

DO CHILDREN AND YOUNG ADULTS WITH UPPER LIMB REDUCTION DEFICIENCY PERFORM DIFFERENTLY?

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INTRODUCTION

Since 1999 the arm prosthetics team of the Erasmus University Medical Center has been involved in development, validation and implementation of measures of functional status in children and adults with an upper limb reduction deficiency (ULRD) (1,5,6) Internationally now validated instruments such as the Prosthetic Upper Extremity Functional Index (PUFI) and Unilateral Below Elbow Test (UBET) are available (2,3,4) The clinical use of these measurement instruments and interpretation of the results is still a matter of discussion (7,8) We do not yet understand why patients choose to wear or not to wear arm prostheses, nor can we predict the amount and pattern of use. From previous research we know that both wearers and non-wearers perform well in activities of daily life. Still 30-50% of the patients with ULRD do choose to wear an arm prosthesis. Arm prostheses seem to have functional merits for specific activities. In addition they are likely to have a considerable personal function, in which self-esteem and cosmetics play important roles as well. The importance and influence of these aspects have not yet been evaluated. No longitudinal cohort studies or intervention studies have been done until now, so we do not yet know how capacity of prosthetic use and performance in daily life change with age.

Assessing aspects of functioning on the different ICF levels and searching for relationships among them may lead to better understanding of the functionality of arm prostheses and the performance of patients with ULRD.

In this paper we will explore whether age might be a relevant factor for functioning with or without a prosthesis. The first purpose is to compare two age groups regarding capacity and performance of functional activities with or without prosthesis, measured by the PUFI and UBET (2,3,4) The second purpose is to get further insight in clinical usefulness of these instruments.

METHODS

Patients

In this study two age groups participated, 20 children and 20 young adults recruited from the Department of Rehabilitation Medicine of Erasmus University Medical Center Rotterdam (Table 1), all with a one-sided below elbow congenital reduction defect.

Table 1

	N Male	N Female	Mean age (SD)	Non Wearers	Wearers	Myo	Passive
Children	10	10	8.7 (2.0)	11	9	8	1
Young Adults	9	11	19.4 (4.7)	12	8	5	3

Procedures and measurement

Each participant had one visit to the Departments of Rehabilitation Medicine or was visited at home. Each participant performed the Unilateral Below Elbow Test (UBET). For those using a prosthesis, the UBET was first performed with the prosthesis followed by test performance

without using the prosthesis. In addition, each participant or his/her parent filled out the Prosthetic Upper extremity Functional Index (PUFI). Wearing time, method of use (capacity and performance), ease of performance and usefulness of the prosthesis were evaluated. In addition adapted scores for ease of performance and usefulness were computed in which only those activities are scored, for which the prosthesis is actually used.

Results

Both age groups seem to differ in wearing time, we saw an increases of wearing time with age.

Table 1 **Wearing time**

	0-2 hrs/day	3-5 hrs/day	6-10 hrs/day	11-15 hrs/day
Child	3	3	2	1
Young Adult		1	3	4

Users of a prosthesis can do more than they actually perform in daily life, so there is a difference between capacity and performance. This discrepancy seems to be larger in the young adult group. (Table 2 and 3, the sum of active and passive use in UBET versus PUFI for young adults 84% versus 34%, children 68% versus 30%) The prosthesis was used for different activities in both groups. The children used it more for playing activities, the young adults more for activities of daily life. Both groups used the prosthesis for riding bicycles. The method of use of the prosthesis varied between the groups (table 2,3) The young adults tend to use the prosthesis more in an active way and use their residual limb less than the children. More striking was the difference in use of the residual limb in the non-user group and users without prosthesis group (table 2 UBET) The young adults act more passive with their residual limb compared to the children who make more active use of the residual limb and use their elbow/trunk. The non-user children seem to act far less one-handed than the children without the prosthesis and the young adults on performance measures (Table 3 PUFI)

Table 2 **method of use UBET (capacity)**

Method of use prosthesis/ residual limb (% of activities)	Young adult Users with prosthesis (n = 8) Mean (SD)	Child Users with prosthesis (n = 9) Mean (SD)	Young adult Users without P (n = 8) Mean (SD)	Child Users without P (n = 9) Mean (SD)	Young adult Non-users (n = 12) Mean (SD)	Child Non-users (n = 11) Mean (SD)
Actively	35 (26)	30 (28)	19 (28)	44 (24)	18 (21)	55 (30)
Passively	49 (33)	38 (25)	53 (35)	19 (15)	56 (32)	17 (13)
Elbow/trunk	0 (0)	11 (14)	8 (14)	16 (17)	9 (16)	27 (27)
One-handed	14 (33)	21 (13)	18 (34)	21 (23)	17 (33)	1 (3)

Table 3 **Method of use of prosthesis or residual limb in PUFI (performance)**

Method of performance (% of activities)	Young adult Users with (n = 8) Mean (SD)	Children Users with (n = 9) Mean (SD)	Young adult Non-users (n = 12) Mean (SD)	Children Non-users (n = 11) Mean (SD)
Prosthesis actively	20 (29)	15 (18)	0 (0)	0 (0)
Prosthesis passively	14 (16)	15 (21)	0 (0)	0 (0)
Residual limb	33 (26)	41 (34)	77 (12)	85 (12)
One-handed	27 (16)	23 (18)	19 (11)	5 (6)
Some help	2 (2)	2 (4)	3 (5)	3 (3)
Cannot do	5 (5)	4 (4)	1 (2)	7 (9)

The young adults have higher scores for ease of performance compared to the children. Users with prosthesis of both groups have lower ease of performance scores than the non-users. However, the adapted ease of performance score over only those activities for which they really use their prosthesis is much higher and comparable to the scores of the non-user group. (Table 4)

Table 4 Ease of performance of functional activities

	Child Mean	Child Min	Child Max	Young adult mean	Young adult Min	Young adult Max
Non users	79.9	54.6	95	95.3	82.9	98.7
Users without P	75.8	56.8	88	87.3	78.5	94.1
Users with P	45.2	5.6	75	60.1	11.3	91.5
Users with P Specific activities	88.0	66.7	100	95.9	86.3	100

Usefulness scores seem higher in the young adult group. Again the adapted score for usefulness was higher in both groups.

Table 5 Usefulness

	PUFI Mean (SD) N = 8	activities		PUFI Median (range) N = 9	activities
Young adult	43.8 (9.7-81.8)	all	Child	37.5 (1.9-58.8)	all
Young adult Specific act	86.4 (71.4-100)	riding a bike, pushing lawnmower and twisting lid off a bottle.	Child Specific act	75 (66.7-100)	Riding bike, scissors

Discussion

In this study we found differences between age groups of patients with ULRD in wearing time, method of use and performance. Both age groups perform well with and without prosthesis. Both children and young adult users seem to have slightly more difficulty in performing activities without their prosthesis than the non-users, as seen in other studies (7) Non-user children act less one-handed than the other groups of children and young adults. An explanation might be that these children make more functional use of the residual limb. The discrepancy between capacity and performance in daily life possibly grows with age. One would expect that prosthetic skills, wearing time and motivation increase with age and that ease of performance therefore is better in young adults. This is indeed shown in his study. The fact that the discrepancy between capacity and performance was larger in the young adult group compared to the children was an unexpected feature. Everyday use apparently does not develop while ease of performance and usefulness scores do. Personal and environmental influences, such as developing self-esteem and the importance of cosmetics may also influence the method and amount of use of the prosthesis in the group young adults. Additional measurement of skills of prosthetic use and personal and environmental influences may give a more clear view at the relationships of prosthetic use and performance during development.

Longitudinal standardized follow up of capacity and performance of patients with ULRD seems interesting and clinical useful according to our study. For a better comparison of the performance of the prosthetic users to the non-user group we advice using the PUF1 adapted scores for ease of performance and usefulness assessment.

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