Baby Brain Optimization Project (BBOP) Lab
APPLES-tele Study

Results from Kinematic and Somatosensory Gains in Infants with Cerebral Palsy After a Multi-Component Upper-Extremity Intervention: A Randomized Controlled Trial.

The prior APPLES study conducted at Nationwide Hospital in Ohio showed that the APPLES intervention improved kinematic and somatosensory outcomes in young children with CP. The APPLES intervention in the Nationwide study was conducted in person and with children 6-24 months corrected age, with the same inclusion/exclusion criteria as the currently recruiting study.

The results from this study indicated that participating in the APPLES intervention improved function in the child's weaker arm. These participants showed improved smoothness of reach with their more affected (i.e., weaker) arm/hand as demonstrated by a decrease in movement units during a reach (see chart below). These participants also showed highly significant improvement in their unimanual Bayley score and significant improvement in their Bayley total fine motor score (see chart below).

Effectiveness on more affected upper extremity function

Outcome	N	Effect (95% CI)	P-value
Somatosensory response amplitude[a]	69		
N140 Frontal Left		-0.11 (-0.28 to 0.06)	.03
N140 Frontal Right		0.09 (-0.25 to 0.08)	.63
P2 Frontal Left		0.19 (0.02 to 0.37)	.03
P2 Frontal Right		0.22 (0.01 to 0.44)	.04
Kinematics	58		
Number Movements (mean difference)		-2.25 (-3.47 to -1.02)	<.01
Number Movements (fold difference)		0.60 (0.46 to .77)	<.01
Arc length (mean difference)		-25.60 (-65.03 to 13.82)	.20
Bayley-III	73		
Unimanual		1.49 (0.42 to 2.56)	<.01
Total Fine Motor		1.35 (0.03 to 2.67)	.05

Measures expressed as difference in outcome in the intervention compared to control group, controlling for individual's baseline.

Additionally, participating in the APPLES intervention did not seem to affect their ability to use their less affected (i.e., stronger) arm/hand. These participants showed no significant differences in the sensory function of their less affected extremity at the end of the intervention as compared to the control group (see chart below). These participants also showed no significant differences in bimanual or gross motor function of their less affected extremity as compared to the control group (see chart below).

Safety outcomes: sensory function in less affected extremity and motor development

Outcome	N	Effect (95% CI)	P-value
Event-Related Potential amplitude[a]	69		
N140 Frontal Left		0.18 (-0.23 to 0.06)	.19
N140 Frontal Right		0.04 (-0.29 to 0.08)	.29
P2 Frontal Left		-0.08 (-0.26 to 0.10)	.38
P2 Frontal Right		-0.03 (-0.22 to 0.15)	.71
Bayley-III	73		
Gross Motor Scores		0.60 [-0.49 to 1.68]	.28
Bimanual scores		0.25 [-0.28 to 0.78]	.35

Measures expressed as difference in outcome in the intervention compared to control group, controlling for individual's baseline.

Maitre NL, Jeanvoine A, Yoder PJ, Key AP, Slaughter JC, Carey H, Needham A, Murray MM, Heathcock J; BBOP group. Kinematic and Somatosensory Gains in Infants with Cerebral Palsy After a Multi-Component Upper-Extremity Intervention: A Randomized Controlled Trial. Brain Topogr. 2020 Nov;33(6):751-766. doi: 10.1007/s10548-020-00790-5. Epub 2020 Aug 3. PMID: 32748303.