

PREVENTING INJURIES IN GUITARISTS

FOCAL HAND DYSTONIA

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Dystonia is a syndrome where involuntary prolonged muscle contractions can lead to sustained twisting postures.^{1,2,3} If symptoms start before 28 years of age the dystonia is classified as 'early onset', but if they start after 28 years of age it is classified as 'late onset'. Dystonia can be further categorised into primary dystonia, where there are no obvious effects on the brain, or secondary dystonia, where a part of the brain (the basal ganglia) may be affected.

Symptoms can be:

- 'General', where symptoms manifest in all extremities
- 'Hemi', where symptoms are focused on one side of the body
- 'Segmental', where a section of the body is affected, or
- 'Focal', where a single body part is affected.

Any part of the body can be affected by focal dystonia, including the neck, eyelids, vocal cords or hand.^{4,5}

In this article we will look at focal hand dystonia (FHD), a late-onset, primary dystonia that is often task-specific and includes musician's and writer's cramp (Fig 1).

Focal Hand Dystonia In Musicians

FHD in musicians is a primary dystonia that is painless and is usually task-specific, focal and of late onset. Symptoms can include lack of coordination, cramps and tremors.⁶ They tend to be specific to each individual and related to the instrument played.



Fig 1. Task-specific action-induced focal hand dystonia has different forms, including musician's dystonia, which can affect the hand and embouchure (a), and writer's cramp (b).

Patients can respond to sensory tricks, and if they do, this is usually a good indicator of how successful hand therapy will be. Sensory tricks can be used to 'fool' the brain and give a 'nonsense' message to the brain. This breaks the fixed message for a short time.^{4,7,8} Often the novelty will not be effective for long and the brain recalibrates to the automatic dystonic pattern. Coban, Blu-Tack, latex gloves and splints can all be used as sensory tricks (Fig 2).

It's estimated that 2–10% of professional musicians have focal hand dystonia,^{9,10,11} which is higher than the 0.1% of writer's cramp sufferers in the general population.¹² FHD is overwhelmingly more common in classical than in pop, rock or jazz musicians. The high percentage of FHD in this population reflects the specific demands of continuous repetition made upon them. Musicians who suffer from focal hand dystonia may be genetically predisposed to developing this

condition, and then excessive playing or overtraining may bring it on. Ongoing work to identify abnormal genes in patients with focal dystonia continues and results of further studies are eagerly awaited.

Who Develops FHD?

Many factors can 'trigger' the development of FHD in musicians, such as a sudden increase in playing time, change in technique, return to playing after a long break, trauma,



Fig 2a. A plastic splint being used as a sensory trick.

history of nerve entrapment, psychological aspects or change of instrument. Repetitive movements can induce stereotypical feedback messages, which lead to disorganisation in the area of the brain that controls hand movement (sensory cortex) and a failure in coordination between sensory and motor messages to and from the brain (sensorimotor integration). This can lead to uncoordinated movement (Fig 3).

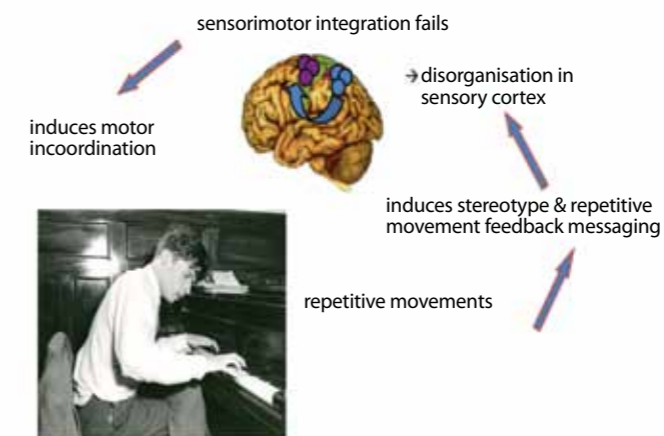


Figure 3: Byl model of focal hand dystonia in humans showing impairment of the sensorimotor feedback loop.

Treatments

At present there is no 'cure' for dystonia, and many of the treatments available have significant limitations. Current treatments include oral medication, Botulinum toxin injections, surgery, rehabilitative therapies and supportive approaches. Butler and Rosenkranz^{13,14} published two papers that clearly outline many of the treatments that have been researched and trialled with patients who are affected by FHD.

The rehabilitative approaches include:

- Sensory re-education
- Sensory motor retuning (SMR)
- Slow-down exercise therapy (SDET)

- Multi-disciplinary approach
- Limb immobilisation
- Supportive approaches

In this paper some of the more commonly used treatment techniques and current research findings will be explored.

Sensory Re-education

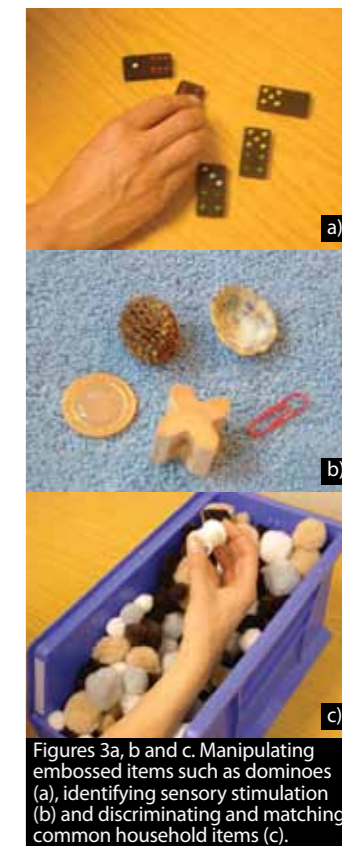
Repetitive motions can induce plasticity changes in the sensory cortex, which may degrade the hand representation and interfere with motor control.^{15,16} Using sensory training to treat patients with FD is raised through this research. Sensory re-education programmes facilitate and positively influence

the relearning process and improve function. Sensory discrimination training is taught as part of the home exercise programme.^{17,18,19} However, the same number of repetitions that lead to the disorder may be required to restore the hand representation, so cooperation is essential when using this treatment technique.^{15,16}

To facilitate normal sensation and perception, and reinforce hand function, patients are asked to visualise healing, imagine normal sensory processing, motor control and task execution. Byl expects patients to complete 1–2 hours a day of sensory discrimination activities at home.¹⁷ These activities can include: matching objects/shapes or textures, braille reading, or identifying and manipulating common household objects with vision occluded (Figure 3a, b and c).

Zeuner et al²⁰ report on their studies of the efficacy of learning to read Braille as a method of sensory training for patients with focal hand dystonia. The authors conclude that training in Braille reading improves spatial discrimination and decreases the level of disability in patients with focal hand dystonia. They also show that sensory training lasting longer than eight weeks may lead to continued improvement.²¹

Rosenkranz et al²² present proprioceptive (awareness of where your body is in space) training as a sensory intervention in order to assist in increasing control of movements while



Figures 3a, b and c. Manipulating embossed items such as dominos (a), identifying sensory stimulation (b) and discriminating and matching common household items (c).

playing the piano. The authors conclude that proprioceptive training applied for only 15 minutes significantly restored the pattern of sensory motor organisation in musicians' dystonia and improved motor performance on the piano objectively and subjectively for up to 24 hours. This intervention is a highly promising tool for rehabilitation and it is hoped that further investigations into this exciting treatment technique can continue.

Sensory re-education is a treatment technique used at London Hand Therapy and many patients respond well to it. Careful explanation and massive amounts of encouragement are required for a patient to continue with this treatment technique long enough for the sensory changes to occur and for the effects to be noticed while playing their instrument.

Sensory Motor Retuning (SMR)

The 'compensating' finger is fixed in a splint while the 'dystonic' finger carries out exercises.²³ These exercises are completed under supervision and involve one or more of the other digits to

exercise for up to 2.5 hours per day for eight consecutive days.^{24,25}

It is believed that SMR produces functional improvement associated with neuronal reorganisation. Candia et al²⁴ present results of 11 professional musicians who took part in a prospective case series that had a follow-up comparison group of 3–25 months for piano and guitar subjects and 0–4 months for oboe and flute subjects. SMR was seen as being a valuable treatment technique for pianists and guitarists as each patient displayed improved performance without the splint. Treatments that alter movement patterns may provide assistance to patients with FHD.

Slow-Down Exercise Therapy (SDET)

An exercise called 'slow-down movement therapy' (SDET) that Sakai²⁶ presents, works very well with guitarists, even though the initial research was performed using pianists. The therapy follows these five steps:

- The patient chooses a piece of music that causes a dystonic hand movement.
- The performance speed is reduced until there is no dystonic movement evident and the metronome marking is noted.

- At this slow tempo the patient rehearses the piece for half an hour per day for two weeks and is allowed to play other pieces freely.
- After two weeks the speed is increased by 10%. If symptoms do not appear with this increase in speed the patient proceeds to practise for an additional two weeks at this tempo. If the dystonic movement does reappear then the speed is decreased.
- After two weeks the speed is gradually increased again by another 10%, and the programme continues.

SDE therapy teaches a patient to reduce the speed of movement below the level where memories and emotions associated with dystonia exist. Movement patterns are then retrained. This treatment technique is utilised in the clinic setting with great effect. Many patients find it encouraging being able to play their instrument freely when not doing the slow-down exercises and appreciate mapping their progress by looking at the metronome markings.

Hand Therapy & The Multi-disciplinary Team (MDT)

No single treatment modality seems to be effective for the



Fig 4a. Blocking splints made of plastic.

treatment of FHD. When treating musicians an MDT approach can be very helpful and necessary. This team will frequently include: the musician, neurologist, hand therapist, music teacher, instrument maker and psychologist.

MDT treatments can include traditional hand therapy modalities, encouraging rest, psychological support, modifications to the instrument, Alexander technique or Feldenkrais therapy, mirror treatment techniques and retraining the whole body and associated movement patterns. A brief outline of each of the above treatments will follow.

Traditional hand therapy modalities include splinting (Figure 4a, b and c), adaptive devices, heat, ice, exercise, strengthening, rehabilitation and preventative measures against

the development of FHD. Soft-tissue massage may be required to decrease muscular tension. Education and liaison with the teachers and other members of the MDT are integral.

Dystonic movements occur predominately while performing perceptual motor tasks involving emotion. There is difficulty changing emotional and motor traces that have become associated, and this may lead to preservation of dystonic symptoms. Emotional support or referral for professional help may be necessary for some patients.

Modifications to the instrument may assist in decreasing symptoms through eliminating postural triggers (Fig 5). Modifications could include: changing to a smaller instrument, altering location of thumb on neck of instrument or altering tension or type of strings. Playing positions can also be changed, ie standing up, kneeling or lying down to play.

Feldenkrais and Alexander techniques can help patients gain awareness of control, with simple movements being practised and then more complex patterns being introduced once muscle activity and relaxation have been learnt.²⁸

Chamagne²⁹ particularly focuses on increasing shoulder control. I use arm-swinging



Figs 4b and c. Splints can assist in retraining movement patterns and can block movements or act as a sensory trick.²⁷

exercises in the clinical setting frequently and integrate them into the patient's home exercise programme, and many people report these as being very effective and helpful.

Mirror treatment techniques were first used with patients suffering from phantom limb.³⁰ When using this technique with dystonic patients, instant visual feedback with mirrors can help patients recognise dystonic and non-dystonic movements. The mirror is positioned so the musician can see the uninjured hand looking like the injured one. The illusion is created and the brain thinks there is activity in the injured hand.³¹ It is very useful to use this technique with pianists in particular, as both hands are performing similar motions. This technique is not so easily translated to instruments such as the guitar as the hands perform such different movements. However, this technique can be useful in retraining basic movement patterns in guitarists and is used frequently within the clinic setting to assist guitarists in

retraining hand movements away from the instrument.

Prevention Is Better Than Cure!

Animal studies show that highly repetitive motor movements contribute to disorganisation in the area of the brain that controls the hand.

Protect yourself:

- Vary the speed and force of repetitive movements.
- Maintain your instrument in top playing condition to reduce excessive energy outlay.
- Intersperse practice with other activities.
- Control stress and anxiety before a performance and practice sessions.

Conclusions

The mechanisms by which FD develops in musicians need to be identified. Treatment must assist in re-establishing the link between sensory and movement control and commands. A comprehensive therapy and home exercise programme with sensory re-education as



Fig 5: Instrument modifications can include using supports that alter the position of the guitar, and this can lead to a change in arm and hand positions that may assist in decreasing postural triggers.

a focus can improve sensory processing and motor control of the hand. SMR, slow-down exercise therapy, and hand therapy techniques are of value when treating FD in guitarists. A whole-body approach must be adopted when treating this patient group and regular review and assessment of the musician

playing their instrument is essential. Scientific research investigating preventative measures and appropriate treatments for FHD is essential. Collaboration and an MDT approach to prevention, treatment and research are imperative and will benefit all.
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