consumer Product Safety Design. Highway Safety Research Institute, University of Michigan, Ann Arbor, Ml (1975b); Prepared for the U.S. Consumer Product Safety Commission. Final Report UM-HSRI-BI-75-5 under Contract FDA-72-70 31, 56 ps. (May 1975)
14. Snyder, R.G., Schneider, L.W., Owings, C.L., Reynolds, H.M., Golomb, D.H., Schork, M.A.: Anthropometry of Infants, Children and youths to Age 18 for Product Safety Design. Highway Safety Research Institute, University of Michigan. Prepared for the U.S. Consumer Product Safety Commission. May 31. UM-HSRI-77-17 Final Report, 648 ps. (1977)
15. Stephenson, E.: The silent and inviting trap. The Building Official and Code Administrator, 28–34 (November/December 1988)
16. Stephenson, E.: Update on the silent and inviting trap. Building Standards, 4–5 (January-February 1991)