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Correlation between upper limb function and activities of daily living capability in cerebral palsy

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Purpose
This study examined the correlation between upper limb function and activities of daily living capability in children with cerebral palsy (CP).

Methods
Seventy children with CP (mean age 7.0 ± 3.2 years old; 39 boys, 31 girls) participated in this prospective cross-sectional study. Melbourne Assessment of Unilateral Upper Limb Function, version 2 (MA2) and upper limb physician's rating scale (ULPRS) were conducted to measure upper limb function. Activities of daily living capability were measured using Pediatric Evaluation of Disability Inventory-computer adaptive test (PEDI-CAT). The percent score of MA2 and scaled score of PEDI-CAT were used for analysis. In the case of bilateral CP, data of more affected limb was selected. Spearman or Pearson correlation coefficients were calculated to estimate the correlations among the scores on the functional tests.

Results
The fluency dimension of MA2 showed a moderate positive correlation with daily activity and mobility domain of PEDI-CAT (r=0.43, 0.41, respectively; p<0.05), and a weak positive correlation with responsibility domain (r=0.27; p<0.05). The range and accuracy dimension of MA2 also showed a weak positive correlation with the daily activity domain of PEDI-CAT (r=0.33, 0.32, respectively; p<0.05). As for ULPRS, active elbow extension, forearm supination, wrist deviation, and two-handed function score, along with total score were weakly correlated with the daily activity and responsibility domain of PEDI-CAT (r=0.24-0.40; p<0.05). However, the total score of ULPRS did not significantly correlate with mobility and social cognitive domains of PEDI-CAT.

Conclusion

This study investigates how well upper limb function measured by MA2 and ULPRS relates to the child's actual performance in activities of daily living. MA2 and ULPRS were significantly correlated with daily activity domain, not with social cognitive domains in PEDI-CAT. A relatively weak correlation with the responsibility domain suggests that upper limb function does not lead to participation in managing complex, multi-step life tasks in children with CP.

Table 1. Participant characteristics.

Characteristic	Number /Value*
Number of participants	70
Age at assessment	7.0 ± 3.2 (3 – 16)
More affected side, right/left	35 / 35
Gender, male/female	39 / 31
Involved side, unilateral/ bilateral	30 / 40
MACS level, I-II / III-IV	30 / 40

MACS, manual ability classification system
* Values are mean ± standard deviation (range)

Table 2. Correlation coefficients between Melbourne Assessment and PEDI-CAT

	PEDI-CAT			
	Daily activity	Mobility	Social cognitive	Responsibility
MA2				
Range				
Correlation	**0.328†**	0.141	0.014	0.190
p-value	0.006	0.245	0.906	0.116
Accuracy				
Correlation	**0.323†**	0.085	0.173	**0.287†**
p-value	0.006	0.482	0.151	0.016
Dexterity				
Correlation	0.216	-0.033	0.004	0.091
p-value	0.072	0.787	0.977	0.455
Fluency				
Correlation	**0.439†**	**0.410***	0.102	**0.274***
p-value	<0.001	<0.001	0.400	0.022

MA2, Melbourne assessment of unilateral upper limb function, version 2; PEDI-CAT, pediatric evaluation of disability inventory-computer adaptive test
* Correlation is significant at the 0.05 level by Pearson's correlation coefficient
† Correlation is significant at the 0.05 level by Spearman's rank correlation coefficient

Table 3. Correlation coefficients between ULPRS and PEDI-CAT

	PEDI-CAT			
	Daily activity	Mobility	Social cognitive	Responsibility
ULPRS				
Active elbow extension				
Correlation	**0.284**[*]	0.227	0.091	**0.237**[*]
p-value	0.017	0.059	0.456	0.048
Active supination in extension				
Correlation	**0.317**[*]	0.200	0.106	0.177
p-value	0.007	0.096	0.382	0.143
Active supination in flexion				
Correlation	**0.397**[*]	**0.379**[*]	0.153	**0.258**[*]
p-value	0.001	0.001	0.206	0.031
Active wrist dorsiflexion				
Correlation	0.141	-0.005	0.043	0.194
p-value	0.243	0.970	0.722	0.107
Wrist deviation				
Correlation	**0.343**[*]	0.145	**0.265**[*]	**0.275**[*]
p-value	0.004	0.232	0.026	0.021
Finger opening				
Correlation	0.016	-0.105	-0.070	0.051
p-value	0.895	0.386	0.563	0.673
Thumb in palm				
Correlation	0.097	-0.108	-0.042	0.034
p-value	0.427	0.372	0.732	0.778
Associated increase in muscle tone				
Correlation	**0.279**[*]	0.164	0.080	0.182
p-value	0.020	0.176	0.058	0.132
Two-handed function				
Correlation	**0.369**[*]	**0.279**[*]	0.113	**0.247**[*]
p-value	0.002	0.019	0.351	0.039
Total score				
Correlation	**0.384**[*]	0.160	0.143	**0.259**[*]
p-value	0.001	0.186	0.237	0.031

ULPRS, upper limb physician's rating scale; PEDI-CAT, pediatric evaluation of disability inventory-computer adaptive test
[*] Correlation is significant at the 0.05 level by Spearman's rank correlation coefficient