

HYPNOSIS FOR REHABILITATION AFTER STROKE: SIX CASE STUDIES

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Abstract

This report presents qualitative accounts from a pilot clinical study of six chronic stroke subjects. Our hypothesis was that a hypnotic procedure would help overcome learned nonuse, which is thought to contribute to impaired motor function of the paretic upper limb in chronic stroke patients. The hypnotic procedure involved selecting motor tasks that would challenge each subject, then (1) imagined practice of the challenging motor task revived from prior to the stroke alternated with imagined practice in the present; (2) imagined practice in the present alternated with imagined practice during active-alert hypnosis; and (3) active-alert imagined practice alternated with actual physical performance. We observed qualitative improvements in motor function related to increased range of motion, increased grip strength, and reduced spasticity of the paretic upper limb. Subjects consistently reported an improved outlook, increased motivation, as well as greater awareness of and decreased effort to perform motor tasks with the paretic limb. Copyright © 2006 British Society of Experimental & Clinical Hypnosis. Published by John Wiley & Sons, Ltd.

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Introduction

Case reports documenting the use of hypnosis in conjunction with rehabilitation therapy after stroke date back to the 1950s (Shires, Peters and Krout, 1954). These reports describe improvements in paretic limb function (Chappell, 1964; Crasilnech and Hall, 1970; Manganiello, 1986), strength and range of motion (Vodovnik, Roskar, Pajntar and Gros, 1979; Holroyd and Hill, 1989) and tolerance of therapy (Appel, 1990). Hypnosis in this context typically involves suggestions from the hypnotist to the subject for imagined movements. A hypnotic procedure is used to encourage and evaluate responses to suggestions (Green, Barabasz, Barrett and Montgomery, 2005). This served as our operational definition of hypnosis.

Previous reports of success with hypnosis applied to stroke patients led us to hypothesize that a hypnotic procedure would help overcome a learned behavioural suppression, referred to as 'learned nonuse', which has been proposed to limit functional use of the paretic limb in chronic stroke patients (Taub, Miller, Novack, Cook, Fleming,

Nepomuceno, Connell and Crago, 1993). Based on our initial hypothesis, we conducted a pilot clinical study that included a hypnotic procedure with measurements of motor function and brain activity (Diamond, manuscript in preparation). The present report provides qualitative observations from the hypnotic procedure conducted during this pilot clinical study.

Six subjects (see Table 1) with a unilateral stroke that resulted in upper limb paresis participated in this Institutional Review Board approved study. Subjects were recruited through the outpatient services of Massachusetts General Hospital and Spaulding Rehabilitation Hospital. For inclusion, the stroke must have occurred at least six months prior to participation in the study so that little or no spontaneous recovery was expected (Wade, Langton, Hewer, Skilbeck and David, 1990). All subjects were right hand dominant prior to having a stroke, medically stable, and cognitively competent based on scoring at least 24 on the Mini-Mental State Examination (Folstein, Folstein and McHugh, 1975). As a group, these subjects were relatively young (mean age 49.5). The hypnotist, Dr. Diamond, studied hypnosis at the Hypnotherapy Training Institute (Corte Madera, CA) and was a certified member of New England Society of Clinical Hypnosis at the time. The experimental protocol involved four sessions to establish baseline motor function followed by four sessions of the hypnotic procedure. Four follow-up sessions were conducted to track changes in motor function post-intervention. The hypnotic procedures were approximately one hour in duration, and occurred with a frequency of once or twice per week.

The hypnotic procedure comprised three stages. The first stage involved selecting a motor task that could be performed prior to the stroke but was currently impaired. Following the hypnotic induction, subjects alternated between imagined practice revived from prior to the stroke and then imagined practice in the present. This stage aimed to transfer imagined execution of the task into the present hypnotic state. The second stage involved having subjects imagine performing the task with eyes opened alternating with eyes closed. The aim of this stage was to transfer successful imagined performance to an active-alert hypnotic state. When a high level of confidence resulted from perfect imagined task performance, subjects were shifted to the third stage which alternated imagined practice with physical performance.

Table 1. Subject demographics

Subject number	Age	Gender	Side of hemiparesis	Months post stroke	UE-FM	HIP
1	51	Male	Left	26	43	10
2	45	Male	Left	34	17	12
3	63	Female	Left	39	4	7
4	39	Male	Right	6	21	7
5	47	Male	Right	30	57	12
6	52	Female	Left	79	6	11

Note: Overall motor function of the paretic upper limb was established with the upper extremity component of the Fugl-Meyer standardized test (UE-FM) (Fugl-Meyer, Jaasko, Leyman, Olsson and Steglind, 1975). A UE-FM score of 66 is expected for normals. Hypnotizability was assessed with the Induction Score of the Hypnotic Induction Profile (HIP) (Speigel and Speigel, 1978). An HIP induction score of 12 indicates maximum hypnotic responsiveness.

Strong rapport with the stroke subjects was essential. This was established by empathizing with their emotional associations regarding the initial stroke event and its aftermath, and by validating the importance of their personal and professional contributions to society. Rapport was furthered both by carefully tuning the motor tasks to the subjects' abilities, and by tailoring the suggestions and imagery to positive emotional associations from their pasts. This approach balanced expectancy with attainable goals such that even a small physical success ratified the process and created strong personal investments.

The progressive three-stage hypnosis procedure and strong rapport established new patterns of successful motor learning. The hypnosis procedure also enabled subjects to accept transitory deficiencies in motor task performance and to return to a previously successful stage when necessary. During the study, we observed apparent improvements in range of motion, strength and evidence of reduced spasticity of the paretic upper limb. Subjects consistently reported greater awareness of the paretic limb and an improved outlook. Importantly, these benefits of the hypnotic procedure were retained at the follow-up sessions.

Subject 1

The first subject used to be the captain of a large ship prior to having a stroke. His passion for this job was one of the driving factors in his endeavour to recover as much functional ability as possible. Although his general level of recovery was good, he complained of a lack of dexterity to perform most tasks with his left hand and described it as a club. Progressive relaxation was used as a hypnotic induction because the subject related easily to its strong physical component. The hypnotic deepening techniques involved working on the ship on a perfect day with nice weather, a light chop on the water and no shipping traffic nearby.

He visualized entering his office on the ship, the place chosen for the imagined practice of hand movements, and then established a set of ground rules: maintain a positive outlook; allow distractions to pass by without affecting concentration; relax into the moment; suspend judgment; accept any outcome that occurs. With these guidelines in place, he proceeded to count out money for the week's payroll, a task that requires considerable bi-manual dexterity, during which the subject occasionally used the phrase, 'countin' the money'. This phrase was adopted as an anchor that the subject was instructed to repeat whenever the task felt most natural and automatic.

Next the subject was instructed to imagine performing sequential opposition of the thumb to each finger, first on the right hand, and then on the left. He did this with ease on the right side, but was unable to do it at all on the left. He was then instructed to repeat the key phrase and proceed to cycle back and forth between imagined practice on the right and on the left. This process enabled the subject to achieve perfect imagined performance of the sequential finger opposition task.

Afterwards, the subject was told to imagine performing the task while watching each of his hands in turn. It was again difficult to imagine performing the task on the left side. The key phrase was used again with cycling between eyes-closed and eyes-open imagined practice until he achieved perfect imagined performance with his eyes open. Then, he was asked to perform the task physically, and a similar process ensued that culminated in the subject touching his thumb to his ring finger for the first time since his stroke.

At the start of subsequent hypnosis sessions, the range of motion for the subject's thumb remained improved from baseline but not as significantly as immediately after

the hypnotic procedure. On the fourth hypnosis session, the subject came in and announced that he was practising the visualizations on a daily basis and that he had tied his own shoelaces for the first time. He remarked that, 'When my doctor told me that I reached 99 percent of recovery, I just gave up. Now I feel like I am making progress again'. Upon being asked to describe what was different after hypnosis he explained, 'When I do it perfectly, there's no thinking, it just happens. It's just a relaxed reaction'.

Subject 2

Subject 2 used to work in a biology research lab and enjoyed riding a motorcycle prior to his stroke. Having a moderate level of recovery after stroke, he walked with an ankle brace but was unable to use his paretic limb for functional tasks. His primary complaint was that his paretic limb would tense up during movements and require manual opening and stretching to relax. Progressive relaxation was chosen as an induction technique, and imagery of relaxing while floating on the water of a favourite lake was used to deepen the hypnotic state.

The imagined task of operating motorcycle controls was used with limited success. While the subject enjoyed the visualizations, the imagined practice did not translate into physical improvement as easily as with Subject 1. More attention was given to the relaxation imagery at the lake; the subject observed that muscle tension was noticeably reduced by the imagery of floating on the water. To pursue this observation further, the subject was instructed to perform a series of elbow bends prior to hypnosis and then again immediately after hypnosis. The jerkiness that occurred during the pre-hypnosis elbow bends practically vanished after hypnosis. The subject reported maintaining the floating sensation in his mind while actually performing the task. This evidence of reduced spasticity was reproducible during subsequent sessions.

After a number of hypnosis sessions, the subject reported increased sensation in his hand. He commented that, 'Hypnosis releases tension and removes distractions' and that, 'practising after hypnosis enables me to incorporate new sensations and strategies'. The subject elected to practise the visualizations every evening and found that it both relaxed him and put him in a better mood during the following day. He also reported using less effort to squeeze his hand and said that he is better able to feel the muscles release. Even though there was no change in functional use of his paretic hand, the subject reported gaining a sense of value for his paretic hand, which he previously considered to be only an encumbrance.

Subject 3

Subject 3 loved reading and family and was passionate about the village where she grew up. She had the most severe physical impairment of the subjects in this study, having almost no ability to move her paretic limb and requiring the use of a wheelchair. Eye-fixation and downward counting were used for the hypnotic inductions. Visualization of walking up a favourite twisting path was used for hypnotic deepening, with instructions to notice every detail, from the smells in the air to the way the pebbly stones on the path crunched under her feet.

She remarked feeling disconnected with her left side, 'like it was numb', and said that it was easier for her to grip with her left hand when visually fixating on her hand. Initial hypnotic suggestions called for increased awareness and connectivity with her paretic

limb. Subject 3 was very self-directed with the hypnotic imagery, and when asked what she was imagining, she described, 'I can see grey wires inside my arm that connect to my hand. The wires are a tangled up mess and I can't tell what goes where'. When untangling the wires became too difficult, suggestions were given to colour the wires one at a time and to add labels indicating which wire went to which finger and so forth. The subject reported feeling increased awareness of her hand after this process. During another hypnosis session she imagined the wires in her arm again but sent green keys down the wires to 'unlock' her fingers and then red keys back up to her brain when it was time to stop a movement. Measures of her maximum hand grip force showed dramatic increases following the hypnosis sessions (See Figure 1).

When asked about the changes during hypnosis, she said, 'I respond to how my arm is responding' and further described this as 'going with the flow'. She reported more awareness of her thumb movements and reduced numbness. She realized that her mind often wandered when using her left hand and that hypnosis helped her maintain focus.

Subject 4

Subject 4 was a physicist who also had 30 years of experience playing the cello and was passionate about music. His level of recovery was moderate; he walked with an ankle brace and was able to perform gross movements with his paretic limb. Eye-fixation combined with progressive relaxation was used as the induction. Imagery from a vacation house was used for hypnotic deepening. The imagined task of playing a phrase on the cello was chosen because he had a significant amount of experience bowing with the paretic limb. Visualizations focused on fluid movement of the bow, graceful slurs, and bow changes, and the anchor words 'precise and relaxed' were used. The subject found that imagining the sound that emerged from proper movement was more natural than visualizing the movements themselves.

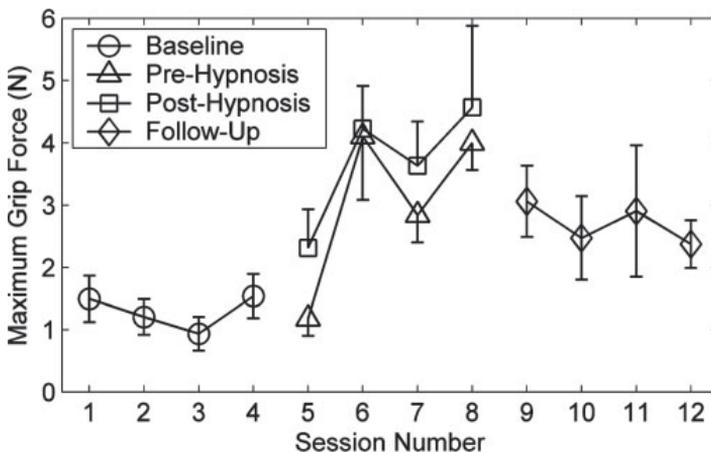


Figure 1. Maximum grip force measurements from Subject 3. Each data point represents the average of 12 grip force trials with standard error indicated. Two-sample *t*-tests with pooled variance on the mean grip force across sessions relative to baseline ($df = 6$) were significantly different for pre-hypnosis ($t = 2.50$, $p < 0.05$), post-hypnosis ($t = 4.64$, $p < 0.01$) and follow-up ($t = 6.47$, $p < 0.001$).

While the subject found that imagined practice on the cello was enjoyable, actually performing the movements was a significant emotional challenge and he reported a sense of loss and regret when bowing. This turned out to be the first time the subject allowed himself to focus on his cello since having a stroke. The subject chose not to change the task, but rather to spend more time on the imagined practice and to select music that he could bring to logical completion during the short practice intervals. He described the imagined cello practice as a process of emotional expression through story. 'The music is always the same book but the story is different every time it is played'.

In time, the physical practice of bowing movements became more enjoyable, just like the imagined practice. The subject also elected to practice at home and felt that his paretic limb extension was improving. There were clear improvements by the end of the study, such as regaining the ability to pick up cans and to form a precision grip.

Subject 5

Subject 5 was a restaurant manager prior to his stroke, was passionate about his family, and loved sports. He walked without assistance and could use his paretic limb for non-dexterous functional tasks. He complained of a less-than-full range of motion in hand and wrist movements and the low endurance of his paretic limb. Eye-fixation and progressive relaxation were used for hypnotic induction. His preferred imagery for hypnotic deepening was descending an elevator in a luxury hotel and then heading out of the lobby onto the beach where he watched the clouds go by.

The subject chose the motor task of dribbling a basketball, and elected to practise the basketball visualizations at home where he could use an actual basketball for the physical practice. He returned at the next session reporting that he could bounce a ball about 10 times when before he could achieve only 1 or 2 bounces. When asked about the effects of hypnosis, the subject said that the hypnosis during the study sessions resulted in a high-intensity concentration that he could not achieve when practising on his own. Improvements were observed in the range of motion of wrist rotation and finger extension.

Subject 6

Subject 6 loved to visit a secluded rocky beach with her husband where they would watch the waves break and dance through the rocks back to the ocean. Her professional career was interrupted by a severe stroke from which she was not expected to survive. The love of her family and laughing in the hospital carried her through those early days, and during the following months at home she cultivated a zealous passion for the Boston Red Sox.

Following the advice of her therapist, she focused the majority of her time and energy on regaining the ability to walk, but at the expense of her paretic upper limb. At the time she found all the exercises to be very fatiguing and said that her therapists, 'pretty much discouraged me from practising with my hand because they said it was futile with my high muscle tone'. She felt that it came down to a simple choice: 'Either you accept the disability or fight it, and fighting became so frustrating that eventually I just gave up and decided to ignore my arm. I'm not sure now that was such a good idea'.

An early consideration for mental practice was playing the piano because the subject had many years of experience with the instrument prior to her stroke. In this case, however, the subject decided that a motor task based on the piano was emotionally too painful and instead she chose a hand grip motor task. Initially, the subject was unable

to imagine good performance with her paretic hand. Following the hypnotic procedure, her performance on the task steadily improved. By the third hypnosis session, it was also noticeably easier to remove the grip from her hand, possibly due to decreased spasticity. On the last day of the study, the subject reported feeling encouraged to restart the daily stretching and exercises with her paretic limb that she had abandoned years ago.

Discussion

Among the major effects of the hypnotic procedure were increases in range of motion, increased strength, and evidence of reduced spasticity of the paretic upper limb. These changes were retained at follow-up sessions and were achieved despite there being no expectation of spontaneous recovery so long after the stroke event. Subjects also consistently reported an improved outlook, increased motivation, greater awareness of the paretic limb and decreased effort to perform motor tasks with the paretic limb. These qualitative observations support the hypothesis that a hypnotic procedure may counteract learned non-use of the paretic upper limb after stroke and warrant further investigation.

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References

- Appel PR (1990) Clinical applications of hypnosis in the physical medicine and rehabilitation setting: three case reports. *American Journal of Clinical Hypnosis* 33: 85–93.
- Chappell DT (1964) Hypnosis and spasticity in paraplegia. *American Journal of Clinical Hypnosis* 35: 33–6.
- Crasilnech HB, Hall HB (1970) The use of hypnosis in the rehabilitation of complicated vascular and post-traumatic neurological patients. *International Journal of Experimental Hypnosis* 18: 145–59.
- Folstein MF, Folstein SE, McHugh PR (1975) Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* 12: 189–98.
- Fugl-Meyer AR, Jaasko L, Leyman I, Olsson S, Steglind S (1975) The post stroke hemiplegic patient: I. a method for evaluation of physical performance. *Scandinavian Journal of Rehabilitation Medicine* 7: 13–31.
- Green JP, Barabasz AF, Barrett D, Montgomery GH (2005) Forging ahead: The 2003 APA division 30 definition of hypnosis. *International Journal of Clinical and Experimental Hypnosis* 53: 259–64.
- Holroyd J, Hill A (1989) Pushing the limits of recovery: hypnotherapy with a stroke patient. *International Journal of Clinical and Experimental Hypnosis* 37: 120–8.
- Manganiello AJ (1986) Hypnotherapy in the rehabilitation of a stroke victim: a case study. *American Journal of Clinical Hypnosis* 29: 64–8.
- Shires EB, Peters JJ, Krout RM (1954) Hypnosis in neuromuscular re-education. *U.S. Armed Forces Medical Journal* 5: 1519–23.
- Speigel H, Speigel D (1978) *Trance and Treatment: Clinical Uses of Hypnosis*. Basic Books, New York.
- Taub E, Miller NE, Novack TA, Cook EW, Fleming WC, Nepomuceno CS, Connell JS, Crago JE (1993) Technique to improve chronic motor deficit after stroke. *Archives of Physical Medicine and Rehabilitation* 74: 347–54.

Vodovnik L, Roskar E, Pajntar M, Gros N (1979) Modeling the voluntary hypnosis-induced motor performance of hemiparetic patients. *IEEE Transactions on Systems Man and Cybernetics SMC-9*: 850–5.

Wade DT, Langton Hewer R, Skilbeck CE, David RM (1985) *Stroke: A Critical Approach to Diagnosis, Treatment, and Management*. Chicago: Year Book Medical Publishers.

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