

HOW EFFECTIVE ARE LYCRA SUITS IN THE MANAGEMENT OF CHILDREN WITH CEREBRAL PALSY?

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Keywords

Lycra, pressure, pelvic stability, normalisation of movement.

Summary

This is the report of a study to try and evaluate the effectiveness of Lycra suiting in the management of Cerebral Palsied children. Fifteen children participated in the trial which was conducted over a period of twelve months. Whilst some children showed little change in the functional assessment, others showed a marked improvement, especially those with athetosis, ataxia and hypotonia.

Introduction & background

Limited work has been carried out on the effect of Lycra suits in children with Cerebral Palsy. Camp having been manufacturers of Lycra suits for burns victims had been approached by parents to manufacture a suit which could be used to help their children. They responded to this but felt that some trials should be conducted using the suit before embarking on full scale manufacture of the suit. Camp approached the paediatric physiotherapy team in Burnley to help them with the trials using children from their caseload.

This report illustrates our recordings, thoughts and reactions to the suit made during the trial. It is emphasised that the work was a trial conducted to assess the design and manufacture of the suit and to produce a discussion of the findings in the trial which we hope fellow therapists may find of interest and value.

What is the Lycra Body Suit?

The Lycra body suit fits closely to and completely covers the trunk, arms and legs. It is made as the name suggests of Lycra and consists of individual panels which are sewn together in such a way that pressure is exerted to the trunk and limbs. Zips allow for ease of application. Each suit is made to fit a child's individual requirements. The suit allows the child to move freely and there is no boning in the suit.

As a result of the trial Camp have produced several adaptations to the original suit such as short sleeves and legs, and experience has been gained as to where to apply pressure in the garments to achieve optimum effect.

Protocol

Before we could embark on the trial approval had to be sought from the ethical committee, following which the children who were to be asked to participate were selected. Various considerations were taken into account when the selections were being made. These included:

1. Degree of pelvic and shoulder stability

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2. Ease of access for assessment purposes
3. Compliance from parents and school staff.

All parents were approached individually and the nature of the trial explained fully before they signed to give permission for their child's inclusion.

Fifteen children (eleven boys and four girls) with a diagnosis of Cerebral Palsy were selected from existing caseloads, their ages ranging from 2-12 years. The children presented with varying degrees of motor impairment, mobility and intellect. (Table I). An assessment was used which examined gross motor skills, balance and fine motor function and the results expressed as a percentage of the maximum score achievable. It is this score which is used in Table II.

TABLE I TABLE TO SHOW AGE AND CONDITIONS OF THE CHILDREN.

PATIENT No	AGE	DIAGNOSIS	MOBILITY	INTELLECT
1	5	HYPOTONIA	W/CHAIR	S.L.D
2	5	SPASTIC ATHETOID	W/CHAIR	M.L.D
3	12	SPASTIC ATHETOID	FRAME	M.L.D
4	2	HYPOTONIA	W/CHAIR	M.L.D.
5	8	SPASTIC QUAD	W/CHAIR	S.L.D.
6	11	SPASTIC ATHETOID	FRAME	M.L.D.
7	10	SPASTIC ATHETOID	STICKS	M.L.D
8	4	SPASTIC DIPLEGIA	W/CHAIR	NORMAL
9	4	SPASTIC QUAD	W/CHAIR	S.L.D.
10	5	SPASTIC DIPLEGIA	W/CHAIR	NORMAL
11	11	HEMI WITH ATAXIA	W/CHAIR	S.L.D.
12	8	SPASTIC ATHETOID	W/CHAIR	NORMAL
13	5	SPASTIC DIPLEGIA	FRAME	NORMAL
14	9	SPASTIC DIPLEGIA	FRAME	NORMAL
15	4	SPASTIC ATHETOID	FRAME	NORMAL
KEY				
S.L.D.= SEVERE LEARNING DIFFICULTIES				
M.L.D.= MODERATE LEARNING DIFFICULTIES.				

Following assessment the children were measured for their suit using the standard measuring procedure normally used for measuring pressure garments by Camp.

The suits were worn initially for two hours and this was increased by one hour a day until a wearing time of six hours was achieved. In the first week the suits were put on and taken off at school so that the children could be closely monitored and any adverse reactions recorded. Throughout the trial the children wore the suit for a minimum of six hours a day.

Each child was reassessed regularly throughout the trial whilst wearing the suit and any improvement/regression was recorded. At the end of twelve

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TABLE II

TABLE TO SHOW AGE AND CONDITION OF THE CHILDREN

AND THE EFFECTS OF THE SUIT

PATIENT No	AGE	DIAGNOSIS	INITIAL SCORE	FINAL SCORE	AREAS SHOWING MOST IMPROVEMENT
1	5	HYPOTONIA	15.33%	36.83%	ALL
2	5	SPASTIC ATHETOID	22.17%	30.50%	GROSS MOTOR
3	12	SPASTIC ATHETOID	84.17%	87.50%	BALANCE, WALKING
4	2	HYPOTONIA	17.17%	26.17%	SITTING BALANCE
5	8	SPASTIC QUAD	46.67%	80.00%	FINE MOTOR
6	11	SPASTIC ATHETOID	70.17%	83.83%	ALL
7	10	SPASTIC ATHETOID	83.33%	88.67%	WALKING, BALANCE
8	4	SPASTIC DIPLEGIA	68.67%	76.00%	BALANCE, FINE MOTOR
9	4	SPASTIC QUAD	39.00%	51.17%	FINE MOTOR
10	5	SPASTIC DIPLEGIA	60.83%	75.67%	ALL
11	11	HEMI WITH ATAXIA	60.00%	61.33%	FINE MOTOR, HANDLING
12	8	SPASTIC ATHETOID	45.83%	50.33%	FINE MOTOR
13	5	SPASTIC DIPLEGIA	64.67%	78.17%	BALANCE, FINE MOTOR
14	9	SPASTIC DIPLEGIA	75.17%	83.50%	FINE MOTOR
15	4	SPASTIC ATHETOID	70.17%	80.33%	WALKING, FINE MOTOR

months the children spent one month without wearing the suit followed by reassessment.

Results of previous assessments were not made available to the assessors at the time of reassessment at any stage throughout the trial.

Camp visited regularly and were able to make adjustments to the suits, discuss and rectify any problems and measure for new suits.

Photographing and videoing took place when appropriate.

Questionnaires were distributed to parents and carers on a regular basis asking for comments about the suit, particularly with regard to handling of the child and their ability in daily living skills.

Throughout the trial physiotherapy treatment sessions remained the same as before the trial.

Discussions of Findings

Initially almost all the children developed an erythema in the axilla which continued to be a problem for some children, especially the athetoids. As a result the design of the suit was modified and the problem alleviated.

At the end of the first week fourteen children were tolerating the suit well and were wearing it for a minimum of six hours - some for up to twelve. One child tolerated it for four hours but no more and this continued throughout the trial. During this week carers generally reported an improvement in sitting balance which was not apparent when the suit was

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removed, although as the trial progressed it was observed that in many instances the effect of the suit was maintained for some time after its removal. After one month fourteen children showed an increase in their functional ability. One developed a hip problem which has since resolved and found not to have been caused by the suit. In addition to gross and fine motor improvements speech and language therapists reported improved breath control and, subsequently, speech particularly in one child with athetosis.

No respiratory problems arose with the children as a result of wearing the suit. In most children an increased confidence in their functional ability was noted which in turn enhanced their progress.

In subsequent months daily function varied according to behaviour, illness and tolerance but in follow up assessments there was an overall increase in scores. From the evidence shown in Table II the effect of the suit can be looked at according to the type of Cerebral Palsy.

Hypotonia

Of the two children with severe hypotonia the most improvement took place, perhaps quite significantly, within the first three months of the trial. Interestingly this was maintained during the month at the end of the trial when the suit was not worn. The youngest, aged two, gained improvement in trunk control and fine motor skills. The second, aged five had received physiotherapy since birth with limited results but upon wearing the suit he showed marked improvement in sitting and fine motor skills. This was remarked upon by all who cared for him. This child went on to begin to develop righting reactions which had previously been absent.

Spastic Athetoids

Six children fell into this category. Four of them showed steady progress with fine motor skills throughout the trial. The youngest child, aged four, demonstrated a marked improvement from first wearing the suit. Three of the four older children had been described as exhibiting static fine motor skills prior to the trial, so here some of the improvement could be attributed to the suit. These children also showed steady improvement in gross motor skills throughout the trial. Five of the six children all had particularly pleasing progress from a physiotherapy view in general handling, balance and walking. There was also a visible reduction in involuntary movements, this could be attributed to the compression of the shoulders, trunk and hips increasing central stability.

Spastic Diplegia

Four children with spastic diplegia were included in the trial, all with associated mild learning difficulties. During the trial all demonstrated improvement in fine motor control. Taking into consideration their ages and the fact that the improvement was gradual throughout the trial (including the one month without the suit) this could be due to a normal sequence of development. However all four showed improvement in sitting balance so this could have enhanced fine motor development. The two youngest had the most significant improvement in the first three months

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suggesting perhaps the influence of the suit. The nine year old already had independent sitting balance prior to the trial. However this was with a marked asymmetrical posture that was immediately corrected upon wearing the suit.

Spastic Quadriplegia

Both children with spastic quadriplegia had most significant improvement in fine motor skills which is comparable with the diplegias. The youngest, age four, could have the results attributed to normal development but therapists felt in both cases that these children had better trunk stability in the suits enabling them to use their hands more effectively. The older child, age eight, showed marked improvement in sitting balance.

Hemiplegia with Ataxia

The results on this child are less conclusive, which can perhaps be attributed to behavioural and management problems and a large growth spurt throughout the trial. However, generally, he showed increased dynamic control in sitting, improved weight bearing, easier handling and more accurate control when using his communication aid. During the month without the suit at the end of the trial all persons involved with the child found handling more difficult, weight bearing unreliable and fine motor control less effective.

Parents Reactions (Table III)

There was a mixed response from parents. Whilst all have had something positive to say about the suit and the effect that it has had on their child, many did have problems, the principal one being difficulty in putting the suit on and resistance from the children in doing so.

Most parents found that the suit helped improve gross motor skills (most notably sitting and standing) more than fine motor. This does not altogether compare with our findings in which many children, especially the diplegias,

TABLE III

PARENTS QUESTIONNAIRE AND RESULTS

QUESTION	NOT AT ALL	A LITTLE	A LOT	DONT KNOW	N/A
THE SUIT HAS HELPED MY CHILD	1	8	6	0	0
THE SUIT HAS HELPED MY CHILD STAND	1	6	8	0	0
THE SUIT HAS HELPED MY CHILD CRAWL	6	5	0	2	1
THE SUIT HAS HELPED MY CHILD WALK	0	9	4	2	0
THE SUIT HAS HELPED MY CHILD WRITE	4	4	2	3	2
THE SUIT HAS HELPED MY CHILD FEED HIMSELF	2	8	4	1	0
THE SUIT HAS MADE MY CHILD EASIER TO HANDLE	2	8	4	1	0
I LIKE THE SUIT	3	4	7	1	0
IFIND THE SUIT EASY TO PUT ON	4	7	4	0	0
I FIND THE SUIT EASY TO CARE FOR	3	3	9	0	0
MY CHILD IS HAPPY IN THE SUIT	2	5	8	1	0
I WOULD LIKE MY CHILD TO WEAR THE SUIT AFTER THE TRIAL	4	3	7	1	0

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were found to have made most improvement in fine motor function. This is perhaps indicative of what a parent looks for in a child's improvement. One mother in particular feels that the suit has been instrumental in the progress that her daughter has made. She states :The suit to me has been the best thing for my daughter - she has been happier in herself and the suit has helped her co-ordination, balance, independence, fine motor skills and gross motor skills. She thinks her suit is magic."

Of the fifteen children who began the trial all wore the suit for its duration. We have seven children who have continued to wear the suit. Six of these children have athetosis, ataxia or hypotonia to some degree. The remaining child is a spastic diplegia. All have shown improvement in balance and walking.

Adverse Effects

Toileting did prove to be a problem with some children, especially the girls, who sometimes wet the suit. Enlarging the hole helped a little to alleviate this problem. In those older children who had previously been independent in toileting this independence was lost because the suit does need to be removed to have the bowels opened. Children also needed assistance in putting on and taking off the suit so again some independence was lost.

In summer some children did find the suit warm, we found in school it was mainly a problem when they were outside in an uncontrolled environment.

General Discussion

In our extensive reading whilst carrying out this trial we have come across many articles which helped us to understand how the suit could be affecting the children. In this discussion we refer to just a few of these articles.

Clinical observations and studies have shown that spastic subjects have a capacity for achieving control over movement when a suitable feedback is provided (Harrison & Kruz 1987) and adequate postural alignment and stability can improve the functional performance of children with Cerebral Palsy when sitting. (Brogren 1996). If the trunk control is poor it cannot be relied upon to provide a stable platform for the control of the lower limbs (Stallard 1996) and the learning process is disrupted.

Treatments designed using Roods sensorimotor approach are based on the understanding that normal development continues from stability in weight bearing to mobility in non weight bearing patterns. (Case Smith *et al* 1989).

By putting children in suits body alignment and trunk control was possibly being improved so sensory and motor feedback was enhanced and thus the learning strategies.

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Proximal key points of control are used to give optimal amount of support or stability to promote distal control (Bobath 1964). In our treatment of children with Cerebral Palsy we aim to give proximal stability in accordance with the proximal to distal principal of normal development. This states that trunk stability and central control is necessary before upper and lower limb function is possible (Bobath 1964).

Therapists following the Bobath principal handle from the child's axilla, so as to control the scapulae and the whole arm. In this way the movement of the head, trunk, arms and legs can be controlled and any flexor or extensor hypertonus can be inhibited. The therapist may place their hands over the shoulders so that the clavicles, scapulae and head of humerus are covered. By doing this direction and varying degrees of pressure can be exerted as the movement progresses and there is a steadying influence on movement. These 'grips' firstly mobilise and lift the shoulder girdle and secondly align the trunk and arms so aiming to give increased stability. This is especially useful in the athetoid child who lacks postural stability (Bobath 1964). This stability was provided by the suit leaving our hands free to work elsewhere and increasing the child's potential to improve distally.

In some cases especially those with hypotonia, proprioceptive stimulation is given in the form of tapping, pressure, weight bearing and resistance in order to increase muscle tone. (Bobath).

By putting such children in the suit this proprioceptive input is being given continuously in the form of pressure and resistance. This pressure can be adjusted by minor alterations to the design of the suit so increasing its effectiveness.

Conclusion

The findings in the trial indicate that the use of lycra suiting in the management of Cerebral Palsied children can enhance function, improve posture and aid handling and can be a valuable adjunct to conventional therapy measures used in the treatment of these children. However compliance of all parties is imperative in its success.

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