

# Lycra-based splinting

## Can it really help?

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## **Acknowledgements**

It is important to thank all the individuals who agreed to participate in this project, giving up a considerable amount of their time in order to provide a greater source of information, in order that others may have the benefit of using Lycra-based splinting as appropriate.

Thanks are also expressed to Scope and the members of the steering group for their support throughout this project; to my colleagues within Birmingham Specialist Community Health NHS Trust (now Birmingham Primary Care Trust) and the team from Second Skin.

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**The main aspect covered in this article relates to the findings of a project carried out in the West Midlands during 1998-2000. In order to set this work in context, I will also review other work carried out which forms the current evidence base related to the use of Lycra-based splinting, and provide information on manufacturers of Lycra-based splints within Great Britain, and detail the published papers of the subject for your further reference.**

## **From small things...**

Lycra-based splinting has been gradually increasing in its use in this country for people with a wide range of movement disorders. Scope, the charity for people with cerebral palsy, coordinated the first clinics for Dynamic Lycra Splinting, with representatives of Second Skin, an Australian company, started in 1996.

Since 1996, there has been continued growth in the use of Lycra-based splinting, both here in Great Britain and overseas, with an increased number of clinics being run throughout the country, and the emergence of new manufacturers of Lycra-based splints.

Alongside the increase in availability of Lycra-based splinting there have also been changes within health care provision, which require clinicians to identify and deliver the most appropriate clinical interventions on your behalf. In order to do this, clinicians refer to the evidence base, usually in the form of published material, and where this is limited or inconclusive, we refer to examples of best clinical practice.

At the time we started the project, there was very limited information available related to the use and benefits of Lycra-based splinting. The evidence base at that time consisted of one article and a few newspaper articles. A result of the limited evidence base was that purchasers of health care were reluctant to provide funds for Lycra-based splints, when there was such limited evidence that showed any benefits.

To date the evidence base has increased, but still remains limited, with there being approximately six published articles, the earlier newspaper articles, and a limited number of sites on the internet – usually reflecting personal experiences of the use of Lycra-based splints.

## **What the papers say...**

The earliest published work related to the use of Lycra-based splinting for people with movement disorders I could find dated from 1993. The literature available comprises individual case reports/information and group studies/clinical trails. I've attempted to extract relevant information related to the effect Lycra-based splinting has on an individual's functional ability. I have referenced all of the sources at the end of the report for your further study.

## Individual case reports/information

### 'It suits me Daddy' <sup>1</sup>

#### **WHAT IT SAYS...**

The article reports comments from Pasha and her parents regarding the benefits of her Up-suit. Pasha is able with the suit to move from sitting to standing, and back to sitting independently. Her confidence and faith in her own body was massively improved.

Her parents felt that even her schoolwork would improve, as she would be able to sit and concentrate better without pain.

#### **SOURCE OF ITEM**

**Newspaper article: Today Thursday 19 October 1995**

**Author: Geraint Jones**

### Dynamic Trunk Splints and Hypotonia: A case study <sup>2</sup>

#### **WHAT IT SAYS...**

The article discusses the effect of a dynamic trunk splint fabricated from 5mm neoprene, on the abilities of a nine-month-old boy with truncal hypotonia.

The child's mother and physiotherapist reported a number of gains related to: improved rolling, increased ability to sit longer in high chair, improved head control, increased laughter, increased spontaneous incidence of mid-line play, increased vocalization, increased alertness, increased visual responsiveness. These and other gains were maintained at six months after the introduction of splints.

#### **SOURCE OF ITEM**

**Internet site: <http://aacpdm.org>**

**Authors: Ginny Paleg, Sandra Hubbard, Edna Breit, Kathy O'Donnell**

### Help where it is needed – A Second Skin offers support for Singaporeans <sup>3</sup>

#### **WHAT IT SAYS...**

The article talks about the benefits of Lycra splinting for Mary Chia, a child with mild cerebral palsy, with her writing. Mary thinks her splint is 'magic'. The article also talks about the customization of splints to reduce stigma, quoting Jenni Ballantyne as saying 'the days of having unattractive, old-fashioned equipment for people with disabilities are no more... it's especially important that children don't see the suits as geeky'.

Also one of the children at the Spastic Children's Association of Singapore Jeralyn Tan reported her ability now to move her affected arm.

#### **SOURCE OF ITEM**

**Internet site: [www.asiaweek.com](http://www.asiaweek.com)**

**Author: Catherine Shepherd**

## Group studies/clinical trails

### Letter to the Editor

#### **WHAT IT SAYS...**

'Lycra splinting and the management of cerebral palsy' <sup>4</sup>

Reported the development of this entirely new approach to the management of cerebral palsy. Discussed the gains for a child with athetoid cerebral palsy, who reach and function were improved by the provision of increase trunk and shoulder stability with the use of a Lycra suit.

The article also discusses the design and unique features of Lycra splints, which 'enable freedom of movement at the same time as providing support, and also allows intimate skin contact to be maintained'.

Reference is also made to the study in progress, later published in the 1995 journal, which indicates initial positive effects on the reduction of hypertonia and involuntary movements. The most exciting effect being on function, with children wearing the splints being able to do more.

#### **SOURCE OF ITEM**

**Journal: Developmental Medicine & Child Neurology 1993**

### A study of a dynamic proximal stability splint in the management of children with Cerebral Palsy <sup>5</sup>

#### **WHAT IT SAYS...**

Discussed the research project, which explored the effect of the Up-suit for children with cerebral palsy. The conclusions of the trial demonstrate that Up-suit wear:

- Increases postural stability
- Reduces involuntary movements
- Increases confidence in attempting motor tasks
- That there is some potential retention of improvements after the splint is removed

The article also suggests that for the optimum benefit wearers need to have a capacity for purposeful intent and be active participants in daily activities.

#### **SOURCE OF ITEM**

**Journal: Developmental Medicine & Child Neurology 1995**

## How effective are Lycra suits in the management of children with cerebral palsy <sup>6</sup>

### **WHAT IT SAYS...**

The study looked at the effect of Lycra suits manufactured by Camp (which do not include boning) for 15 children who have cerebral palsy.

The study identified benefits from wearing the suits for a 12-month period for children with motor problems of: hypotonia (2), spastic/athetoid (6), spastic diplegia (4), spastic quadriplegia (2), and hemiplegic with ataxia (1). The gains for the child with hemiplegia were limited, whilst the other children were identified as making most gains in gross motor tasks, and some fine motor tasks. The findings indicated that Lycra suits can 'enhance function, improve posture and handling and can be a valuable adjunct to conventional therapy measures used in the treatment of these children'.

One mother said, 'The suit to me has been the best thing for my daughter – she has been happier in herself and the suit has helped her coordination, balance, independence, fine motor skills and gross motor skills. She thinks the suit is magic.'

### **SOURCE OF ITEM**

**Journal: APCP March 1999**

## Turning Disability into Ability – Investigating Lycra Splinting <sup>7</sup>

### **WHAT IT SAYS...**

Discusses the joint study carried out by Capability Scotland and Edinburgh Sick Children's Hospital.

The study looked at the effect of the Lycra Up-suits for 20 children over an eight-month period.

What is showed, was that:

- not everybody liked or benefited from the suits
- some children benefited significantly
- children needed to develop some basic sitting ability before the suit could help them move on
- the suit offered a dampening effect on overactive muscles and allowed weaker muscles to work and control movement
- children grew in confidence, tried new movements, relaxed and felt able to play without fear of falling
- improvement in walking seen with balance and control showing changes

The team is now looking to undertake comparative work with suits provided through other manufacturers.

### **SOURCE OF ITEM**

**Summer 2000, Internet site: <http://www.capability-scotland.org.uk>**

## An evaluation of Lycra garments in the lower limb using 3-D gait analysis and functional assessment (PEDI) <sup>8</sup>

### **WHAT IT SAYS...**

Looked at the effect of whole body garments on eight children's walking, and their level of functional ability. The measurement tools used included 3-D gait analysis, the use of the paediatric evaluation of disability index and a questionnaire that looked at parental acceptance.

The suits were worn over in total an eight-week period. The findings indicated:

- proximal stability improved around the pelvis for five children
- distal stability improved for three children
- Five children improved in at least one aspect of the PEDI

However, 'even though parents and children detected these improvements, they did not outweigh the disadvantages of wearing the suit. Only one of the eight families considered continuing with the Lycra garment.'

### **SOURCE OF ITEM**

**Journal article: Gait & Posture Sept 2000**

## The development and use of SPIO compression bracing in children with neuromuscular deficits <sup>9</sup>

### **WHAT IT SAYS...**

The article talks about the development of flexible compression bracing for persons with neuromotor deficits, and the 'improved possibilities for stability and movement control without severely limiting joint movement options.

The SPIO vests were 'generally helpful for children with moderate to severe mobility and proprioceptive deficits'. For some they 'provided a very powerful aid to dynamic stability, movement organization and movement control'.

The authors discuss a number of individuals who have benefited from the use of the SPIO:

- seven-year-old boy with mixed athetoid/ataxic cerebral palsy
- two-year-old boy with mixed athetoid/spastic quadriplegia
- four-year-old boy with unsteady walking who has mild athetoid/ataxic type involvement
- two-year-old girl with a recently acquired moderate to severe cerebellar ataxia
- two-year-old boy with marked sensory difficulties and poor grading of motor control
- three-year-old with Angelmann's syndrome and ataxic type involvement and for numerous children two years and older with motor dis-co-ordination and sensory integration type problems.

### **SOURCE OF ITEM**

**Journal: Pediatric Rehabilitation 1997**

## ‘Short-term effects of dynamic Lycra splints on upper limb in hemiplegic patients’<sup>10</sup>

### **WHAT IT SAYS...**

The article discussed the effect of wearing dynamic Lycra splints on the upper limb of individuals who had had a stroke three weeks prior to their involvement in the study.

The study identified positive effects from three hours wearing the splints on: comfort, wrist posture, reduced wrist and finger spasticity, reduced swelling for those who had previously had problems with swelling, improved passive range of movement at the shoulder and impaired flexion of the fingers.

### **SOURCE OF ITEM**

**Journal: Archives of Physical Medicine and Rehabilitation 2000**

Having reviewed the literature available related to the use of Lycra-based splinting, we now turn to the project carried out in the West Midlands, entitled: **“A clinical evaluation of the functional gains associated with Dynamic Lycra Splinting, related to adults and children with movement disorders”**

## **Asking questions...**

As a group of clinicians, we wanted to find out as much as possible about the usefulness of Dynamic Lycra Splints for individuals with a range of movement disorders, both adults and children, who we saw through our work at Oak Tree Lane Centre in Birmingham.

We designed a project to look specifically at the differences that the splints made to the everyday things people wanted to be able to do better. We asked the people who were provided with Dynamic Lycra Splints through the assessment clinics at the centre, if they wanted to take part in the project. As the project coordinator I approached 52 people over a two-year period. Forty-five people agreed to take part in the project.

Most people gave their own consent (75.5%); some people were unable to give their own consent, and in this situation consent to participate was given by their relative (24.4%). Four of the people approached declined to participate in the project.

As with many projects, a number of people dropped out, leaving 40 people completing the project (23 adults and 17 children). Each person, having contact with me for seven months, six months of which they were wearing the Dynamic Lycra Splints.

## So how did we look at the effect of the splints?

A number of general tests were used to look at the effects the splint(s) had on:

- the range of activities which were important to people
- how their muscles were working (muscle tone)
- the level of help people needed in activities
- how easy the splints were to use and look after
- what people thought about their splints

Measurements with these tests were taken for the group of 40 people.

I also used a number of tests, which were used to look closer at the specific functional activities that were the most important for each person in the project. The areas included:

- how well a person could sit
- how well a person could use a switch
- the person's walking ability
- the way in which the person could use their hands and arms
- and whether a limb could be held in a better position

The people taking part in the projects were allocated to one of the five sub-groups based on their main functional goal, keeping the project with a client-centred focus.

I have listed the measurement tools at the end of the article for people who want to know more about the specific tests used.

## Getting answers...

A huge amount of information was collected during the project, and is to be submitted for publication in a number of journals. Information about the articles, as they are published will be made available on the websites for Scope and Birmingham Community Health NHS Trust. These are listed at the end of the article, to help you keep informed.

I have summarised information from the findings of the main areas of the project, to demonstrate some of the changes that occurred. The results of the general tests administered for the group of 40 are presented first, with results from the specific functional areas being presented second.

I also include some of the comments made by people or their carers to illustrate aspects of the effects when wearing the Dynamic Lycra Splints.

The movement difficulties, and diagnosis people taking part had, included:

- |                           |                           |
|---------------------------|---------------------------|
| ■ Hypertonia (spasticity) | ■ Multiple sclerosis      |
| ■ Hypotonia (flaccidity)  | ■ Acquired brain injury   |
| ■ Ataxia and tremor       | ■ Metabolic disorders     |
| ■ Athetosis               | ■ Spino cerebellar ataxia |
| ■ Cerebral palsy          | ■ Undiagnosed             |

## How have the range of activities which were important to people been effected?

A measurement tool called the Canadian Occupational Performance Measure was used to identify the activities that people wanted to improve. The measurement tool used scales, to identify the person's five most important goals. The person then scores their ability to carry out each activity (Performance Score), and how they feel about their ability regarding the activity (Satisfaction Score).

Individuals identified a range of goals related to personal care, productivity, and leisure activities. When we looked at the difference in the score at the end of the project to the beginning (equal to six months of wearing the splints), we could identify that there was a significant difference related to the use of the Lycra splints, both for performance and satisfaction scores for the everyday activities rated.

<b>COPM areas assessed</b>	<b>Difference between measurements T=3 (end) and t=0 (baseline)</b>	<b>P-value</b>
Performance	t3 & t0	< 0.001
Satisfaction	t3 & t0	< 0.001

The p-value is a statistical term, which looks at the chance that the change in scores could have happened by chance, that is not to be due to the use of the splints. The smaller the p-value, the more likely the change in the results is related to the use of the splints. The values identified above indicate that the change in functional performance is very much due to the use of the splints.

## How did the splints affect the way people's muscles worked (muscle tone)?

During the project I used two tests, which looked specifically to pick up features related to increase muscle tone or spasticity. The tests used were the Modified Ashworth and the Tardieu scales.

The different movement disorders people had, have different profiles in the way in which their muscles were working, as such we may not have expected all the people in the study to present with spasticity. So what did the results tell us?

<b>Modified Ashworth Period between measurements explored statistically</b>	<b>Overall P-values from Wilcoxon Signed Rank Test</b>
t3 – t0	< 0.001
	Hypertonia
	0.002

The table above shows in the first line that there is a significant impact on the level of muscle tone related to the use of the splints.

The second score shows that the splints help to reduce increased muscle tone (spasticity) for clients with hypertonia.

<b>Muscles measured using Tardieu scale (x = level of spasticity score)</b>	<b>Overall P-values from Wilcoxon Signed Rank Test</b>
Forward flex adductor (x)	0.013
Horizontal adductor (x)	0.007
Supinators (x)	0.021
Wrist flexor (x)	0.025
Finger flexors (x)	0.039

Again we can see that the splints have had a positive effect (there has been a statistically significant change), by reducing the level of spasticity present in certain muscles, as measured by the Tardieu scale.

### **What effect did the splints have on the level of help people needed in everyday activities?**

In order to explore the impact the splints have on the level of assistance people needed before and after wearing the Lycra splints, I used a measurement tool called the OPCS disability scale. This scale asks people to identify their level of ability in a range of tasks such as: *reaching and stretching, locomotion, personal care, dexterity*.

After scoring their ability in each of the areas, an overall score is calculated, and it is the difference in this score, which is presented:

	<b>Overall group P-value from Wilcoxon Signed Rank Test</b>
<b>Total disability score</b>	0.012

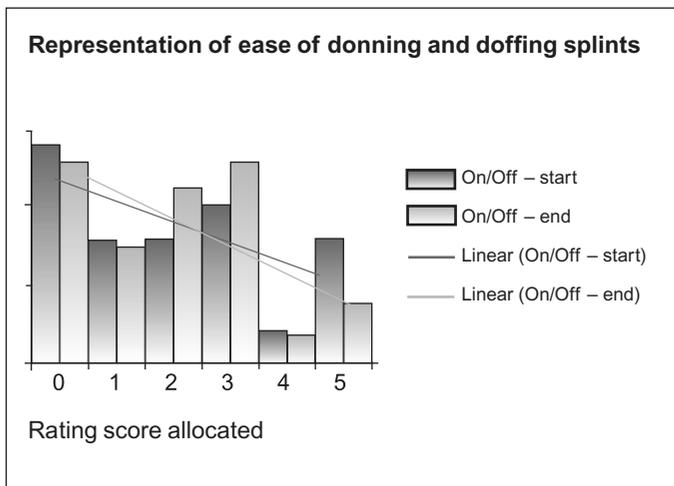
So it can be seen that there has been positive and a significant effect on the level of disability (the assistance needed with tasks), which individuals identified at the end of the project when compared to the start, related to the use of the splints.

### **How easy are the splints to use, look after and wear?**

During the project I used a questionnaire that collected information related to different features of splint care and use. I asked questions where people used a rating scale, and also collected specific comments about the splint.

For the questions rate I used a scale, which gave a score from 0 to 5. Zero represented the best or most positive score; where as a score of five represented the most negative score.

If we start by looking at how easy people found it to get the splints on and off at the beginning and end of the project.



At the beginning and end of the project the group was equally split 50% / 50% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

However if you look at the graph, you can see that there is a positive shift for the overall group, which suggests that people find splint application and removal easier at the end of the six months.

## With regard to looking after the splints...

People appear to have had different experiences related to washing and drying the splints, and aspects such as toileting. The frequency that problems occurred was however quite small. Here are a number of comments from the questionnaire:

### Washing and drying – problems...

Client using Up-suit body splint occasionally found problems getting the splint dry, especially when they were wearing it for longer periods.

*‘Drying on two occasions – top half dry/bottom half damp. Try to wash weekend fully – lightly wash in week.’*

*‘Drying the splint – it sometimes takes a while.’*

*‘Can take a while to dry – dry however when want to wear it.’*

### Toileting can be a trial...

Difficulties were encountered by a number of individuals and their carers where Up-suits were being used. Modifications to the splint’s design and advice sheets on toileting did help reduce the problems. Sometimes positioning on the toilet can be crucial.

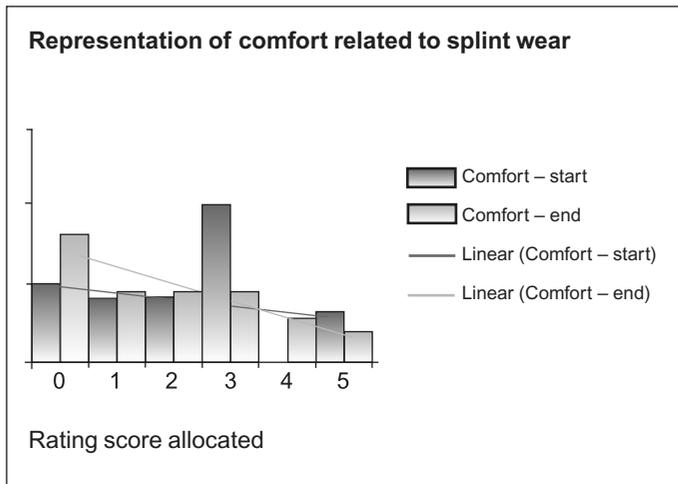
*‘Toileting – because tight fitting, is getting soiled by faeces – problems with suit being able to dry in time; and finding time to wash it. Not getting full-time wear.’*

*‘Harder to get bend to position bottom in seat ...wetting suit during toileting ...wee goes straight up.’*

### What did people think about their splints?

People were asked a number of questions related to whether they felt the splints were comfortable, what the splints looked like (were they attractive), how useful they felt the

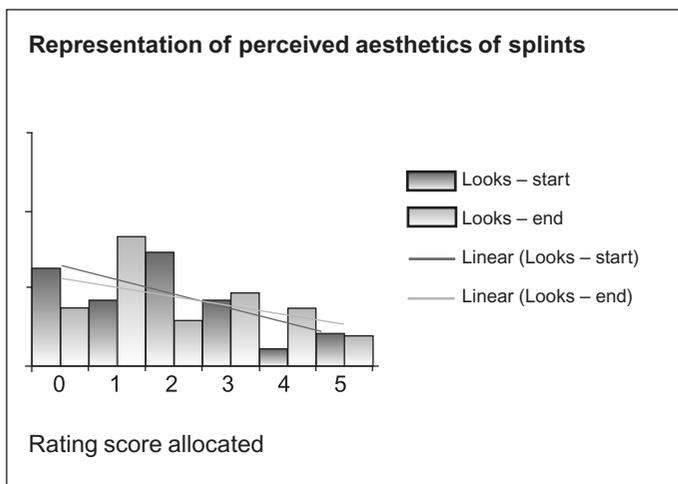
splints were, and whether they had any problems with regard to getting hot when wearing the splints.



At the beginning of the project the group was split 50% / 50% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

At the end of the project the group was split 65.4% / 34.6% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

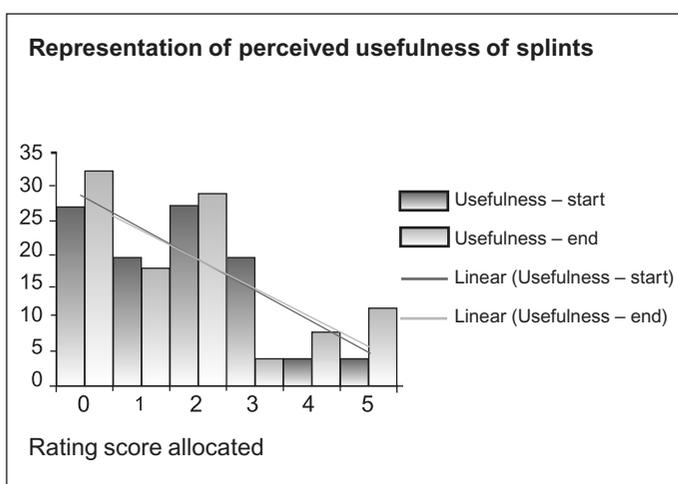
If you look at the graph, you can see that there is a positive shift for the overall group suggesting that people find splint more comfortable to wear at the end of project.



At the beginning of the project the group was split 71% / 29% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

At the end of the project the group was split 59% / 41% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

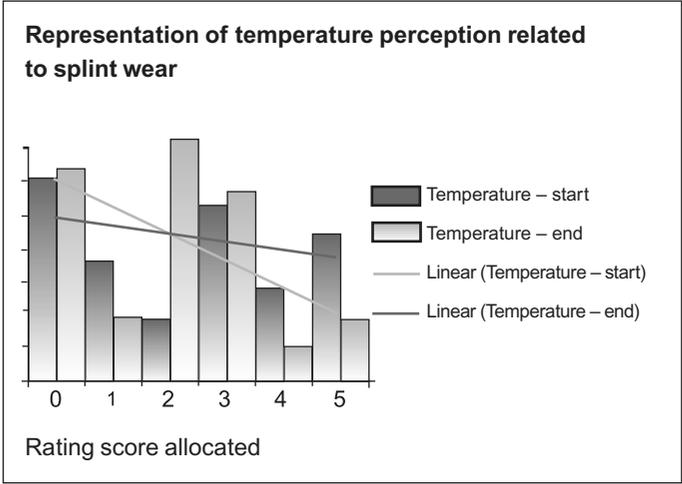
If you look at the graph, you can see that there is a negative shift for the overall group suggesting that people find splint less attractive at the end of project



At the beginning of the project the group was split 73% / 27% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

At the end of the project the group was split 79% / 21% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

This would suggest that people find the splints slightly more useful toward the end of the project, but there is a slightly negative shift in the end trend.



At the beginning of the project the group was split 48% / 52% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

At the end of the project the group was split 65% / 35% between the positive scores (0 – 2) and the more negative end of the scale (3 – 5).

This would suggest that people find temperature issues when wearing the splint less problematic at the end of the project. This shift is also demonstrated by the positive shift with the trend line.

**How the weather affected people**

*‘Keeping her cool and comfortable in a heat wave.’*

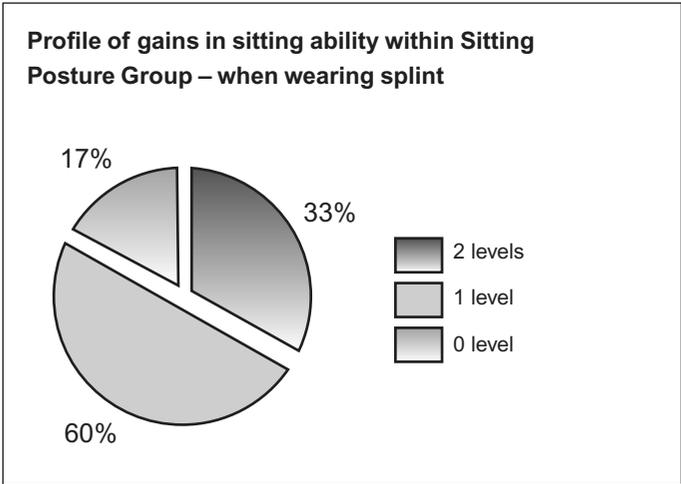
*‘Heat’s a problem with hot weather – had to remove splints where temperature over 80 degrees.’*

*‘Problems with heat in the summer months.’*

**How did people do with regard to their main functional goal?**

Specific measurements were taken related to changes in sitting ability, upper limb function, walking ability, switch access and resting limb position. The changes are presented as gains and losses for the groups with some comments made by people involved in the project.

**Sitting ability:** the group comprised six children who completed the project. The children’s sitting ability was scored using the Chailey Sitting ability scale, which goes from level 1 to level 7. The level scored reflects your ability to be more dynamic in your movements in, out and within sitting postures.



Of the six children who completed the project, only one did not improve their level on the Chailey scale; their score remained unchanged. The comments that follow are related to some of the areas of change that the children and parents from the sitting ability group identified:

*'Splint has helped with standing, sitting and arm posture/use – but not his walking. Mainly notices difference with sitting – but have noticed is using hand every day.'*

*'Posture, definitely Nursery think it's wonderful. Chair changed, as doesn't need as much support. Everything in general is improved – mainly his arms need to work on.'*

*'Posture, sitting and standing, stepping, walking with a frame. Her head control. Her reaching and grasping when playing. I think her dexterity has improved. Obviously more vocal and her vision has improved. I think her chest has improved less crumpled, perhaps breathing. Scoliosis has all but disappeared. More contented.'*

**Resting Limb Posture:** measurements to look at the change in joint angles associate with the use of the splints were taken with a goniometer, a piece of equipment that electronically measures range of movement. The statistician analyzed the results. Significant positive changes in joint positions of the wrist and knuckle of the little finger were demonstrated when the splints were worn.

With splints	P-values from Wilcoxon Signed Rank Test
	t3 – t0
Wrist flexor	0.008
Wrist deviation	0.024
Little MCP	0.036

There were also significant changes to the resting position of other joints demonstrated, when the splints had just been removed:

Without splints	P-values from Wilcoxon Signed Rank Test
	t3 – t0
Elbow extension	0.037
Wrist flexor	0.044

The use of the Lycra splints, being seen to have a positive impact on joint angles. The comments that follow are related to some of the areas of change that the children and parents from the limb posture group identified:

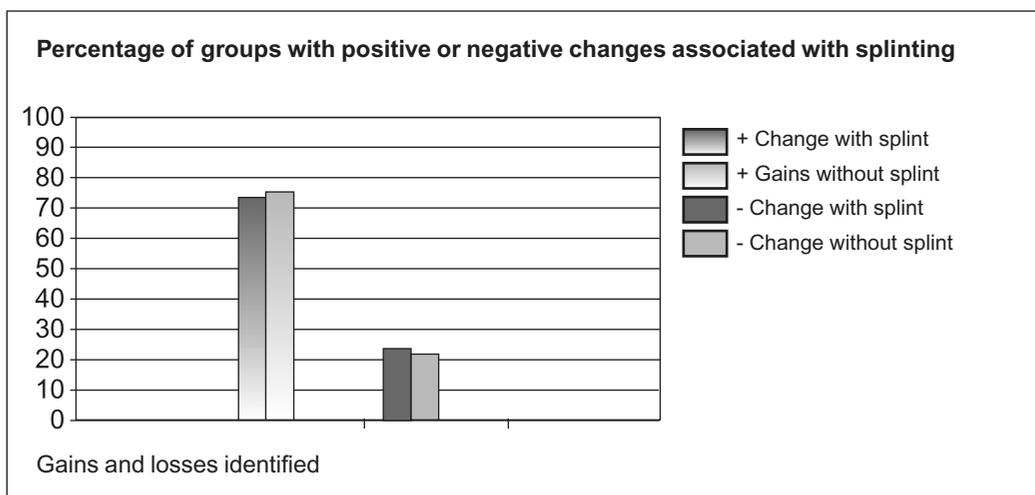
*'Sometimes they help with the cramp, but sometimes they don't. They help in other ways as well. Easier to put CD's in, just if I'm picking something up I can hold it better, not pulling up towards chin as much. Some days arm is looser, other days not, can't really tell if muscles are more relaxed.'*

*'Walking better. Balance improved – football, running. Straightening it out. When cooking with Nan – steadying cups (pouring with right hand). Steadying milk bottle (bilateral). Improved position of limb – sitting posture when using computer.'*

*'Driving powered wheelchair and computers easier, don't know about anything else. You know my fingers, if I don't wear this, fingers start to bend in to different position – when I'm driving my fingers used to bend back.'*

*'Dressing left arm, before a real struggle, now easier. Easier to get clothes on, doesn't go into spasm as much. May be related to combination of things: exercises, Botox and splint.'*

**Upper Limb Group:** changes in upper limb function were explored using the upper limb function test. This group mainly comprised of adults who have Multiple Sclerosis, and problems of tremor or ataxia.



It can be seen that over three-quarters of the group made gains in upper limb function with and without the splint on; this change occurring over a six-month period. This would suggest that the use of Lycra splinting can have a positive effect on tremor and ataxic movements.

Again some comment made by the individuals taking part or their carers, regarding the things they can do better related to the use of the splints:

*'Gardening – using long clippers/lawn edgers/holding (bilateral) whilst pruning. Can now get up and down on garden kneeler. Holding garden fork – light digging. Holding broom. Holding saucepan (with soup) to serve; and from frying pan. Holding tin cans better. Generally holding/carrying items. With splint on doesn't curl over as tight. Hoovering a bit better with both hands. Cutting fingernails – splint keeps fingers out straight. Can now turn tap on to fill kettle whilst holding kettle in other hand.'*

*'Stop hands shaking as much when drinking, have stopped spilling. Still shaking when putting earrings in.'*

*'I've... well take for instance five weeks ago, could go out to garden and prune roses – which couldn't do without splints on. Have done all pruning at Day Centre – going into horticulture and computers. Well for instance, the other day put bolt on back gate, and*

*a new lock on (couldn't have tried it before without splints). Noticed difference when other (L) splint went back. Generally all areas are improved when wearing the splints – goes worse in the evening; probably the MS.'*

**Walking ability:** during the project we looked at the effect of the splints on the walking ability of four people – one child and three adults. Each of the group members having a different diagnosis and movement disorder. Common improvements identified following the provision of the Dynamic Lycra suit, included (information provided by Mr. Paul Fairburn – Clinical Scientist):

1. Improved trunk posture/stability.
2. Reduced lateral trunk bending.
3. Reduced gait width.
4. Controlled mediolateral drift/movement.
5. Reduced pelvic rotation.
6. Reduced internal femoral rotation/scissoring/lateral heel whip.

### **What the individuals and their carers noticed**

*'Get up on own from floor, and on/off chair. Walking is better – faster – can keep up with cousins. Can carry things when walking. Standing is easier. Feel safer in standing; can concentrate on other things – window-shopping. Easier getting in/out of taxi. Don't go knock-kneed.'*

*'Walking – can walk faster; don't really have to think about it. K walker used at school, and sometimes at home i.e. at brownies – last few times haven't used anything.'*

*'Helped with balance a bit.'*

*'Bit more steady. Mouse – depends on what sort day it is – if it's really cold become worse (would have happened before). Mouse is more steady. Keyboard – OK, but it has improved. Mostly that – steadier.'*

*'I can walk well – can walk further, easier. Balancing better. Helped me move my arm.'*

**Switch and keyboard access:** the final group we looked at was that related switch or keyboard access. This group comprised individuals with cerebral palsy, with either athetoid movements or spasticity.

The individuals were assessed on their ability to press a Jelly Bean switch placed in different positions in front of them. We then looked at changes in the number of errors made, and the time taken to press the switch. Over the six months of wear the following gains and losses for each switch site were identified with the use of the splints:

Profile of gains (+) and losses (-) related to switch access					
Switch sites	+ / +	+/- /0	- / -	- / 0	Number completing test site
1	1 (14.3%)	4 (57.1%)	2 (28.6%)	0	7
2	0 (66.7%)	4 (66.7%)	1 (16.7%)	1 (16.7%)	6
3	2 (33.3%)	4 (66.7%)	0	0	6
4	0	0	1 (50%)	1 (50%)	2
5	0	1 (33.3%)	1 (33.3%)	1 (33.3%)	3

In the table

+/+ represents the person has made a gain in speed of access and a reduction in the number of erroneous switch presses.

=/-/0 means the individual has made a gain in one of the areas of switch access

-/- means the individual is slower in switch access, and has made an increased number of errors

-/0 means there has been a loss in one of the areas related to switch access.

We can see that over the time wearing the splints that there have been positive changes related to switch access for the majority of individuals on the first three switch sites, with more losses being identified for the final two switch positions. It is felt that the losses may in part be related to the mechanical forces built into the splint, which may have resulted in resistance to certain directions of movement.

Comments people or their carers in the switch access group made related to their abilities after wearing the Lycra splints for six months, including the areas, which are improved:

*'Swimming is easier. Can lift arms up better when stretching. Painting at college easier with splints on. (Physio impressed – improved arm and trunk posture). Easier to help Mum when getting dressed (will bring arm forward).'*

*'Helped with switching, spasms are less. Getting more control over body as well, not using body as much. Overall limb position better.'*

*'Symbolic play type activities – e.g. hair brushing. Pointing to body parts – eyes/ears/mouth etc. Feeding (hand over hand). Switching.'*

*'Holding and getting things (more successful getting things on first attempt). On my keyboard – easier – other people have said that, too.'*

*'When eating finger foods like crisps and chocolate, had less spasms, so not breaking food as much. Helped when turning pages and handling books, as less spasms, relaxing my hand. Folding clothes at home is easier. Where two-handed tasks – easier. Getting money out of purse is easier. Fine movements are improving – can pick up a sewing needle easier. Using left hand more than right hand for activities. Left hand seems more relaxed; right hand seems tighter now – can't let go. Had noticed before splinting, but beginning to increase now.'*

## **In conclusion**

If we look back over the changes demonstrated in this project and other projects, we are able to state that Lycra-based splinting is beneficial to both adults and children with a range of movement disorders and clinical diagnoses.

The results reflect observations of groups of varying sizes, and abilities, which affects the degree of confidence with which we can make statements regarding the effectiveness of the different Lycra-based splints.

The study in Birmingham does enable us to state with confidence that individuals with spasticity will benefit from using Lycra-based splinting. Also that the use of Lycra-based splinting has a positive influence on the functional abilities of adults and children, and the level of disability which they describe.

It is important to reflect that in order for the individual to attain their optimum outcome, it is important that they have good support, from their family, carers and therapists to ensure they have the opportunities to carry out tasks that help to maximize their potential gains in motor activity and function ability.

## Some useful terms

<b>Ashworth and Tardieu</b>	Two spasticity scales which indicate the amount of overactivity in the muscles (spasticity)
<b>Finger flexors</b>	The muscles that bend your fingers.
<b>Forward flex abductor</b>	Muscles or muscle movement which cause your arm to be lifted upwards in front of you at your shoulder level.
<b>Goniometer</b>	A piece of equipment, a bit like a protractor, which allows the position of joints to be measured.
<b>Horizontal abductor</b>	Muscles or muscle movement which cause your arm to be lifted out to your side, at your shoulder level.
<b>Proprioceptive</b>	Messages from sensors in the joints and muscles that let you know where body parts are in space.
<b>SPIO</b>	The name of a type of bracing developed in America, which uses a combination of Lycra and neoprene.
<b>Supinators</b>	The muscles which turn your forearm to face upwards (i.e. so your palm is facing up to the ceiling).
<b>Wrist flexor</b>	The muscles which bend your wrist down (so your thumb and fingers move closer to the inside of your forearm).

## More information

### The tests used

#### Quantitative tests

Canadian Occupational Performance Measure; Chailey Sitting Ability Scale; Goniometry; Modified Ashworth and Tardieu spasticity scales; computer-based switch access test and quality of switch access test; Gait analysis and Quality Assessment of Walking Ability; OPCS Disability Scale.

#### Qualitative tools

Questionnaire and a weekly diary sheet.

### More information about specific products/manufacturers

Second Skin Pyt  
Trefoil House  
Firth Room  
Gogarbank  
Edinburgh EH12 9DA  
Tel: 0131 339 8885 Contact: Jenny Colgate – UK representative

Kendall Camp  
Tyco Healthcare UK Ltd  
2 Elmwood  
Chineham Business Park  
Basingstoke  
Hampshire RG24 8WG  
Tel: 0800 581596

Gilbert and Mellish Ltd  
Unit 13  
Harrington Mill  
Leopold Street  
Long Eaton  
Nottinghamshire NG10 4QG  
Tel: 0115 973 4300 Contact: John Copley

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