

Modified Dressing Aids Improved Self-Care Performance in Cerebral Palsy: A Case Report

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ABSTRACT

The benefits of assistive technology (AT) for improving the mobility of children with Cerebral Palsy (CP) have been proved in several studies. The better improvement on movement of the children with CP is one of crucial purpose to allow the children to gain their quality of life. As we interviewed caregivers at Sittida-home, home for children living with disability, self-dressing of a child with CP was a barrier to take care of this case and limited the self-esteem.

Additionally, the caregivers expected the child with cerebral palsy (CP) to be self-care by using assistive technology (AT). In fact, his family and Sittida-home care center could not afford to pay expensive AT. To alleviate the problem, we designed modified dressing aids (MDA) by using cheap materials available in Thailand in order to reduce the cost, and evaluate the effectiveness of MDA based on Sirindhorn National Medical Rehabilitation Centre (SNMRC) score in CP.

In this study, the subject was nine-year-old child with CP diagnosed by physical therapist, and followed up the use of MDA with evaluating SETT and SNMRC during physical therapy training for six days. We found that, especially, the domain of dressing activity demonstrated the SNMRC scores increased on pre- and post-trainings from 11 to 17, respectively. Moreover, the caregivers at the center observed that the child with CP was accustomed with the use of MDA very well.

Keywords: Movement disorder, Assistive technology, Rehabilitation, training

1. INTRODUCTION

Several studies have drawn attention to assistive technology (AT) for persons with disabilities (PWDs). The benefits of AT for training, improving, and developing children with Cerebral Palsy (CP) have been demonstrated in numerous research. Advances in AT's development to assist children with CP is crucial for their development and their families. The smart AT available today is remarkably easier to operate and portable in a sense that has never been possible before. New technologies are changing our community as well as everyday life, especially for people with disabilities.

In Dabney et.al. (1997), Cerebral Palsy (CP) refers to a heterogeneous group of non-progressive motor disorders occurred in the developing brain, causing permanent damage. The motor disorders observed in dystonic, or more frequently, spastic cerebral palsied individuals can affect speech, swallowing and breathing (Buchholz & Robbins, 1997). Clinical patterns of involvement described in spastic CP include (1) diplegia (significant leg involvement with little effect on the arm), (2) hemiplegia (involvement of the ipsilateral arm and leg), and (3) quadriplegia (involvement of all four limbs) (Dabney et. al, 1997). Participation in regular activities is associated with several important health benefits including improved body composition, musculoskeletal health, cardiorespiratory fitness, and increased self-concept and self-esteem (Janssen & LaBlanc, 2010).

In general, the children with CP have activity limitations, especially self-care activities which include bathing, dressing, grooming, and eating due to their malfunctions of motor and sensory control. Therefore, improving the programs using AT tools can optimize health outcomes for the children's life. The activities are not only provided the self-control and movement, but also offer the self-esteem for children with CP. In fact, in case of self-care, commercial AT tools are expensive for families having their children with CP and low income.

Hence, to alleviate these limitations, this case study aimed to (1) modify dressing aids using cheap materials available in Thailand, and (2) evaluate the effectiveness of the modified dressing aids based on SNMRC score.

2. METHODOLOGY

2.1 Participant

2.1.1 Subject

One nine-year-old participant who is diagnosed as CP with developmental delay, and indicated at level 3 of independent with minimal assistance (depicted on Table 1) based on Sirindhorn National Medical Rehabilitation Centre (SNMRC) in Thailand was studied. In addition, there were no other health conditions reported by the parent.



(A) (<http://www.youcantoocan.com/DRESSING-STICK-detail.htm?productId=-171616&catalogId=-8628&fp=1>)



Figure 1. (A) A commercial dressing stick, (B) and (C) modified dressing aids (MDA) H(U)-shape and J(N)-shape, respectively.

2.1.2 Modified Dressing Aids (MDA)

The MDA was developed from the commercial product, as shown in Figure 1 (A), made by the long stick with hook at the end of it, and modified using local and cheap materials available in Thailand in order to reduce the cost for the subject's family. From Figure 1 (B) and (C), the MDA composed of 2 sticks (j-shape hook and h-shape hook). The j-shape hook was applied for pulling a cloth into the subject's body, while h-shape hook was applied for taking

off the cloth from the body. MDA materials include (1) PVC pipe (diameter: 0.5 inches, length: 1 meter), (2) clothes hanger stand/bar (diameter: 1 cm, length: 60 cm), (3) wire, and (4) duct tape.

2.2. Study Design

The baseline phase consisted of initial motor skill, SETT model, and physical activity assessments. The training phase consisted of six-day training held at a physical therapy (PT) clinic once per day for general PT program and activity daily living (ADL) training with MDA (see Table 1). On sixth day, post-training was immediately followed up to administer all assessments.

2.3. Assessment

2.3.1 SETT Framework

The SETT framework (Zabala, 2005) was used to evaluate the subject with CP and its evaluation was to promote collaborative decision-making in all phases of AT service design and delivery from consideration through implementation and evaluation of effectiveness on MDA.

2.3.2 Sirindhorn National Medical Rehabilitation Centre (SNMRC) score

The SNMRC score is used to classify children with CP based on functional and ambulatory ability, and includes five levels and thirty-five items in 10 domains for evaluation as shown Table 1 and Table 2.

From Table 1, performance levels of SNMRC include:

- Complete independent* means that the patient can perform activities by themselves without any assistance and assistive devices.
- Independent with assistance* means that the patient can perform activities by themselves, but takes longer time than usual, and, perhaps, requires using devices or needing help from assistance.
- Independent with minimal assistance* means that patient can perform activities by themselves, but needs some help from assistance, and expends more than 50% of effort.
- Independent with moderate assistance* means that patient can perform activities by themselves, but needs much help from assistance, and expend less than 50% of effort.

- *Dependent* means that patient cannot perform activities by themselves, and need much help from assistance, and assistive devices.

Each level is inferred by total score of 35 activities as shown on Table 2.

2.4. Training

General PT program was applied for subject with CP; however, the training of MDA was implemented during ADL training. The total duration of training was 60 minutes per session for 6 days.

Table 1 *Sirindhorn National Medical Rehabilitation Centre (SNMRC) score*

Performance	Level	Range Score
Complete Independent	5	175
Independent with assistance	4+	160-174
	4	144-159
	4-	129-143
Independent with minimal assistance	3+	114-128
	3	98-113
	3-	83-97
Independent with moderate assistance	2+	67-82
	2	51-66
	2-	36-50
Dependent	1	35

3. RESULTS AND DISCUSSION

Results of SETT framework, functional and ambulatory ability were presented using the case model as follows:

3.1 SETT Framework (Zabala, 2005)

Student: after discussing with teachers, caregivers and family members, we found that the area of concern in this case was self-dressing.

- The subject with CP is a 9 years old, male.
- Medical diagnosis of Cerebral Palsy)Spastic hemiplegia (with Delay development.
- Hypertonia of both hands)right > left (and legs, making it difficult for him to sit and stand. He can grab by left hand. The coordination of both hands is poor. He has weakness of both legs, but can crawl with minimal bending of both hips and knees.
- Dressing activity: he used his left hand to take off the big size T-shirt from his body, but this function will be limited if the size is small. He can perform buttoning for his shirt, but takes a long duration. He can take off his pants but not complete, by using his hands and legs to take off the pants from waist level to the knee level. The expectation is to do dressing by himself.
- He has to stay at – Sitthida Home: Home for children living with disability at 8 am to 4 pm.
- He can perform self-feeding.
- One of caregivers needs to help for self-care especially wearing and taking off the clothes.

Environment:

- The bathroom is on the second floor in his house. Caregiver or family member must help him for several activities such as dressing, bathing, cleaning.
- Attitude/Expectation of family and staffs: negative attitude from family member. He lives with his father (parent divorced).

Task:

- He can help some activity related to self-care, such as, feeding.

Tool:

- After discussing with caregivers, we found that they needed a dressing aid assisting the child as self-care to minimize their efforts.

3.2 Sirindhorn National Medical Rehabilitation Centre (SNMRC) score

The result of SNMRC were compared between pre-training (score=102) and post-training (score = 108) as shown Table 2. It demonstrated that, after MDA-training, the score was increased. The specific dressing domain (domain 4) was improved in an outstanding score (Table 3).

His performance in taking off the T-shirt showed post-training score (score = 4: independent with assistance) is better than the other (score = 2: independent moderate assistant).

He spent short time duration for this activity when applying the MDA with his left hand to wear and take off the T-shirt and the pant by himself. However, according to the table 3, he still needs moderate to minimal assist to complete the activity. The score was improved for 1 level. Improvements in aspects of motor skills, physical activity were observed, thus providing preliminary support of positive gains based on AT for a child with CP.

This study demonstrated the positive effects between AT assisted physical activity participation and motor skill performance. Using the proposed AT improved the physical activity in severe motor impairment, similarly several studies (Tai, Blain & Chau, 2008). According to Hersh and Johnson (2008) have been proposed that “*AT is inclusive of products, environmental modifications, services, and processes that enable access to and use of these products, specifically by PWDs and older adults*”, we took this advantage of the definition to modify the equipment around the community for diminishing the barrier of this case (Herish & Johnson, 2008; Cook & Polgar, 2015). The custom designed device, MDA, was made since the chief complaint of the caregivers expecting the child to be self-care was concerned.

The present study aimed to capitalize on this potential-motivational mechanism through the MDA, by doing physical therapy training and including to MDA-training for 6 days at the department. The physical activity, especially dressing, was improved as follow the hypothesis.

The improvement of this domain might come from the motor learning or motor re-learn concepts (Burtner, Leinwand & Sullivan, 2014; Sullivan, Katak & Burtner, 2008).

4. CONCLUSION

This single case study documented a relation between use of MDA and SNMRC score. The training was distributed for 6 days together with physical therapy training. The child with CP could increase his performance of dressing activity when using the proposed MDA. Moreover, the caregivers informed our team that, after practice using MDA, the child with CP got familiar with the MDA and performed self-dressing and continued using MDA at home. Overall, the proposed MDA can be modified with cheap materials found available in Thailand, and employed to the persons with CP as similar as the child in this case study.



Figure 2. Presented the using of MDA (h-shape) by taking off the short-pants



Figure 3. Presented the using of MDA (j-shape) by wearing short-pants

Table 2. *Sirindhorn National Medical Rehabilitation Centre (SNMRC) score*

Domains	Activities	Pre-test	Post-test
1. Feeding	1. Drinking	5	5
	2. Eating	5	5
2. Grooming	3. Brushing teeth	5	5
	4. Washing face	5	5
	5. Washing hand	5	5
	6. Combing	5	5
3. Cleaning	7. Bathing/drying	2	2
	8. Washing hair	2	2
	9. Cleaning after bowel movement	2	2
4. Dressing	10. Taking off shirt	2	4
	11. Taking off pants	2	4
	12. Taking off socks/shoes	1	1
	13. Putting on shirt	2	3
	14. Putting on pants	3	4
	15. Putting on sock/shoes	1	1
5. Bowel & Bladder Management	16. <i>Bladder control</i>	5	5
	17. Bowel control	5	5
6. Mobility	18. Turning on bed	5	5
	19. Sitting up	5	5
	20. Balance control in sitting	5	5
	21. Standing up	2	2

Domains	Activities	Pre-test	Post-test
	22. Standing balance	1	1
	23. Transference	1	1
7. Walking	24. Walk on the walk way	1	1
	25. Walk on the slope	1	1
	26. Walk up-down 12-14 step-stairs	N/A	N/A
8. Communication	27. Listening	4	4
	28. Language communication	4	4
9. Social & Cognition	29. Social interaction	5	5
	30. Problem solving	4	4
	31. Memory	5	5
10. IADL	32. Calculation	1	1
	33. Food preparing	N/A	N/A
	34. House cleaning	N/A	N/A
	35. Taking medicine	1	1
Total Score		102	108

Table 3. Dressing domain compared between pre and post-training by using Sirindhorn National Medical Rehabilitation Centre (SNMRC) score

Domains	Activities	Pre-test	Post-test
4. Dressing	10. Taking off shirt	2	4
	11. Taking off pants	2	4
	12. Taking off socks/shoes	1	1
	13. Putting on shirt	2	3

	14. Putting on pants	3	4
	15. Putting on sock/shoes	1	1
Total Score		11	17

5. REFERENCES

- Buchholz, D., & Robbins, J. (1997). Neurologic diseases affecting oropharyngeal swallowing. *Perlman A. Schulze-Delrieu K. Deglutition and its disorders. San Diego, Singular Publishing Group.*
- Dabney K. W., Lipton G. E. & Miller F. (1997). Cerebral palsy. *Curr. Opin. Pediatr, 9:81-88.*
- Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International journal of behavioral nutrition and physical activity, 7(1), 40.*
- Tai, K., Blain, S., & Chau, T. (2008). A review of emerging access technologies for individuals with severe motor impairments. *Assistive Technology, 20 (4), 204-221.*
- [Hersh](#), MA., Johnson, M. A. (2008). On modeling assistive technology system-Part1: Modeling framework. *Technology and Disability, 20:193-215.*
- Cook, A. M., & Polgar, J. M. (2014). *Assistive Technologies-E-Book: Principles and Practice.* Elsevier Health Sciences.
- Burtner, P. A., Leinwand, R., Sullivan, K. J., Goh, H. T., & Katak, S. S. (2014). Motor learning in children with hemiplegic cerebral palsy: feedback effects on skill acquisition. *Developmental Medicine & Child Neurology, 56(3), 259-266.*
- Sullivan, K. J., Katak, S. S., & Burtner, P. A. (2008). Motor learning in children: feedback effects on skill acquisition. *Physical therapy, 88(6), 720-732.*
- Zabala, J. (2005). Ready, SETT, go. *Getting started with the SETT framework. Closing the Gap, 23(6), 1-3.*