

초청논문

About the Necessity for Development of Autonomous Mobility Device for Children with Severe Developmental Retardation

Kiyomi Matsuo*, Tomoyuki Murata, Takanori Koga, Atsuko Kubo, Yuichi Yoshida, Yosuke Karakawa, Hiroshi Kawaguchi, Toru Tanaka, Jun Masaki, Toshikatsu Taketomi and Takeo Kitajima

ABSTRACT

In this paper, I will report the cases of children who are able to study at kindergarten or elementary school because they learned how to move by themselves using a moving aid before school age, and I will also discuss the development of a mobility device which allows severely disabled preschoolers to practice moving around by themselves safely and easily at home and institutions.

Keyword : Children with Severe Developmental Retardation, Moving Device, Posture Support Devices

1. Introduction

It is my assumption that if preschoolers who are unable to walk or keep a sitting posture due to their locomotive disabilities caused by impaired legs or the trunk shall obtain a means of autonomous mobility substituting for their disabled legs, they will become able to move

around by themselves safely by the time they reach school age, increasing their opportunities to receive further education at junior high, high school and university as well as raising the possibilities of helping them to obtain their sense of independence, responsibility and sociability or to become tax payers, although it also depends on their competence and efforts, and I have verified my assumption with several cases I worked with so far. In this paper, I will report the cases of children who are able to study at kindergarten or elementary school because they learned how to move by themselves using a moving aid before school age, and I will also discuss the development of a mobility device which allows severely disabled preschoolers to practice moving around by themselves safely and easily at home and institutions.

접수일 :

심사완료일 :

Kiyomi Matsuo : Center for Comprehensive Community Medicine, Faculty of Medicine, Saga University, Saga, Japan
matsuoki@cc.saga-u.ac.jp

Tomoyuki Murata, Takanori Koga, Atsuko Kubo : Center for Comprehensive Community Medicine, Faculty of Medicine, Saga University, Saga, Japan

Yuichi Yoshida : Department of Rehabilitation, the Center for Developmentally-disabled Children, Saga, Japan

Yosuke Karakawa, Hiroshi Kawaguchi, Toru Tanaka, Jun Masaki : Industrial Technology Center of Saga, Japan

Toshikatsu Taketomi : Togami Electric Manufacturing Co. Ltd.

Takeo Kitajima : Saga Plant Inc

2. Purpose of Study

The purpose of my study is to develop an electric mobility device and to establish a support system, helping children with severe developmental retardation to learn how to move independently by the time they reach school age while playing and practicing how to control the

device from the earliest possible age.

3. Method of Study

I will research the moving aid used by children who are able to move around by themselves at their school because they obtained and learned how to use it before school age, and summarize experimental models of the mobility device being developed.

4. Results

4.1 Cases of children who are able to move around by themselves with moving aid

I will report three cases;

Case 1: Child with limb deficiencies who moves an electric wheelchair with his left leg and goes to regular elementary school.

Case 2: Child, whose upper limbs are mobile only from the side of his body and forward, became able to move around by himself by adapting a six-wheeler, and he goes to regular elementary school.

Case 3: Child with incomplete spinal cord injury, who is unable to walk while he can move his lower limbs slightly, has adapted himself to a wheelchair since the age of 2.

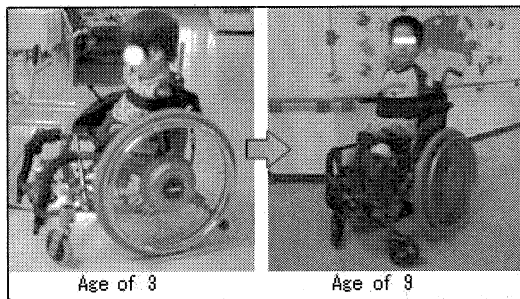


Figure 1. Child who has been using an electric wheelchair with powered steering since the age of three (Case 1)



Figure 2. When he was 3 years old, he became able to move around by himself by adapting a six-wheeler, and he goes to regular elementary school (Case 2)

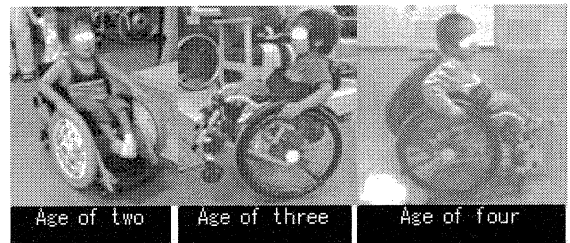


Figure 3. Child who has been using a manual wheelchair since the age of two (Case 3)

4.2 Development of mobility device through experimental research

4.2.1 Development System

Government, industry and academia, namely, Saga Prefecture, local companies and universities are working in collaboration to develop the mobility device.

Saga prefecture and local companies are in charge of manufacturing and university hospital and the Center for Developmentally-disabled Children are in charge of planning and evaluating experimental models, and the experimental model 3 is now being evaluated after a series of trials and improvement.

4.2.2 Aim of Development

Our aim is to develop a device, to which a seating unit, a wheelchair, or a standing table are easily attached, allowing children to control the device themselves and move around safely once they are on board.

4.2.3 Development of Experimental Models

Experimental models #1~3 are in Figure 4. The models, which can go over steps of 1~2 cm in height, are designed for indoor use, such as residence and institutions. As for controller, feasible variations, such as a large-sized push-button switch, a joystick and a micro switch, are being explored and adopted at an experimental stage so that children can control the device themselves.

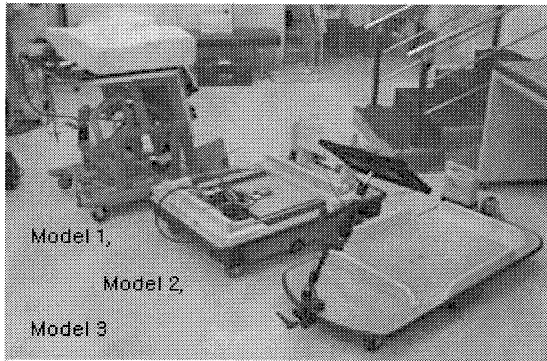


Figure 4. Experimental models of electric mobility device



Figure 2. Seating unit attached

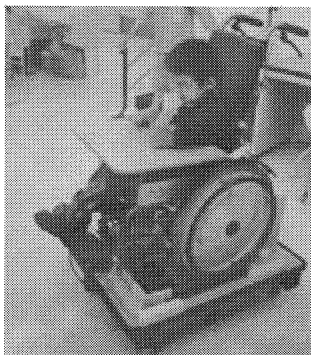


Figure 3. Wheelchair attached

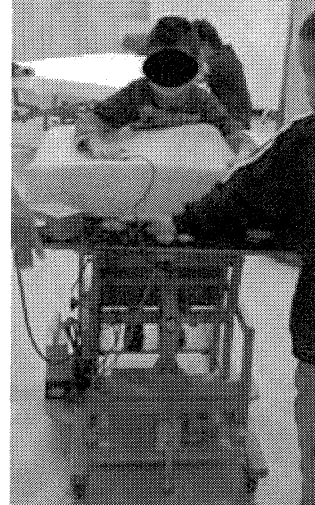


Figure 4. Standing table attached

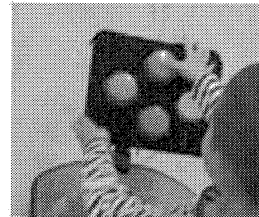


Figure 5. A example of switches



Figure 6. Child on board

5. Discussion

5.1 Moving environment of developmentally disabled children

Children who are not capable of or have difficulties walking with their own legs or moving their body by using their upper trunk are carried by their parent, caretaker or on a buggy.

It is the same with non-handicapped children while they are infants until the age of about three. At school age, however, disabled children go to school for the handicapped while non-handicapped children go to regular elementary school. Lately, more children with severe developmental retardation are going to regular school using a wheelchair, as in the cases discussed. The reason behind this change is that handicapped children are learning to move around by themselves on a wheelchair. Children who grew up being carried by adults are less likely to move around by themselves even after reaching school age. These children must have left behind their sense of autonomy at some point.

5.2 Future moving environment for developmentally-disabled children

It is important to communicate to severely-disabled children, their parents, caretakers, doctors and teachers while showing the actual device that these children can move an electric wheelchair or electric mobility device as long as they can move some part of their body at their will, such as upper or lower limbs, elbows or neck, or if they can utter sounds or words at their will.

6. Conclusion

It is important to assist children with severe physical disabilities to learn how to move around by themselves before they reach school age, by providing them with input devices, a standing wheelchair or an electric wheelchair. Just like a non-handicapped child, the sooner these children begin to practice and learn how to move around by themselves, the better their sense of autonomy, sociability and communication skills will develop.