

Regional Survey of Assistive Devices Use by Children with Physical Disabilities in Southern Taiwan

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Background: Despite increasing use of assistive devices (ADs) by physically disabled (PD) children, the use rate, number, effects and related services have seldom been studied. Understanding AD utilization is helpful in improving the related services. This study describes the usage of ADs by children with physical disabilities (PDs).

Methods: This regional survey enrolled children with PDs. The children's parents or primary caregivers filled out structured questionnaires regarding the children's use of and need for ADs, the benefits and problems associated with the ADs and related services.

Results: In total, 224 ADs were used by 124 children (1.79 ADs per child). The most commonly used ADs were orthoses (n = 77, 62.10%), mobility aids (n = 51, 41.13%), and aids for therapy and training (n = 21, 16.94%). The degree of disability, age, gender, diagnosis and rehabilitation training location were not associated with the number of ADs used. Most children (n = 103, 83.06%) benefited from ADs, and 93 (75%) children had been evaluated prior to buying ADs. Eighty three (66.94%) parents paid for the Ads, and 108 (87.10%) parents acquired information from rehabilitation professionals. Forty one (40.20%) parents were satisfied with the services of local suppliers; 119 (95.97%) parents had applied to their local government for financial support; 82 (68.91%) parents were not satisfied with the application procedures or the amount of support they received.

Conclusion: Although parents of PD children favored the usage of ADs, they needed additional information. We suggest that policies and strategies are needed to reduce barriers to ADs utilization, enhance insurance coverage and improve ease of using the services.

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Key words: assistive devices, children, physical disabilities

Children with physical disabilities (PDs) have various neurological and/or orthopedic problems that interfere with motor function and daily activi-

ties. The International Classification of Functioning, Disability and Health (ICF) advances the assumption that human functioning is a product of each person's

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interaction with the physical and social environments.⁽¹⁾ Assistive devices (ADs), which are part of the physical environment, refer to any item, piece of equipment, or product system that is used to increase, maintain, or improve function for people with disabilities. Appropriate ADs can reduce activity limitations, decrease participation restrictions, promote self-confidence, and enhance emotional and educational development.⁽²⁻¹¹⁾ Increased awareness of the benefits of ADs will result in increased demand and will likely lead to discrepancies between need and available resources. Social welfare agencies in Taiwan have developed programs that fund the purchase of most ADs, and in some cases, supply second-hand ADs. In recent years, the use of ADs by children with PDs has expanded. Despite considerable expenditure of public funds, little information is available regarding ADs utilization, benefits to users, or the effectiveness of programs that govern the availability of ADs. Identifying the barriers of the use of ADs is helpful in promoting the related services.

The aim of this regional survey in southern Taiwan was to assess AD use rates and device types, functional changes of children using the ADs, economic burden on the families buying ADs and related services of ADs. This study also provides insight into factors affecting AD use.

METHODS

One hundred twenty four children with PDs, such as cerebral palsy, myelomeningocele, arthrogryposis multiplex and other congenital or acquired neurological disorders were enrolled from a tertiary hospital, a day care institution, a special school and several local clinics in southern Taiwan. The degree of disability was assessed according the disabilities handbook provided by the Taiwanese government.⁽¹²⁾ For example, if a child had a significantly impaired limb (muscle power $\leq 3/5$ or losing more than 70% of normal range of motion of a big joint) or could not walk well due to the problem of trunk control, the degree of disability was defined as mild; if a child had a limb without any function or two significantly impaired limbs or could not stand well due to the problem of trunk control, the degree of disability was defined as moderate; if a child had two limbs without any function or could not sit well due to the problem

of trunk control, the degree of disability was defined as severe; if a child had four limbs without any function or had two limbs without any function and could not sit well due to the problem of trunk control, the degree of disability was defined as profound. Their parents or primary caregivers completed structured questionnaires, in some cases aided by their therapists or teachers. In addition to basic demographic and information of disabilities, the detailed questions acquired data regarding use of ADs and related services.

The questions were based on our experiences in assisting disabled children to choose ADs. Four principal question categories were utilized including:

(1) History of AD usage: this category covers the ADs that had been purchased before; the ADs were prescribed but not purchased, the reason for not purchasing the devices; and the ADs were in use at the time when the questionnaires were completed;

(2) Effectiveness: functional changes of children using the ADs;

(3) Economic factors: AD cost and ability to afford the ADs; and,

(4) Related services: difficulties in repairing or maintaining ADs, problems in applying for financial support and availability of information for ADs.

To determine the number of ADs used by each child at the time when the questionnaires were completed, the children were divided into two groups—(1) only one AD was used, and (2) more than one AD was used. Further analysis of the associations between gender, diagnosis, age, degree of disability, rehabilitation training location and the number of ADs used were completed.

Statistical analysis

The chi-square test was utilized to test whether gender, diagnosis, age, disability severity and rehabilitation training location had significant associations with children using more than one AD. A probability value of $p < 0.05$ was considered statistically significant. Statistical analysis was performed using the SPSS version 10.0 for Windows (SPSS Inc., Ill, USA).

RESULTS

Characteristics of the physically disabled (PD) children are shown in Table 1. Of the 124 children

Table 1. Characteristics of the Physical Disabled Children

Child characteristics		Number of children (n = 124)
Gender	Boy/Girl	69/55 (55.65%/44.35%)
Age (years)	0~3.9	37 (29.84%)
	4~6.9	45 (36.30%)
	7~12.9	27 (21.77%)
	13~17.9	15 (12.10%)
Diagnosis	Cerebral palsy	106 (85.48%)
	Myelomeningocele	3 (2.42%)
	Arthrogryposis multiplex	2 (1.61%)
	Others	13 (10.48%)
Degree of disability	None	4 (3.23%)
	Mild	10 (8.06%)
	Moderate	35 (28.23%)
	Sever	51 (41.13%)
	Profound	24 (19.35%)
Training location	Hospital	100 (80.64%)
	Clinic	11 (8.87%)
	Day-care institution	9 (7.26%)
	School	4 (3.23%)

enrolled, 69 (55.65%) were male and 55 (44.35%) were female. Thirty-seven (29.84%) children were aged < 4 years, 45 (36.30%) were 4-6.9 years, 27 (21.77%) were 7-12.9 years, and 15 (12.10%) were 13-17 years. The principal diagnosis was cerebral palsy (n = 106, 85.48%), three (2.42%) had myelomeningocele, two (1.61%) had arthrogryposis multiplex and 13 (10.48%) had other diagnosis. Four children did not meet the criteria for disabilities, 10 (8.06%) had mild disabilities, 35 (28.23%) had moderate disabilities, 51 (41.13%) had severe disabilities, and 24 (19.35%) had profound disabilities. One hundred (80.64%) children received rehabilitation training at hospitals, 11 (8.87%) children received training at local clinics, nine (7.26%) children received training at daycare institutions, and four (3.23%) received training at special schools.

Use of ADs

Fig. 1 presents a summary of the ADs once used, needed but not purchased and those in use at the time when the questionnaires were completed.

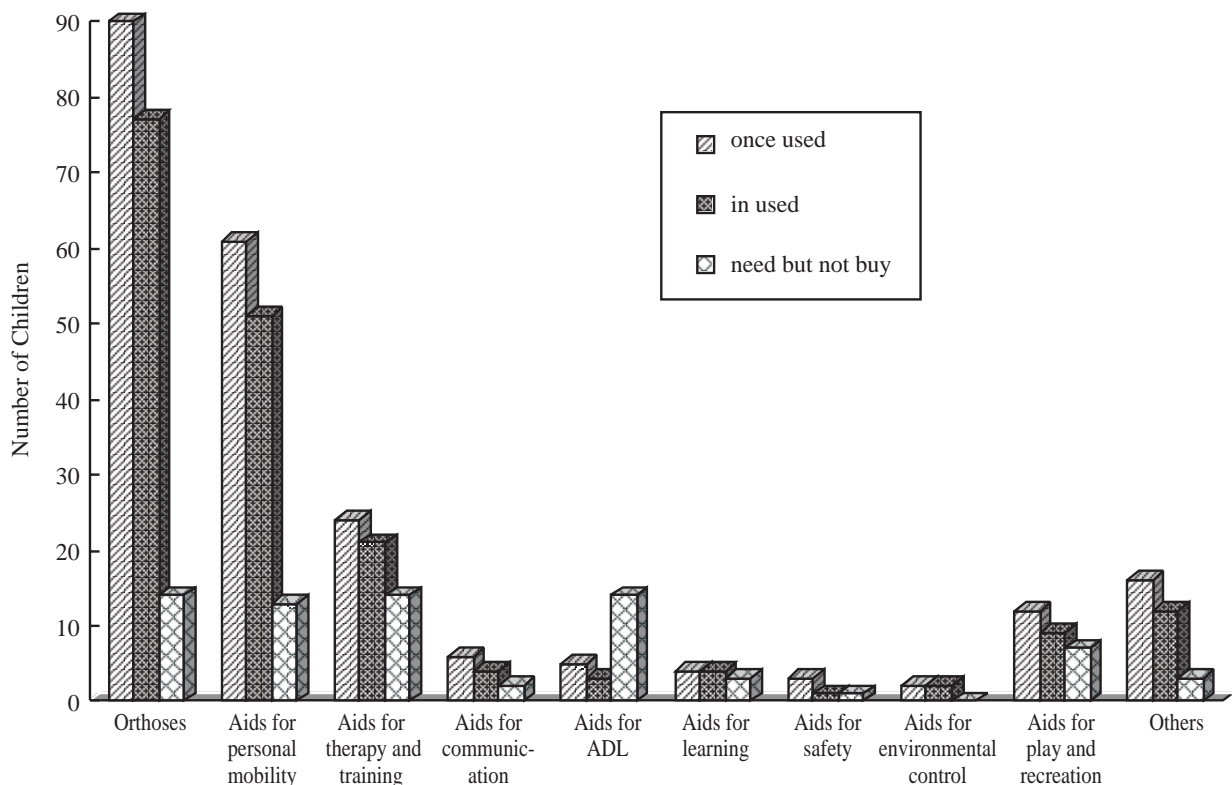


Fig. 1 The Distribution of Various Devices as Once Used, In Use, Need But Not Buy

The Nordic Classification System on Aids for Disabled Persons was modified to classify the ADs in this study.^(13,14) We classified the ADs into 10 types: (1) orthoses, such as ankle foot orthosis, antispastic splint; (2) aids for personal mobility, such as walkers, wheel chairs; (3) aids for therapy and training, such as standing tables, wedges for positioning; (4) aids for communication, such as communication boards; (5) aids for activities of daily living (ADL); such as curved spoons, U cups; (6) aids for learning, such as enlarged pencils, special computer interfaces; (7) aids for safety, such as helmets; (8) environmental control; (9) aids for play and recreation, such as modified toys; and (10) others. Of the 124 children, 89 (71.77%) once used orthoses, 61 (49.19%) used aids for personal mobility, 24 (19.35%) children used aids for therapy and training, six (4.84%) used aids for communication, five (4.03%) used aids for ADL, four (3.23%) used aids for learning, three (2.42%) used aids for safety, two (1.61%) used aids for environmental control, 12 (9.68%) used aids for play and recreation, and 16 (12.90%) used aids for other reasons.

Some ADs were suggested by professionals and not bought by the parents. They included orthoses (n = 14, 19.72%), aids for personal mobility (n = 13, 18.31%), ADs for therapy and training (n = 14, 19.72%), ADs for communication (n = 2, 2.82%), ADs for ADL (n = 14, 19.72%), ADs for learning (n = 3, 4.23%), ADs for safety (n = 1, 1.41%), ADs for play and recreation (n = 7, 9.86%), and ADs for other reasons (n = 3, 4.23%).

The reasons why parents did not buy the recommended ADs were as follows: the price was excessively high (n = 28, 81.85%); the ADs were not available at a local supplier (n = 9, 16.67%); there was no space to store the ADs (n = 9, 16.67%); and, the parents thought the ADs were not appropriate for their child's needs (n = 8, 14.81%). There are 224 ADs in use by 124 children at the time the questionnaires were completed (1.79 ADs per child). Sixty-six children (53.23%) used one AD, 35 children (28.23%) used two, nine children (7.26%) used three, and 14 children (11.29%) used ≥ four. Seventy-seven children (62.10%) used orthoses, 51 (41.13%) used ADs for personal mobility, 21 (16.94%) used ADs for therapy and training, nine (7.26%) used ADs for play and recreation, four (3.23%) used ADs for communication, four (3.23%)

used ADs for learning, three (2.42%) used aids for ADL, two (1.61%) used ADs for environmental control, one (0.81%) used ADs for safety, and 12 (9.68%) used ADs for other reasons. Gender, age, diagnosis, severity of disability and rehabilitation training location were not significantly associated with the use of more than one AD (Table 2).

Functional improvement of using ADs

In total, 103 (83%) children had achieved postural or functional improvement using various ADs. Among them, 22 of 26 (84.62%) children who used ADs for positioning achieved postural improvement; nine of 11 (81.82%) children using ADs for communication, reading or environmental control attained functional improvement; 19 of 25 (76%) children who utilized ADs for ADL or play achieved functional improvement; and 103 of 118 (87.29%) children using ADs for mobility or orthosis experienced functional improvement.

Cost of ADs

Initially 24 (19.35%) parents did not pay for ADs because the public health insurance system paid for the ADs. Thirty (24.19%) parents paid < NT\$5000 for the ADs; 35 (28.23%) parents paid

Table 2. The Associations between Piece of Devices in Use and Children's Gender, Age, Diagnosis, Degree of Disability, Training Location

Factor		Piece of device		p
		1	> 1	
Gender	Male	36	33	0.79
	Female	30	25	
Age (years)	< 4	25	12	0.08
	4~6	22	23	
	7~12	12	15	
	13~17	7	8	
Diagnosis	Cerebral palsy	56	50	0.83
	Others	10	8	
Degree of disability	None	3	1	0.10
	Mild	6	4	
	Moderate	21	14	
	Severe	26	25	
Training location	profound	10	14	0.91
	Hospital	53	47	
	Others	13	11	

NT\$5001-10000, 18 (14.52%) paid NT\$10001-20000; and 17 (13.71%) paid > NT\$20000. The local social welfare departments covered a proportion of the ADs, thus, the actual costs the parents paid for the ADs were as follows: none for 41 (33.06%) parents; < NT\$5000 for 36 (29.03%) parents; NT\$5001-10000 for 28 (22.58%) parents; NT\$10001-20000 for 13 (10.48%) parents; and, > NT\$20000 for six (4.84%) parents. Forty-five (36.29%) parents considered the cost of ADs prohibitively high. Sixty-seven (54.03%) parents believed that the ADs resulted in financial difficulty or hardship. In total, 108 (87.10%) parents accepted second hand ADs when the ADs were suitable and no financial support was available.

Sources of information for ADs

The source of information the parents cited the most was physician or other rehabilitation professional, which accounted for 108 (63.91%) of all sources. Other frequently noted sources were as follows: 31 (18.34%) obtained information from school professionals; 11 (6.50%) obtained information from the local supplier; seven (4.14%) found information on the Internet; and, 12 (7.23%) obtained information from other media.

Related services

Before buying the aids, 93 (75%) children were evaluated, primarily at hospitals (86/93, 92.47%). Of the 124 subjects, 107 (86.29%) received instruction on how to use the ADs during or after buying the ADs, of which 91 (85.05%) received instructions at the hospitals. Forty-one parents were satisfied with service supplied by the local suppliers, nine were unsatisfied, 22 received no service, and 52 had no opinion.

Financial support from the local government

One hundred eighteen (86.4%) parents were aware that they could apply for financial support from the local government; however, 24 (20.34%) believed that the procedures were too complex. Thirty-one (26.27%) asked for additional financial support from public funds, 36 (30.51%) complained that the share of the costs from local government were too low, 11 (9.32%) complained that the usage time periods of the ADs were too long and their children outgrew the ADs rapidly, five (4.24%) thought

that some government officials were hard to deal with.

DISCUSSION

In this study, we investigated AD use rates of children with PDs as well as device types, functional improvement of children with the ADs, economic burden on the family and related services for ADs in southern Taiwan. This data will be useful in improving the delivery services and establishing adequate public policies governing ADs.

Use of ADs

In total, 124 children were using 224 ADs at the time the questionnaires were administered (1.79 ADs per child). The use rate was significantly lower than that for children in Finland (Korpela et al., 1993)⁽¹⁴⁾ and Norway (Ostensjo et al., 2005).⁽¹⁾ Korpela et al., who investigated 204 children living in the region surrounding Tampere University Hospital (age range, 0.8-16.8 years; mean, 7.7 years) identified that these children used 1278 ADs (6.27 ADs per child). Ostensjo et al. in Norway determined that 86 children with cerebral palsy were given 1497 environmental modification devices by the national insurance system: 1075 were ADs for every day activities, 299 were for therapy and training and 123 were orthopedic devices.

The potential barriers to ADs usage included lack of funds for purchasing ADs, lack of centralized information and evaluation systems, fraud and abuse by certain providers, and denial of need by third-party payers.⁽¹⁵⁾ Limited financial support may be a reason for the low rate of ADs usage in this study. In Finland, disabled children are provided ADs at no cost to the family.⁽¹⁴⁾ The ADs program of the Ontario Ministry of Health, Canada, pays for approximately 75% of the cost of certain ADs.⁽¹⁾ In this study, 50 children were prescribed ADs that their parents chose not buy, of whom 29 (58%) parents chose not to buy the ADs for economic factors. Lack of knowledge regarding the availability of ADs was another likely factor related to the low AD usage rate in this study-most parents got the information of ADs from rehabilitation professionals, and the parents usually did not search for the information themselves.

In this study, the largest AD group was orthotic aids, followed by ADs for personal mobility, and

ADs for therapy and training. The roles of ADs in performing daily activities, such as bathing, eating, dressing, and going to the bathroom, received scant attention, only three (2.42%) children used such devices. Conversely, the ADs for ADL were more frequently (19.72%) prescribed by health professionals and not purchased by parents. Korpela et al. obtained a similar finding,⁽¹⁴⁾ noting that the largest group of ADs were for personal mobility, followed by orthoses and prostheses, ADs for therapy and training, ADs for furniture and adapting homes and land, ADs for personal hygiene, ADs for communication, information and signaling, ADs for handling other products, and ADs for play and recreation. Caudrey and Seeger⁽¹⁶⁾ followed up patients from a rehabilitation engineering service of the Regency Park Center for Young Disabled in Australia. They followed up 100 patients who had been given 111 new pieces of equipment (upper and lower limb orthoses, spinal orthoses, seating devices, ADL aids, mobility aids, standing frames) for 16 weeks after the ADs were supplied. They found that ADL aids were most likely to be no longer used or broken. The low number of ADs for ADL likely reflects the reluctance of parents to teach their children to live independently; furthermore, many parents have limited time, and find caring for their child less time consuming than teaching a child how to use ADs. Children with PDs should learn to live as independently as possible. When the child has sufficient cognitive and motor capacity to learn how to care for himself, adaptive ADL equipment should be prescribed.

Play is a vital part of the daily life of all children. In a developmental context, play is not recreation, but rather a fundamental feature of learning that encompasses engagement in purposeful activities with objects or toys alone or with others.⁽¹⁷⁾ Assistive devices offer opportunities to PD children who have difficulties playing with toys or are not able to play at all. In a study by Ostensjo et al.,⁽¹⁾ roughly 25% of cerebral palsy children used switches to control battery-powered toys, tape recorders and computers. In this study, nine children utilized modified toys, one had an AD for computer access. The low use rate of modified toys and other computer devices may be due to parents did not understanding very well the effects of play or computer technology on their children's development.

The degrees of disability were not associated with the numbers of ADs utilized. This observation result differs from those obtained by Ostensjo et al.⁽¹⁾ and Korpela and Koivikko,⁽¹⁸⁾ who found that the severity of motor disability was the most important factor impacting the need for and use of ADs when performing daily activities. Children with only mild motor difficulties may not use ADs in daily living, and children with severe motor but mild mental disability benefited the most.⁽¹⁹⁾ In this study, a trend was found for using additional devices when children had severe disabilities; however, variations existed among children at the same level, and no significant differences were found among the groups with different degrees of disabilities. The differences in findings obtained in this study and those obtained by Ostensjo et al.⁽¹⁾ and Korpela and Koivikko⁽¹⁸⁾ may have resulted from the limited financial support for ADs in our study.

Korpela et al. also determined that age was associated with AD use;⁽²⁰⁾ however, age was not associated with usage of ADs in our study. Neither clinical diagnosis nor rehabilitation training location had any association with the number of ADs used in this study.

Perceived usefulness of ADs

Nearly 90% of PD children benefit from ADs in this cross-sectional study. As the need for ADs by PD children changes over time, follow-up is essential to measure the utility of ADs and alter ADs when necessary.

Cost of ADs

Forty-five (36%) parents believed that the price of ADs was excessively high. Although local social welfare departments provided some financial support for purchasing ADs, most (53.6%) parents had the financial constraints for buying ADs.

Unused ADs should be retrieved, as they can be adjusted for another child and thereby save costs to the health insurance program. We cannot prescribe ADs regardless of the cost as most parents are concerned about the available financial support. In the future, additional discrepancies will likely exist between the need and amount of financial support. We suggest that all unused ADs, except for special orthotic shoes, insoles, tooth brushes and aids for eating, should be collected when not used and adjust-

ed to fit another child to save costs and reduce the distance between the needs and available resources. The results of this study showed that the majority of parents (108/124) would accept second hand ADs.

Related service

Assessment of the abilities and needs of PD children prior to buying ADs is necessary to increase the effectiveness of the ADs. For some particular devices, local social welfare departments require assessment reports from professional therapists when applying for financial support. Ninety-four children in this study (75%) were assessed prior to purchasing ADs. In a Canadian study that surveyed the use of technical aids by disabled children, only 1% of the 502 families studied received inadequate instructions.⁽²¹⁾ Children also need services after buying ADs. Considering the services of repairing and maintaining ADs, about 32.8% of parents were satisfied with the services supplied by the vendors. Applications for public financial support were not considered problematic for the parents; however, parents indicated that financial support may be insufficient.

Study limitations

As this survey was undertaken in southern Taiwan, the results represent the regional status and problems in the delivery of ADs to PD children. The differences in financial support for ADs in various cities may limit the ability to generalize the results of this study.

Other factors limiting the generalization of this study are that most subjects were enrolled from a tertiary hospital and physicians prescribed the ADs; this may not be the cases when ADs are prescribed by a variety of professionals or are offered by commercial dealers.

Future studies

A national survey of the ADs utilization by PD children will help achieve an understanding of the use of ADs in Taiwan.

Conclusion

Our survey results suggest that parents of PD children were willing to accept ADs, but needed information regarding their benefits and therapeutic aspects, especially for the roles in daily activities and

play. Effective AD use is dependent upon a coordinated assessment and implementation process. Variations in the use and the benefits of ADs in this study demonstrated the need for comprehensive assessments of factors related to the children, family members, technology, and service system, as well as the efficient cooperation between parents and various professionals. We suggest that improved social services system, needs assessment, follow-up and re-circulation of ADs are effective methods of improving device delivery services and, thus, partly eliminating the distance between ADs costs and the ability of parents to pay for ADs.

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南台灣肢障兒童使用輔具狀況調查

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- 背景：**儘管肢障兒童使用輔具有增加的趨勢，卻鮮有研究探討肢障兒童輔具使用率、項目、使用效果及相關服務的情形。如果我們對肢障兒童輔具使用的狀況有更清楚的了解，將有助於提供較好的輔具相關服務。本研究的目的在了解肢障兒童使用輔具的狀態。
- 方法：**本研究是一地區性調查，我們邀請南台灣肢障兒童的父母或主要照顧者填寫一份問卷，內容包括：肢障兒童使用輔具的數目與項目，專業人員認為需要使用卻沒有購買的輔具及其理由，使用輔具帶來的好處及使用輔具遇到的困難，接受輔具相關服務的情形。
- 結果：**有 124 位肢障兒童在填問卷時仍使用輔具，總共使用 224 件輔具，平均每位小朋友 1.79 件。最常使用的輔具類別分別是，支架類 (77 位小朋友使用)，其次為行動輔具 (51 位小朋友)，再其次為訓練用輔具 (21 位小朋友)。每位小朋友使用輔具件數與殘障嚴重度、年齡及性別均不相關。約八成的小朋友使用輔具後有獲得好處，七成五的小朋友在購買輔具前曾接受評估。約一半的父母需自己花錢買輔具，近六成的輔具資訊來自復健專業人員。四成的父母滿意廠商的售後服務。119 位父母曾申請政府補助，其中 82 位父母不滿意申請的過程及補助。
- 結論：**肢障父母均能接受使用輔具之觀念，但他們需更多的資訊。我們建議政府需制定相關政策或方法以減少輔具使用的障礙，增加補助範圍及促進相關服務的方便使用。
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