



There is insufficient evidence to support the use of lycra splints for functional benefits for children with cerebral palsy.

Prepared by; Carly Halkett and Monica McMahon
3rd year Undergraduate Occupational Therapy students.
School of Occupational Therapy, Otago Polytechnic.

Date: 06 June 2008

Review date: 06 June 2010

CLINICAL SCENARIO

Cerebral palsy presents early in childhood development and is present throughout an individual's lifetime. Cerebral palsy is a non progressive permanent neurological disorder caused by damage to the immature brain. (Kerem, Livanelioglu, Topcu, 2001, p 307). Children suffering from cerebral palsy often need to wear orthoses or lycra garments to prevent deformity and give stability for walking and weight bearing. Therefore the purpose on this critical appraisal is to investigate the use of lycra garments as an intervention technique for children with cerebral palsy.

FOCUSSED CLINICAL QUESTION

What is the evidence to determine whether the use of lycra garments as an intervention increases functional performance for children with cerebral palsy?

SUMMARY OF SEARCH, 'BEST' EVIDENCE' APPRAISED, AND KEY FINDINGS

A comprehensive search was conducted using five databases. Three articles found were not available electronically in the Bill Robertson Library or the University of Otago Library. Therefore the process of filling out an inter-loan form from the help desk at the Bill Robertson Library was conducted. But due to the two week allocation period of getting the articles, these were not received by the researchers.

Reference lists of all retrieved articles were also searched.

Five articles fulfilled the inclusion criteria and were of adequate quality. One systematic review and one clinical trial were reviewed to investigate the use of splinting and lycra garments, in occupational therapy interventions, to improve functional ability in children with cerebral palsy. The systematic review found inconclusive evidence to support the efficacy of occupational therapy interventions for children with cerebral palsy.

The clinical trial (Knox, 2003) aimed to evaluate the effect of wearing Lycra garments in children with cerebral palsy. The study suggested that Lycra garments can provide functional benefits with 7 out of 8 participants reporting such benefits.

The small sample size makes it hard to generalise the perceived benefits from the results concluded in this study. Therefore future research is recommended and should critically reflect on methodological issues and be more rigorous.

CLINICAL BOTTOM LINE

On the basis of the systematic review and clinical trial it can be concluded that there is insufficient evidence to support the use of lycra garments to increase functional performance for children with cerebral palsy.

LIMITATION OF THIS CAT

This critically appraisal has been peer-reviewed by two independent students, Carly Halkett and Monica McMahon. This appraisal has also been reviewed by one lecturer as part of the assignment criteria.

SEARCH STRATEGY

Terms used to guide Search Strategy:

The overall search strategy was developed to identify any literature on the use of 'compression splints' or 'orthoses' or lycra garments' as an intervention for children with cerebral palsy.

Databases and sites searched	Search Terms	Limits used
<ul style="list-style-type: none"> • CINAHL with full text • ProQuest 5000 • Cochrane Library • Ebsco MasterFILE Premier • PubMed 	<p>Children OR "cerebral palsy" OR "Lycra Garments" OR Orthoses OR "Compression Garments" OR Compression Clothing"</p> <p>(Dependent on database specific terms and search methods)</p>	Nil

INCLUSION and EXCLUSION CRITERIA

Inclusion:

Children aged 0-18years.
 Diagnosis of cerebral palsy
 Had to include splinting or lycra as an intervention

Exclusion:

Included in the systematic review

The year of publication did not proceed 2003
 Participants with multiple diagnosis
 Studies not reported in English.

RESULTS OF SEARCH

Five relevant studies were located and categorised as shown in Table 1

Table 1: Summary of Study Designs of Articles retrieved

Study Design/ Methodology of Articles Retrieved	Level	Author (Year)
Systematic Review	I - 1	Steultjens et al., 2004.
A Review	III - 1	Attard & Rithalia, 2004.
Quantitative Study	II - 1	Kerem et al., 2001.
Clinical Trial (Before and after design)	III - 1	Knox, 2003.
A Review	III - 1	Teplicky et al., 2002.

BEST EVIDENCE

The following study/paper was identified as the 'best' evidence and selected for critical appraisal.

Reasons for selecting this study were:

Systematic review:

From the four systematic reviews allocated for this appraisal students selected occupational therapy for children with cerebral palsy (Steultjens, Dekker, Bouter, van de Nes, Lambregts & van den Ende, 2004). This review was provided by lecturer Linda Robertson.

Clinical Trial: Knox 2003

- Met the requirements of the inclusion criteria.
- Provided current research which directly addressed the clinical question.
- Not included as a research study within the systematic review.

SUMMARY OF BEST EVIDENCE

Table 1a: Steultjens, E. M. J., Dekker, J., Bouter, L.M., van de Nes, J.C.M., Lambregts, B.L.M. & van den Ende, C.H.M. (2004). Occupational therapy for children with cerebral palsy: a systematic review. *Clinical Rehabilitation*, 18, 1-14.

Taylor, (2007) guidelines were followed for this critical appraisal.

Study Design

Systematic review

Objective of the Systematic Review

To determine whether "occupational therapy interventions improve functional ability and social participation for children with cerebral palsy?"(p.2).

Was relevant background literature reviewed

An extensive search was conducted utilising MEDLINE (1966- June 2003), CINAHL (1982- Dec 2002), EMBASE (1982- Dec 2002), SCISERACH (1974- Dec 2002), AMED (1985- Dec2002). Two Dutch libraries of medical and rehabilitation literature were also searched: Dutch National Institute Allied health Professional (NPI) and Netherlands Institute for Health Services Researched (NIVEL). The reference lists of identified articles were hand searched and relevant authors were contacted to identify further studies.

Justification for the need of the study

No systematic summary has been produced of the evidence of the efficacy of various occupational therapy interventions in children with cerebral palsy.

Inclusion criteria

- Five inclusion criteria had to be met and were listed.
- Efficacy studies.
- Occupational therapy intervention.
- Cerebral palsy < 19 years.
- Measured functional ability or social participation.
- Full text publication.

Exclusion criteria

- Single subject design.
- Participants with cerebral palsy and other diseases.
- Low quality studies.
- Outcome measures not included in the review.

Methods

Methodology Quality:

- The articles were assessed by two independent reviewers and disagreements were resolved by discussion.
- The criterion used was suggested by van Tulder which included descriptive elements, internal validity, and statistical criteria. Controlled designs were assessed using van Tuldere's full version of criteria.
- The uncontrolled design trails were assessed with a criteria customized by the authors.

Analyses

- Due to the nature of interventions used the outcome measures and the heterogeneity of clients a meta-analysis was not carried out.
- A best evidence-synthesis was performed.
- Statistical significance of the results and outcome measures were accounted for in the analysis of the study design and methodological quality.
- For each of the six intervention categories analysis was performed.

Main findings of the search strategy

- Initially 1004 studies were retrieved.
- Selection based on the title and abstract were reduced to 128 articles.
- Forty seven studies of those 128 publications involved the efficacy of occupational therapy in children with cerebral palsy.
- Thirty occupational therapy studies were excluded because they did not meet the eligibility criteria (a single subject design, children with diseases other than cerebral palsy or the outcome measures were beyond the scope of the review).
- Seventeen studies fulfilled the eligibility criteria.
- All studies that had high/sufficient methodological quality were studies of splinting efficacy.
- Methodological quality was high for one RCT, and sufficient for two other designs
- The remaining thirteen studies reported low methodological quality. See table 1 a.

Table 1a Effects on motor skills, dexterity and functional ability.

Reference (N)	Design	Methodological quality	Motor skills		Functional ability	
			Mean (SD) baseline	SMD [CI]	Mean (SD) baseline	SMD [CI]
Comprehensive OT						
Law ⁵¹ (79)	RCT	low	I: 25.0 (17.5)	0.14 ^a	–	–
NDT			R: 27.3 (20.3)	(-0.52;0.79)	–	–
Law ⁵¹ (79)	RCT	low	I: 30.6 (18.4)	0.14 ^a	–	–
cast			R: 27.3 (20.3)	(-0.52;0.80)	–	–
Law ⁵² (52)	RCT	low	I: 20.4 (9.0)	0.10 ^a	–	–
			R: 19.2 (8.6)	(-0.45;0.66)	–	–
Training of sensorimotor function						
Bumin ⁵⁴ (41)	CCT	low	NR	0.85 ^a	NR	0.50
				(0.00;1.70)	–	(-0.32;1.33)
Talbot ⁵³ (59)	RCT	low	NR	NE ^a	–	–
Training of skills						
Guidetti ⁵⁵ (5)	OD	low	–	–	I: 52.6 (7.5)	$p \geq 0.05$
Training of sensorimotor functions vs training of skills						
Carlsen ⁵⁶ (20)	RCT	low	I: 17.5 (10.9)	0.12	–	–
			R: 16.1 (9.2)	(-0.68;0.92)	–	–
Parental counselling						
Hanzlik ⁵⁷ (20)	RCT	low	–	–	I: 0.09 (0.1)	0.17
					R: 0.17 (0.1)	(-0.71;1.05)
McConachie ⁵⁸ (58)	RCT	low	–	–	I: -2.6 (1.1)	0.27
urban					R: -2.0 (1.5)	(-0.50;1.04)
McConachie ⁵⁸ (58)	RCT	low	–	–	I: -2.1 (1.8)	0.05
rural					R: -1.8 (2.0)	(-0.68;0.77)
Advice/instruction regarding assistive devices						
Noronha ⁵⁹ (10)	OD	low	NR	$p = 0.87$	–	–
Pope ⁶⁰ (9)	OD	low	–	–	I: 2.7 (0.5)	NR
Provision of splints						
Exner ⁶¹ (12)	RCT	high	NR	NE	–	–
Blair ⁶⁵ (25)	OD	sufficient	NR	NR	–	–
Edmondson ⁶⁶ (15)	OD	low	–	–	I: 54.9 (22.1)	NR
Nicholson ⁶⁷ (12)	OD	sufficient	–	–	NR	$p = \text{significant}$

^aDexterity.

ADL, activities of daily living; SMD, standardized mean difference; CI, 95% confidence interval; I, intervention group; R, reference group; RCT, randomized controlled trial; CCT, controlled clinical trial; OD, other than controlled design; NR, not reported; NE, not estimable; – not assessed.

As a consequence of the low methodological quality, the majority of these studies included in this review produced insignificant clinical evidence for occupational therapists. Of interest to our practice question the author concluded that there is insignificant evidence to support the efficacy of occupational therapy interventions for children with cerebral palsy.

CRITICAL APPRAISAL

Validity

Limitations of the search strategy:

- It was not clear what role the author had in conducting the search as terms used within different databases were performed by an experienced medical librarian.
- No alternative terms were included for the word cerebral palsy, therefore the search results could have been limited or relevant articles could have been overlooked.

Limitations of the methodological appraisal:

- An example of the tool used to evaluate the methodological quality was provided in the appendix, however the validity and reliability of the tool is unclear. Components of the tool were attributed to at least three sources.

Explanation of results

- Significant results were found for only one study which had a significant p value but did not include sufficient data.

Summary/Conclusion

Inconclusive evidence was produced within each occupational therapy intervention category to support the efficacy of occupational therapy interventions for children with cerebral palsy. Therefore future research is recommended and should critically reflect on methodological issues and be more rigorous.

Due to the high methodological quality of the studies reviewed with regards to the provision of splints, the students decided to direct their focus on this area of intervention. Specifically lycra splints.

Table 1b: Knox, V (2003). The use of lycra garments in children with cerebral palsy: a report of a descriptive clinical trial. *British Journal of Occupational Therapy*. 66 (2) p.71-77. See appendix 1.

McMaster (1998) guidelines for critical review/qualitative studies was followed for this critical appraisal.

STUDY PURPOSE

Outline the purpose of the study and/or research question:

Does wearing a lycra garment regularly (for more than 4 hours per day) improve gross and fine motor function in children with cerebral palsy?

SETTING

Bobath Centre.

PARTICIPANTS

Inclusion Criteria:

- A diagnosis of cerebral palsy.
- Aged 2-16 years.
- No previous use of lycra garments.
- Attendance at the Bobath Centre for therapy once a week or every fortnight.
- A child and parent who was interested in trying the use of Lycra garments.
- Assessed as likely to benefit from the provision of Lycra garments by the treating therapist (not specified).

LITERTURE

Describe the justification of the need for this study. Was it clear and compelling?

Only a limited amount of literature exists to inform decisions about using lycra garments for children with cerebral palsy, therefore a study of the use of lycra garments was implemented.

How does this study apply to your practice and/or your research question? Is it worth continuing this review?

Occupational therapists are often required to make decisions regarding the use and benefits of lycra garments for children with cerebral palsy. It is worth continuing this review because best practice requires evidence to support the use of intervention techniques.

STUDY DESIGN

What was the design?

The design used was a before and after design.

A mixed method was used, using a descriptive qualitative questionnaire and two standardised assessments for data collection.

Was the design appropriate for the study question?

Yes a mixed method design was appropriate with pre and post testing giving a baseline to re-assess against post intervention of the Lycra garments. The qualitative method of the descriptive questionnaire was essential to gain participants and parents subjective view points on the use of lycra garments. However, this would have been enhanced by eliciting narrative perspectives of the participants and parents experiences of using the lycra garments. (E.g. day to day log book records, in-depth interviews).

Describe the theoretical or philosophical perspective for this study

Not specified.

METHODS USED

- Descriptive questionnaire
- A repeated measure was used, with participants being tested with two forms of standardised assessments pre and post intervention.
- It was not considered beneficial to attempt to obtain a matched control group because there would inevitably have been a difference between intervention participants and the control group. In addition, finance was only available for the purchase of garments for a small sample size of children.
- The author asked treating therapists at the end of the trial whether they thought there were any advantages or disadvantages.

Describe the method (s) used to answer the research question.

Participants and parents completed questions regarding the perceived advantages and disadvantages of the participant wearing the lycra garment (not specified when this took place).

Participants were assessed using the Gross Motor Function Measure (GMFM) which assesses the gross motor ability of children with cerebral palsy in five dimensions.

The participants were also assessed using the Quality of Upper Extremity Skills Test (QUEST). This assesses both function and quality of movement in upper limbs of children with cerebral palsy including range of motion, grasps, weight-bearing and protective extension. The QUEST was designed for “children who exhibit neuromotor dysfunction with spasticity and was originally used on children with hemiplegia. Although it was expected that children with other types of cerebral palsy would be included in this trial, the test was used because, at the time of the trial planning, no other appropriate upper limb assessment was available” (Knox, 2003, p. 73).

SAMPLING

Describe the sampling methods used.

There was no process of purposeful selection described, however, children were included if they were recognised as being amenable to treatment with a lycra splints.

Are the participants described in adequate detail? How is the sampling applicable to your practice or research question?

- Diagnosis of cerebral palsy
- Age 2-16 years
- No previous use of lycra garments
- Attendance at Bobath centre for therapy
- A child (and parent) who was interested in trying to use a lycra garment
- Assessed as likely to benefit from the provision of a lycra garment.

Was informed consent obtained?

Yes, it was obtained from the potential participant's parents and local community therapists.

DATA COLLECTION

Describe the context of the study. Was it sufficient for understanding the “whole” picture?

- Does not give a clear context description.
- Does not give the role of the researcher in relation to the clients.

What was missing and how does that influence your understanding of the research?

- How the parents kept a record of the amount of hours children wore the suit for if they wore it at home.
- Where did they wear the lycra suit?
- Where the study took place?

MAIN FINDINGS

Three participants had improved GMFM total score post-intervention and one (3) had a slightly reduced score. (see table 1)

GMFM Results : Table 2a

Participant	Test	Lying	Sitting	Crawling	Standing	Walking	Total
1	Pre	57	27	0	0	0	16.8
	Post	62	33	0	0	0	19.0
2	Pre	98	97	86	26	19	65.2
	Post	96	90*	93	39	19	67.4
3	Pre	71	20	0	0	0	18.2
	Post	67	13	0	0	0	16.2
4	Pre	Not tested	32	Not tested	Not tested	Not tested	32.0
	Post	Not tested	48	Not tested	Not tested	Not tested	48.0

* In error, 2 items were not tested, resulting in a potentially lower score.

Two participants (2 and 3) showed improved QUEST total score post intervention. See table 2.

QUEST Results : Table 2b

Participant	Test	Dissociated Grasps movements	Grasps	Weight bearing	Protective extension	Total
1	Pre	7.8	-11.2	16.7	Not tested	4.4
	Post	7.8	-22.2	16.7	Not tested	0.8
2	Pre	56.3	66.7	98.0	100.0	80.3
	Post	87.5	77.8	100.0	100.0	91.3
3	Pre	1.5	7.4	33.3	0	10.6
	Post	17.2	40.7	14.3	0	18.1
4	Pre	31.3	-7.4	44.0	44.4	28.1
	Post	26.6	-7.4	30.0	33.3	20.6

Only the QUEST and the sitting dimensions of the GMFM were tested as these were the areas expected to change.

The questionnaire results were not integrated into a summary.

PROCEDURAL RIGOUR

Do the researchers provide adequate information about data collection procedures?

- The researcher does not give a time frame for when assessments took place pre and post wearing the garment. However, it did state that assessment post intervention took place once wear time of the lycra garment reached 4 hours per day for 4 weeks.
- Researcher did not clearly explain procedures used to collect data accurately or provide completed questionnaires from participants and parents involved.
- Data was obtained from the standardised assessments but it did not provide reviewers with a representative of the whole picture.
- Researcher did include:
 - That assessors were trained in the GMFM but not in the QUEST as no - training available for the QUEST.
 - Was recognised that the GMFM and the QUEST only cover aspects of function.

AUDITABILITY

Describe the decisions of the researcher

- Process of making decisions was not given.
- Information from post-intervention questionnaires from participants and parents were collated, as were comments from therapists.
- Areas where comments coincided or differed from the results of standardised testing were recorded.

ORIGINAL AUTHORS CONCLUSIONS

The author anticipated that the wearing of lycra garments could lead to possible benefits and improvements in function. Compliance for wearing the garment was recognised as being an issue for participants because the garment has the potential to be uncomfortable and time

consuming to put on and take off. The author recognised the need to obtain subjective views of both the participants and the parents about the benefits and implications of wearing the garments.

INTERPRETATION OF RESULTS

Four participants stopped wearing the garment for numerous reasons.

These included, the garment being restricting, having to wear an additional spinal jacket during the trial. One participant did not have the QUEST performed because she only had lycra shorts.

CONCLUSIONS AND IMPLICATIONS

What did the study conclude?

The overall conclusion showed improvements in function in one standardised test in four participants who completed the trial. Clinical observations showed functional benefits such as; sitting balance, grasping of objects and self feeding. Perceived advantages were often outnumbered by disadvantages for example; the garment being time consuming to put on and off, children finding them restrictive for movement and in certain cases decreased specific functions.

Overall the study suggested that lycra garments can provide functional benefits for children with cerebral palsy. In this trial 7 out of 8 participants reported such benefits.

What were the main limitations in the study?

Due to the small sample size it is hard to transfer the perceived benefits from the results concluded in this study.

The lack of a control group also made it difficult to conclude if the lycra garments were solely benefiting the children. This could have been because other factors facilitating the children's functional performances. E.g. Other interventions that were being implemented at the Bobath Centre.

There is a potential bias for this study as the author was the main assessor in all cases except one. This personalised the research which could have caused numerous implications. Such as, the assessor could have overlooked an important ethical dilemma.

Limited standardised testing was carried out due to no appropriate upper limb assessment being available at the time of the clinical study.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

The clinical question composed for this review resulted in a search for answers from a range of different sources. The two studies included different methodologies and both had numerous design limitations. Given the variety of differences between the systematic review and the clinical trial it was difficult to compare them to each other. Overall both studies provided little or no evidence of the provision of splints or lycra garments for children with cerebral palsy. Due to these insignificant findings it is hard as occupational therapy students to implement and justify these specific types of interventions.

Both studies concluded many limitations in their research findings and acknowledged that future research is needed to justify interventions for children with cerebral palsy. The clinical trial conducted by Knox (2003), discussed that one of the limitations of the trial was the small sample size and lack of control group. It is recognised that future research is needed to explore the interventions that increase function for children with cerebral palsy. One benefit would be the use of a control group during this clinical trial. A control group would provide the researcher with a good basis for comparison. It would also provide greater trustworthiness and credibility. In contrast one problematic issue for the use of a control group could be the unethical practice of participants not receiving interventions that have the potential for greater quality of life (Taylor, 2007).

An aspect of future research could be to consider the use of a greater compression element in the lycra garment which would reduce contractors of muscle and soft tissue improving overall postural alignment and upper limb movements. The benefits of a tighter fitting garment may lead to increased proximal stability. In addition, due to the increase of compression, there would be flexibility to decrease the wearing time of the garments, therefore improving overall compliance of participants.

Reference List

- Attard, J., & Rithalia, S. (2004). A review of the use of lycra pressure orthoses for children with cerebral palsy. *International Journal of Therapy and Rehabilitation*, 11 (3), 120-126.
- Hyde, P. (2004). Fool's gold: examining the use of gold standards in the production of research evidence. *British Journal of Occupational Therapy*, 67 (2), 89-94.
- Ikiugu, M. (2007). *Psychosocial conceptual practice models in occupational therapy. Building adaptive capability*. St Louis: Mosby Inc.
- Kerem, M., Livanelioglu, A., & Topcu, M. (2001). Effects of Johnston pressure splints combined with neurodevelopment therapy on spasticity and cutaneous sensory inputs in spastic cerebral palsy. *Developmental Medicine and Child Neurology*, 43 (5), 307-313.
- Knox, V. (2003). The use of lycra garments in children with cerebral palsy: a report of a descriptive clinical trial. *British Journal of Occupational Therapy*, 66 (2), 71-77.
- Law, M., Pollock, N., & Stewart, D. (2004). Evidence-based occupational therapy: Concepts and strategies. *New Zealand Journal of Occupational Therapy*, 51 (1), 14-22.
- Law, M., Stewart, D., Letts, L., Pollock, N., Bosch, J., & Westmorland, M. (1998). Guidelines for Critical Review Form – Qualitative Studies., From <http://www-hs.mcmaster.ca/rehab/ebp/>.
- Steultjens, E. M. J., Dekker, J., Bouter, L. M., van de Nes, J. C. M., Lambregts, B. L. M., & van den Ende, C. H. M. (2004). Occupational therapy for children with cerebral palsy: a systematic review. *Clinical Rehabilitation*, 18 (1), 1-14.
- Taylor, M.C. (2007). *Evidence based Practice for Occupational Therapists* (2nd ed.). Oxford: Blackwell Science.
- Teplicky, R., Law, M., & Russell, D. (2002). The effectiveness of casts, orthoses, and splints for children with neurological disorders. *Infants and Young Children*, 15 (1), 42-50.