





Appendix





Table I. Summary of Clinical Studies

<i>Study Design</i>	<i>Paper / Study Size</i>	<i>Therapy/ Dosage</i>	<i>Condition</i>	<i>Age</i>	<i>Measures</i>	<i>Risk of Bias</i>	<i>Major Findings</i>
						A B C D E F G	
<i>RCT</i>	Friel [31] / 79	HABIT vs CIMT / 90 hrs	Unilateral Spastic CP	5 - 17 yrs	AHA JTTHF COPM ABILHAND-Kids BBT PEDI Imaging		- similar improvements are made with both CIMT and HABIT independent of CST connectivity
	Bingol [47] / 32	Bimanual vs mCIMT / 75 hrs	Congenital Hemiplegia	10.4 ± 2.9 yrs	ABILHAND-Kids QUEST		- a potential advantage of mCIMT over bimanual therapy is larger and more sustainable short-term improvements
	Gordon [4] / 42	HABIT vs CIMT / 90 hrs	CP	3.5 - 10 yrs	AHA JTTHF GAS		- both CIMT and HABIT lead to similar improvements in hand function - HABIT may promote greater progress toward self-determined goals
	Gelkop [43] / 12	HABIT vs CIMT / 96 hrs	Congenital Hemiplegic CP	1.5 - 7 yrs	AHA QUEST		- mCIMT and HABIT in school settings can improve

						bimanual skill and movement patterns
Hung [56] / 20	HABIT Structured vs Unstructured / 90 hrs	Unilateral Spastic CP	6 - 12 yrs	Kinematics		- skill progression is important to improve upper extremity and trunk movement control and consistency
Hung [36] / 20	HABIT vs CIMT / 90 hrs	Unilateral Spastic CP	6 - 12 yrs	Kinematics		- both CIMT and HABIT improved joint control, but CIMT improved the more-affected limb's motor planning and head control
Figueiredo [39] / 39	HABIT vs Standard / 90 hrs	Bilateral CP	4 - 16 yrs	AHA JTTHF COPM BBT PEDI		- HABIT improved daily functioning, skills, and dexterity of the dominant hand over standard care - group or time did not explain variance in bimanual ability or dexterity of the non-dominant hand - bimanual ability did not change after HABIT
Sakzewski [57] / 34	Bimanual vs CIMT / 60 hrs	Unilateral CP	5 - 16 yrs	AHA JTTHF COPM MUUL		- bimanual therapy and CIMT improves dexterity of the impaired upper limb, and bimanual performance



Sakzewski [51] / 80	Bimanual / 60 hrs vs 30 hrs	Unilateral CP	5 - 16 yrs	AHA JTTHF COPM MUUL	? + + ? + ? +	- a small dose of mCIMT or bimanual therapy made clinically meaningful gains in occupational performance
Bleyenheuft [53] / 24	HABIT-ILE Immediate vs Delayed / 90 hrs	Unilateral Spastic CP	6 - 13 yrs	AHA ABILHAND-Kids BBT PEDI	? ? + ? + + +	- HABIT-ILE improved ability in both upper and lower extremities - no effect found between delay
Kuo [35] / 19	HABIT vs HABIT-T / 90 hrs	Unilateral Spastic CP	6 - 15.5 yrs	AHA JTTHF Other	? + + + + ? ?	- tactile spatial resolution can improve after standard HABIT or with materials of various shapes and textures
Brandao [48]/ 18	HABIT / 45 hrs vs 90 hrs	Unilateral CP	4 - 12 yrs	AHA JTTHF	? + + - + ? +	- high and low doses improve manual dexterity and bimanual hand use similarly
Facchin [44] / 105	Bimanual vs CIMT vs Standard/ 210 hrs vs 20 hrs	Hemiplegic CP	2 – 8 yrs	QUEST Besta Scale	? + + - + + +	- more improvements resulted from intensive practice than from standard - mCIMT improved grasp - bimanual therapy improved spontaneous use and activities of daily living

Sakzewski [42] / 62	Bimanual vs CIMT / 60 hrs	Congenital Hemiplegia	5 - 16 yrs	Other	? + + - ? + +	- CIMT and bimanual therapy achieved changes in quality of life related to feelings about functioning, participation, and physical health
Hung [16] / 20	HABIT vs CIMT/ 90 hrs	Hemiplegia	4 - 10 yrs	AHA JTTHF Kinematics	? + + ? + + -	- HABIT improves bimanual training in agreement with the principle of practice specificity
Deppe [3] / 42	HABIT vs mCIMT / 80 hrs	Unilateral CP and Non-progressive Hemiplegia	3.3 - 11.4 yrs	AHA MUUL	? + + - + - ?	- mCIMT can improve unimanual function of the hemiplegic arm better than HABIT - HABIT and mCIMT improve spontaneous hand use - improvements are greater in more impaired children but not affected by age
Chamudot [2] / 33	Bimanual vs CIMT	Infant Hemiplegia	8 - 16 mo.	Mini-AHA	? + - - - + +	- mCIMT and bimanual therapy are equally effective for treating infants
Sakzewski [46] / 62	Bimanual vs CIMT / 60 hrs	Congenital Hemiplegia	5 - 16 yrs	AHA JTTHF MUUL	- + + - ? + ?	- CIMT and bimanual therapy had similar improvements post-intervention - unimanual capacity was better maintained by the CIMT group - bimanual performance was

						better maintained by the bimanual group
Aarts [58] / 50	Bimanual and mCIMT / 72 hrs	Unilateral Spastic CP	2.6 - 8 yrs	Other		- mCIMT followed by bimanual therapy improves capacity and performance of the upper limbs
Friel [59] / 20	HABIT Structured vs Unstructured / 90 hrs	Unilateral Spastic CP	4 - 17 yrs	AHA JTTHF COPM TMS		- structured and unstructured practice improves bimanual hand use and dexterity - only structured practice increased size of the affected hand motor map and amplitudes of motor evoked potentials - improvements are correlated with larger changes in map size - CNS organization does not affect improvement
Ferre [52] / 24	Home-HABIT vs LIFT / 90 hrs	Unilateral Spastic CP	2 - 6 yrs	AHA COPM BBT		- home-based models provide a valuable, family-centered approach to achieve increased treatment intensity
<i>Quasi-random</i> Bleyenheuft [19] / 41	HABIT-ILE vs Standard / 90 hrs	Unilateral CP	6 - 16 yrs	COPM ABILHAND-Kids BBT FA & MD		- HABIT-ILE improves FA/MD and hand function - CST fibers retain a capacity for functional restoration




Within-subject

Bleyenheuft [41] / 20	HABIT-ILE vs Standard / 84.5 hrs vs 36.4 hrs	Unilateral CP	6 - 15 yrs	COPM ABILHAND-Kids BBT PEDI		- HABIT-ILE improves lower-extremity performance, functional upper-extremity abilities, and dexterity of the less affected upper limb
Weinstein [38] / 12	HABIT/ 60 hrs	Hemiparesis	7 - 18 yrs	AHA CHEQ JTTHF fMRI DTI		- increased white matter integrity was detected in the corpus callosum and CST after intervention in about half of the participants
Robert [33] / 9	HABIT / 90 hrs	Hemispherectomy	7 - 16 yrs	AHA JTTHF COPM ABILHAND-Kids BBT		- completion of HABIT is feasible for children with hemispherectomy - HABIT improves JTTHF, AHA, ABILHAND-Kids, and COPM
Cohen-Holzer [50] / 10	HABIT and CIMT / 60 hrs	Hemiparetic CP	6 - 10 yrs	AHA JTTHF		- combining intensive practice in multiple modalities improves both upper- and lower extremity function
Schertz [60] / 20	HABIT / 60 hrs	Unilateral CP	7 - 16 yrs	AHA JTTHF fMRI DTI		- greater structural, functional and connective brain damage showed enhanced responses to bimanual intervention

						- baseline imaging may identify response to intervention
	Green [27] / 23	HABIT / 72 hrs	Spastic Hemiplegia	7 - 15 yrs	AHA JTTHF	 - themed HABIT improves AHA and spontaneous use - impairment severity does not influence progress
	Levy [61] / 8	HABIT / 60 hrs	Hemiparesis	6 - 11 yrs	AHA COPM	 - HABIT improves bimanual skills, goal attainment, and satisfaction with care
	Smorenburg [54] / 33	HABIT / 90 hrs	Unilateral Spastic CP	6 - 17 yrs	AHA JTTHF COPM ABILHAND-Kids DTI	N/A - ipsilateral CST control had worse JTTHF and AHA scores at baseline - bimanual hand use was independent of CST projection - improvements following HABIT were independent of the CST connectivity
<i>Case study</i>	Bleyenheuft [20] / 2	HABIT-ILE / 90 hrs	Unilateral Spastic CP	6 & 9 yrs	fMRI DTI TMS	N/A - following HABIT-ILE, activation and size of the motor areas controlling the affected hand increased independent of CST reorganization - fMRI showed additional changes in the reward circuit

							while using the affected hand
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Study size indicates the number of subjects for which outcome measures, as indicated in the table, are reported.

Risk of bias is split into seven categories: A) overall risk of bias, B) random sequence generation (selection bias), C) allocation concealment (selection bias), D) blinding of participants and personnel (performance bias), E) blinding of outcome assessment (detection bias), F) incomplete outcome data (attrition bias), and G) selective reporting (reporting bias). Risk of bias is ranked as follows:  green is low risk,  yellow is unclear risk of bias,  red is high risk.