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A MULTIFACETED APPROACH TO THE TREATMENT OF PHANTOM LIMB PAIN USING HYPNOSIS

Candy Bamford

Disablement Services Centre, Withington Hospital, Manchester

Abstract

This study looks at the efficacy of a multifaceted approach to the relief of phantom limb pain. Using hypnosis, four therapeutic interventions are incorporated into this treatment: hypnotic analgesia; visualization and movement of an imaginary limb to facilitate the movement of the phantom limb; psychological therapy and self-hypnosis. Twenty-five amputees completed a course of hypnosis averaging six weekly sessions. All patients were taught self-hypnosis and encouraged to continue this practice on a daily basis. The levels, duration and frequency of all pains were recorded before and after each session with a follow-up postal questionnaire sent out six months after treatments were completed. Results showed a highly significant ($p < 0.001$) reduction in pain levels from baseline to post treatment. Pain levels showed some increase by the six month follow-up questionnaire but were still significantly lower than the baseline. This study supports these combined hypnotic techniques as a treatment for phantom limb pain.

Key words: analgesia, exercise, hypnosis, perception, phantom, visualization

Introduction

In England and Scotland there are over 40,000 amputees attending prosthetic centres, with an unknown number who do not attend. Since 1997 the number of new amputees per year has remained at approximately 5000. Between the years 2003 and 2004 these 5000 patients were made up of: lower limb amputees (92%); upper limb amputees (6%); and those born with congenital absences (2%) (NASDAB 2003/2004).

In 1985 Jensen and colleagues investigated the extent of phantom limb pain in amputees. Results showed that 72% experienced pain eight days post-surgery reducing to 65% after 6 months. More alarming were the results that 60% were still in pain 7 years later. Potentially therefore, of the 40,000 plus prosthetic users in this country, 24,000 remain in pain.

Theory of pain

Merskey (1979) defined pain as ‘an unpleasant sensation and emotional experience which is associated with actual or potential tissue damage or is described in terms of such damage’.

The gate control theory of pain, which was first proposed in 1965, has provided an explanation for pain, incorporating previous knowledge of the central nervous system, the brain and acknowledging the cognitive and emotive component. Recent research has developed this further, or complimented this already established theory (Melzack and Wall, 1996).

The gate control theory is concerned with the balance of nerve fibre impulses, their activity on entering the spinal cord and their progression to the brain. These fibres are: the large heavily myelinated A-beta fibres, thinly myelinated A-delta fibres and finer unmyelinated C fibres (Skevington, 1996). When the body is injured, impulses from these fibres travel to the transmission cells (T cells) in the dorsal horn of the spinal cord. The T cells excite sending a signal to a suppressor cell in the Substantia Gelatinosa, which is a layer of small cells near the T cells in the dorsal horn.

When impulses from the large fibres (A-beta) activate the T cells, the cells in the Substantia Gelatinosa inhibit activity 'closing the gate' and halting signals travelling to the brain. When impulses from the smaller fibres (A-delta and C) activate the T cells, the cells of the Substantia Gelatinosa increase activity 'opening the gate', allowing signals to continue to the brain (Skevington, 1996). Descending messages from the brain can inhibit the activity of signals travelling up the spinal cord. These descending messages can also be influenced by ascending messages, forming a connecting loop of continually modified signals flowing up and down the spinal cord (Melzack and Wall, 1996). There are several somatosensory ascending pathways carrying pain information to the brain.

Melzack and Casey (1968) proposed that the neospinothalamic projection pathway could explain part of the sensory-discriminatory component of pain. Results showed that motivational drive and unpleasant affect were due to the activation of the reticular and limbic systems and that the higher central nervous system processed past experiences that influenced motivation and cognitive processes. It was thought that the activity of the T cells over a critical level could result in negative affect and aversion drive. Melzack and Casey concluded that the behaviour that characterizes pain was determined by sensory, motivational and cognitive processes and that these processes act on many areas of the brain.

Hypnosis and pain

Hypnotic analgesia has proved an effective treatment for chronic pain conditions, and has been shown, in research, to be more effective than other analgesics (including morphine) in the reduction of ischaemia and cold pressor pain (Jensen and Barber, 2000). Grachev, Fredericksen and Apkavian (2000) noted abnormal brain chemistry in chronic pain subjects, in some cases involving the prefrontal and cingulate cortices.

The relationship between the prefrontal regions of the brain, the cingulate gyru and pain was also observed by Croft, Williams, Haenschel and Gruzelier (2002). Subjects were fitted with EEG equipment at 28 scalp sites and given pain stimulation lasting 10 minutes each. Results showed that gamma frequency in the prefrontal region was the only predictor of pain ratings. These subjects were in three groups: control, hypnotic and hypnotic analgesia. Findings revealed the relationship between gamma frequency and pain ratings to be consistent; however this relationship was no longer present in highly susceptible subjects following hypnosis, though it was retained in subjects with low susceptibility who remained unhypnotized.

This finding supports the results of other studies which show that hypnosis can suspend higher order systems (e.g. Gruzelier, 2006). The area of the gamma frequency was centred on the bilateral anterior cingulum which again is consistent with previous

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finding of the relationship between these areas and the reporting of pain. Melzack and Casey (1968) highlighted the importance of the limbic structures, of which the cingulate gyrus are closely connected, and their role in the complex emotional behaviour associated with pain.

Theories of phantom limb pain

Ramachandran's findings (Ramachandran and Hirstein, 1998; Ramachandran and Blakelee, 1999) on the cortical mapping with amputees and his use of the 'mirror box' have highlighted the complex interaction of cognitive functions involved in phantom limb pain. His work shows the results of limb loss on cognitive function and the effect of visual feedback on the phantom limb.

Motor commands originating in the motor cortex travel to the muscles instructing them to perform a task. Information is returned in a feedback loop informing the brain that the task has been completed. Where a limb is absent and the phantom limb cannot be moved, this feedback does not take place. This may be due to the limb being immobile for some time prior to surgery or due to the limb not being moved following surgery. The brain learns that the limb is immobile and adopts a learned paralysis. Ramachandran's work found that lack of feedback to the somatosensory cortical map resulted in the area associated with the absent limb dying back and being overtaken by the areas on each side.

This lack of feedback has two implications for phantom limb pain. First, lack of feedback causes the motor commands to intensify with patients experiencing shooting pains travelling down their phantom limb. Second, feedback also serves as a damping process to stop commands. Many upper limb patients perceive their nails digging into their phantom hand due to lack of proprioceptive feedback.

Motor commands simultaneously inform the cerebellum and the parietal lobes which store the body image. Due to the absence of proprioceptive feedback and visual feedback from the absent limb the last information sent to the parietal lobe is of the limb in pain/trauma prior to surgery. Due to this lack of updated information the pain memory survives in the phantom limb. Any deformity in the limb can also be carried over into the phantom limb. The vividness of this pain is thought to be due to the attention/focus given to the painful limb prior to surgery.

Ramachandran's 'mirror box' used visualization originally to observe the effects on the somatosensory cortical map of an absent limb. The perception patients had of their phantom hand moving as a result of using the 'mirror box' showed re-activation of the areas on the cortical map. The phantom hand became mobile even where the limb had not moved for several years. The use of the 'mirror box' on a regular basis has shown to reduce phantom limb pain and telescope the limb making it impossible to have pain in a non-existent phantom. This telescoping is thought to be due to conflicting information in the parietal lobes between the lack of proprioceptive feedback and the visual feedback from the 'mirror box'.

Treatment for phantom limb pain

Treatments for phantom limb pain have been extensive with Sherman, Sherman and Gall (1980) reporting over 40 types of therapy. Pharmacological treatments are mainly tricyclic antidepressant and anticonvulsants. The most widely prescribed of these are Amitriptyline and Gabapentin. A recent study (Robinson et al., 2004) found no significant difference in

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depression between those taking Amitriptyline and those taking a placebo. Amitriptyline was not found to be effective in reducing phantom limb pain or residual limb pain.

A recent study on Gabapentin (Grady and Kulkarni, 2002) shows its effectiveness as a treatment for phantom limb pain. The study was carried out on 20 established lower limb amputees.

Where pharmacological intervention has failed to relieve pain, many patients are given surgical options. These can include dorsal root entry zone (DREZ) lesioning, ganglion blocks, dorsal column stimulators and deep brain stimulators. Complementary therapies are becoming more readily available to patients at the prosthetic centres. These include acupuncture, TENS machines, 'mirror box' and counselling.

Hypnosis and phantom limb pain

In 2002 Oakley, Whitman and Halligan reviewed the existing work including two case studies of their own. One treatment used included an ipsative/imagery approach, using the patient's representation of their pain and adapting this representation to alleviate their pain. The second treatment included a movement/imagery based approach encouraging the patient to move their phantom limb. Some cases used an imaginary 'mirror apparatus' to move the phantom while other studies moved the phantom limb freely.

Conclusions from this study emphasized the need for a large study using these two treatments, monitoring their effect over time. Initial results were promising and felt to be worth further investigation. The study also emphasized the need to treat the phantom limb as a real body part throughout the treatments. Telescoping or shrinking of the phantom limb occurred spontaneously in a number of cases. In common with Ramachandran's findings, this appeared to be associated with the end of phantom limb pain.

This treatment

Merskey (1994) learned that the effectiveness of various therapies for pain relief could be cumulative if used in combination. This applies to both psychological and pharmacological therapies. Melzack and Perry (1975) also found the same cumulative effect when using hypnosis and biofeedback. Each therapeutic procedure has a different effect on the different neural mechanisms which may explain the success of this multiple convergent therapy (Melzack and Wall, 1996).

The rationale behind this treatment is the use of multiple therapies that have already been shown to have some success. It was hoped that by combining these four therapies, a cumulative result will be achieved.

This treatment incorporates:

1. Hypnotic analgesia: As already stated, hypnosis for the relief of pain has been well documented. Hypnosis techniques and ways of working are numerous (Hammond, 1990; Jensen and Barber, 2000). Different approaches may need to be adopted to treat different experiences of phantom limb pain with each patient (Oakley et al., 2002).
2. Visualization and movement of an imaginary limb: Unlike Ramachandran and Blakeslee's study (1999) using the 'mirror box', visualization and movement of an imaginary limb are achieved using hypnosis. This produces movement of the phantom limb outside of hypnosis to facilitate pain relief.

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3. Psychological therapies: There are two instances when phantom limb pain can increase more than at any other time. One is where the patient has an infection and the second is where they are feeling anxious or stressed. Both of these situations are common in amputees. Hypnosis has been shown to improve mood and reduce clinical depression and anxiety and up-regulate the immune system (Gruzelier 2002), all of which benefit these patients in terms of their levels of phantom limb pain and their health issues. As a result of the fluctuations in emotional state of this patient group therapeutic interventions can play a large part in the reduction of phantom pain. Using hypnosis as a therapeutic tool allows cognitive interventions – for example, normalizing, reframing and ego strengthening – to be more actively taken up. Post-traumatic stress disorder (PTSD), which also has a high prevalence in this patient group, can be addressed at this time using counselling/hypnosis techniques (Hammond, 1990). The sensory, motivational and cognitive components of pain as outlined by Melzack and Casey are of particular relevance to this patient group due to the life changing nature of their surgery, the length and difficulty of the rehabilitation process and the implications of that rehabilitation for their future.
4. Self-hypnosis: Hammond (1990) emphasized the need for frequent reinforcement sessions when working with chronic pain and the importance of learning self-hypnosis as soon as possible. Self-hypnosis provides these patients with a self-management strategy giving them the control and mastery to counteract any feelings of low self-esteem and self-worth.

Method

Thirty-four amputees were referred for hypnosis for their phantom limb pain. Three showed cognitive impairment (2: learning difficulties; 1: alcohol problems) and 6 failed to attend after the first session. No hypnotic susceptibility testing was carried out, as these results were initially only recorded for auditing of this service.

The study was conducted with the remaining 25 amputees. Of these, eighteen were lower limb amputees and 7 upper limb. Ten were female and 15 male, with ages ranging from 27 to 78, with a mean of 57 years. They were referred by their rehabilitation consultant or by the post-amputation pain clinic after failing to get pain relief by various other interventions. All patients had been on medication for several years without successful relief. Most were on antidepressants and anti-epileptic medication and, as can be seen from Table 1, were on several different types of medication to help in the control of their phantom limb pain. All reported feeling that their quality of life was determined by their day to day pain levels.

The causes of amputation were: trauma, 13 (52%); vascular 10 (40%); and cancer 2 (8%). The mean duration of pain was 7 years 1 month; the median was 4 years with interquartile range (IQR) of 2 years 6 months and 11 years.

Patients were asked to make a commitment to attending for the 6 weekly sessions and to undertake self-hypnosis three times a day at home. At the first session patients gave a detailed description of their pain. This included thermal sensations, kinaesthetic sensation and pressure, and imagery of pain as outlined by Hammond (1990). Most patients had many different pains located at different points within the same phantom limb. Three patients reported that their phantom foot moved around clockwise at certain times. Information was also taken about the phantom limb, the length of the phantom limb, any distortion, its location in relation to their body and whether the phantom limb was mobile or static. The frequency of each pain was noted and the severity of individual

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Table 1. Previous treatments for pain

Interventions	Number of patients on medication
Tricyclic antidepressant	
Amitriptyline	15
Clomipramine	1
Anti-epileptics	
Gabapentin	13
Carbamazepine	7
Clonazepam	3
Tegretol	2
Nortriplyline	1
Opioid analgesics	
Morphine sulphate	2
Tramadol	2
Codeine	1
Buprenorphine	1
Dipipanone	1
Non-opioid analgesics	
Aspirin	4
Diclofenac	1
Ibuprofen	1
Co-codamol	1
Selective Serotonin Re-uptake Inhibitors (SSRI)	
Fluxetine	1
Skeletal muscle relaxant	
Zanaflex	2
Capsaicin	1
DREZ lesioning	1
Ganglion blocks	2
Dorsal column stimulator	2
Deep brain stimulator	1
Other therapies	
Acupuncture	3
TENS	4

pains were recorded using the VAS (visual analogue scale) where 0 = no pain and 10 = the worst pain.

Patients were then taken through an induction and relaxation which included calming, soothing and relaxing the nerves throughout the body, ego strengthening and self-hypnosis instruction. Following hypnosis patients were asked about their experience of hypnosis, and any modifications were made to assist them with their self-hypnosis practice. The second and subsequent session followed the same sequence.

The frequency and severity levels of the pain were documented at the start of each session using the VAS scale. The hypnosis consisted of three parts: hypnosis analgesia, exercise and therapy. Each session was adjusted and modified as the pains and issues of the patient altered. The following is an outline of a session.

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Dissociation of the pain from the limb

Following a simple induction patients were taken through a guided imagery of their choice (e.g. garden, wood, beach) to a healing pool. They were asked to enter the pool floating on the water in the middle of the pool or at the edge. The purpose of working in the water was to increase the sensory stimulation of the phantom limb. Patients were then asked to visualize the whole of the limb covered in a block of ice, 'like a plaster cast of ice'. They were asked to visualize each pain, being given suggestions but encouraged to make their own interpretation. Once the pain had been visualized they were asked to take this pain out of the limb and set it into the ice. This process was continued until every pain was in the ice.

Patients were then asked to send the warm healing water over the ice to melt it and 'as the ice gets smaller so the pain gets smaller' until the ice dropped into the pool and was carried away down the stream/channel of water to the sea, leaving them with a 'feeling of warm comfort where the pain used to be'. Patients with peripheral vascular disease (PVD) need to be in a cool healing pool and the ice needs to be frozen making it expand and crack 'just like ice on a lake in winter'. Using warm water on a patient with PVD has in some cases made their pain levels increase.

Exercise

As patients remained floating on the water they were asked to visualize a limb, but *not* their phantom limb because the last memory the brain had of the phantom limb was of it being in pain/trauma. Patients need to visualize a 'normal' leg/arm and as they watch this limb they see, for example, the toes curling up and straightening, the foot going up and down and rotating and the knee bending and straightening. This movement of a limb in hypnosis produces movement of the phantom limb outside of hypnosis. Following this visualization patients were asked to extend their pool and to take a swim, the emphasis being on using two arms and two legs and feeling the water moving over their limbs, and their limbs propelling them through the water pushing the water out of the way.

Therapy

While patients remained swimming, suggestions and post-hypnotic suggestions were made to reinforce the dissociation and the exercise. Ego strengthening was always included to motivate patients and empower them to maintain their self-hypnosis each day. Many patients were locked in depression or anger by their experiences of amputation, being affected by chronic pain and the multiple losses this involves. Sometimes normalizing their feelings and letting them know that fluctuating anger and depression are normal experiences following multiple traumas was helpful. At other times silent abreaction can help to release months or years of anger. In many cases re-framing is needed for patients who have been told by health professionals that they will have their pain for life. Whatever was mentioned by the patient, and was seen as a barrier to releasing the pain, was addressed at this point. The treatment may be as simple as standing under a waterfall and washing away anxiety and stress to more complex issues of PTSD which may need to be approached at another time.

Following the session the levels of pain were again documented along with any feedback about the hypnosis. Patients were taken through the main points of their hypnosis session to familiarize themselves with the techniques, enabling them to use these three times each day in their self-hypnosis. On completion of their hypnosis course patients were encouraged to continue with their self-hypnosis, reducing it when they were free from pain and had, on their doctor's instructions, reduced their pain medication.

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A questionnaire was sent out 6 months after the completion of treatment. It asked for the overall levels of pain before the start of their hypnosis treatment (baseline), after their final hypnosis treatment, and 6 months later. Pre- and post-pain levels were asked to determine whether their evaluation of pain levels had remained consistent over time. They were also asked if they had continued with their self-hypnosis, and what other benefits, if any, they had gained from their treatment.

Results

Statistics

Pain score data were collected by questionnaire at three time points and by clinical examination at two time points. The baseline and post-treatment scores were retrospective in the questionnaire, showing some difference in the memory of pain levels following their treatment. Three questionnaires were not returned. Since the pain score data were not found to follow a normal distribution, non-parametric tests were used throughout this study. Friedman matched samples and Wilcoxon matched-pair signed rank tests were used, as appropriate, to compare the pain scores taken at baseline, post-treatment and follow-up.

The improvement in pain post-treatment and at follow-up compared to the base pain level was also analysed between different subgroups. These were tested using Mann-Whitney U test or the Kruskal-Wallis test as appropriate. Spearman rho correlations were used to investigate relationships between changes in pain scores, pain duration and age.

Friedman matched samples tests were used to compare the mean ranks of the pain Scores (see Table 2). There had been a significant change in pain scores at baseline, post-treatment and follow-up for all the cases. The lower and upper limb subgroups also show a significant change, however, the small sample size in the upper limb subgroup means that the significance must be treated with care.

Comparison of each pain score was done using Wilcoxon matched-pairs signed rank test. The p-values have been adjusted using the Bonferroni correction to take the multiple comparisons into account. A significant change in pain scores occurred between baseline and post-treatment for all the cases and the lower limb sub-group, as shown in Table 3. Although the upper limb subgroup showed an overall significant change ($p = 0.032$), the post hoc pairwise comparisons show no significant change.

Comparison of each pain score by clinical examination was done using Wilcoxon signed ranks test. As can be seen in Table 4, there had been a significant change in pain scores for all the cases. The lower and upper limb subgroups also showed a significant change. However, the small sample size in the upper limb subgroup means that the significance must be treated with care.

Table 2. Pain scores by questionnaire

		Baseline		Post-treatment		Follow-up		
	Sample size	Median	Range	Median	Range	Median	Range	p-value
All cases	22	8	[7,10]	3	[0,8]	3	[0,8]	<0.001
Lower	17	8	[7,10]	3	[0,7]	3	[0,7]	<0.001
Upper	5	9	[8,10]	4	[2,8]	6	[1,8]	0.032

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Table 3. Pairs of pain scores by questionnaire

	Sample size	Base Post	Follow-up post	Follow-up base
All cases	22	<0.001	1.000	<0.001
Lower	17	<0.001	0.960	<0.001
Upper	5	0.204	1.000	0.186

Table 4. Pain scores by examination

		Baseline		Post-treatment		
	Sample size	Median	Range	Median	Range	p-value
All cases	25	8	[5,10]	0	[0,6]	<0.001
Lower	19	8	[5,10]	3	[0,5]	<0.001
Upper	6	8.5	[5,10]	1	[0,6]	0.027

Table 5. Improvement in pain as measured by questionnaire

			Post treatment: baseline			Follow-up: baseline		
		Sample size	Median	Range	p-value	Median	Range	p-value
Site	**Right**	16	4.5	[0,8]	0.22	5	[0,9]	0.48
	Left	6	8	[0,10]		6	[0,9]	
	Lower	17	5	[0,10]	0.5	5	[0,9]	0.23
	Upper	5	5	[0,7]		3	[0,7]	
Cause	**2**	9	4	[0,9]	0.44	5	[0,8]	0.09
	3	12	6	[0,10]		6.5	[0,9]	
	4	1	4	[4,4]		9	[9,9]	
Self-hypnosis	**Yes**	15	5	[0,10]	0.5	6	[0,9]	0.07
	No	7	5	[0,8]		4	[0,8]	

The questionnaire results were re-examined by clinical subgroup such as lateralization of the amputation, as well as the use of self-hypnosis. There were no significant differences in the baseline to post-treatment improvement in pain score comparing right with left sides, lower or upper limbs, cause of amputation or use of self-hypnosis (Table 5). Causes of amputation were vascular (2), trauma (3) and others (4). In the comparisons of improvements from baseline there were no significant differences in the pain subgroups, however, self-hypnosis shows a nearly significant difference ($p = 0.07$) in favour of self-hypnosis practice.

Null effects were also borne out by comparisons with the clinical examination pain scores (Table 6), where use of self-hypnosis showed no advantage.

Correlation coefficients (r) were calculated using Spearman's rho correlations and are shown in Table 7. These disclosed no significant association between age and any of the

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Table 6. Improvement in pain as measured by examination

			Post -treatment: baseline		
		Sample size	Median	Range	p-value
Site	**Right**	18	7.5	[2,10]	0.95
	Left	7	6	[4,10]	
	Lower	19	7	[3,10]	0.85
	Upper	6	6.5	[2,10]	
Cause	**2**	10	7.5	[4,10]	0.83
	3	13	7	[2,10]	
	4	2	8	[7,9]	
Self-hypnosis	**Yes**	15	8	[3,10]	0.35
	No	7	7	[2,10]	

Table 7. Improvement in pain scores

		By questionnaire				By examination	
		Baseline: post		Baseline: follow-up		Baseline: post	
	Sample size	R	p-value	R	p-value	R	p-value
Pain duration	22	0.346	0.11	0.493	0.02	−0.248	0.23
Age	22	0.147	0.51	0.011	0.96	0.009	0.96

improvements in pain score. There is a positive association between pain duration and the improvement in pain score between follow-up and baseline, ($r = 0.493$, $p < 0.02$).

Other findings

It was noted that after each session the phantom limb became more mobile which allowed patients to move the fingers/toes to reduce any pains that may return. One patient with a 'club foot' had never been able to move his ankle until, following his amputation, he received hypnosis for his pain. In most cases following each session the phantom limb telescoped; this tended to happen gradually over the 6 sessions. As the pain reduced, the limb telescoped.

Where the phantom limb was distorted, the first session of hypnosis, which dealt with the pain, usually corrected the distortion. One patient reported their phantom limb bent at the knee and out to the side as it had done when he was riding a motor bike. Following his hypnosis session the leg had straightened. Four of the patients in this study perceived themselves as walking on their phantom limb rather than on their prosthetic limb. One patient reported her phantom limb as turned inwards at the ankle which caused her to swing her prosthetic limb to the side to place it within her phantom limb. Following hypnosis these four patients experienced telescoping of their phantoms and experienced, for the first time, walking on their prosthetic limb.

Using hypnosis for the relief of phantom pain had a different effect on each patient's phantom limb pain. In some cases a patient's different types of pain reduced by the same degree at the same time; in others one type of pain reduced more quickly than another.

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Other benefits reported on the questionnaires were better sleep patterns and feeling more calm and relaxed. Many felt that the fear they had had of their pain had gone now that they were able to control it.

Discussion

It should be pointed out that this is a small study and that one or two patient's outcomes can dramatically alter results when numbers are so small. Many variables were tested to ascertain whether or not they were predictors of outcome. In all cases none were found to be significant. With a larger study this result may be different.

Three patients failed to return the questionnaire, one had moved out of the area and the other two were working away. Sixty-eight per cent of patients reported continuing with their self-hypnosis and whilst this was not found to be a significant factor in further pain reduction it may be sustaining the reduction until such time as it became established. Ramachandran advised patients to continue using the 'mirror box' for 6 weeks, which he found was needed to establish the reduction in pain.

Patients usually experience a lightness in their prosthetic limb and a release of pressure in the socket following their first hypnosis session. When the phantom limb straightens and/or telescopes, and because this happens within the hypnosis session, it can have an effect on their balance, their gait pattern and the alignment of their prosthetic limb, all of which could have been out of alignment previously as the patient makes adjustment to superimpose their phantom limb on their prosthetic limb. One patient had always tried not to put the heel of his prosthetic limb on the ground because his phantom heel was so painful. These findings need to be taken up by a physiotherapist and prosthetist enabling them to ask patients the right questions to elicit this information.

As the pain reduces the perception of the phantom limb reduces causing the phantom to telescope. This usually indicates that the pain will not return. Patients only feel the part of their phantom limb that is in pain or the areas that the shooting pains travel along. It is possible to have pain in a limb that is not there but not in a limb that cannot be perceived.

It is interesting to note that 52% of patients in this study had their amputations due to trauma when statistically trauma patients only make up 8% of the lower limb patients that attend prosthetic centres (NASDAB 2003/2004). This may bear out the evidence that phantom limb pain is more prevalent in patients that suffer with anxiety or stress. The fact that many trauma patients who become amputees are young people of working age can make their future adjustments very difficult.

Being able to relieve their own pain had a motivating effect on patients allowing them to take control of other areas of their life. Self efficacy and the relief from pain had given what one patient described as 'a new lease of life'.

This treatment has reduced the number of post-amputation pain clinics, it has reduced the number of appointments for pain-related issues with the rehabilitation consultants, and it has allowed patients to reduce some of the large amounts of medication they were on and the side effects that they cause.

This treatment is being continuously monitored and modified in the daily course of clinical work treating over fifty patients a year from around the country. In view of the nearly significant difference ($p = 0.07$) noted with regard to self-hypnosis, further monitoring is being carried out. Those who have used self-hypnosis following treatment are being compared with those using a personalized CD of their hypnosis. Other areas where neuropathic pain may be reduced with hypnosis are brachial plexus injuries and complex regional pain syndrome (CRPS).

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It is hoped that this paper will generate new avenues and ways of working adapting many techniques from outside hypnosis and incorporating them into a hypnosis framework.

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Address for correspondence:
Candy Bamford
Disablement Services Centre
Withington Hospital
Cavendish Road
Didsbury
Manchester M20 1LB
Email: candy.bamford@smuht.nwest.nhs.uk

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