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# Episodic versus Continuous Care in Outpatient Pediatric Clinics

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Episodic versus Continuous Care in Outpatient Pediatric Clinics

May 2016

This evidence project, submitted by

Rebecca Newman, Kimberly McGarvey, Laura Hoppe

has been approved and accepted  
in partial fulfillment of the requirements for the degree of  
Master of Science in Occupational Therapy from the University of Puget Sound.

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Project Chairperson: George Tomlin, PhD, OTR/L, FAOTA

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Dean of Graduate Studies: Sunil Kukreja, PhD

Key words: Pediatrics, Occupational Therapy, Treatment Frequency, Service Delivery Model

### Abstract

UW Medicine Valley Medical Center, Children's Therapy (VMC-CT) has experienced difficulties with consistent service delivery schedules for their clients. Long waitlists, absences, and scheduling and insurance constraints have impeded client ability to receive standard, continuous therapy. Thus, this critically appraised topic (CAT) paper addresses a research question developed in conjunction with Kari Tanta, PhD, OTR/L, FAOTA, the Rehabilitation Manager at VMC-CT, to understand the most effective methods of service delivery: episodic therapy (i.e. high frequency over a short duration) or continuous therapy (i.e., low frequency over a longer duration). The following research question was developed: Is episodic pediatric care as effective as continuous care for children (birth to 21 years old) with orthopedic conditions or developmental delays? From a review of twenty articles and one master's thesis, it appears that this modest amount of evidence (most from children with cerebral palsy) is inconclusive regarding which service delivery model is more effective. Thus, therapists can feel confident that scheduling treatment around reasonable real-world constraints will still provide no less effective care for their clients.

Due to increased clinician concern regarding scheduling issues, Dr. Tanta felt that two knowledge translation activities would be appropriate: a concise handout outlining our CAT findings for use at a staff in-service, and a case study article from VMC-CT, combined with our CAT evidence, for dissemination to the greater clinician community. As a means of assessing the impact of this article, we will track how many times the article is accessed. Based on the results of this CAT paper, it is clear that future research should focus on a broader array of diagnoses, and clinics should seek to track outcomes after changes in service delivery.

## **Executive Summary**

The current project reflects a year-long collaborative effort between three occupational therapy graduate students, a faculty mentor/project chair, and a collaborating clinician, Kari Tanta, PhD, OTR/L, FAOTA, Rehabilitation Manager, at Valley Medical Center Children's Therapy (VMC-CT). Therapy allocation at VMC-CT was restricted due to factors such as family schedules, insurance limitations (e.g., therapy caps), and/or limited client understanding of the benefits of therapy. These factors resulted in clients inadvertently receiving a variety of service delivery models at the clinic, including care that mirrored an episodic schedule. Further, Dr. Tanta reported a large proportion of no-show appointments; the clinic is unable to fill the no-show time slot due to short notice, and the spot which could be used to decrease the wait list is not utilized. Based on the complex amalgamation of these problems, Dr. Tanta desired research on the effectiveness of an episodic versus continuous therapy model. Evidence supporting episodic care could be used to reassure parents and therapists that more intense/less frequent therapy would not adversely impact outcomes. Through collaboration the following research question was developed: Is episodic pediatric care as effective as continuous care for children (birth to 21 years old) with orthopedic conditions or developmental delays? After minimal results we expanded our researchable question to include children with all diagnoses, excluding autism spectrum disorder (as per request of our collaborating clinician). After a meeting to present our preliminary findings, our research was expanded to include parent education as a method to improve family buy-in to therapy and adherence to treatment schedules.

Regarding differences in the effectiveness of episodic versus continuous treatment, the preliminary results were inconclusive, which implied that changing to an episodic therapy

schedule should not adversely impact therapeutic outcomes. A disproportionate amount of research was available for cerebral palsy specifically. This implies that further research is required for a variety of diagnoses. In regards to parent education, preliminary research demonstrated that families on the waitlist expressed a need for early and consistent communication with a therapist, and greater information on the scope of occupational therapy, their child's diagnosis, and activities they can complete with their child while on the waitlist. These findings implied that pediatric clinics should consider providing families on the waitlist with educational packets, which include specific information on caring for children with disabilities, advocacy, and resources in the area. In addition, professionals should maintain communication with clients from referral to discharge. Based on these findings, it is suggested that therapists can select therapy schedules based on the needs of the child and real world constraints without undue concern for diminishing outcomes, as different allocation schedules do not appear to adversely affect therapy results. Further, clinics should implement parent education programs to provide families with resources in lieu of treatment.

When presented with our findings, Dr. Tanta reported the information would be beneficial for clinicians with time constraints preventing self-directed research. She suggested that we publish a consolidated version of our CAT in The Journal of Occupational Therapy, Schools, and Early Intervention as our knowledge translation product. In the future, Dr. Tanta will contribute a case study summary from her clinic to be a portion of the published product. Further, we will create a poster with our research process and findings to present to the community. We will be sending Dr. Tanta an electronic version of our final poster to print and present to her clinic staff.

**Final, Revised CAT**

This version of the CAT paper was submitted to and approved by George Tomlin, PhD, OTR/L, FAOTA, our project chair, on February 28, 2016.

**CRITICALLY APPRAISED TOPIC (CAT) PAPER****Focused Question:**

Is episodic pediatric care as effective as continuous care for children (birth to 21 years old) with orthopedic conditions or developmental delays?

**Prepared By:**

Kimberly McGarvey, Laura Hoppe, and Rebecca Newman

**Date Review Completed:**

February 28, 2016

**Clinical Scenario:**

A Rehabilitation Supervisor at a pediatric outpatient clinic is wondering if interventions delivered discontinuously at the clinic, due to long wait lists, bimonthly appointments, and no-show appointments, are as effective as interventions delivered continuously for children with orthopedic conditions or developmental delays.

**Review Process****Procedures for the selection and appraisal of articles****Inclusion Criteria:****Inclusion criteria included:**

Peer-reviewed journal articles  
Samples of children with developmental delays  
Samples of children with orthopedic conditions  
Therapy delivery by a speech language pathologist (SLP), physical therapist (PT), occupational therapist (OT), or rehabilitation aide in a clinic setting

Exclusion Criteria:

<p><b>Exclusion criteria included articles focused on:</b>                  Autism Spectrum Disorder                  Adult or Geriatric rehabilitation                  Failure to compare an “intensive” or blocked condition to standard treatment                  Service delivery solely outside of a clinic setting</p>
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*Search Strategy*

Categories	Key Search Terms
Patient/Client Population	Pediatric, children, kids AND Orthopedic, orthopaedic OR developmental delay/impairment, cognitive delay/impairment, social delay/impairment, language delay/impairment, emotional delay/impairment motor coordination
Intervention (Evaluation)	Episodic, frequency, intensity, dosage, duration, concentration, interval, sporadic, schedule, discontinuous, intensive therapy Service delivery model Occupational therapy, speech language pathology, physical therapy
Comparison	N/A
Outcomes	Treatment outcome, waiting list

Databases and Sites Searched
PubMed
Google Scholar
PsycInfo
Taylor & Francis Group
Pediatrics (Journal)
CINAHL

**Table 1. Search Strategy of databases.**

<b>Search Terms</b>	<b>Date</b>	<b>Database</b>	<b>Initial Hits</b>	<b>Articles Excluded</b>	<b>Total Selected for Review</b>
concentrat* AND child* AND therapy AND waiting list	10/24/2015	PubMed	19	19	0
dosage AND child* AND therapy AND waiting list	10/24/2015	PubMed	40	40	0
"Treatment Outcome"[MeSH Terms] AND intensive therapy AND child* AND occupational therap*	10/24/2015	PubMed	28	27	1
(((intensive therapy OR continuous care)) AND (pediatric* OR child*)) AND (occupational therap* OR speech therap* OR physical therap*) AND (service delivery OR service delivery model)	10/24/2015	PubMed	6	6	0
(((frequency OR concentrat* OR dosage OR duration OR intensity OR interval OR episod* OR schedule OR sporadic OR discontinuous OR standard care)) AND (occupational therap* OR physical therap* OR speech language patholog* OR speech therap*)) AND (child* OR pediatric*)) AND (waiting list* OR wait time* OR time factor* OR delivery)	10/24/2015	PubMed	286	285	1
((delivery of healthcare/methods) AND occupational therapy) AND waitlists	10/01/2015	PubMed	2	1	1
(((waiting list*) AND dosing of treatment) AND occupational therapy) AND pediatrics	10/23/2015	PubMed	0	0	0
((dosing of treatment) AND occupational therapy) AND pediatrics	10/23/2015	PubMed	1	1	0
(((dosing of treatment) AND concentrated care) AND occupational therapy	10/23/2015	PubMed	0	0	0



concentration of care AND occupational therapy AND pediatrics	10/23/2015	PubMed	13	13	0
wait time outcomes, occupational therapy, pediatrics	10/23/2015	PubMed	0	0	0
concentration of care) AND occupational therapy	10/23/2015	PubMed	439	439	0
"intermittent treatment" in pediatric occupational therapy outcomes for developmental and physical disabilities	10/24/2015	Google Scholar	99	99	0
(((((frequency OR concentrat* OR dosage OR duration OR intensity OR interval OR episod* OR schedule OR sporadic OR discontinuous OR standard care)) AND (occupational therap* OR physical therap* OR speech language patholog* OR speech therap*)) AND (child* OR pediatric*)) AND (waiting list* OR wait time* OR time factor* OR delivery)	11/09/2015	PsychInfo	17	17	0
((frequency OR concentrat* OR dosage OR duration OR intensity OR interval OR episod* OR schedule OR sporadic OR discontinuous OR standard care OR waiting list) AND (pediatric* OR child*) AND (therapy OR treatment) AND (occupational therap*))	11/09/2015	PsychInfo	78	78	0
((frequency OR concentrat* OR dosage OR duration OR intensity OR interval OR episod* OR schedule OR sporadic OR discontinuous OR standard care OR waiting list) AND (pediatric* OR child*) AND (therapy OR treatment) AND (occupational therap* OR physical therap*)) <b>keywords:</b> (orthopedic OR orthopaedic OR developmental OR cognitive OR emotional OR social OR language) AND (impairment OR delay OR deficit)	11/09/2015	Taylor & Francis Group	19	19	0

<p>((frequency OR concentrat* OR dosage OR duration OR intensity OR interval OR episod* OR schedule OR sporadic OR discontinuous OR standard care) AND (waiting list* OR wait time* OR time factor* OR delivery) AND (occupational therap* OR physical therap* OR speech language patholog* OR speech therap*) AND (child* OR pediatric*))</p>	<p>11/10/2015</p>	<p>Pediatrics</p>	<p>12</p>	<p>12</p>	<p>0</p>
<p>(intensi* OR blocked OR discontinuous OR intermittent) AND (treatment OR therapy) AND (developmental AND (impairment OR delay)) AND (pediatr* OR child*) AND (occupational therap* OR physical therap* OR speech therap* OR speech language patholog* OR rehab aid*)</p>	<p>11/11/2015</p>	<p>PubMed</p>	<p>26</p>	<p>25</p>	<p>1</p>
<p>(blocked therapy OR intensive therapy OR continuous OR conventional therapy OR therapy dosage OR therapy frequency) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)</p>	<p>11/14/2015</p>	<p>CINAHL</p>	<p>4</p>	<p>4</p>	<p>0*</p>
<p>(service delivery model) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)</p>	<p>11/14/2015</p>	<p>CINAHL</p>	<p>1</p>	<p>1</p>	<p>0</p>
<p>(service delivery model AND decrease* waiting time) AND (pediatric* OR child* OR youth)</p>	<p>11/14/2015</p>	<p>CINAHL</p>	<p>0</p>	<p>0</p>	<p>0</p>

AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)					
(service delivery model OR decrease* waiting time) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)	11/14/2014	CINAHL	1	1	0*
(service delivery model OR episodic care OR blocked therapy OR therapy frequency) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)	11/14/2015	CINAHL	4	4	0*
(treatment outcomes OR efficacy OR effectiveness) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition)	11/14/2015	CINAHL	1	1	0
(treatment outcomes OR efficacy OR effectiveness) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (developmental delay OR orthopedic condition) AND (intermittent therapy OR concentration of care)	11/14/2015	CINAHL	0	0	0
(parent education) AND (waiting list OR attendance) AND (occupational therap* OR physical therap*)	2/3/2016	PubMed	6	5	1
((group OR parent) AND (education)) AND (reduc*) AND (occupational therap*) AND (adherence OR attendance)	2/3/2016	PubMed	3	3	0

((group OR parent) AND (education)) AND (occupational therap*) AND ((preclinic OR prior) AND (treatment OR therap*))	2/3/2016	PubMed	44	44	0
patient education AND patient satisfaction AND patient outcomes AND pediatric* AND occupational therap*	2/5/2016	PsycINFO	0	0	0
patient education AND patient satisfaction AND pediatric* AND occupational therap*	2/5/2016	PsycINFO	0	0	0
((occupational therap*) AND pediatri*) AND patient education	2/5/2016	PubMed	6	5	1
((duration of treatment) AND ("2015/10/01"[Date - Publication] : "3000"[Date - Publication])) AND occupational therapy) AND pediatric*	2/5/2016	PubMed	2	1	1
(service delivery model) AND (pediatric* OR child* OR youth) AND (occupational therap* OR physical therap*) AND (motor coordination)	2/28/16	PubMed	3	3	0
Total number of articles used in review from database searches = 7					

\* article excluded because it came up in a different search and was already included in the CAT  
For exclusion reasons, see below.

**Table 2. Articles from citation tracking.**

Article	Date	Database	Initial Hits	Articles Excluded	Total Selected for Review
Trahan & Malouin (2002)	10/23/2015	Google Scholar	114	112	2
Camden, Swaine, & Levasseur (2013)	10/23/2015	Google Scholar	2	2	0
Feldman, D., Swaine, B., Gosselin, J., Meshefedjian G., & Grilli, L. (2008)	10/23/2015	Google Scholar	19	19	0

Bailes, Reder, & Burch (2008)*	10/24/2015	Google Scholar	8	7	1
Jenkins & Sells (1984)*	11/09/2015	Google Scholar	16	16 #2	0
Christiansen, & Lange, (2008)	11/10/2015	Google Scholar	43	39 #3	4
Stewart, Galvin, Froude & Lentin (2010)	2/5/2016	PubMed	1	0	1
Total number of articles used in review from citation tracking = 8					

\*article not used in CAT table due to one or more reasons: failed to meet inclusion criteria, met exclusion criteria, was a review of an original study, or irrelevant to topic.

# indicates the number of articles that were promising but couldn't be accessed

**Table 3. Articles from reference tracking.**

Article	Date	Articles Referenced	Articles Excluded	Total Selected for Review
Camden, Swaine, & Levasseur (2013)	10/23/2015	24	23	1
Christiansen, & Lange (2008)	10/25/2015	9	8	1
Schreiber (2004)	10/24/2015	25	24	1
Freeman (2009) *	10/01/2015	6	5	1
Tinderholt-Myrhaug, Østensjø, Larun, Odgaard-Jensen, & Jahnsen (2014)	11/10/2015	62	61	1
Caris (2007)	11/14/2015	25	25 #2	0
Tsorkakis, Evaggelinou, Grouios, & Tsorbatzoudis (2004)	11/13/2015	36	35	1
Total number of articles used in review from reference tracking = 6				

\*article not used in CAT table due to one or more reasons: failed to meet inclusion criteria, met exclusion criteria, duplicate of article that was already used, or irrelevant to topic.

# indicates the number of articles that were promising but couldn't be accessed

Total number of articles used in review from database searches = 7  
Total number of articles used in review from citation tracking = 8  
Total number of articles used in review from reference tracking = 6  
Total number of articles used in review from UPS Master's Thesis = 1  
Total number of articles used in CAT = 22

***Quality Control/Peer Review Process:***

We developed the following research question with our collaborating practitioner, Kari Tanta, OTR/L: Is episodic pediatric care as effective as continuous care for children with orthopedic conditions or developmental delays? Once we agreed on our clinical question, we met with Eli Gandor-Rood, the library liaison, to help us develop our search strategy. He showed us how to navigate the library website to access articles through PubMed and use the Mesh Terms and citations from relevant articles to find more research.

Our initial search strategy was to search the following terms: episodic care, continuous care, frequency of therapy, therapy dosage, and pediatric therapy services. We did not include specific populations of developmental delays or orthopedic conditions because we were uncertain of the number of articles that would result for the initial search. We then searched PubMed using the MeSH term "occupational therapy." After receiving a range of results, we then added the MeSH terms "time factors," and the words "pediatric\* AND child\*" into the search. This resulted in a single article, "Did waiting times decrease following a service reorganization? Results from a retrospective study in a pediatric rehabilitation program in Québec" (Camden, Swaine, & Levasseur, 2013). Referencing the MeSH terms for this article resulted in a new search term, "delivery of healthcare." A search with the MeSH terms "delivery of healthcare," "waiting list," and "occupational therapy" resulted in a commentary on the article "Is Waiting for Rehabilitation Services Associated with Changes in Function and Quality of Life in Children with Physical Disabilities?" which was then retrieved using Google Scholar (Feldman, Swaine, Gosselin, Meshefedjian, & Grilli, 2008).

To gain more resources, we used PubMed and Google Scholar databases. We used citation tracking and reference tracking on the articles we found to increase our body of resources (refer to above tables for more detail). The total number of articles found was 1,547, but 1,526 of them were excluded because they did not fit our clinical question. Twenty-one articles and one master's thesis were reviewed and put into a CAT table. The articles were found from our search strategy and the master's thesis was a recommendation from our committee chair. While our search terms resulted in a multitude of articles, the majority of the articles were not consistent with our clinical question, failing to meet our inclusion criteria or meeting the exclusion criteria. Many of the articles that came up in the search focused on specific medical interventions (e.g. drug trials), clinician behaviors or preferences instead of clinical outcomes, or focused solely on group interventions. Additionally, many articles only met one search term (e.g. article about hearing aids tied to search term of rehab aid\*) and were irrelevant to our research question.

**Results of Search**

*Summary of Study Designs of Articles Selected for the CAT Table*

<b>Pyramid Side</b>	<b>Study Design/Methodology of Selected Articles</b>	<b>Number of Articles Selected</b>
Experimental	$\frac{1}{2}$ Meta-Analyses of Experimental Trials <u>5</u> Individual Blinded Randomized Controlled Trials <u>    </u> Controlled Clinical Trials <u>3</u> Single Subject Studies	8 $\frac{1}{2}$
Outcome	$\frac{1}{2}$ Meta-Analyses of Related Outcome Studies <u>1 <math>\frac{1}{2}</math></u> Individual Quasi-Experimental Studies <u>1</u> Case-Control Studies <u>3 <math>\frac{1}{2}</math></u> One Group Pre-Post Studies	6 $\frac{1}{2}$
Qualitative	<u>    </u> Meta-Syntheses of Related Qualitative Studies <u>2 <math>\frac{1}{2}</math></u> Small Group Qualitative Studies <u>    </u> brief vs prolonged engagement with participants <u>    </u> triangulation of data (multiple sources) <u>    </u> interpretation (peer & member-checking) <u>    </u> a posteriori (exploratory) vs a priori (confirmatory) interpretive scheme <u>    </u> Qualitative Study on a Single Person	2 $\frac{1}{2}$
Descriptive	<u>    </u> Systematic Reviews of Related Descriptive Studies $\frac{1}{2}$ Association, Correlational Studies <u>2</u> Multiple Case Studies (Series), Normative Studies <u>2</u> Individual Case Studies	4 $\frac{1}{2}$
Comments:		<i>TOTAL:</i> 22

**ADMINISTRATION/PROGRAM ORGANIZATION**

<b>Author, year</b>	<b>Study objectives</b>	<b>Study design/ level of evidence</b>	<b>Participants: sample size, description, inclusion/exclusion criteria</b>	<b>Interventions and outcome measures</b>	<b>Summary of results</b>	<b>Study limitations</b>
Camden, Swaine, Tetreault, & Brodeur (2010)	To determine whether parent and service provider perception of service was impacted during a service reorganization .	Level II, O2 & Q3 Three group, nonrandomized cohort design and qualitative group study design with less rigor	N = 222 families with children aged 0-21 yo, attending 1 of 6 rehabilitation settings during the 2007 (n = 69), 2008 (n = 80), and 2009 (n = 73) fiscal years. AND “about 50” service providers and 6 planning committee representatives during the mentioned fiscal years. <b>Inclusion:</b> families receiving rehab for at least 6 months.	<b>IV:</b> service reorganization involving early contact of families by social workers, group and community interventions <b>DV:</b> MPOC and MPOC-SP measure perception of service quality. Includes questionnaire and open ended questions. Families sent each April; Staff completed during annual program meeting.	No statistically significant difference in MPOC (p = 0.37) or MPOC-SP (p = 0.16) scores over the 3 years No statistically significant difference based on hours of service received. Families reported they appreciated the service reorganization (group treatments) and service providers reported the early contact w/ families allowed them to provide information quickly.	Low response rate to survey (24.6%). Failed to account for other rehabilitation services that may be received.
Camden, Swaine, & Levasseur (2013)	The literature indicates that long waiting lists are problematic to	Level III, O4 one group, pretest,	N = 188 families. Three sampling groups: those referred before, during and after implementation	<b>IV:</b> the organization introduced new admissions procedures and	The overall program and each discipline experienced a decrease in waiting time (in days) from before to	The researchers had no control over how the data was entered into the system (i.e., possible administrative errors).



	patient outcomes; this study aimed to examine changes in wait list times before, during and after a service re-organization.	posttest design	of new admission procedures. <b>Inclusion:</b> all cases at the facility <b>Exclusion:</b> cases referred before 2000 or after 2009 (in 2000 waiting times began to be collected and 2009 is when the study was completed).	increased group and community interventions to decrease wait list times. <b>DV:</b> length of wait for therapy measured in days	during to after the service reorganization; only the overall program and OT had a statistically significantly ( $p < 0.05$ ) shorter wait list time from before to after the service reorganization.	The number of patients referred to each discipline was different, thus the numbers may have been too small to detect a significant change in wait list time for services other than OT. The service reorganization was not adequately described; study not replicable.
Feldman, Swaine, Gosselin, Meshefejian, & Grilli (2008)	The study aimed to determine if longer therapy waiting times correlated with decrease in quality of life and/or functional ability.	Level IV, D2 and Level III, O4 correlational study	$N = 124$ parents of children with physical disabilities waiting for OT or PT services at 5 local rehab centers in Montreal. Convenience sampled. <b>Inclusion:</b> parents spoke English or French. <b>Exclusion:</b> children with only cognitive problems; people that lived more than 50 km from the city.	<b>IV:</b> Waiting time <b>Outcome measure:</b> Parent interviews every 3 months using a structured questionnaire pretested in a pilot study, the SSS-FES, WeeFIM, and PedsQL. The final score on each questionnaire (score at admission) minus the initial score at referral.	WeeFIM cognition improved over time, but no significant change in mobility scores. PedsQL scores declined significantly. No significant difference in SSS-FES scores. There was a negative association between waiting time and children's quality of life ( $p < 0.05$ ), but not with their function.	Parent-self report may not be the most accurate way to acquire the WeeFIM information. The study did not exclude children receiving private services. The study should have taken factors related to admission to services, such as the place of referral, into account during the analysis of the follow-up.
Caris (2007)	To determine the efficacy of	Level IV, E4	$N = 7$ children aged 5 - 9 yo convenience	<b>Intervention:</b> Both groups received 10	Participants from both groups (except 1) had	Attrition of 1 participant due to parent's not

	<p>an alternating sensory integration tx versus continuous tx in an outpatient pediatric setting.</p>	<p>multiple baseline, single subject design</p>	<p>sampled from the waiting list of OP OT. Age- and referral-matched before allocation to group. <i>Continuous (C) n = 4</i> <i>Alternating (alt) n = 3</i> (only 2 from alternating group finished study due to preferences/finances) <b>Inclusion:</b> referred for SI concerns. <b>Exclusion:</b> dx of PDD, neuromuscular disorder, musculoskeletal birth defect, or ODD.</p>	<p>wks of SI-based tx and created 3 goals based on GAS 5-pt scale. <u>C tx:</u> OP OT for ten weeks. <u>A tx:</u> OP clinic for 1st 4 wks, home program for next 4 weeks, and OP clinic for last 2 wks. Home program was co-created by parents and therapist. <b>Outcome</b> <b>Measure:</b> modified GAS, to measure the efficacy of tx. Modified from scale of -2 to +2 to -1 to +3, to allow for more regression from initial functioning score. Scored by therapist each wk during tx, but by parents during home program for alternating tx group. Alternating tx group was given</p>	<p>at least an average score of +1.00 on the GAS. In <math>\frac{2}{3}</math> pairs, group C had higher final GAS scores but significance tests couldn't be run due to sample size. In <math>\frac{1}{3}</math> pairs, Alt group had higher final score but significance tests couldn't be run. Based on therapist scores, C group had an average higher score than the Alt group (<math>p = 0.004</math>). Average therapist score of Alt group was 0.17 points lower than C in the final week but parent scores of Alt group in final wk were 0.12 higher than C. Parents in Alt group reported that it was convenient to do a home program, except some reported that the home program was less effective than the clinic, due to lack of professional guidance and to lack of</p>	<p>wanting to have alternating tx. Co-tx w/ PT or SLP during study. Small sample size due to attrition led to lack of statistical analysis. Researcher did not mention duration of clinic and home tx sessions, so replication would be difficult. Tx log would have been beneficial to document adherence to home program.</p>
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				survey on convenience and effectiveness of home tx.	motivation from their child.	
Hanson, Harrington, & Nixon-Cave (2015)	The purpose is to examine the feasibility and application of implementing a tx frequency and duration guidelines program in hospital-based pediatric outpatient PT.	Level V, D4 Administrative case report	Phase 1 <i>N</i> = 225 charts Phase 2 <i>N</i> = 197 charts	<b>IV</b> : Phase 1: initial implementation of informing staff about the change in tx procedures using a powerpoint presentation. Phase 2: due to the poor adherence to the TFDG by staff after phase 1. During phase 2, therapists were reeducated in small groups, where they were able to discuss and ask questions. <b>DV</b> : adherence to new procedure	Phase 1: 31% of charts demonstrated adherence to the new policy and procedures (22 therapists - 7 adhered >50% of the time, 5 adhered <50% of the time and 10 did not adhere at all). Phase 2: 90% of the charts demonstrated adherence (17 therapists - 16 adhered >50% of the time and 1 adhered <50% of the time)	Resistance to changing the policies and guidelines was a major problem for this facility, but after the re-educating (phase 2) more therapists adhered to the new procedures. During an organizational change, it is important to ensure that all staff members fully understand and know how to comply with new procedures and why the new procedures are being implemented. Resistance to implementing new guidelines is a common problem and should be considered when making changes.

**PARENT EDUCATION**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/ exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Stewart, Galvin, Froude & Lentin (2010)	To evaluate effectiveness of informational material provided to parents/ caregivers of children with special needs	Level IV D3, Q2 Descriptive telephone survey with a qualitative component with more rigor	<p><i>N</i> = 18 caregivers of children with physical and behavioral disabilities</p> <p><b>Inclusion:</b> caregiver of a child 0-18 with a disability who was given an informational packet</p>	<p><b>Intervention:</b> Caregivers attended an orientation about the information packet; they used it for 8 weeks</p> <p><b>Outcome measure:</b> Caregivers were sent an evaluation questionnaire after using the materials for 7 weeks with questions they would be asked in the phone survey; researchers contacted the participants via phone call after 8 weeks to discuss the effectiveness of the informational program.</p>	72% of the caregivers reported they read and were actively using the information, 28% reported that they read the packet. Participant opinions of the program: the orientation was helpful, the informational packet helped them access resources, it would be better to receive the information closer to the time of diagnosis, it helped them record information about their child, and communicate to others about their child.	The participants were recruited from a convenience sample, so many of their children had had the diagnosis for an extended period of time before receiving the information packet. The sample size was very small and does not represent the full diversity in educational level, language preference, and career/job responsibilities of the larger population.
Mitchell & Sloper	To explore how families	Q3	<i>N</i> = 27 parents of children with	<b>Methods:</b> Four focus groups were	In general, the parents felt that the quality of	Limited resources, separated services, and

(2002)	of children with disabilities would like to receive information and to develop a model of good information provision		disabilities <b>Inclusion criteria:</b> parents of children ages 5-19 with a variety of disabilities or chronic illnesses	set up and met twice for an hour and a half each. Before the second group meeting, participants were sent a variety of materials using different media and were asked to discuss the benefits of each one.	information given was enhanced by good presentation; information was up to date, accurate and easy to read; information was delivered personally by someone knowledgeable, approachable and understanding; information was accessible in everyday places; information was available in at different stages and in varying depths; information was delivered by a variety of healthcare professionals. Information should include in-depth written information but should be personally delivered.	not enough staff may hinder the feasibility of information provision. There were a limited number of people in the sample, and there were few minorities represented in the sample. This study was published in the UK so opinions may not generalize to the US (or elsewhere!).
Hoyt-Hallett, Beckers, Enman, & Betuzzi	To determine organizational changes that may reduce the current	Level IV D3, Q3 Descriptive Interview	N = 13 n = 9 parents n = 4 occupational therapists	<b>Methods:</b> Qualitative data was gathered to determine the clinic's current	<i>Document Analysis:</i> 75 children on the waitlist with 7-12 referred each month, and only 1 new child seen each	Study failed to provide demographic information on the occupational therapists and parents sampled.

<p>(2009)</p>	<p>waitlist in a pediatric OP setting through a Human Performance Technology analysis of interview data.</p>	<p>with a qualitative component with less rigor</p>	<p>Convenience sample was used from the hospital-based OP OT clinic. OTs were sampled who initially assess school-age children in the clinic. Parents were sampled whose children had recently been assessed. No demographic information or exclusion/inclusion criteria were provided.</p>	<p>service delivery performance, gaps in desired versus actual service, and the cause of the current service quality.</p> <p><b>Outcome Measure:</b>  <i>Document analysis:</i> Current waitlist statistics (number of children on waitlist, number referred each month, number seen each month)  <i>Stakeholders:</i> OT interviews to elicit their perception of service, issues with service, and additional resources they felt would be beneficial to parents. Parent interview on information received while on waitlist, experience on waitlist, information that</p>	<p>month. The current wait time was one year for children above the age of 5 with nonacute conditions.</p> <p><i>Performance Analysis:</i> OTs reported that a broad service inclusion criteria resulted in many referrals, mainly children with long-term conditions. OTs felt some conditions were better suited for a non-hospital setting, felt parents should be given a description of service when referred, and be given information on other options and resources. Parents reported they wanted information on OT scope/services and home interventions they could implement during wait times. They wanted more clinician contact throughout the therapy process.</p> <p><i>Gaps:</i> Excessive wait time, inconsistent</p>	<p>No information on how themes were identified from the OT interview.</p>
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				<p>would have been helpful to receive, and general suggestions for the clinic</p>	<p>staffing, no understanding of OT services, no awareness of other resources, hospital environment being inappropriate for school interventions, referral rate &gt; discharge rate.  <i>Cause:</i> Lack of information provision to parents and limited resources.</p>	
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**CEREBRAL PALSY**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Sakzewski, Miller, Zivani, Abbott, Rose, Macdonell, & Boyd (2015)	To examine if a short-length, high frequency group model of therapy would improve unimanual abilities and bimanual performance more than individualized standard care in children with CP.	Level I, E2 Randomized controlled trial	<p><i>N</i> = 44  <i>n</i> = 25 in hybrid CIMT group  <i>n</i> = 19 in standard care group  <b>Inclusion:</b> unilateral CP, child age 5-16, ability to follow instructions, predominant spasticity (MAS score of 1-3)  <b>Exclusion:</b> dystonia, MAS score &gt;3, previous orthopedic surgery on an upper limb</p>	<p><b>Intervention:</b> Hybrid CIMT group: 6 hrs/day over 10 days (2-five day weeks of camp), therapist to child ratio of 1:2                      Standard care group: 1.5 hrs 1x/wk and for 6 weeks and a home program meant to be completed 30 mins, 6 days/wk for 12 weeks.  <b>Outcome measures:</b> MUUL (upper limb function), GMFCS (performance of self-initiated tasks), AHA (bimanual performance), and COPM (self-perception of performance)</p>	<p>Both groups received same total dose of therapy, but different lengths, frequencies, durations and therapist to child ratios between the intervention groups, but due to participant illness only 56% of the children in the hybrid CIMT group received the allocated therapy dose compared to 95% of the children in the standard care group.                      The standard care group had statistically significant gains on the AHA (<i>p</i> = 0.006) and COPM (<i>p</i> = 0.04).                      These results support the use of a standard care program for children with unilateral CP.</p>	<p>Intensive group based therapy may not be feasible, as it is a large time commitment for service providers and families. As shown by the lower rate of participation in the program, compliance is difficult for such a time consuming period, even if it is only for a two week period.</p>



<p>Tsorlakis, Evaggelidou, Grouios, &amp; Tsorbatzoudis (2004)</p>	<p>This study examines the effect of NDT and the differences in its intensity of gross motor function of children with CP.</p>	<p>Level I, E2 Randomized controlled trial</p>	<p><i>N</i> = 34, 12 females, 22 males; a proportionate stratified sample based on age, sex, and distribution of motor impairment. <b>Inclusion:</b> mild to moderate spastic hemiplegia, diplegia, or quadriplegia; GMFCS levels 1 to 3; ages 3 to 14 years; <b>Exclusion:</b> other severe abnormalities; orthopedic remedial surgery or medication to reduce spasticity; participation in other therapy programs.</p>	<p><b>Intervention:</b> Group A participated in NDT 2x/week for 16 weeks, Group B participated in NDT 5x/week for 16 weeks. <b>Outcome Measure:</b> GMFM-66 (measures gross motor function)</p>	<p>Both group A and B combined showed significant differences from initial to final measurements in GMFM-66 scores (<math>p &lt; 0.001</math>). Group B's improvement in gross motor function was significantly greater than that of Group A (<math>p = 0.018</math>). The younger children (ages 3 to 5 years) improved more than older children (ages 10 to 14 years) (<math>p = 0.046</math>).</p>	<p>One limitation is that even though the study showed improvement for children with spastic CP, the results cannot be generalized to children with other forms of CP.</p>
<p>Christiansen &amp; Lange (2008)</p>	<p>To compare the effect of intermittent vs. continuous physiotherapy given to children with CP.</p>	<p>Level I, E2 Randomized controlled trial.</p>	<p><i>N</i> = 24 (control: <math>n = 14</math>; intervention: <math>n = 10</math>) children (16 males, age range: 2 mo - 8 yr 9 mo) convenience sampled from children being treated at Smabornscetret, Aarhus, Denmark. <b>Inclusion:</b> diagnosis of CP <b>Exclusion:</b> Need for</p>	<p><b>Intervention:</b> Intermittent group: physiotherapy 45-mins, 4x/wk for 4 weeks, followed by a 6-week break; repeated over 30 weeks with a max of 48 sessions. Continuous group: 45 mins, 1-2 x/wk for 30 weeks totaling a max of 48 sessions.</p>	<p>Both control (<math>p = 0.038</math>) and intervention (<math>p = 0.026</math>) groups increased in GMFCS scores. No significant difference between groups in GMFCS scores (<math>p = 0.81</math>).</p>	<p>Physiotherapists had differing level of experience (2-26 yrs), did not specify the mean experience of therapists in control versus intervention group.</p>

			interpreter, candidates for surgery or medication that might influence outcome measures	<b>Outcome measure:</b> GMFCS-66 before and after intervention to measure gross motor function		
Deluca, Echols, Law, & Ramey (2006)	To determine the efficacy of CIMT in children with CP	Level I, E2, randomized controlled, crossover trial	<i>N</i> = 18 children with CP (range of 7-96 months of age, mean age was 41.5 months) <b>Eligibility criteria:</b> diagnosis of CP with asymmetric UE involvement, 8 years of age or younger, and in good health	<b>Intervention:</b> CIMT administered 6hrs/day, 21 consecutive days to increase functional abilities of the involved UE. The less involved UE was casted from axillary area to the fingertips. Phase 1: 9 children received CIMT and 9 in the control group (traditional OT/PT) Phase 2: 9 children in control group crossed over to receive CIMT <b>Outcome measures:</b> QUEST, Pediatric Motor Activity Log, Emerging Behavior Scale	Phase 1: tx group had borderline significant main effect over control group ( $F = 3.38, p = 0.09$ ) Phase 2: initial control group had significant effect after CIMT ( $F = 6.35, p = 0.05$ ) Significant overall effect for all 18 children on CIMT ( $F = 5.97, p = 0.04$ ) indicating that intensive CIMT is effective in increasing functional skills in children with CP with asymmetric UE involvement; significant positive changes on all three outcome measures ( $p < 0.0001$ ).	This specific CIMT program provided one-on-one intensive tx for 6 hours a day with one child. This may not be feasible or realistic for certain settings. This schedule is also very demanding for parents. Future studies should investigate if this type of tx is effective with less one-on-one therapist led time and increased time completing a home program or through using volunteers.
Brunner, Rutz, Jueneman,	To determine whether physiotherapy	Level III, O3 2 groups	<i>N</i> = 26 children (originally 39, but 13 dropped out) from 15	<b>Intervention:</b> Group A: year 1 had regular physiotherapy and	The GMFM-66 values for both groups improved over the 2	One limitation is the study may not have been long enough to

<p>&amp; Brunner (2014)</p>	<p>is more effective when applied in blocks of tx or continuously in children with CP and similar conditions.</p>	<p>pre-post study</p>	<p>institutions in Switzerland.  <b>Inclusion:</b> children 6-16 years old, GMFCS II-IV, and a diagnosis of CP or a syndrome with similar symptoms.  <b>Exclusion:</b> children who planned to have surgery or change rehab program.</p>	<p>year 2 had blocks. Group B: year 1 had blocks and year 2 had regular. Each year run from mid-August to end of June. Regular therapy was 1 to 2 times per week. The blocks were 2 to 4 times per week for a quarter of the year, alternated with a quarter-long break from therapy.  <b>Outcome measure:</b> GMFM-66 (gross motor) assessed before the study, after the first year, and after the second year.</p>	<p>years in only 2 (standing; and walking/running/jumping) of the 5 dimensions (lying and rolling; sitting; crawling and kneeling; standing; walking, running and jumping) (Group A <math>p = 0.022</math>, Group B <math>p = 0.039</math>). Improvements in GMFM-66 scores were seen only after the periods of regular therapy (both groups <math>p &lt; 0.05</math>). No significant changes were found after blocks of therapy for either group.</p>	<p>show significant developmental and motor progress. It is impossible to make this study longer because the children will most likely need adaptations of their physiotherapy, which is an exclusion criteria. Another limitation is the high attrition rate.</p>
<p>Law, Russell, Pollock, Rosenbaum, Walter, &amp; King (1997)</p>	<p>The purpose was to compare the combined effect of intensive NDT and casting, and a less intensive regular OT program in improving hand function,</p>	<p>Level III O4                  2 group pre-post study</p>	<p><math>N = 50</math>  <b>Inclusion:</b> children 18 months to 4 years old with CP with limb involvement of diplegia, hemiplegia, or quadriplegia; UE involvement moderate to severe with wrist in flexed; difficulties with manual dexterity, coordination, isolated</p>	<p><b>Intervention:</b> Children initially assigned to intensive NDT and casting or regular OT using a blocked randomization design. After first 4 mos of therapy, had 2-month break, then switched intervention for next 4 mos. The intensive intervention</p>	<p>Scores in all outcome measures did improve over time for both tx orders (Peabody <math>p = 0.0001</math>, QUEST <math>p = 0.007</math>, COPM <math>p = 0.0001</math>). The study found no significant differences in hand function, quality of UE movement, or parents' perception of child's</p>	<p>This study design does not differentiate between whether the improvement over time was due to developmental progress or the influence of therapy. The structure of the study did not allow researchers to see the effects of a no therapy control group.</p>

	quality of UE movement and ROM in children with CP.		finger movement, and in-hand manipulation activities. <b>Exclusion:</b> demonstrated skin sensitivity to casting material; had a fixed permanent contracture at wrist; had or planned surgery; used anti-spasticity medication; or had severe cognitive impairment.	had 3 times more therapy than regular OT. <b>Outcome Measures:</b> Peabody Fine Motor Scales Secondary Outcomes: QUEST; COPM- parents' perception of their child's ability in hand-function activities. Assessments performed at baseline, 4 mos, 6 mos, and 10 mos.	hand-function activities when children were receiving intensive NDT and casting or regular OT. There appeared to be no extra benefit to increasing the amount of therapy.	
Trahan & Malouin (2002)	This pilot study aimed to determine the feasibility and effectiveness of implementing a PT program that combines intensive therapy with periods without therapy in children with CP	Level IV, E4 multiple baseline, single subject design	<i>N</i> = 5 <b>Inclusion:</b> the children had to be enrolled in a rehabilitation program in the facility where the study took place, have a diagnosis of CP and impairment of the four limbs and trunk. <b>Exclusion:</b> children who were candidates for surgery or had other conditions	<b>Intervention:</b> Multiple baseline design with staggered duration of the baselines among the participants. Phase A: standard physical therapy treatment plan (45 mins, 2x/wk) Phase B: experimental intensive therapy phase (45 mins, 4x/wk for 4 wks) followed by an 8 week rest period with	Three children had statistically significant ( <i>p</i> < 0.05) improvements in their GMFM scores at the end of phase B; none showed deterioration. This study confirms that an intensive therapy model is feasible; only 1 treatment session was missed and caregivers reported that the children tolerated the intensive treatments well. It was noted that	Staggered baselines attempted to provide a between- and within-subjects control, but the study did not have a control group. Future studies should include a control group to assess if intensive therapy is more effective than standard therapy. Scheduling intensive therapy is difficult, as the children had many other appointments and required an increased time commitment for

				no therapy <b>Outcome measure:</b> GMFM, taken every 4 weeks to measure gross motor function	intensive therapy should not span more than 4 weeks due to increased fatigue.	caregivers.
Ustad, Sorsdahl, & Ljunggren (2009)	To determine effectiveness of blocked versus standard physiotherapy in infants (<1 yo) dx'ed with CP.	Level IV, E4 Single-subject, multiple-baseline ABABA	<i>N</i> = 5 children (age range: 5 mo and 3 wk to 9 mo and 2 wk) recruited from a university hospital. <b>Inclusion:</b> children 6-12 months, who show symptoms of CP, and live w/in 30 min from hospital. <b>Exclusion:</b> comorbidity, orthopedic surgical interventions, botulinum toxin A injection, or alterternative tx.	<b>Intervention:</b> ABABA <u>A1, 2, 3:</u> children received standard physiotherapy at home, the amounts varied per child; 2 received tx 1x/wk or 1x/2wk, 2 had not been referred for tx, and 1 had a pause in tx. A1 ranged from 4-16 weeks. A2 and A3 were 8 weeks. <u>B1, 2:</u> 4 wks w/ 40-60 min sessions/5x/wk (2 at home; 3 in hospital). Tx involved training parents to facilitate movement. Max 19 sessions each period. <b>Outcome Measures:</b> GMFM-66 and -88 (measures changes in gross motor function in children w/ CP)	Used 2 SD band method for GMFM-66 and celeration line for GMFM-88 data. Child 1: significant improvement in GMFM-66 in B2. Positive trend for GMFM-88 data, all points above celeration line. Child 2: GMFM-66 points exceeded 2 SD band in period B2. Points of GMFM-88 score were along celeration line. Child 3: Significant difference in B1 and B2 on GMFM-66. All points along celeration line for GMFM-88 score. Child 4: Scores above 2 SD band for A2, B2, and A3. GMFM-88 scores exceeded the celeration line during	Children had a wide range of gross motor severity, increasing heterogeneity of sample. 4/5 children were male. Inconsistent tx methods during A periods, ranging from no tx to tx 1x/wk. Failed to report compliance during A periods. No records comparing home versus hospital sessions.

				every 4 wks.	A2 and B2. Child 5: Seemed to be an increase in GMFM-66 score in B2 but 1 data point was missing, making it difficult to interpret. GMFM-88 increase above celeration line in A3. Comparing change scores for all children, most had a higher change score in B2 compared to B1.	
Palisano, Begnoche, Chiarello, Bartlett, Westcott McCoy, & Chang (2012)	To determine the percentage of children in PT and OT in school, clinic, or both settings, the frequency of services, parent perception of interventions, the effect of setting, GMFCS level, and area of the U.S. on PT and OT frequency,	Level IV O3 Case-control, pre-existing group	<i>N</i> = 399 parents (377 female primary caregivers) of children (224 males) 23 to 74 mo w/ CP who were previously part of the Move & PLAY study. Convenience sample to have an even distribution of ages and representative distribution of GMFCS levels. Sampled from children’s hospitals, community EI programs, community rehab programs, and	14 PTs, a pediatric nurse, and 2 other interviewers conducted 60-75 min long phone interviews with parents. <b>Measures:</b> GMFCS, measures gross motor function. Service Questionnaire, developed by investigators to determine: setting, frequency (x/month or year), amount of PT and OT (average minutes per visit), the	Majority of children receiving OT and PT in school or clinic (53 to 61%) received 2-4 sessions/month. Mean minutes/month of PT no different in school versus clinic ( <i>p</i> = 0.11). Mean minutes of OT greater in school ( <i>p</i> < 0.05). Mean minutes of PT greater for GMFCS levels II-III ( <i>p</i> < 0.01) and IV-V ( <i>p</i> < 0.01) compared to level I; no difference between levels II-III and IV-V ( <i>p</i> = 0.89). Mean minutes OT	Although the researchers attempted to be representative, the convenience sample may not be representative of the population. Interview relied on parent self-report, which could be inaccurate. Clinical documentation would have been a more accurate resource for data frequency and amount of therapy.

	and the effect of GMFCS level on the intervention focus and process.		therapist practices in 4 regions of U.S. and 9 regions of Canada. <b>Inclusion:</b> children who have or were suspected to have CP.	focus and process of interventions. <b>IV:</b> Setting, GMFCS level, region of U.S. <b>DV:</b> mean min/month of PT and OT	greater for levels IV-V compared to I ( $p < 0.01$ ); no difference between level I and II-III ( $p = 0.42$ ) or II-III and IV-V ( $p = 0.13$ ).	
Christman, McAllister, Claar, Kaufman, & Page (2015)	To survey occupational therapists to determine their opinions on 2 protocols for pediatric CIMT	Level IV D3	$N = 272$ pediatric occupational therapists <b>Inclusion Criteria:</b> licensed occupational therapists working with pediatric clients at least 50% of the time. Needed to work in school systems, early intervention, health system or hospital-based outpatient clinic, subacute or rehab facility, acute care hospital, or private practice. Did not need to have experience with using CIMT to participate.	<b>Intervention:</b> Protocol A = child wearing cast on functional arm 24 hrs/day for 3 wks., with OT services 7 days/wk for 6 hr/day. Protocol B = child wearing cast on functioning arm 2 hrs/day for 8 wks, with OT services 1 day/wk for 2 hrs. <b>Outcome Measure:</b> Survey asking about concern for length of treatment and wearing schedule, billing, child safety, child's frustration level, and adherence to protocol.	The majority of therapists reported moderate to high concerns about every facet for Protocol A. Therapists reported low or no concerns with 5 out of the 7 facets of Protocol B. Therapists reported moderate to high concerns for child's ability to participate in 2 hr/day of therapy, and full adherence to Protocol B. The majority preferred the less intense therapy.	The participants of this study did not need to have any experience with CIMT. The results may have been skewed because some of the participants did not understand the intricacies of CIMT. Another limitation is that this is the first study to examine opinions about pediatric CIMT. More research needs to be done on the topic to come to more definitive conclusions.

**OTHER DIAGNOSES**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/ exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Ulrich, Lloyd, Tiernan, Looper, & Angulo-Barroso (2008)	To determine whether an individualized, higher intensity treadmill training program resulted in earlier motor development gains in stepping than a lower intensity program for children with DS.	Level I E2 Randomized controlled trial	<i>N</i> = 26 infants with DS recruited from parent support groups. Infants started the treadmill intervention when they were able to take 6 supported steps (10 mo for most). High-intensity (HI) <i>n</i> = 16; Low-intensity (LI) <i>n</i> = 14. Attrition of 1 in LI group and 3 in HI group. <b>Exclusion:</b> seizure disorder, uncorrectable vision problems, and any condition that would greatly limit participation in tx.	<b>Intervention:</b> Home treadmill training intervention implemented by parent. <u>LI:</u> 8 min/day for 5 days/wk at a belt speed of 0.15 m/s. <u>HI:</u> ankle weights, increased belt speed, and daily duration as tolerated. Training ended when infants could take 3 steps independently. <b>Outcome Measure:</b> 8 items from the BSID motor subscale, to measure gains in motor milestones. 1-min videotapes of the infant	Both groups had increases in alternating steps/min over time, but HI group progressed faster in 4th and 5th videotaped recordings (no significance provided). HI group achieved the BSID items “moves forward using pre-walking methods” and “raises self to standing position”, earlier than the LI group ( <i>p</i> = 0.01, <i>p</i> = 0.05). High effect sizes for earlier achievement of 6/8 BSID items in HI group versus LI group (effect size range for 6/8 items: 0.55 - 1.07). When 8 BSID items were combined into a construct, there was a significant difference in earlier time to achieve	Minimal significant findings between groups could be attributed to complexity of grading required in the HI group (e.g. parents needed to adjust belt speed, duration of tx, and amount of weight). Small sample size also reduced the likelihood of significant findings.



				stepping on treadmill (5 in total) were coded for frequency of alternating steps. Then average number of alternating steps/min and average number of alternating steps/min over 2 months were calculated.	milestones in HI versus LI group ( $p = 0.04$ ).	
Namasivayam, Pukonen, Goshulak, Hard, Rudzicz, Rietveld, Maassen, Kroll, & Van Lieshout (2015)	To investigate differences in outcome measures of children with CAS based on low or high intensity of speech therapy based on Motor Speech Treatment Protocol	Level III, O4 one group, pretest/posttest design	$N = 33$ , convenience sample from 85 preschool aged children with moderate to profound motor speech difficulties. <b>Inclusion:</b> social, play, and attention skills to participate in direct speech intervention, mild or greater delays in expressive language, moderate to profound speech-sound disorder (SSD), and motor speech involvement	<b>Intervention:</b> Lower intensity: 45 mins, 1x/wk for 10 wks ( $n = 12$ ) Higher intensity: 45 mins, 2x/wk for 10 wks (two subgroups: RND 1: $n = 10$ , RND 2: $n = 11$ ) <b>Outcome measures:</b> Sounds-In-Words subtest of the GFTA-2 to measure changes in the speech sound system, CSIM and BIT to	Paired $t$ -tests indicated that both higher intensity groups had statistically significant improvement on the GFTA-2 (RND 1: $p < 0.001$ , RND 2: $p = 0.002$ ) and FOCUS (RND 1: $p = 0.009$ , RND 2: $p = 0.004$ ) while the lower intensity group showed no significant improvement. None of the groups showed improvement on the CSIM or BIT. This indicates that for changes in the speech-	This study was, in part, conducted based on current insurance policies restricting the amount of tx time for children with CAS; because this study took place in Ontario, Canada, it may have different implications for tx in the US where we have a different healthcare system. This study controlled for intervention duration, so future studies could focus on whether lower intensity for longer (1x/wk for 20 weeks) has the same result as higher intensity for a shorter time (2x/wk for 10 weeks).

			<b>Exclusion:</b> global motor involvement, ASD, oral structural deficits, feeding impairments or significant drooling.	measure speech intelligibility, and FOCUS to measure functional communication.	sound system and functional communication, higher intensity of therapy provides better outcomes.	
Schreiber (2004)	To determine if higher intensity PT could improve gross motor function and goal attainment for a 31 mo child w/ a genetic condition on chromosome 18 (18p-).	Level V D4 Case Study design	<i>N</i> = One 31 mo female w/ a dx of 18p- and impaired gross motor fxn. Enrolled in EI. PT since she was 4 mo then from 10 to 28 mo she had PT sessions for 1hr/2x/month, with no gains.	<b>Intervention:</b> Increase in therapy intensity to 1hr/4x/wk for 4 weeks. Completed 14 sessions. 3 sessions per week in PT gym and 1 session in home. <b>Outcome measures:</b> PDMS-GMS, GMFM, and GAS to measure gross motor gains.	PMDS-GMS total score increased 6 points. Score increase in GMFM (score increases ranged from 1.4 to 27.4) GAS scores increased, with 3 objectives changing from stable baselines on two previous measurements to higher scores. Parents reported improvements in standing, balance, and independence.	Only short term follow-up on improvements (1 wk post). Reduced generalizability due to single subject case study and restrictions of EI services.

**META-ANALYSIS**

<b>Author, Year</b>	<b>Study Objectives</b>	<b>Study Design/ Level of Evidence</b>	<b>Number of Papers Included, Inclusion and Exclusion Criteria</b>	<b>Interventions &amp; Outcome Measures</b>	<b>Summary of Results</b>	<b>Study Limitations</b>
<p>Tinderholt-Myrhaug, Østensjø, Larun, Odgaard-Jensen, &amp; Jahnsen (2014)</p>	<p>To describe and categorize different motor function and functional skills interventions for children with CP, to summarize the effects of the different interventions and determine why there were different effects</p>	<p>Level I, O1 and E1, Systematic review and meta-analysis  <i>n</i> = 29 randomized controlled trials, level I, E2 <i>n</i> = 9 controlled, pretest/post test design, level III, O4</p>	<p><i>N</i> = 38 papers reviewed  <i>n</i> = 11 databases searched  <b>Inclusion:</b> children with CP &lt; 7 y.o.; studies investigating motor function and functional skills training more than 3x/wk; studies comparing conventional therapy, same type of intervention completed less frequently, or a different intensive intervention; outcomes measured as hand</p>	<p><b>Interventions:</b> comparisons of conventional therapy, same intervention provided less frequently, various intensive interventions  <b>Outcome measures:</b> measures for hand function, gross motor function, and/or functional skills (31 measures total were used)</p>	<p><b>Effects on hand function:</b> 23 studies targeted hand function; when compared to conventional therapy, intensive CIMT programs completed more than 1 hour per day were the most effective in increasing unilateral hand function. No significant impact on bimanual hand function. Most of the CIMT programs had 3-7 therapist led sessions per week with a home program to be completed daily.  <b>Effects on gross motor function:</b> 16 studies targeted gross motor function; the results from the studies included were too heterogeneous to be pooled. Only two studies supported intensive task oriented therapy as a means of increasing gross motor function. Eight studies had fewer than 25 participants and all studies with significant results supporting intensive therapy had a high risk of bias.  <b>Effects on functional skills:</b> 20 studies targeted functional skills; many of these</p>	<p>Many of the intensive programs required extensive home programs that interfered with the family's routines; thus, depending on the family, an intensive program may not be feasible. Many of the studies included had small sample sizes and lacked any power calculations (so they may not have had the</p>

			<p>function, gross motor function, and/or functional skills</p> <p><b>Exclusion:</b> studies combining motor function/ functional skills training with passive interventions or if outcomes were body functions and structures</p>		<p>also looked at hand and gross motor function. Two meta-analyses of seven studies indicated that CIMT was effective in increasing functional skills. In two studies, intensive training showed an effect on functional skills. When intensive CE was compared with intensive NDT, the CE produced more functional skills. When an intensive NDT and casting program was compared with regular OT, the NDT/casting group showed more gains in functional skills.</p> <p><b>Overall:</b> This meta-analysis shows increasing evidence for the use of CIMT in children with CP. Studies that included a home program produced greater results for functional skills and greater ability to generalize skills to other settings. For motor function and functional skills, there was no conclusive difference between intensive and conventional therapy.</p>	<p>power to detect differences between groups). Half the studies included had a high risk of bias, so the effects are unclear.</p>
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Abbreviations

Abbreviation	Full name
AHA	Assisting Hand Assessment
ASD	Autism Spectrum Disorders
BIT	Beginner’s Intelligibility Test
BSID	Bayley Scales of Infant Development
COPM	Canadian Occupational Performance Measure
CIMT	Constraint Induced Movement Therapy
CP	Cerebral Palsy
CSIM	Children’s Speech Intelligibility Measure
CAS	Childhood Apraxia of Speech
DS	Down Syndrome
EI	Early Intervention
FOCUS	Functional Outcomes for Children Under Six
GAS	Goal Attainment Scaling
GFTA-2	Goldman-Fristoe Test of Articulation
GMFM & GMFM-66 & GMFM-88	Gross Motor Function Measure & Gross Motor Function Measure-66 & Gross Motor Function Measure-88
GMFCS & GMFCS-66	Gross Motor Function Classification System & Gross Motor Function Classification System – 66

MAS	Modified Ashworth Scale
MPOC	Measure of Processes of Care
MPOC-SP	MPOC for service providers
MUUL	Melbourne Assessment of Unilateral Upper Limb Function
NDT	Neurodevelopmental Treatment
ODD	Oppositional Defiance Disorder
OT	Occupational Therapy
PDMS-GMS	Peabody Developmental Motor Scales - Gross Motor Scales
PDD	Pervasive Developmental Disorder
PT	Physical Therapy
QUEST	Quality of Upper Extremity Skills Test
ROM	Range of Motion
SI	Sensory Integration
SSS-FES	Service System Subscale of the Family Empowerment Scale
TFG & TFDG	Treatment Frequency Guidelines & Treatment Frequency and Duration Guidelines
UE	Upper extremity

## Summary of Key Findings:

### Summary of Experimental Studies

The experimental research regarding appropriate treatment dosage for cerebral palsy (CP) is mixed. One study found no difference between conditions, five studies found intensive therapy versus standard therapy resulted in more gains, and two articles found that continuous versus alternating/high intensity treatment resulted in greater gains. More detailed descriptions of studies and limitations in study design are discussed below.

Christiansen and Lange (2008) used a randomized controlled trial design and found no difference between intermittent versus continuous physiotherapy in gross motor gains. In contrast, five studies found that more intensive therapy resulted in more gains than standard or less intensive care. Tsorlakidis et al. (2004) found that children with CP who received more intensive therapy with rest periods had greater gains in gross motor function than children who received less intensive, continuous therapy. However, the study only included children with spastic CP, so the results cannot be generalized to other forms of CP. Similarly, Ustad et al. (2009) found in a study with five participants that most children had positive change scores in gross motor function in the block physiotherapy condition. However, gains were variable, and the treatment methods during the standard therapy conditions were inconsistent among participants. Trahan and Malouin (2002) conducted a multiple baseline study that provided more support for intensive therapy treatment, but there was no control group and it was noted that the intensive therapy was more difficult to schedule and was very demanding for the children and their families.

In addition, Deluca et al. (2005) found that CIMT was more effective than standard care in increasing functional skills in children with CP with asymmetric upper extremity involvement. In this study, CIMT was done one-on-one for 6 hours a day for 21 consecutive days. A limitation of this study was that intensity of the CIMT may not be feasible or realistic for certain practice settings and the schedule of intensive CIMT is also very demanding for parents. Ulrich et al. (2008) found that children with Down Syndrome in a more intensive treadmill training group had more gains in motor developmental milestones earlier than the lower intensity group. However, there was no statistically significant difference between the groups on specific developmental outcomes.

In contrast, two other studies suggested that standard, continuous treatment may result in better outcomes. Sakzewski et al. (2015) compared two groups of children with CP to determine if a short-length, high frequency group model of therapy (hybrid CIMT) would improve unimanual abilities and bimanual performance more than individualized standard care in children with CP. The results supported the use of a standard care program for children with unilateral CP over a CIMT, intensive therapy program. However, unequal therapy time resulted in asymmetry of treatment between the groups; the two-week intensive treatment group in this study had lower patient participation rates during that time than did the group receiving standard, non-intensive treatment. Similarly, Caris (2007), using a multiple baseline design, found that a continuous SI therapy group had higher average goal attainment scores than the alternating SI treatment group. However, the continuous group average scores were only 0.17 points higher than the alternating group score. The researcher explained that in terms of efficiency of treatment time versus gains, alternating treatment was actually the more efficient treatment compared to the continuous treatment. The study had a small sample size, which limited the ability to run statistical analysis on all findings.

Overall, there is mixed experimental evidence regarding effects of intensive therapy versus standard treatment.

### Summary of Outcome Studies

The outcome studies included in the CAT table focused on three main issues: outcomes for children receiving standard versus intensive treatment, perceptions and outcomes after a service reorganization, and therapy allocation and schedule based on gross motor functional level. More detailed descriptions of studies and limitations in study design are discussed below.

One outcome study found that higher intensity therapy resulted in better outcomes than lower intensity therapy. For children diagnosed with childhood apraxia of speech, Namasivayam et al. (2015) found that higher intensity therapy resulted in better outcomes than lower intensity therapy. This article highlights the importance of providing the correct frequency of treatment for this population.

However, another outcome study suggested that continuous treatment rather than intensive, blocked therapy resulted in the better outcomes. For children with CP or syndromes with similar symptoms, Brunner et al. (2014) found that gross motor function improved after periods of regular, continuous therapy, but not after intensive therapy blocks with rest breaks. The intensive blocks of therapy were not as effective as the regular therapy. However, a limitation of this study was that there was a high attrition rate due to the length of the study (two years). Research suggests that the study needed to last longer in order to show more significant developmental and motor improvements, which may be a reason the blocks of therapy with rests did not yield any significant improvements. This finding is in contrast to the Law et al. (1997) study, which found no significant difference between the improvement of the intensive group and the improvement of the less intensive group for children with CP. The results suggest that increasing therapy intensity does not significantly affect the therapy outcomes for children with CP. Neither study included a control group.

From an administrative point of view, longer waiting times are associated with poorer patient outcomes but service reorganizations were not associated with negative impacts. Camden et al. (2013) investigated a service reorganization that attempted to decrease wait list times. Only the overall program and occupational therapy program had statistically significant decreases in wait time. This article did not adequately describe the service reorganization, thus, it is not replicable. Additionally, this clinic reported that the perceptions of the service providers and families indicated that the quality of care did not decrease during the service reorganization. In addition, Camden et al. (2010) surveyed the families who experienced a service reorganization to get information about their perception of service during and after the changes. The study found no significant difference in service quality over three years, indicating that the service reorganization did not have a negative impact on patients and their families. In regards to patients on waitlists, Feldman et al. (2008) found that there appears to be a negative correlation between time on the waitlist and quality of life, but differences in wait time had no impact on the child's function.

In regards to therapy allocation, Palisano et al. (2012) found that mean minutes of PT for children with CP per visit was greater for GMFCS levels II-III and IV-V compared to level I. Further, mean minutes of OT was greater for levels IV-V compared to level I.

Overall, the evidence from outcome studies is mixed on the efficacy of standard versus intensive treatment. One study found higher intensity therapy resulted in better outcomes, whereas, another found continuous but not intensive therapy to be the most beneficial, and yet another found no difference between the treatments. In terms of service reorganization, longer waiting times were associated with poorer patient outcomes but a service reorganization did not result in a perception of lower quality service. Last, a study on therapy allocation found that service allocation received is related to the functional levels of the client being treated.



### Summary of Qualitative Studies

In Camden et al. (2010), families reported they appreciated the service reorganization (group treatments) and service providers reported that the early contact with families allowed them to provide information quickly.

Patient education is an important aspect of treating children with disabilities. Providing information to parents can help alleviate stress associated with long waitlist times and can help parents and caregivers feel more confident in caring for their children. Hoyt-Hallet et al. (2009), found that both parents and occupational therapists desired more parent education after referral for services, including resources, information on occupational therapy's scope of practice, and activities they can do with their children while on the waitlist. Stewart et al. (2010) provided parents of children with disabilities with an informational packet regarding services available to their children, a general description of their disabilities, and a place to record information about their child's progress or concerns to ask their physician. They found that the parents appreciated having specific information regarding caring for a child with disabilities, what resources are available and how to best advocate for their child. Mitchell and Sloper (2002) conducted interviews with caregivers of children with disabilities regarding the best methods of providing information. The caregivers found that in-depth information was most helpful, but that it was even better if they received the information from a knowledgeable, approachable professional in addition to receiving pamphlets and other reading materials with in-depth information.

### Summary of Descriptive Studies

Based on Schreiber (2004), a case study of a child with 18P- (a genetic condition on chromosome 18), increased physical therapy intensity led to increased gross motor performance. The parents of this child also reported increased independence in daily tasks. However, there was only a short-term follow-up on improvements, so it is not apparent whether the gains would be maintained.

From a service organization perspective, Feldman et al. (2008) found patients with increased waitlist times had lower quality of life scores, no change in mobility scores and increased cognition scores. The cognition scores may have been contaminated by a variety of factors (e.g., schooling or other private treatment). Thus, patient quality of life was impacted but there was no change in function after being on a waitlist.

Hanson et al. (2015) examined feasibility and application of implementing a treatment frequency and duration guidelines program in a hospital-based outpatient clinic; after the initial education, compliance with the new guidelines was very low. After a re-education, compliance was greatly increased and 90% of the charts reviewed adhered to the new guidelines put in place. This finding suggests that resistance to change is problematic (and likely common in many facilities), so it may take several phases of education about the new system to ensure compliance with the new program.

Christman et al. (2015) interviewed pediatric therapists regarding two types of CIMT protocol, and found that there were fewer concerns regarding compliance, client safety, billing, and frustration level with length of time of wearing schedule with the lower intensity group.

Regarding parent education, Stewart et al. (2010) conducted a survey evaluating the efficacy of a specific informational program used in Australia. They found that 72% of the parents who received the information read and actively used it, while 28% of the parents only read the information. Hoyt-Hallet et al. (2009) found in an analysis of documents from their pediatric clinic that there were 75 children on the waitlist with 7-12 referred each month but only 1 new child starting services each month. This reflected the need for a service reorganization in the clinic, to adapt to the demand for therapy.

### Summary of Meta-Analysis

Tinderholt-Myrhaug et al. (2014) conducted a meta-analysis that provided increasing evidence to support the use of CIMT in children with CP. Studies that included a home program produced greater results for functional skills and greater ability to generalize skills to other settings. For motor function and functional skills, there was no conclusive difference between intensive and conventional therapy. For hand function, when compared to conventional therapy, intensive CIMT programs completed more than one hour per day were the most effective in increasing unilateral hand function, but there was no significant impact on bimanual hand function. Most of the CIMT programs had 3-7 therapist led sessions per week with a home program to be completed daily. In interventions focused on gross motor function, the evidence was too mixed to be pooled; some studies with high risk of bias supported the use of intensive treatment over standard care and only two of sixteen studies supported an intensive, task oriented approach over conventional therapy. For functional skills, about half of the studies reviewed indicated that intensive therapy was more effective. Overall, half the studies reviewed for the meta-analysis had high risk of bias. Additionally, extensive home programs present in many of the studies interfered with the family's routines; this limitation indicates that the needs of the family should be considered carefully when developing treatment plans and home exercise programs. Again, this meta-analysis found mixed results regarding the effectiveness of two different service delivery models (standard versus intensive treatment).

### Implications for Consumers:

The consumers of the information gained from this CAT review are the children and families of children attending Valley Medical Center - Children's Therapy (VMC-CT). The population we researched varied based on the broad nature of our project, the populations of interest in this CAT included children with CP and their families, children with other diagnoses and their families, OTs, SLPs, PTs, and hospital departments. Important to families attending VMC-CT, the evidence to support one type of service delivery over another is inconclusive; it is unclear whether it is beneficial to have more intense therapy for a shorter duration. Thus, if VMC-CT changes to an intermittent therapy schedule, the progress from therapy should not be impacted for children with CP, specifically. Furthermore, our research indicated that families reported similar quality of therapy during and after a service reorganization. Thus, families of children with CP attending VMC-CT should not be worried that their quality of care would be lessened if a service reorganization were to occur. In all of the studies with intensive treatment, the children seemed to be able to tolerate the treatment well. However, the increased parental time commitment must be considered when deciding to use an intensive therapy service delivery model, as some parents may be unable to accommodate this type of schedule. Consumers should work with VMC-CT to determine what therapy schedule would be most conducive to their needs as a family.

Research on parent education reflected that parents feel they do not have adequate information on OT's scope of practice, activities to complete with their children, and the benefits of therapeutic services. This illustrates the need for consumers to be advocates for themselves and their children, asking for clarification from practitioners when needed. Ideally, therapeutic practice should be collaborative, with practitioners and families exchanging information and resources.

**Implications for Practitioners:**

The literature indicated that any new procedures that are introduced may receive some resistance from current practitioners. Thus, changing programs must be well-supported by administrators and well-explained to the staff. The literature also indicated that there was no decrease in quality of treatment after a service reorganization, from the perspectives of the therapists.

For SLPs working with children with childhood apraxia of speech, greater intensity (two times per week) was associated with greater gains in speech-sound changes and functional speech. Further, for PTs working with infants with Down Syndrome, greater intensive treadmill training was associated with more gains in motor developmental milestones earlier than a lower intensity group. These findings have important implications regarding insurance reimbursement and patient education to encourage families to prioritize therapy appointments.

The literature was mixed regarding treatment plans for children with CP; however, therapists can still utilize this information based on the needs of their clients. One study found no difference in conditions, five studies found more intensive therapy versus standard therapy resulted in more gains, and one article found that continuous versus intermittent treatment resulted in greater gains. VMC-CT can use these findings to decrease wait list times by seeing children intensively for shorter periods followed by rest periods. Some of the evidence indicates that treatment schedules can be customized to the results of assessment and ongoing outcome measures; this is consistent with the occupational therapy principle of client-centered care and creating an individualized therapy plan based on the needs of each child and their family. This information will also help therapists educate parents about therapy frequency and intensity. In addition, the mixed research on episodic care highlights the need for future study of this topic. The body of evidence could be strengthened if OT practitioners keep outcome data before and after service delivery reorganizations in order to confirm any benefits or limitations of episodic care.

If VMC-CT implements changes in their service delivery model, it will be imperative that practitioners measure the outcomes of their patients before, during, and after the change in order to determine if there is a positive (or negative) impact on patient outcomes. Due to the inconclusive nature of the evidence presented in this CAT paper and the limited number of diagnoses explored, the practitioners at VMC-CT could be asked to contribute their clinical expertise in helping to determine best practice for service allocation.

Research on parent education during the process of care has reflected the need for education and a continuum of communication between parents and healthcare providers throughout the rehabilitation process. Parents and practitioners both feel a need for parent education on the scope of practice of OT, available resources, and activities they can do with their children while on the waitlist. Pediatric clinics should consider providing families on the waitlist with educational packets, which include specific information on caring for children with disabilities, advocacy, and resources in the area. In addition, professionals should provide clients with a continuum of care, being available to provide information and answer questions from referral to discharge.

**Implications for Researchers:**

Future research should focus on comparing episodic care with standard, continuous care for a variety of diagnoses. Our search results on this topic have been limited, but we have received the most information about CP. Because of this, the results may not be generalizable to other populations.

Additionally, much of the research on this topic has taken place in other countries that have different health care systems. It is important that future research focuses on treatment in the US so that centers there can adopt service delivery models that can be justified to insurance companies.

**Bottom Line for Occupational Therapy Practice/ Recommendations for Best Practice:**

This research can help an occupational therapy practitioner formulate his/her service delivery model. The research provides mixed results, however, the majority of the studies showed no significant worsening in the child's function or well-being when provided with episodic, intensive care versus continuous, less intensive care. Frequency and duration of care should be based on the child's needs, but the most efficient service delivery model for the clinic is also of critical importance.

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## **Involvement Plan**

### **Introduction**

Our clinical collaborator, Kari Tanta, Ph.D., OTR/L, FAOTA, Rehabilitation Manager at UW Medicine Valley Medical Center Children's Therapy (VMC-CT), was satisfied overall with our CAT project. She felt that our research validated the therapy schedule that is currently being implemented. Currently, service allocation is determined by the therapist. However, due to cancellations, insurance constraints, and a large wait list, many patients at VMC-CT are approximating an episodic rather than a continuous care schedule. The inconclusive findings reassured Dr. Tanta that receiving occupational therapy is beneficial regardless of schedule, and episodic care does not demonstrably result in adverse effects. Thus, she does not intend to change the clinic's current service delivery model based on these findings.

The future intent of this project is to disseminate the information from our CAT paper to the wider community of clinicians. Given that no further translation of the knowledge from our CAT paper was needed, as the findings from the CAT table validated current practice, Dr. Tanta would like to proceed with a published article for the general therapist community. She reported that other administrators and clinicians in the larger pediatric therapist community who have limited time would benefit from a concise article outlining the inconclusive findings between different treatment dosages. Thus, we plan to collaborate with Dr. Tanta to prepare an article to be submitted to the Journal of Occupational Therapy, Schools, and Early Intervention. She expressed interest in creating a case study report about her clinic, infused with information from our CAT project. Thus, we will be working with Dr. Tanta at VMC-CT and Yvonne Swinth,



Ph.D., OTR/L, FAOTA, the editor of the journal, to revise and consolidate our original CAT project to make it more accessible to clinicians. Dr. Tanta also expressed that she would like a copy of the poster, as she may be interested in completing a future in-service presentation.

### **Contextual Factors**

Based on the needs of VMC-CT, the Availability, Responsiveness, and Continuity (ARC) model of knowledge translation was deemed the most appropriate (Glisson & Schoenwald, 2005). This model emphasizes that change does not occur in a vacuum, but that any implementation within an organization will be dependent on the fit between the change and the social context within the organization and greater community (Glisson & Schoenwald, 2005). The ARC model attempts to bridge the gap between that social context and the “service technology,” which in this scenario would be implementing evidence-based practice related to therapy dosage. This model accounts for not only the social context of the service organization (e.g., clinician willingness to change, clinic climate, culture, structure, and technology), service provider (needs, attitudes, behaviors), service (quality, effectiveness), but also the context of the larger community, such as the clients in this scenario (Glisson & Schoenwald, 2005). In light of the research findings validating the clinic’s current practice, a change is not indicated at VMC-CT. However, it is important to address barriers that the social contexts may impose if the clinic enacts a service reorganization in the future to address wait lists.

Regarding the social context of the service organization, Dr. Tanta has expressed that the clinic has previously undergone service reorganization, including group therapy for a period that was later discontinued due to insurance constraints. Previous changes in service reorganization demonstrated that VMC-CT clinicians have accepted change in the clinic previously; the clinic structure and culture appears to be used to change. Regarding service provider factors, Dr. Tanta

has a long career as an employee and manager at VMC-CT. Thus, she is familiar with the outpatient facility's regulations, policies, and employees. In addition, her employees are an invaluable strength of the organization, as they are invested in providing positive outcomes for their clients. However, with current productivity rates, time constraints are a barrier to self-directed research regarding protocols for therapy allocation. In addition, regarding service delivery factors, therapy is currently allocated at the discretion of the therapist. Based on our research, therapy of any dosage (e.g., continuous, episodic, intensive, or standard) results in better outcomes than no therapy. However, in line with the ARC model, therapy allocation should be considered in relation to the social context of the family.

In regards to publication, the social context must be considered. The Journal of Occupational Therapy, Schools, and Early Intervention is read not only by occupational therapy practitioners, but also by the general public, including families. It is imperative that we consider the journal's reader population to ensure that we are translating knowledge in a way that is accessible to a wide variety of readers. As families may be future consumers of this information, the article should be written in order to promote consumer understanding. If these individuals feel comfortable with the state of the published evidence, then they may better support the therapist's plan of care. The results of our CAT facilitate consumer buy-in, however, because the evidence indicates that the children will benefit from either continuous or episodic treatment, reassuring them that the clinic is providing no less effective treatment.

**Tasks/Products and Target Dates**

<b>Task/Product</b>	<b>Deadline Date</b>	<b>Steps</b>
Select published CAT format	March 25, 2016	Meet with Yvonne Swinth to discuss how the CAT table should be formatted for her journal, based on previous published submissions. Kari will be included during the meeting via Skype or phone call.
Revised and consolidated CAT project to Kari	April 10, 2016	<ol style="list-style-type: none"> <li>1. Select most salient articles to include in final CAT (March 30)</li> <li>2. Edit “bottom line” conclusion for practitioners to provide stronger implications for practice (April 10)</li> <li>3. Edit summary statements to include articles used for CAT (April 10)</li> </ol>
Create concise poster	April 26, 2016	<ol style="list-style-type: none"> <li>1. Create poster based on information most relevant to administrators and clinicians, based on implications from original CAT paper (April 15)</li> <li>2. Revise poster based on feedback from Kari (April 20)</li> </ol>
Publish journal article based on CAT	April 2018	<ol style="list-style-type: none"> <li>1. Submit CAT to the <u>Journal of Occupational Therapy, Schools, and Early Intervention</u> (May 2016).</li> <li>2. Publish article with revisions based on editor feedback (April 2018).</li> </ol> <p>*Completion date may be variable due to the timeline of receiving feedback, the amount of revisions required, and the number of re-submissions.</p>

**Monitoring Outcomes**

Throughout the knowledge translation process, we will keep open communication with our collaborator. In collaboration with Yvonne, we will select the format of our journal manuscript. Dr. Tanta will be able to directly monitor progress, as she will be virtually present during the meeting. We will submit our first draft on April 10th, and follow-up with Dr. Tanta as to whether the draft meets the information needs of her journal and the therapists at her clinic.

We will then implement pertinent feedback, to create a succinct poster of the information. We will follow-up with Dr. Tanta, sending her our poster and providing a short answer survey to determine if the knowledge product meets the needs of her clinic staff. After publication of our consolidated CAT article, the impact of our article on the occupational therapy community will be assessed through how many times the article is accessed and utilized. Specifically, outcomes will be measured by the number of times the article is cited in 5 years after publication and by the number of times the article is downloaded on Sound Ideas, the University of Puget Sound's online database of student and faculty works.

#### Reference

Glisson, C., & Schoenwald, S. (2005). The ARC organizational and community intervention strategy for implementing evidence-based children's mental health treatments. *Mental Health Services Research, 7*, 243-259.

#### **Process for Knowledge Translation Products**

Dr. Tanta felt that the CAT paper adequately met the information needs of VMC-CT. As many of the VMC-CT clinicians were grappling with scheduling issues, she sent her staff members a copy of the CAT paper. Due to the length and extent of the paper, the majority of the clinicians did not have time to read it. To ensure the information is more accessible to the VMC-CT staff, we will be providing an electronic version of our final project poster to print out and give to her staff members. It will describe the results of our CAT paper in a concise and reader-friendly format. Due to scheduling difficulties, we were unable to find a time to hold an inservice at the facility. If Dr. Tanta holds an inservice in the future, we suggested that she utilize a survey regarding the effectiveness of the handout for her staff members. It would be beneficial to

understand what their concerns were prior to the inservice, if the handout improved their confidence with treatment allocation, and additional questions that came up as a result of the information.

Beyond creating a handout for staff at VMC-CT, Dr. Tanta felt that this information would be valuable to other clinicians and encouraged us to work with her to publish the CAT paper in the Journal of Occupational Therapy, Schools, and Early Intervention. As there was no need for further knowledge translation, our product is a revised version of our original CAT paper. We met with the editor of the journal, Yvonne Swinth, PhD, OTR/L, FAOTA, to discuss the information needs of the journal and review previously published CAT papers. She agreed that the information from our CAT paper would be beneficial to the wider community of occupational therapists. This process will be ongoing beyond the end of the semester.

The original CAT paper has been reviewed several times by Dr. Tanta and the project chair/faculty mentor, George Tomlin, PhD, OTR/L, FAOTA. It was again revised based on feedback from Dr. Tanta and Dr. Swinth and submitted for Dr. Tanta to review on April 10, 2016. One article from the original CAT paper was removed, along with the detailed outline of our search strategy. The most recent version of the paper was completed on April 29, 2016. Revisions will be ongoing until the paper is publication quality. Further, Dr. Tanta will be writing a case study about her clinic to be published with our CAT paper. Since the knowledge translation needs were met for VMC-CT, this nontraditional translation of the knowledge will help to disseminate the information from our CAT paper to the greater occupational therapy community.

**Knowledge Translation Products**

Based on the unique knowledge translation needs of the clinic, we developed two knowledge products. Our final revised CAT to be published is outlined below. Additionally, we will be sending Dr. Tanta the electronic version of our final project poster to print out and give to her clinicians.

This version of the CAT paper was approved by Kari Tanta, PhD, OTR/L, FAOTA, on April 29, 2016.

**Abstract**

UW Medicine Valley Medical Center Children's Therapy (VMC-CT) has experienced difficulties with consistent service delivery schedules for their clients. Long waitlists, no-show visits, and other factors are impeding client ability to receive standard, continuous therapy. Because of this, many of the children seen at this outpatient pediatric clinic are receiving care on a more episodic basis. Thus, this critically appraised topic paper addresses a research question developed in conjunction with Kari Tanta, PhD, OTR/L, FAOTA, the Rehabilitation Manager at VMC-CT, to understand the most effective methods of service delivery. Based on scheduling issues at VMC-CT, the following research question was developed: Is episodic pediatric care as effective as continuous care for children (birth to 21 years old) with orthopedic conditions or developmental delays? After reviewing twenty articles and one master's thesis, it appears that the evidence is inconclusive regarding which service delivery model is most effective. Therapists can feel confident that scheduling treatment around reasonable real-world constraints will still provide no less effective care for their clients.

**Focused Question:**

Is episodic pediatric care as effective as continuous care for children (birth to 21 years old) with orthopedic conditions or developmental delays?

**Clinical Scenario:**

UW Medicine Valley Medical Center Children's Therapy (VMC-CT), an outpatient pediatric clinic, is experiencing difficulties with consistent service delivery schedules for their clients. Currently service delivery schedules are determined at the discretion of the treating therapist, based on client factors, therapist expertise, and appointment availability. However, this pre-determined treatment schedule can be altered due to scheduling conflicts with families or no-show appointments, which leads to some children receiving treatment that resembles an episodic therapy schedule. Other factors at the clinic, such as a long wait list to receive services, also create an episodic treatment schedule for children. Kari Tanta, PhD, OTR/L, FAOTA, the Rehabilitation Manager at VMC-CT, questions whether treatment delivered on an episodic schedule, due to these various factors, is as effective as continuous treatment per week. She questions whether an episodic therapy schedule (shorter total duration, increased weekly frequency) is as effective as a continuous service delivery schedule (longer total duration, decreased weekly frequency) for children at her clinic, specifically for children with orthopedic conditions or developmental delays.

**Review Process and Procedures for the selection and appraisal of articles*****Inclusion criteria included articles focused on:***

- Peer-reviewed journal articles
- Samples of children with developmental delays
- Samples of children with orthopedic conditions
- Therapy delivery from a speech language pathologist (SLP), physical therapy (PT), occupational therapist (OT), or rehab aide in a clinic setting

***Exclusion criteria included articles focused on:***

- Autism Spectrum Disorder
- Adult or Geriatric rehabilitation
- Failure to compare an "intensive" or blocked condition to standard treatment
- Service delivery solely outside of a clinic setting

***Search Strategy:***

Search Strategy is displayed in Table 1.



**Table 1.**  
Search Strategy

Categories	Key Search Terms
Patient/Client Population	Pediatric, children, kids AND Orthopedic, orthopaedic OR developmental delay/impairment, cognitive delay/impairment, social delay/impairment, language delay/impairment, emotional delay/impairment motor coordination
Intervention (Evaluation)	Episodic, frequency, intensity, dosage, duration, concentration, interval, sporadic, schedule, discontinuous, intensive therapy Service delivery model Occupational therapy, speech language pathology, physical therapy
Comparison	N/A
Outcomes	Treatment outcome, waiting list

***Databases and Sites Searched:***

Databases and sites searched for research purposes were PubMed, Google Scholar, PsycInfo, Taylor & Francis Group, *Pediatrics* (Journal), CINAHL

***Quality Control/Peer Review Process:***

A variety of databases were searched, outlined above, to find articles to answer the research question. Citation tracking and reference tracking were also used on the articles found to increase the body of resources. The total number of articles found was 1,547, but 1,527 of them were excluded because they did not fit with the clinical question. Twenty articles and one master's thesis were reviewed for this critically appraised topic; seven articles were used from database searches, eight articles were used from citation tracking, and five articles were used from reference tracking. The articles were found from the search strategy outlined above and the master's thesis was a recommendation from the committee chair, George Tomlin, PhD, OTR/L, FAOTA. While the search terms resulted in a multitude of articles, the majority of the articles were not consistent with the clinical question, failing to meet inclusion criteria or meeting the exclusion criteria. Many of the articles that came up in the search focused on specific medical interventions (e.g. drug trials), clinician behaviors or preferences instead of clinical outcomes, or focused solely on group interventions. Additionally, many articles only met one search term (e.g. article about hearing aids tied to search term of rehab aid\*) and were irrelevant to the research question. Several drafts of this CAT paper have been reviewed by the committee chair, George Tomlin, at the University of Puget Sound and Kari Tanta, the collaborating occupational therapist.

Included articles are categorized based on AOTA research level, as well as by Research Pyramid level (Tomlin & Borgetto, 2011). Unlike the AOTA research levels, the Research Pyramid allows for the categorization of qualitative research and assignment of research level based on rigor.

**Results of Search**

Relevant articles were included in this critically appraised topic paper. Table 2 identifies the study design of selected article and Table 3 includes a summary of selected articles.

**Table 2.**  
Summary of Study Designs of Articles Selected for the CAT Table

<b>Pyramid Side</b>	<b>Study Design/Methodology of Selected Articles</b>	<b>Number of Articles Selected</b>
Experimental	<u>½</u> Meta-Analyses of Experimental Trials <u>5</u> Individual Blinded Randomized Controlled Trials <u>   </u> Controlled Clinical Trials <u>3</u> Single Subject Studies	8 ½
Outcome	<u>½</u> Meta-Analyses of Related Outcome Studies <u>1 ½</u> Individual Quasi-Experimental Studies <u>1</u> Case-Control Studies <u>3½</u> One Group Pre-Post Studies	6 ½
Qualitative	<u>   </u> Meta-Syntheses of Related Qualitative Studies <u>2½</u> Small Group Qualitative Studies <u>   </u> brief vs prolonged engagement with participants <u>   </u> triangulation of data (multiple sources) <u>   </u> interpretation (peer & member-checking) <u>   </u> a posteriori (exploratory) vs a priori (confirmatory) interpretive scheme <u>   </u> Qualitative Study on a Single Person	2½
Descriptive	<u>   </u> Systematic Reviews of Related Descriptive Studies <u>½</u> Association, Correlational Studies <u>2</u> Multiple Case Studies (Series), Normative Studies <u>1</u> Individual Case Studies	3½
Comments:		<i>TOTAL:</i> 21

**Table 3.**  
Summary of the Results

**ADMINISTRATION/PROGRAM ORGANIZATION**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Camden, Swaine, Tetreault, & Brodeur (2010)	To determine whether parent and service provider perception of service was impacted during a service reorganization .	Level II, O2 & Q3 Three group, nonrandomized cohort design and qualitative group study design with less rigor	<i>N</i> = 222 families with children aged 0-21 y.o., attending 1 of 6 rehabilitation settings during the 2007 ( <i>n</i> = 69), 2008 ( <i>n</i> = 80), and 2009 ( <i>n</i> = 73) fiscal years. AND “about 50” service providers and 6 planning committee representatives during the mentioned fiscal years. <b>Inclusion:</b> families receiving rehab for at least 6 months.	<b>IV:</b> service reorganization involving early contact of families by social workers, group and community interventions <b>DV:</b> MPOC and MPOC-SP measure perception of service quality. Includes questionnaire and open ended questions. Families sent each April; Staff completed during annual program meeting.	No statistically significant difference in MPOC ( <i>p</i> = 0.37) or MPOC-SP ( <i>p</i> = 0.16) scores over the 3 years No statistically significant difference based on hours of service received. Families reported they appreciated the service reorganization (group treatments) and service providers reported the early contact with families allowed them to provide information quickly.	Low response rate to survey (24.6%). Failed to account for other rehabilitation services that may be received.
Camden, Swaine, &	The literature indicates that	Level III, O4	<i>N</i> = 188 families. Three sampling	<b>IV:</b> the organization	The overall program and each discipline	Researchers had no control over how data

<p>Levasseur (2013)</p>	<p>long waiting lists are problematic to patient outcomes; study aimed to examine changes in wait list times before, during and after a service re-organization.</p>	<p>one group, pretest, posttest design</p>	<p>groups: those referred before, during and after implementation of new admission procedures.  <b>Inclusion:</b> all cases at the facility  <b>Exclusion:</b> cases referred before 2000 or after 2009 (in 2000 waiting times began to be collected and 2009 is when the study was completed).</p>	<p>introduced new admissions procedures and increased group and community interventions to decrease wait list times.  <b>DV:</b> length of wait for therapy measured in days</p>	<p>experienced a decrease in waiting time (in days) from before to during to after the service reorganization; only the overall program and OT had a statistically significantly (<math>p &lt; 0.05</math>) shorter wait list time from before to after the service reorganization.</p>	<p>was entered into the system (i.e., possible administrative errors). Number of patients referred to each discipline differed, thus the numbers may have been too small to detect a significant change in wait list time for services other than OT. The service reorganization wasn't adequately described; study not replicable.</p>
<p>Feldman, Swaine, Gosselin, Meshefejian, &amp; Grilli (2008)</p>	<p>To determine if longer therapy waiting times correlated with decrease in quality of life and/or functional ability.</p>	<p>Level IV, D2 and Level III, O4 correlational study</p>	<p><math>N = 124</math> parents of children with physical disabilities waiting for OT or PT services at 5 local rehab centers in Montreal. Convenience sampled.  <b>Inclusion:</b> parents spoke English or French.  <b>Exclusion:</b> children with only cognitive problems; people that lived more than 50 km from the city.</p>	<p><b>IV:</b> Waiting time  <b>Outcome measure:</b> Parent interviews every 3 months using a structured questionnaire pretested in a pilot study, the SSS-FES, WeeFIM, and PedsQL. The final score on each questionnaire (score at admission) minus the initial score at referral.</p>	<p>WeeFIM cognition improved over time, but no significant change in mobility scores. PedsQL scores declined significantly. No significant difference in SSS-FES scores. There was a negative association between waiting time and children's quality of life (<math>p &lt; 0.05</math>), but not with their function.</p>	<p>Parent-self report may not be the most accurate way to acquire the WeeFIM information. The study did not exclude children receiving private services.</p>

<p>Caris (2007)</p>	<p>To determine the efficacy of an alternating sensory integration tx versus continuous tx in an outpatient pediatric setting.</p>	<p>Level IV, E4 multiple baseline, single subject design</p>	<p><i>N</i> = 7 children aged 5 - 9 y.o. convenience sampled from the waiting list of OP OT. Age- and referral-matched groups.  <i>Continuous (C)</i> <i>n</i> = 4  <i>Alternating (Alt)</i> <i>n</i> = 3 (attrition of 1 from Alt group due to preferences/finances)  <b>Inclusion:</b> referred for SI concerns.  <b>Exclusion:</b> dx of PDD, neuromuscular disorder, musculoskeletal birth defect, or ODD.</p>	<p><b>Intervention:</b>                  Attended 10 wks of SI-based tx and created 3 goals based on GAS scale.  <u>C tx:</u> OP OT for 10 wks.  <u>Alt tx:</u> 4 wks OP OT clinic; 4 wks parent/therapist created home program; 2 wks OP OT.  <b>Outcome Measure:</b> modified GAS, to measure the efficacy of tx, with -1 to +3 scale. Scored by therapist in clinic and by parents in home program. Survey on home tx given to Alt group.</p>	<p>Trend towards improved scores in both groups, 6/7 had an average score <math>\geq +1.00</math> on the GAS. In <math>\frac{2}{3}</math> pairs, group C had higher final GAS scores (no stats due to sample size). Based on therapist scores, C group had an average higher score than the Alt group (<math>p = 0.004</math>). Parents in Alt group reported home program was convenient, but less effective than the clinic, due to lack of professional guidance and child motivation.</p>	<p>Attrition of 1 participant due to parent preference to not receive Alt tx. Co-tx with PT or SLP during study. Small sample size due to attrition led to lack of statistical analysis. Researcher did not mention duration of clinic and home tx sessions, so replication would be difficult. Tx log would have been beneficial to document adherence to home program. Parent ratings of GAS scores may be inaccurate.</p>
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**PARENT EDUCATION**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/ exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Stewart, Galvin, Froude & Lentin (2010)	To evaluate effectiveness of informational material provided to parents/ caregivers of children with special needs.	Level IV D3, Q2 Descriptive telephone survey with a component with more rigor	N = 18 caregivers of children with physical and behavioral disabilities <b>Inclusion:</b> caregiver of a child 0-18 with a disability who was given an informational packet	<b>Intervention:</b> Caregivers attended an orientation about the information packet; they used it for 8 wks <b>Outcome measure:</b> Researchers contacted participants via phone call after 8 wks to discuss effectiveness of the informational program.	72% of caregivers reported they read and were actively using the information, 28% reported that they read the packet. Participant opinions of the program: orientation was helpful, the informational packet helped them access resources, it would be better to receive the information closer to time of dx, it helped them record information about their child, and communicate to others about their child.	The participants were recruited from a convenience sample, so many of their children had had the dx for an extended period of time before receiving the information packet. The sample size was very small and does not represent the full diversity in educational level, language preference, and career/job responsibilities of the larger population.
Mitchell & Sloper (2002)	To explore how families of children with disabilities would like to	Q3	N = 27 parents of children with disabilities <b>Inclusion criteria:</b> parents of children ages 5-19 with a	<b>Methods:</b> Four focus groups were set up and met twice for an hour and a half each. Before the second	Parents felt the quality of information given was enhanced by: good presentation, up to date, accurate and easy to read	Limited resources, separated services, and not enough staff may hinder the feasibility of information provision. There were a limited

	receive information and to develop a model of good information provision.		variety of disabilities or chronic illnesses	group meeting, participants were sent a variety of materials using different media and were asked to discuss the benefits of each one.	information, delivered personally by someone knowledgeable, approachable and understanding, information was accessible in everyday places, information was available in at different stages and in varying depths information was delivered by a variety of healthcare professionals. Information should include in-depth written information but should be personally delivered.	number of people in the sample, and there were few minorities represented in the sample. This study was published in the UK so opinions may not generalize to the US (or elsewhere).
Hoyt-Hallett, Beckers, Enman, & Betuzzi (2009)	To determine organizational changes that may reduce the current waitlist in a pediatric OP setting through a Human Performance Technology analysis of	Level IV D3, Q3 Descriptive Interview with a qualitative component with less rigor	<i>N</i> = 13 <i>n</i> = 9 parents <i>n</i> = 4 OTs Convenience sample was used from the hospital-based OP OT clinic. OTs were sampled who assess school-age children in the clinic. Parents sampled whose children had recently been assessed.	<b>Methods:</b> Qualitative data was gathered to determine the clinic's current service delivery performance, gaps in desired versus actual service, and the causes of current service quality. <b>Outcome</b>	Document Analysis: 75 children on the waitlist with 7-12 referred each month, and 1 new child seen each month. Current wait time of 1 yr for children above 5 yr old with nonacute conditions. Based on parent and therapist report, the identified gaps in	Study failed to provide demographic information on the occupational therapists and parents sampled. No information on how themes were identified from the OT interview.

	<p>interview data.</p>		<p>No demographic information or exclusion/inclusion criteria were provided.</p>	<p><b>Measure:</b>                  Clinic document analysis to determine statistics of clinic services. OT interviews on perception of service, issues with service, and additional resources for parents. Parent interview on information received experience, information they would like to receive, and suggestions.</p>	<p>service were:                  excessive wait time, inconsistent staffing, no understanding of OT services, no awareness of other resources, hospital environment being inappropriate for school interventions, referral rate &gt; discharge rate. The identified causes of the service gap were: lack of information provision to parents and limited resources. Parents also desired contact with therapist throughout tx.</p>	
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**CEREBRAL PALSY**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Sakzewski, Miller, Zivani, Abbott, Rose, Macdonell, & Boyd (2015)	To examine if a short-length, high frequency group model of therapy would improve unimanual abilities and bimanual performance more than individualized standard care in children with CP.	Level I, E2 Randomized controlled trial	<p><i>N</i> = 44  <i>n</i> = 25 in hybrid CIMT group  <i>n</i> = 19 in standard care group</p> <p><b>Inclusion:</b> unilateral CP, child age 5-16, ability to follow instructions, predominant spasticity (MAS score of 1-3)</p> <p><b>Exclusion:</b> dystonia, MAS score &gt;3, previous orthopedic surgery on an upper limb</p>	<p><b>Intervention:</b> Hybrid CIMT group: 6 hrs/day over 10 days (2-five day wks of camp), therapist to child ratio of 1:2                      Standard care group: 1.5 hrs 1x/wk and for 6 wks and a home program meant to be completed 30 mins, 6 days/wk for 12 wks.</p> <p><b>Outcome measures:</b> MUUL (upper limb function), GMFCS (performance of self-initiated tasks), AHA (bimanual performance), and COPM (self-perception of performance)</p>	<p>Both groups received same total dose of therapy, but different lengths, frequencies, durations and therapist to child ratios between the intervention groups, but due to participant illness only 56% of the children in the hybrid CIMT group received the allocated therapy dose compared to 95% of the children in the standard care group.</p> <p>The standard care group had statistically significant gains on the AHA (<i>p</i> = 0.006) and COPM (<i>p</i> = 0.04). These results support the use of a standard care program for children with unilateral CP.</p>	<p>Intensive group based therapy may not be feasible, as it is a large time commitment for service providers and families. As shown by the lower rate of participation in the program, compliance is difficult for such a time consuming period, even if it is only for a two wk period.</p>

<p>Tsorlakis, Evaggelidou, Grouios, &amp; Tsorbatzoudis (2004)</p>	<p>This study examines the effect of NDT and the differences in its intensity of gross motor function of children with CP.</p>	<p>Level I, E2 Randomized controlled trial</p>	<p><i>N</i> = 34, 12 females, 22 males; a proportionate stratified sample based on age, sex, and distribution of motor impairment. <b>Inclusion:</b> mild to moderate spastic hemiplegia, diplegia, or quadriplegia; GMFCS levels 1 to 3; ages 3 to 14 years; <b>Exclusion:</b> other severe abnormalities; orthopedic remedial surgery or medication to reduce spasticity; participation in other therapy programs.</p>	<p><b>Intervention:</b> Group A participated in NDT 2x/wk for 16 wks, Group B participated in NDT 5x/wk for 16 wks. <b>Outcome Measure:</b> GMFM-66 (measures gross motor function)</p>	<p>Both group A and B showed significant differences from initial to final measurements in GMFM-66 scores (<math>p &lt; 0.001</math>). Group B's improvement in gross motor function was significantly greater than that of Group A (<math>p = 0.018</math>). The younger children (ages 3 to 5 years) improved more than older children (ages 10 to 14 years) (<math>p = 0.046</math>).</p>	<p>One limitation is that even though the study showed improvement for children with spastic CP, the results cannot be generalized to children with other forms of CP.</p>
<p>Christiansen &amp; Lange (2008)</p>	<p>To compare the effect of intermittent vs. continuous physiotherapy given to children with CP.</p>	<p>Level I, E2 Randomized controlled trial.</p>	<p><i>N</i> = 25 (control: <math>n = 14</math>; intervention: <math>n = 10</math> after attrition of 1) children (16 males; total age range: 1 yr 2 mo - 8 yr 9 mo) convenience sampled from children being treated at Smabornscetret, Aarhus, Denmark. <b>Inclusion:</b> dx of CP</p>	<p><b>Intervention:</b> Intermittent group: physiotherapy 45-mins, 4x/wk for 4 wks, followed by a 6-wk break; repeated over 30 wks with a max of 48 sessions. Continuous group: 45 mins, 1-2 x/wk for 30 wks totaling a max of 48 sessions. <b>Outcome measure:</b></p>	<p>Both control (<math>p = 0.038</math>) and intervention (<math>p = 0.026</math>) groups increased in GMFCS scores. No significant difference between groups in GMFCS scores (<math>p = 0.81</math>).</p>	<p>Physiotherapists had differing levels of experience (2-26 yrs), did not specify the mean experience of therapists in control versus intervention group.</p>

			<b>Exclusion:</b> Need for interpreter, candidates for surgery or medication that might influence outcome.	GMFCS-66 before and after intervention to measure gross motor gains		
Deluca, Echols, Law, & Ramey (2006)	To determine the efficacy of CIMT in children with CP	Level I, E2, randomized controlled, crossover trial	<i>N</i> = 18 children with CP (range of 7-96 months of age, mean age was 41.5 months) <b>Eligibility criteria:</b> dx of CP with asymmetric UE involvement, 8 years of age or younger, and in good health	<b>Intervention:</b> CIMT administered 6hrs/day, 21 consecutive days to increase functional abilities of the involved UE. The less involved UE was casted from axillary area to the fingertips. Phase 1: 9 children received CIMT and 9 in the control group (traditional OT/PT) Phase 2: 9 children in control group crossed over to receive CIMT <b>Outcome measures:</b> QUEST, Pediatric Motor Activity Log, Emerging Behavior Scale	Phase 1: tx group had borderline significant main effect over control group ( $F = 3.38, p = 0.09$ ) Phase 2: initial control group had significant effect after CIMT ( $F = 6.35, p = 0.05$ ) Significant overall effect for all 18 children on CIMT ( $F = 5.97, p = 0.04$ ) indicating that intensive CIMT is effective in increasing functional skills in children with CP with asymmetric UE involvement; significant positive changes on all outcome measures ( $p < 0.0001$ ).	This specific CIMT program provided one-on-one intensive tx for 6 hours a day with one child. This may not be feasible or realistic for certain settings. This schedule is also very demanding for parents. Future studies should investigate if this type of tx is effective with less one-on-one therapist led time and increased time completing a home program or through using volunteers.
Brunner, Rutz, Jueneman,	To determine whether physiotherapy	Level III, O3 2 groups	<i>N</i> = 26 children (originally 39, but 13 dropped out) from 15	<b>Intervention:</b> Group A: year 1 had regular physiotherapy and	The GMFM-66 values for both groups improved over the 2	One limitation is the study may not have been long enough to

<p>&amp; Brunner (2014)</p>	<p>is more effective when applied in blocks of tx or continuously in children with CP and similar conditions.</p>	<p>pre-post study</p>	<p>institutions in Switzerland.  <b>Inclusion:</b> children 6-16 years old, GMFCS II-IV, and a dx of CP or a syndrome with similar symptoms.  <b>Exclusion:</b> children who planned to have surgery or change rehab program.</p>	<p>year 2 had blocks. Group B: year 1 had blocks and year 2 had regular. Each year run from mid-August to end of June. Regular therapy was 1 to 2 times per wk. The blocks were 2 to 4 times per wk for a quarter of the year, alternated with a quarter-long break from therapy.  <b>Outcome measure:</b> GMFM-66 (gross motor) assessed before the study, after first year, and after second year.</p>	<p>years in only 2 (standing; and walking/running/jumping) of the 5 dimensions (lying and rolling; sitting; crawling and kneeling; standing; walking, running and jumping) (Group A <math>p = 0.022</math>, Group B <math>p = 0.039</math>). Improvements in GMFM-66 scores were seen only after the periods of regular therapy (both groups <math>p &lt; 0.05</math>). No significant changes were found after blocks of therapy for either group.</p>	<p>show significant developmental and motor progress. It is impossible to make this study longer because the children will most likely need adaptations of their physiotherapy, which is an exclusion criteria. Another limitation is the high attrition rate.</p>
<p>Law, Russell, Pollock, Rosenbaum, Walter, &amp; King (1997)</p>	<p>To compare the combined effect of intensive NDT and casting, and a less intensive regular OT program in improving hand function, quality of UE movement</p>	<p>Level III O4                  2 group pre-post study</p>	<p><math>N = 50</math>  <b>Inclusion:</b> children 18 months to 4 years old with CP with limb involvement of diplegia, hemiplegia, or quadriplegia; UE involvement moderate to severe with wrist in flexed; difficulties with manual dexterity, coordination, isolated</p>	<p><b>Intervention:</b> Children initially assigned to intensive NDT and casting or regular OT using a blocked randomization design. After first 4 mos of therapy, had 2-month break, then switched intervention for next 4 mos. The intensive intervention</p>	<p>Scores in all outcome measures did improve over time for both tx orders (Peabody <math>p = 0.0001</math>, QUEST <math>p = 0.007</math>, COPM <math>p = 0.0001</math>). The study found no significant differences in hand function, quality of UE movement, or parents' perception of child's</p>	<p>This study design does not differentiate between whether the improvement over time was due to developmental progress or the influence of therapy. The structure of the study did not allow researchers to see the effects of a no therapy control group.</p>

	and ROM in children with CP.		<p>finger movement, and in-hand manipulation activities.</p> <p><b>Exclusion:</b> skin sensitivity to casting material; had a fixed permanent contracture at wrist; had or planned surgery; used anti-spasticity medication; or had severe cognitive impairment.</p>	<p>had 3 times more therapy than regular OT.</p> <p><b>Outcome Measures:</b> Peabody Fine Motor Scales</p> <p>Secondary Outcomes: QUEST; COPM- parents' perception of their child's ability in hand-function activities.</p> <p>Assessments performed at baseline, 4 mos, 6 mos, and 10 mos.</p>	<p>hand-function activities when children were receiving intensive NDT and casting or regular OT. There appeared to be no extra benefit to increasing the amount of therapy.</p>	
Trahan & Malouin (2002)	<p>This pilot study aimed to determine the feasibility and effectiveness of implementing a PT program that combines intensive therapy with periods without therapy in children with CP</p>	<p>Level IV, E4 multiple baseline, single subject design</p>	<p><i>N</i> = 5</p> <p><b>Inclusion:</b> the children had to be enrolled in a rehabilitation program in the facility where the study took place, have a dx of CP and impairment of the four limbs and trunk.</p> <p><b>Exclusion:</b> children who were candidates for surgery or had other conditions</p>	<p><b>Intervention:</b> Multiple baseline design with staggered duration of the baselines among the participants.</p> <p>Phase A: standard physical therapy tx plan (45 mins, 2x/wk)</p> <p>Phase B: experimental intensive therapy phase (45 mins, 4x/wk for 4 wks) followed by an 8 wk rest period with no therapy</p>	<p>Three children had statistically significant (<i>p</i> &lt; 0.05) improvements in their GMFM scores at the end of phase B; none showed deterioration. This study confirms that an intensive therapy model is feasible; only 1 tx session was missed and caregivers reported that the children tolerated the intensive treatments well. It was noted that intensive</p>	<p>Staggered baselines attempted to provide a between- and within-subjects control, but the study did not have a control group. Future studies should include a control group to assess if intensive therapy is more effective than standard therapy. Scheduling intensive therapy is difficult, as the children had many other appointments and required an increased time commitment for</p>

				<p><b>Outcome measure:</b> GMFM, taken every 4 wks to measure gross motor function</p>	<p>therapy should not span more than 4 wks due to increased fatigue.</p>	<p>caregivers.</p>
<p>Ustad, Sorsdahl, &amp; Ljunggren (2009)</p>	<p>To determine effectiveness of blocked versus standard physiotherapy in infants (&lt;1 y.o.) dx'ed with CP.</p>	<p>Level IV, E4 Single-subject, multiple-baseline ABABA</p>	<p><i>N</i> = 5 children (age range: 5 mo and 3 wk to 9 mo corrected age) recruited from a university hospital. <b>Inclusion:</b> children 6-12 months, who show symptoms of CP, and live within 30 min from hospital. <b>Exclusion:</b> comorbidity, orthopedic surgical interventions, botulinum toxin A injection, or alternative tx.</p>	<p><b>Intervention:</b> ABABA <u>A1, 2, 3:</u> children received standard physiotherapy at home, the amounts varied per child; 2 received tx 1x/wk or 1x/2wk, 2 had not been referred for tx, and 1 had a pause in tx. A1 ranged from 4-16 wks. A2 and A3 were 8 wks. <u>B1, 2:</u> 4 wks with 40-60 min sessions/5x/wk (2 at home; 3 in hospital). Tx involved training parents to facilitate movement. Max 19 sessions each period. <b>Outcome Measures:</b> GMFM-66 and -88 to measure changes in gross motor function every 4 wks. 2 SD band method for</p>	<p>Child 1: significant improvement in GMFM-66 in B2. Positive trend for GMFM-88 data, gains above celeration line. Child 2: GMFM-66 points exceeded 2 SD band in period B2. Points of GMFM-88 score were along celeration line. Child 3: Significant difference in B1 and B2 on GMFM-66. All points along celeration line for GMFM-88 score. Child 4: Scores above 2 SD band for A2, B2, and A3. GMFM-88 scores exceeded the celeration line during A2 and B2. Child 5: Unclear whether there was an increase in GMFM-66 in B2 due to 1 missing data point. GMFM-88</p>	<p>Children had a wide range of gross motor severity, increasing heterogeneity of sample. 4/5 children were male. Inconsistent tx methods during A periods, ranging from no tx to tx 1x/wk. Failed to report compliance during A periods. No records comparing home versus hospital sessions.</p>

				GMFM-66 and celeration line for GMFM-88 data.	increase above celeration line in A3. All children had increases from baseline. All had a higher change score in B2 compared to B1.	
Palisano, Begnoche, Chiarello, Bartlett, Westcott McCoy, & Chang (2012)	To determine the percentage of children in PT and OT in school, clinic, or both settings, the frequency of services, parent perception of interventions, the effect of setting, GMFCS level, and area of the U.S. on PT and OT frequency, and the effect of GMFCS level on the intervention focus and process.	Level IV O3 Case-control, pre-existing group	<i>N</i> = 399 parents (377 female primary caregivers) of children (224 males) 23 to 74 mo with CP who were previously part of the Move & PLAY study. Convenience sample to have an even distribution of ages and representative distribution of GMFCS levels. Sampled from children's hospitals, community EI programs, community rehab programs, and therapist practices in 4 regions of U.S. and 9 regions of Canada. <b>Inclusion:</b> children who have or were suspected to have CP.	14 PTs, a pediatric nurse, and 2 other interviewers conducted 60-75 min long phone interviews with parents. <b>Measures:</b> GMFCS, measures gross motor function. Service Questionnaire, developed by investigators to determine: setting, frequency (x/month or year), amount of PT and OT (average minutes per visit), the focus and process of interventions. <b>IV:</b> Setting, GMFCS level, region of U.S. <b>DV:</b> mean min/month of PT and OT	Majority of children receiving OT and PT in school or clinic (53 to 61%) received 2-4 sessions/month. Mean minutes/month of PT no different in school versus clinic ( <i>p</i> = 0.11). Mean minutes of OT greater in school ( <i>p</i> < 0.05). Mean minutes of PT greater for GMFCS levels II-III ( <i>p</i> < 0.01) and IV-V ( <i>p</i> < 0.01) compared to level I; no difference between levels II-III and IV-V ( <i>p</i> = 0.89). Mean minutes OT greater for levels IV-V compared to I ( <i>p</i> < 0.01); no difference between level I and II-III ( <i>p</i> = 0.42) or II-III and IV-V ( <i>p</i> = 0.13).	Although the researchers attempted to be representative, the convenience sample may not be representative of the population. Interview relied on parent self-report, which could be inaccurate. Clinical documentation would have been a more accurate resource for data frequency and amount of therapy.

<p>Christman, McAllister, Claar, Kaufman, &amp; Page (2015)</p>	<p>To survey occupational therapists to determine their opinions on 2 protocols for pediatric CIMT</p>	<p>Level IV D3</p>	<p><i>N</i> = 272 pediatric occupational therapists <b>Inclusion Criteria:</b> licensed occupational therapists working with pediatric clients at least 50% of the time. Needed to work in school systems, early intervention, health system or hospital-based outpatient clinic, subacute or rehab facility, acute care hospital, or private practice. Did not need to have experience with using CIMT to participate.</p>	<p><b>Intervention:</b> Protocol A = child wearing cast on functional arm 24 hrs/day for 3 wks., with OT services 7 days/wk for 6 hr/day. Protocol B = child wearing cast on functioning arm 2 hrs/day for 8 wks., with OT services 1 day/wk for 2 hrs. <b>Outcome Measure:</b> Survey about concern for length of tx and wearing schedule, billing, child safety, child's frustration level, and adherence to protocol.</p>	<p>The majority of therapists reported moderate to high concerns about every facet for Protocol A. Therapists reported low or no concerns with 5 out of the 7 facets of Protocol B. Therapists reported moderate to high concerns for child's ability to participate in 2 hr/day of therapy, and full adherence to Protocol B. The majority preferred the less intense therapy.</p>	<p>The participants of this study did not need to have any experience with CIMT. The results may have been skewed because some of the participants did not understand the intricacies of CIMT. Another limitation is that this is the first study to examine opinions about pediatric CIMT. More research needs to be done on the topic to come to more definitive conclusions.</p>
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**OTHER DIAGNOSES**

Author, year	Study objectives	Study design/ level of evidence	Participants: sample size, description, inclusion/ exclusion criteria	Interventions and outcome measures	Summary of results	Study limitations
Ulrich, Lloyd, Tiernan, Looper, & Angulo-Barroso (2008)	To determine whether an individualized, higher intensity treadmill training program resulted in earlier motor development gains in stepping than a lower intensity program for children with DS.	Level I E2 Randomized controlled trial	<i>N</i> = 36 infants with DS recruited from parent support groups. Infants started the treadmill intervention when they were able to take 6 supported steps per min (10 mo for most). High-intensity (HI) <i>n</i> = 16; Low-intensity (LI) <i>n</i> = 14. Attrition of 6 (1 in LI group, 3 in HI group, 2 unspecified). <b>Exclusion:</b> seizure disorder, uncorrectable vision problems, and any condition that would greatly limit participation in tx.	<b>Intervention:</b> Home treadmill training by parent. <b>LI:</b> 8 min/day for 5 days/wk at a belt speed of 0.15 m/s. <b>HI:</b> increased ankle weights, belt speed, and daily duration as tolerated. Training ended when infants could take 3 steps independently. <b>Outcome Measure:</b> 8 items from the BSID motor subscale, to measure gains in motor milestones. Coded 5 1-min videotapes of the infant stepping on treadmill for frequency of	Both groups had increases in alternating steps/min over time, but HI group progressed faster in last 2 recordings (no significance provided). HI group achieved the BSID items “moves forward using pre-walking methods” and “raises self to standing position”, earlier than the LI group ( <i>p</i> = 0.01, <i>p</i> = 0.05). High effect sizes for earlier achievement of 6/8 BSID items in HI versus LI (effect size range for 6/8 items: 0.55 - 1.07). When 8 BSID items were combined into a construct, there was a significant difference in earlier time to achieve milestones in HI versus	Minimal significant findings between groups could be attributed to complexity of grading required in the HI group (e.g. parents needed to adjust belt speed, duration of tx, and amount of weight). Small sample size also reduced the likelihood of significant findings.

				alternating steps. Average number of alternating steps/min and average number over 2 months.	LI group ( $p = 0.04$ ).	
Namasivayam, Pukonen, Goshulak, Hard, Rudzicz, Rietveld, Maassen, Kroll, & Van Lieshout (2015)	To investigate differences in outcome measures of children with CAS based on low or high intensity of speech therapy based on Motor Speech Treatment Protocol	Level III, O4 one group, pretest/posttest design	$N = 33$ , convenience sample from 85 preschool aged children with moderate to profound motor speech difficulties. <b>Inclusion:</b> social, play, and attention skills to participate in direct speech intervention, mild or greater delays in expressive language, moderate to profound speech-sound disorder (SSD), and motor speech involvement <b>Exclusion:</b> global motor involvement, ASD, oral structural deficits, feeding impairments or significant drooling.	<b>Intervention:</b> Lower intensity: 45 mins, 1x/wk for 10 wks ( $n = 12$ ) Higher intensity: 45 mins, 2x/wk for 10 wks (two subgroups: RND 1: $n = 10$ , RND 2: $n = 11$ ) <b>Outcome measures:</b> Sounds-In-Words subtest of the GFTA-2 to measure changes in the speech sound system, CSIM and BIT to measure speech intelligibility, and FOCUS to measure functional communication.	Paired $t$ -tests indicated that both higher intensity groups had statistically significant improvement on the GFTA-2 (RND 1: $p < 0.001$ , RND 2: $p = 0.002$ ) and FOCUS (RND 1: $p = 0.009$ , RND 2: $p = 0.004$ ) while the lower intensity group showed no significant improvement. None of the groups showed improvement on the CSIM or BIT. This indicates that for changes in the speech-sound system and functional communication, higher intensity of therapy provides better outcomes.	This study was, in part, conducted based on current insurance policies restricting the amount of tx time for children with CAS; because this study took place in Ontario, Canada, it may have different implications for tx in the US where we have a different healthcare system. This study controlled for intervention duration, so future studies could focus on whether lower intensity for longer (1x/wk for 20 wks) has the same result as higher intensity for a shorter time (2x/wk for 10 wks).
Schreiber	To determine	Level V	$N =$ One 31 mo	<b>Intervention:</b>	PMDS-GMS total	Only short term follow-up

(2004)	if higher intensity PT could improve gross motor function and goal attainment for a 31 mo child with a genetic condition on chromosome 18 (18p-).	D4 Case Study design	female with a dx of 18p- and impaired gross motor fxn. Enrolled in EI. PT since she was 4 mo then from 10 to 28 mo she had PT sessions for 1hr/2x/month, with no gains.	Increase in therapy intensity to 1hr/4x/wk for 4 wks. Completed 14 sessions. 3 sessions per wk in PT gym and 1 session in home. <b>Outcome measures:</b> PDMS-GMS, GMFM, and GAS to measure gross motor gains.	score increased 6 points. Score increase in GMFM (score increases ranged from 1.4 to 27.4) GAS scores increased, with 3 objectives changing from stable baselines on two previous measurements to higher scores. Parents reported improvements in standing, balance, and independence.	on improvements (1 wk post). Reduced generalizability due to single subject case study and restrictions of EI services.
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**META-ANALYSIS**

Author, Year	Study Objectives	Study Design/ Level of Evidence	Number of Papers Included, Inclusion and Exclusion Criteria	Interventions & Outcome Measures	Summary of Results	Study Limitations
Tinderholt-Myrhaug, Østensjø, Larun, Odgaard-Jensen, & Jahnsen (2014)	To describe and categorize different motor function and functional skills interventions for children with CP, to summarize the effects of the different interventions and determine why there were different effects	Level I, O1 and E1, Systematic review and meta-analysis  <i>n</i> = 29 randomized controlled trials, level I, E2 <i>n</i> = 9 controlled, pretest/post test design, level III, O4	<i>N</i> = 38 papers reviewed  <i>n</i> = 11 databases searched  <b>Inclusion:</b> children with CP < 7 y.o.; studies investigating motor function and functional skills training more than 3x/wk; studies comparing conventional therapy, same type of intervention completed less frequently, or a different intensive intervention; outcomes measured as hand function, gross motor function, and/or functional skills	<b>Interventions:</b> comparisons of conventional therapy, same intervention provided less frequently, various intensive interventions  <b>Outcome measures:</b> measures for hand function, gross motor function, and/or functional skills (31 measures total were used)	<b>Effects on hand function:</b> 23 studies targeted hand function; when compared to conventional therapy, intensive CIMT programs completed more than 1 hour per day were the most effective in increasing unilateral hand function. No significant impact on bimanual hand function. Most of the CIMT programs had 3-7 therapist led sessions per wk with a home program to be completed daily.  <b>Effects on gross motor function:</b> 16 studies targeted gross motor function; the results from the studies included were too heterogeneous to be pooled. Only two studies supported intensive task oriented therapy as a means of increasing gross motor function. Eight studies had fewer than 25 participants and all studies with significant results supporting intensive therapy had a high risk of bias.  <b>Effects on functional skills:</b> 20 studies targeted functional skills; many of these also looked at hand and gross motor function. Two meta-analyses of seven studies indicated that CIMT was effective in increasing functional skills. In two	Many of the intensive programs required extensive home programs that interfered with the family's routines; thus, depending on the family, an intensive program may not be feasible. Many of the studies included had small sample sizes and lacked any power calculations (so they may not have had the power to detect differences between groups).

			<p><b>Exclusion:</b> studies combining motor function/ functional skills training with passive interventions or if outcomes were body functions and structures</p>		<p>studies, intensive training showed an effect on functional skills. When intensive CE was compared with intensive NDT, the CE produced more functional skills. When an intensive NDT and casting program was compared with regular OT, the NDT/casting group showed more gains in functional skills.</p> <p><b>Overall:</b> This meta-analysis shows increasing evidence for the use of CIMT in children with CP. Studies that included a home program produced greater results for functional skills and greater ability to generalize skills to other settings. For motor function and functional skills, there was no conclusive difference between intensive and conventional therapy.</p>	<p>Half the studies included had a high risk of bias, so the effects are unclear.</p>
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*Note:* AHA = Assisting Hand Assessment; ASD = Autism Spectrum Disorders; BIT = Beginner’s Intelligibility Test; BSID = Bayley Scales of Infant Development; COPM = Canadian Occupational Performance Measure; CIMT = Constraint Induced Movement Therapy; CP = Cerebral Palsy; CSIM = Children’s Speech Intelligibility Measure; CAS = Childhood Apraxia of Speech; DS = Down Syndrome; DX & DX’ED = Diagnosis & Diagnosed; EI = Early Intervention; FOCUS = Functional Outcomes for Children Under Six; GAS = Goal Attainment Scaling; GFTA-2 = Goldman-Fristoe Test of Articulation; GMFM & GMFM-66 & GMFM-88 = Gross Motor Function Measure & Gross Motor Function Measure-66 & Gross Motor Function Measure-88; GMFCS & GMFCS-66 = Gross Motor Function Classification System & Gross Motor Function Classification System – 66; MAS = Modified Ashworth Scale; MPOC = Measure of Processes of Care; MPOC-SP = MPOC for service providers; MUUL = Melbourne Assessment of Unilateral Upper Limb Function; NDT = Neurodevelopmental Treatment; ODD = Oppositional Defiance Disorder; OT = Occupational Therapy; PDMS-GMS = Peabody Developmental Motor Scales - Gross Motor Scales; PDD = Pervasive Developmental Disorder; PT = Physical Therapy; QUEST = Quality of Upper Extremity Skills Test; ROM = Range of Motion; SI = Sensory Integration; SSS-FES = Service System Subscale of the Family Empowerment Scale; TX = Treatment; UE = Upper extremity

## **Summary of Key Findings:**

### **Summary of Experimental Studies**

Overall, there is mixed experimental evidence regarding the effects of intensive therapy versus standard treatment. For children with CP, the ideal treatment dosage remains unclear. Of the eight articles on CP, one study found no difference between intensive and standard conditions, five studies found intensive therapy to result in more gains, and two studies found continuous versus high intensity to result in the greatest gains. Although these studies had inconsistent results, several mentioned that higher intensity therapy, such as CIMT, may not be feasible or realistic for certain practice settings and the schedule of intensive CIMT is also very demanding for parents. For children with Down syndrome, one article demonstrated that more intensive therapy may be beneficial to promote earlier motor development. Considering all of the included research, evidence is still mixed on the ideal treatment dosage and schedule for children.

### **Summary of Outcome Studies**

The outcome studies included in the CAT table focused on three main issues: outcomes for children receiving standard versus intensive treatment, perceptions and outcomes after a service reorganization, and therapy allocation and schedule based on gross motor functional level. Overall, the evidence from outcome studies is mixed on the efficacy of continuous versus intensive treatment. One study found higher intensity therapy resulted in better outcomes, whereas, another found continuous but not intensive therapy to be the most beneficial, and yet another found no difference between the treatments. In terms of service reorganization, longer waiting times were associated with poorer patient outcomes but a service reorganization did not result in a perception of lower quality service. Further, once the children received services, there was no impact on the child's overall function. Last, a study on therapy allocation found that service allocation received is related to the functional levels of the client being treated (i.e., children with CP with higher gross motor functional levels are allocated fewer minutes of therapy per visit than those with lower gross motor functional levels).

### **Summary of Qualitative Studies**

Based on the literature, both families and clinicians appreciate early contact after referral for services. Clinicians reported that early contact was helpful in order to provide families with information quickly. Families desired early contact which included resources, information on occupational therapy's scope of practice, and activities they could complete with their children. Providing information to parents can help alleviate stress associated with long waitlist times and can help parents and caregivers feel more confident in caring for their children. When providing information to families, it was beneficial to provide parents with specific information on how to care for children with certain diagnoses, how to advocate, and resources available to them. This information was the most valuable when it was provided in a variety of modalities, including in-depth written materials (e.g., pamphlets) and one-on-one contact from a knowledgeable, approachable professional. Patient education is an important aspect of treating children with disabilities.

### **Summary of Descriptive Studies**

The descriptive studies in the CAT were about performance level, adherence to therapy protocols, results of a service reorganization, and parent education. One descriptive study indicated that more intensive therapy led to increased gross motor performance, and increased independence in daily tasks, however, there was only a short-term follow-up on improvements, so it is not apparent whether the gains would be maintained. Another study found fewer concerns regarding compliance, client safety, billing, and frustration level of the children with the lower intensity therapy, which may indicate better results over time. These descriptive studies are contradictory, again providing mixed evidence regarding optimal therapy allocation.

From a service organization perspective, patients with increased waitlist times had lower quality of life scores, no change in mobility scores and increased cognition scores. The cognition scores may have been contaminated by a variety of factors (e.g., schooling or other private treatment). Thus, patient quality of life was impacted but there was no change in function after being on a waitlist. Another study found that a service organization was needed to adapt to the growing demand for therapy and increasing number of children on the waitlist. While on the waitlists, studies found that the majority of the parents who received educational information read and actively used the material to better understand the child's diagnosis and type of therapy needed.

### **Summary of Meta-Analysis**

Tinderholt-Myrhaug et al. (2014) conducted a meta-analysis that provided increasing evidence to support the use of CIMT in children with CP. Studies that included a home program produced greater results for functional skills and greater ability to generalize skills to other settings. For motor function and functional skills, there was no conclusive difference between intensive and conventional therapy. For hand function, when compared to conventional therapy, intensive CIMT programs completed more than one hour per day were the most effective in increasing unilateral hand function, but there was no significant impact on bimanual hand function. Most of the CIMT programs had 3-7 therapist led sessions per week with a home program to be completed daily. In interventions focused on gross motor function, the evidence was too mixed to be pooled; some studies with high risk of bias supported the use of intensive treatment over standard care and only two of sixteen studies supported an intensive, task oriented approach over conventional therapy. For functional skills, about half of the studies reviewed indicated that intensive therapy was more effective. Overall, half the studies reviewed for the meta-analysis had high risk of bias. Additionally, extensive home programs present in many of the studies interfered with the family's routines; this limitation indicates that the needs of the family should be considered carefully when developing treatment plans and home exercise programs. Again, this meta-analysis found mixed results regarding the effectiveness of two different service delivery models (standard versus intensive treatment).

### **Implications:**

#### **Implications for Consumers:**

The evidence is inconclusive regarding whether intensive or standard treatment results in the greatest gains. Thus, if UW Medicine VMC-CT changes to an episodic therapy schedule, the progress from therapy should not be impacted for children with CP, specifically. Furthermore, our research indicated that families reported similar quality of therapy during and after a service reorganization. Thus, families of children with CP attending VMC-CT should not be concerned that their quality of care would diminish if a service reorganization were to occur. In all of the studies with intensive treatment, the children seemed to be able to tolerate the treatment well. However, the increased parental time commitment must be considered when deciding to use an intensive therapy service delivery model, as some parents may be unable to accommodate this type of schedule. In reference to the OTPF, consumers should work with VMC-CT to determine what therapy schedule would be most conducive to their needs as a family based on their child's client factors, the family's performance patterns (i.e., habits, routines, rituals, and roles), and the temporal context to determine a time schedule consistent with the family's routine (AOTA, 2014).

Research on parent education reflected that parents feel they do not have adequate information on OT's scope of practice, activities to complete with their children, and the benefits of therapeutic services. This illustrates the need for consumers to be advocates for themselves and their children, asking for clarification from practitioners when they need clarification or information. Ideally, therapeutic practice should be collaborative, with practitioners and families exchanging information

and resources, but in lieu of this, families should feel justified to seek information from their practitioners as needed during the therapy process.

### **Implications for Practitioners:**

The literature indicated that there was no decrease in quality of treatment after a service reorganization, from the perspectives of the therapists.

For SLPs working with children with childhood apraxia of speech, greater intensity (two times per week) was associated with greater gains in speech-sound changes and functional speech. Further, for PTs working with infants with Down syndrome, greater intensive treadmill training was associated with more gains in motor developmental milestones earlier than a lower intensity group. These findings have important implications regarding insurance reimbursement and patient education to encourage families to prioritize therapy appointments.

The literature was mixed regarding treatment plans for children with CP; however, therapists can still utilize this information based on the needs of their clients. One study found no difference in conditions, four studies found more intensive therapy versus standard therapy resulted in more gains, and one article found that continuous versus episodic treatment resulted in greater gains. VMC-CT can use these findings to decrease wait list times by seeing children intensively for shorter periods followed by rest periods. Some of the evidence indicates that treatment schedules could be based on the results of assessment and outcome measures; this is consistent with the OTPF's principle of client-centered care and creating an individualized therapy plan based on the needs of each child and their family (AOTA, 2014). This information will also help therapists educate parents about therapy frequency and intensity. In addition, the mixed research on episodic care highlights the need for future data acquisition and study on the topic. This body of evidence could be strengthened if OT practitioners keep outcome data before and after service delivery reorganizations in order to confirm any benefits or limitations of intermittent care.

If VMC-CT implements changes in their service delivery model, it will be imperative that practitioners measure the outcomes of their patients before, during, and after the change in order to determine if there is a positive (or negative) impact on the patient outcomes. Due to the inconclusive nature of the evidence presented in this CAT paper and the limited number of diagnoses explored, the practitioners at VMC-CT could be involved in determining best practice for service allocation.

Research on parent education during the process of care has reflected the need for education and a continuum of communication between parents and healthcare providers throughout the rehabilitation process. Parents and practitioners both feel a need for parent education on the scope of practice of OT, available resources, and activities they can do with their children while on the waitlist. Pediatric clinics should consider providing families on the waitlist with educational packets, which include specific information on caring for children with disabilities, advocacy, and resources in the area. In addition, professionals should provide clients with a continuum of care, being available to provide information and answer questions from referral to discharge.

### **Implications for Researchers:**

Future research should focus on comparing intermittent/episodic care with standard care for a variety of diagnoses. The search results on this topic have been limited, but most information regarding intensive versus continuous care is about CP. Because of this, the results may not be generalizable to other populations.

Additionally, much of the research on this topic has taken place in other countries that have different health care systems. It is important that future research focuses on implications for treatment in the United States so that treatment centers in the U.S. can adopt service delivery models that can be justified to insurance companies.



The difficulties with scheduling at VMC-CT are common among many outpatient pediatric clinics, so researchers should partner with these clinics to report outcomes of clients on different therapy schedules. As outlined in the OTPF, therapists should ensure that therapy service delivery models are evidence-based and supported by research (AOTA, 2014). More research is necessary regarding the most effective therapy schedules, in order to provide therapists with the necessary evidence to support their clinical decision-making in conjunction with the various needs of clients and their families.

### **Bottom Line for Occupational Therapy Practice and Recommendations for Best Practice:**

Based on the evidence provided in this critically appraised topic paper, therapists should not expect worsening of a client's condition with episodic care. Further, occupational therapists should remember that frequency and duration of treatment should be determined within the constraints of funding, staffing issues, and family needs. Therapy schedules can acknowledge real world issues, while still focusing on the well-being and needs of the child, and therapists can feel assured that scheduling treatment around reasonable real-world constraints will still provide no less effective care for their clients. The evidence provided mixed results, however, the majority of the studies found no significant worsening in the child's function when provided with episodic or continuous care. Frequency and duration of care should be based on the child's needs, but the most efficient service delivery model for the clinic is also of critical importance

Additionally, clinics may consider developing parent education courses to help parents understand the needs of their children and the benefits of therapy services. Parent education also improves satisfaction with therapy services, and may mitigate no-show visits due to increased understanding of their child's needs.

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**Table 1. Documenting progress on interim dates of completion**

Task	Steps	Deadline Date	Completion Date	Comments
Select published CAT format	Meet with Yvonne Swinth to discuss how the CAT table should be formatted for her journal, based on previous published submissions. Dr. Tanta will be included during the meeting via Skype or phone call.	March 25, 2016	March 31, 2016	Due to a scheduling conflict, Dr. Tanta was not able to virtually attend the meeting. The meeting day was pushed back due to availability during office hours.
Revised and consolidated CAT project to Dr. Tanta	<ol style="list-style-type: none"> <li>1. Select most salient articles to include in final CAT (March 30)</li> <li>2. Edit “bottom line” conclusion for practitioners to provide stronger implications for practice (April 10)</li> <li>3. Edit summary statements to include articles used for CAT (April 10)</li> </ol>	April 10, 2016	April 10, 2016	All deadline dates were met for this item. Revised CAT project was sent to Dr. Tanta for review on April 10 at 4:38 pm.
Create concise poster	<ol style="list-style-type: none"> <li>1. Create poster based on information most relevant to administrators and clinicians, based on implications from original CAT paper (April 15)</li> <li>2. Revise poster based on feedback from Dr. Tanta (April 20)</li> </ol>	April 26, 2016	To be completed.	A poster draft has not yet been completed. This deadline has been extended until final revisions have been received from the consolidated CAT.
Published journal article based on CAT	<ol style="list-style-type: none"> <li>1. Submit CAT to the <u>Journal of Occupational Therapy, Schools, and Early Intervention</u> (May 2016).</li> <li>2. Published article with revisions from editor feedback (April 2018).</li> </ol>	April 2018	To be completed.	The completion date may be variable due to the timeline of receiving feedback, the amount of revisions required, and the number of re-submissions that are required.

### **Monitoring Outcomes**

Thus far, we have monitored outcomes based on meeting predetermined dates outlined in Table 1 above. After submitting our consolidated product to Dr. Tanta, we assessed how well the product met her needs based on a 10 point rating scale (1 = not met; 10 = fully met). Due to the extended timeline of our knowledge translation product, our outcome measure during the current semester will be successful submission to the Journal of Occupational Therapy, Schools, and Early Intervention by May 2016. After publication of our consolidated CAT article, the impact of our article has on the occupational therapy community will be assessed through how many times the article is accessed and utilized. Specifically, outcomes will be measured by the number of times the article is cited in 5 years after publication and by the number of times the article is downloaded on Sound Ideas, the University of Puget Sound's online database of student and faculty work.

### **Evaluation of Effectiveness of Knowledge Products**

Dr. Tanta evaluated our knowledge products using a 10 point rating scale, rating our product a 9. She believed that the CAT paper results validated her current clinic scheduling practices, which was extremely helpful for ongoing service delivery. During a meeting on April 29, 2016, Dr. Tanta expressed that the information regarding parent education will be beneficial to VMC-CT, as it provides her with a foundation on which to implement a new system of parent education for those families on the waitlist. Ideally, providing parents with increased information regarding their child's diagnosis, the child's needs, the importance of therapy services and how to access services, will improve family satisfaction and reduce no-shows for those off the waitlist. In a recent meeting with her staff, they decided to start the new education system with parents of children in the Neonatal Intensive Care Unit at VMC by providing follow up classes.

Our knowledge translation products will disseminate the information gathered from the CAT paper research to the general occupational therapy population. The poster, which will be more reader-friendly and accessible than our CAT paper, will be distributed to all of the staff at VMC-CT. This will provide the therapists with a summarized version of our findings, which will hopefully increase their confidence in allocating therapy services, despite real-world constraints. Further, Dr. Tanta will be able to utilize our poster as a reference handout for families if they are concerned with their child's therapy scheduling. One way to evaluate the effectiveness of the poster would be for Dr. Tanta to provide the therapists and/or families with a survey regarding their impression of the effectiveness of the poster.

Our research topic is relatively new, so published evidence on the effectiveness of different treatment schedules is limited. However, our knowledge translation product is effective because it increases the ease of access to this information, by combining evidence from a variety of existing articles into one summarized CAT paper. In addition, publication in a journal will further bring awareness to the topic, and it may encourage other clinicians to record outcome data on the effectiveness of the service delivery model they are utilizing. This will provide further evidence for episodic versus continuous care, which will be beneficial for supporting different service delivery models in the future. In addition, as stated previously, the effectiveness of the published article will be assessed based on the number of times it is accessed.

### **Evaluation of Overall Process**

The overall process for this project went well; our clinician collaborator was easily accessible and involved throughout the process. She presented us with a specific clinical question, and while our search resulted in limited and inconclusive evidence, our results were sufficient for her information needs. The inconclusive results validated the procedures currently in place at VMC-CT. Because of this, the knowledge translation process was unique, as we were not working to translate new information to her clinic.

Additionally, it was helpful to have a project chair/faculty mentor to monitor progress for the duration of the project. Although Dr. Tanta was involved throughout the process, her busy schedule and the location of the clinic made our encounters with her infrequent. The process was enhanced by having a mentor at the University of Puget Sound readily available. In addition, open communication with our mentor benefitted the knowledge translation process. For example, in one circumstance, miscommunication made it unfeasible to complete a component of the project on time. After contacting and collaborating with our faculty mentor/project chair, we decided to extend the deadline. Open communication and flexibility in this instance benefitted the content of the project by allowing us time to collaborate with our clinician.

Throughout this process, it has been helpful to delegate tasks and have individuals work on specific parts of the CAT paper. Since we have been working on this project for two semesters, we have been able to recognize the strengths of each group member, and delegate tasks in order to maximize those strengths.

Although Dr. Tanta did not feel that her clinic would be making any immediate changes based on the evidence we presented her, the overall process has still been beneficial. The unique needs of VMC-CT resulted in a unique knowledge translation process. Still, the entire process



provided us with ample opportunity to refine our research skills and understand the knowledge translation process. Because of Dr. Tanta's interest in collaborating with us to submit an article for publication, we are also learning (and will continue to learn) the procedures required for submission to a journal.

Overall, this process has been effective in helping us understand the critical appraisal process of turning a research question into a research paper and then implementing the research into occupational therapy practice. Dr. Tanta expressed that her clinic had concerns about and difficulties with scheduling, but that working with students expedited the process of gathering the research and implementing the evidence into practice.

### **Recommendations for Future**

Based on the information gathered in this CAT project, future research should be conducted on the effects of episodic versus continuous care for a wider variety of diagnoses. The current research on pediatric therapy dosage largely pertains to children with cerebral palsy. Thus, the findings are not widely generalizable to the pediatric patient population as a whole. Future research should delve into the effects of dosage for a variety of diagnoses, as many clinics are adopting an episodic care schedule to mitigate large waiting lists. In addition, our collaborating clinician expressed interest in further research regarding the effects of parent education on adherence to therapy later. In our preliminary search, we found three relevant articles. However, future research should be conducted on the effects of early parent education while waiting for therapy to begin on outcomes of and adherence to therapy.

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