
Injury Prevention Engineering Research Team (IPERT)

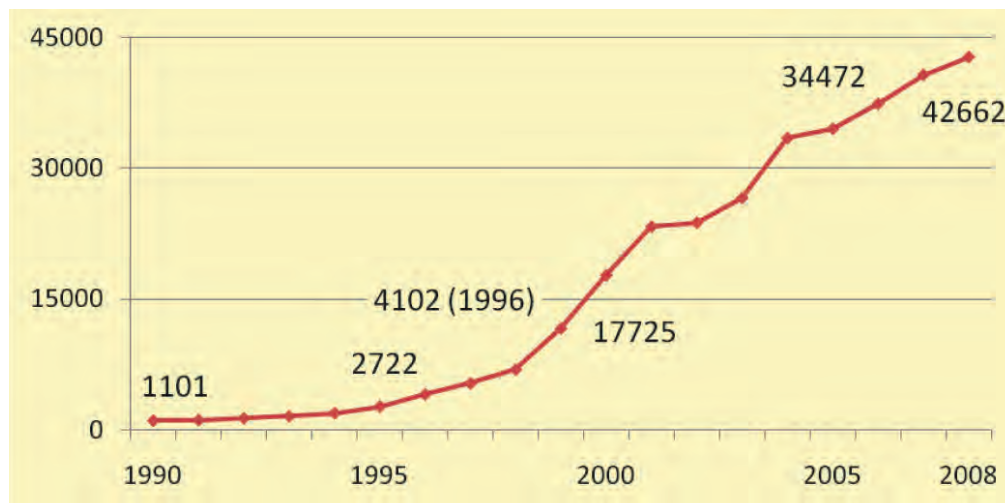
Developing and Using New Technology
to Promote Early Detection and Prevention of
Intentional Injuries among Children

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Background

Intentional injuries to infants and toddlers caused by abuse and neglect are a widespread and increasing social problem in Japan. Reports to child protection agencies of these kinds of injuries increase every year, rising from 37,323 in 2006 to 42,662 in 2008. Between 1996 and 2008, reports increased more than ten-fold. Although one reason for this increase is greater awareness of abuse and neglect leading to increased reporting, experts believe that the actual incidence of abuse and neglect has recently increased due to changes in society.



The number of abuse & neglect cases reported to child protection agencies in Japan (1990-2008)

Despite this marked increase, entities charged with protecting children, such as municipalities, child protection agencies, law enforcement agencies, preschools and schools, find it very difficult to detect early cases or to protect children who face serious harm. Even when intentional harm is strongly suspected, it is difficult to distinguish intentional from unintentional injuries, especially when parents or guardians do not admit to committing intentional harm. The difficulty of early detection of abuse and neglect cases makes it difficult to protect children or pursue other necessary strategies. The unfortunate result is evidenced by recent cases reported in the mass media of children who were abused or neglected resulting in death.

The project is funded by a R&D area 'Protecting Children from Crime,' Research Institute of Science and Technology for Society, Japan Science and Technology Agency.

The inability to distinguish abuse-related injuries from other types of injuries impacts society beyond individual children and their families. In July 2010, the amended Act on Organ Transplantation

will come into effect, making it possible to harvest a child's organs simply based on the permission of the parents. In 2003, the Japanese Pediatric Society recommended that organs should not be harvested from abused children, but noted that it is difficult to distinguish abuse cases from death by other causes, and that technology and a new system is needed in order to make this distinction. Until now, no such technology or system has been in place in Japan or likely in the world.

Currently, distinguishing intentional from unintentional injuries is dependent on the experience of medical doctors, nurses, school teachers, etc., and no scientific standards are available to help with this assessment. This lack of scientific standards hampers the early detection of intentional injuries and the ability to adopt a strategy to protect children. This situation led to the development of this project, titled Developing and Using Information Technology to Promote Early Detection and Prevention of Intentional Injuries among Children. The project's goal is to establish scientific standards and appropriate supporting tools for experts working to prevent child abuse.

Project Components

This project aims to establish the scientific methodology to differentiate between intentional and unintentional injuries in order to detect intentional injuries such as abuse and neglect. The technology will be useful for institutions and entities such as hospitals, child protection agencies and law enforcement agencies. We will continuously collaborate with practitioners and experts, and most importantly will apply the new technology and system to the real world. The major components of this four-year project will be as follows:

Component 1: Developing and Applying Software to Collect Case Data and Share Information

This component will consist of three parts:

- 1) Developing software to enable experts to collect injury case data and share information
- 2) Accumulating injury case data from hospitals, forensic facilities and dental clinics
- 3) Developing software which will enable experts to record parents' explanations of how their children were injured, including the observed attitude and behavior of the parents, and any inconsistencies in the explanations



A screenshot of software using the Body-graphical Information System (BIS)

Component 2: Studying Injury Mechanisms

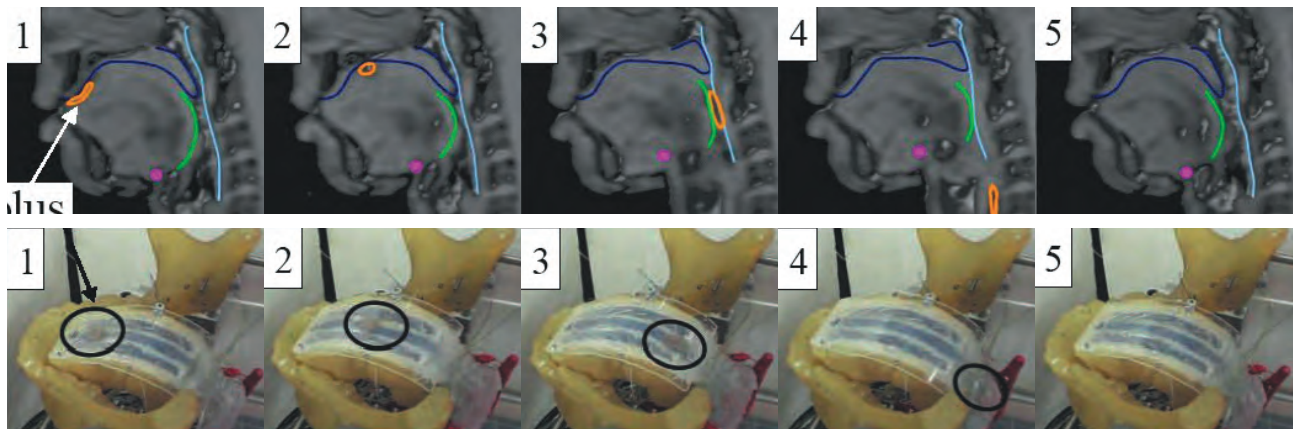
This component will consist of three parts:

- 1) Measuring the physical properties of human body parts, especially the head
- 2) Developing a simulation based on the knowledge and information collected through these measurements. Injury mechanisms in intentional and unintentional injuries will be studied and the difference between the two will be examined. The project will particularly focus on falling and tripping injuries because these are common false reasons given by parents in order to hide abuse.



Biomechanical simulation of Shaken Baby Syndrome(abusive head trauma)

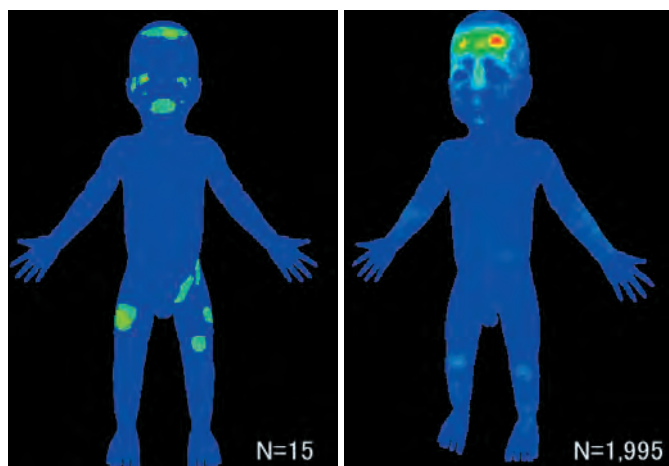
3) Exploration of choking mechanisms



Model of choking mechanism

Component 3: Development and Application of Software to Support Experts in Detecting Injury and Death Caused by Abuse

Based on the above, suspected abuse cases and confirmed abuse cases will be compared with cases that were clearly unintentional injuries. This process will enable us to develop software integrating all of the information to support experts in probabilistically judging whether a case is likely to be abuse or not.



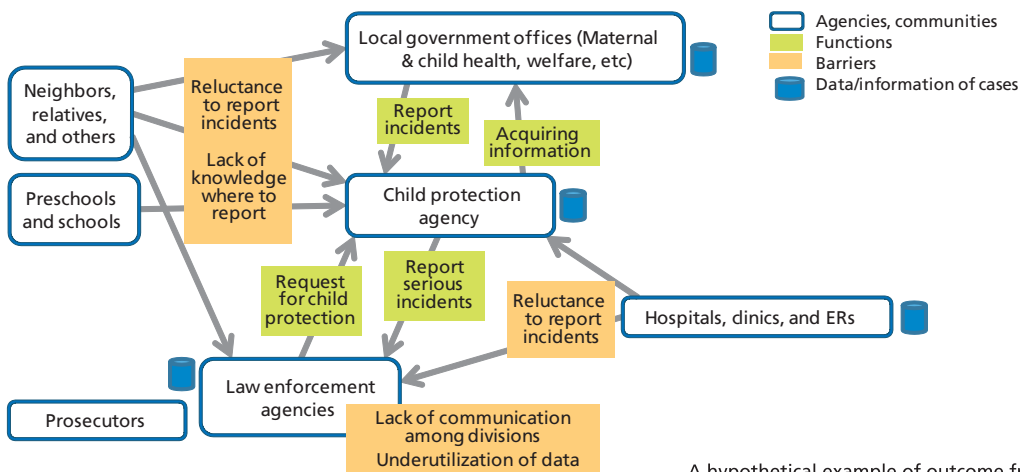
Injuries caused by abuse (left) and unintentional incidents (right) shown on the BIS system

Component 4: Cost Analysis

Based on a conservative 2007 estimate, annual costs due to neglect and abuse in the United States are 103.8 billion dollars, including direct and indirect costs. Faced with this large social loss, the U.S. and other countries are working on early detection and intervention. Japan, on the other hand, lacks data which would support an analysis of the costs due to abuse and neglect. A cost analysis has been conducted as part of the project because of its importance to the goal of promoting a comprehensive strategy to address this serious issue.

Component 5: Social System Analysis

Another factor which hampers early detection and intervention in abuse and neglect cases is a communication gap between the institutions and individuals which attempt to protect children and prevent abuse. Many times these entities fail to communicate. Other times they overlook cases, or fail to act because a particular case is not within their jurisdictions or priorities. Delayed intervention due to a lack of communication between agencies can lead to a severe or fatal result which could have been avoided. This project component will assess communication between relevant agencies, resource capacities of agencies, and institutional attitudes, with the purpose of improving communication and social systems for child abuse prevention.



A hypothetical example of outcome from the social system analysis

Component 6: Public Relations

We will provide our findings and knowledge to the public through mass media, presentations, a website and other appropriate means.

Component 7: Case Consulting

Using the technology and knowledge described above, we will collaborate with other institutions that request our help in examining individual cases. Also, we will provide the software that we develop to other institutions.

Enduring Impact of the Project

During this project, we will develop and promote the use of software which will assist child protection agencies, hospitals and law enforcement agencies in collecting data and detecting abuse. After completing the project, we will continue to disseminate the software and thereby further the goals of the project.

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What is IPERT?

The Childhood Injury Prevention Engineering Council (CIPEC) was established in 2006 to found an injury surveillance project in collaboration with a national children's hospital. From the perspective of engineering, the surveillance focuses on collecting product and environmental information as well as injury characteristics of injured children which enable us to modify consumer products and create a safer environment for children. With funding from governmental agencies and other sources, CIPEC's projects have expanded and membership has increased. In the spring of 2010, CIPEC was reorganized into the Injury Prevention Engineering Research Team (IPERT), which is now officially a research team at Digital Human Research Center, National Institute of Advanced Industrial Science and Technology (AIST).

Our ultimate goal is to create a society in which injury-related information and knowledge are communicated among relevant entities without barriers and utilized effectively for injury prevention and control. This is the concept of “the safety knowledge cycle” shown in the figure below. Many types of injuries involving children occur systematically and repeat themselves due to the lack of a smooth flow of information and knowledge. The safety knowledge cycle will allow us to prevent many childhood injuries in the future by sharing information and knowledge about injury mechanisms and preventive strategies.



The “Developing and Using New Technology to Promote Early Detection and Prevention of Intentional Injuries among Children” project is a new arena for IPERT to apply technology and knowledge we have developed to the prevention of childhood abuse and neglect. IPERT has invited many experts from different areas to create another “safety knowledge cycle” for abuse and neglect prevention.

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