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The effects of pianistic retraining via video conferencing as a means of assisting recovery from focal dystonia: A case study

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Focal dystonia (FD) is a devastating neurological condition that can result in the loss of a musician's playing ability. In pianists, involuntary muscle contractions can cause abnormal finger postures, making it impossible to play at concert level. It is a difficult condition to treat, and although some improvement has been reported with Botulinum toxin therapy, complete recovery is rare. Our study investigated whether retraining with the aid of video conferencing could be helpful in the treatment of a professional pianist resident in the UK with a six year history of focal dystonia. Quality of scales was assessed before and after pianism retraining and included assessment by a listener blinded as to which hand was dystonic and whether they were assessing playing pre- or post-retraining. Although full recovery was not seen, improvement was observed at slow tempi and the hand was visibly less cramped as training sessions progressed. We conclude that video conferencing could be an acceptable medium for pianistic retraining in pianists with FD when location prevents onsite retraining. However, in this study it did not seem as effective as one-to-one retraining in the same location.

Keywords: focal dystonia; pianism; piano technique; retraining; video conferencing

Focal dystonia is usually painless and most commonly affects only one hand, often involving involuntary flexion of just two or three specific fingers. The incidence may be as high as 1% of all professional musicians (Jabusch and Altenmuller 2006). In focal dystonia, the areas in the brain responsible for

the movement of adjacent fingers have become enlarged, due to overuse, and can "overlap" (Elbert 1998). Treatment options have included administration of Trihexyphenidyl or Botulinum Toxin-A, splinting, and limb immobilization, but only exceptionally do musicians with focal dystonia return to normal motor control (Altenmuller and Jabusch 2007). Different methods of retraining alone without the above medical interventions have reported anecdotal success, but few have applied scientific method. We have previously reported successful treatment of FD with intensive one-to-one pianistic retraining without the use of Botulinum Toxin. The aim of the present research was to see whether it is possible to improve the condition of a pianist suffering from FD through pianistic retraining using the medium of video conferencing.

METHOD

Participants

A 65 year old male professional pianist with a five year history of FD affecting digits 3-5 (D3-5) of his right hand participated in a specific retraining program based on a biomechanically sound way of playing with minimal tension through the medium of video conferencing. Subject characteristics are shown in Table 1.

Materials

The following equipment was used: video conferencing facilities, two fixed and two mobile cameras, and two pianos.

Procedure

The subject underwent pianistic retraining using video conferencing technology. A collaboration was set up between the University of Auckland and the Royal College of Music, London. In each location, two cameras were used: one fixed and one mobile. Scales and test repertoire were recorded at the commencement of the study, after ten sessions within three weeks, and then after a further ten follow up sessions within the next year. The sound only of three different scales and a diminished seventh arpeggio at tempi ranging from 60-144 bpm (quarter note) was assessed by a professional pianist (the "blinded listener"), blinded to which hand was playing and whether the playing was pre-, post-ten sessions, or at the end of the retraining process. The assessment used a Scale Quality Evaluation (SQE) and a Dystonic Hand Identification Evaluation (DHIE) where the listener was asked to identify

Table 1. Subject characteristics.

Characteristic	*Data*
Age	65 years
Sex	Male
Level of performance	Professional soloist
Years of playing	60
Duration of dystonia	Six years
Hand dominance	Right
Hand affected	Right
Digits affected	D3-D5

whether the hand playing was dystonic or not. The above evaluation scales have been previously described by the author (de Lisle *et al.* 2006). Statistical analysis was carried out using Generalised Linear Models in SAS v9 for Windows. Estimates are the change in SQE from the initial assessment to the end of the three week 10 session end point or the end of one year endpoint. Seven months following commencement of retraining the author had two face-to-face retraining sessions with the subject in London, but otherwise all training sessions were carried out via video conferencing.

The subject had been used to playing with a very curved hand position and had trained using finger independence exercises involving antagonistic muscle movements simultaneously (e.g. Pischner exercises). The excessively rounded hand position had caused the subject to play at the edge of the white keys with the thumb over the key surface, and D2-5 rarely played between the black keys. An ascending scale passage revealed radial deviation and any upward movement of the wrist caused D3-5 to curl excessively. Descending scale passages involved shoulder abduction when crossing over the thumb, causing the elbow to elevate away from the body and the hand and wrist to pronate while pivoting on the thumb. Therefore, the initial aim was to lower the wrist and to use a flatter hand position and play with fingers less flexed. In scale passages, the subject was instructed to avoid lifting the wrist when passing over the thumb and instead to ride forward on D3, moving the arm toward the fall of the piano.

Particularly challenging was any tremolo movement using rotation, where D5 became stuck to the keys and the wrist would flex excessively. The subject had a lack of freedom in forearm rotation and tended to direct the movement from the wrist. This was corrected by reducing wrist palmar flexion and in-

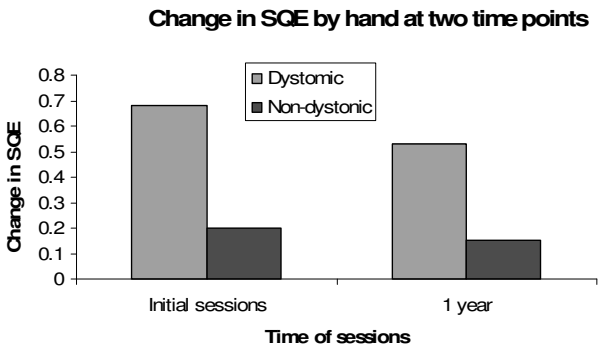

Figure 1. Change in SQE by hand at two time points.

creasing the rotation of the forearm (pronation and supination). Lifting the fingers simultaneously from the metacarpophalangeal (MCP) joints was problematic when pivoting on D2 because D5 tended to lag behind the other fingers and this was given as a specific exercise. This lagging was also apparent in descending scales but could be prevented if the movement of crossing over the thumb was directed from D5 without flexing the wrist. In ascending broken chord playing, passing from D5 to D1 caused excessive curling of D5, but this was preventable at a slow tempo by actively extending D5 away from the cramping movement. Passing from D2-D3 caused cramping of D5, but this could be prevented by a downward convex movement of the wrist to align the fingers with the keys. Chord playing using D1,3,5 was difficult, but D1,4,5 was accomplished with ease.

RESULTS

The analysis showed a significant improvement of the SQE from the pre-assessment to the point in time of the three week, 10 session intensive retraining of 0.46 points [95% CI=(0.11,0.81), p=0.01], after controlling for dystonic/ non-dystonic hand, this effect remained statistically significant. An analysis of the effect by hand showed a small non-significant improvement in the non-dystonic hand of 0.20 points [95% CI=(-0.13,053), p=0.23], while the dystonic hand showed a statistically significant improvement of 0.68 points [95% CI=(0.20,1.17), p<0.01]. When the blind assessor was assessing the playing, they correctly identified the non-dystonic hand 85% of the time with the pre-assessment and 95% of the time at the end of the 10 sessions; this was not statistically different (p=0.29). Whereas with the dystonic hand

the assessor was able to detect the dystonic hand 95% of the time at the pre-assessment, this decreased significantly to 44% after training (p=0.0006).

When we compared the data from the pre-assessment to the end of year assessment (see Figure 1), we again found an overall improvement, in this case of 0.35 points [95% CI=(0.11,0.59), p=0.0044]. After controlling for the effect of hand, this again remained significant. Similarly, analysis by hand found a small but non-significant improvement in the non-dystonic hand of 0.15 points [95% CI=(-0.07,0.36), p=0.17] but a significant improvement in the SQE for the dystonic hand of 0.53 points [95% CI=(0.24,0.82), p=0.0004]. Again, assessment of the non-dystonic hand was successfully assessed 81% of the time at the pre-assessment, and this improved slightly to 91% and the end of training (p=0.26). As before, the dystonic hand was accurately detected 91% of the time at the pre-assessment, and this decreased significantly to 69% at the end of training (p=0.03).

DISCUSSION

We have previously shown that it is possible to treat FD effectively in pianists with intensive retraining (de Lisle *et al.* 2006). The novel finding of the present study is that this retraining can be undertaken using video conferencing technology. Although full recovery was not seen, improvement was observed at slow tempi, and the hand was visibly less cramped as training sessions progressed. We conclude that video conferencing could be an acceptable medium for pianistic retraining in pianists with FD when location prevents on-site retraining. However, in this study, it did not seem as effective as one-to-one retraining in the same location. Many factors influenced this. First, technical problems often meant that the sessions were shorter than the planned time of one hour. Also apparent was the fact that when retraining sessions were too far apart, movement patterns were not easily maintained, and it was difficult to maintain the motivation of the subject. Another distracting factor was that this subject did not stop other concert playing during the retraining process, and this tended to interfere with new movement patterns being strongly established. The clearest understanding of the process occurred when the sessions were close together (e.g. 10 sessions within three weeks). A greater improvement in this process may have been possible had the following sessions been at more regular intervals and if the subject had ceased all other playing during the retraining process. However, feedback at distance to both retrainer and subject lacks the element of touch, which is the most immediate way of conveying the fine technical adjustments that are necessary for recovery from focal dystonia. While video conferencing may be useful in

establishing new movement patterns the results are probably slower than those possible in the same location. However, it could be an effective tool to supplement and monitor progress after an initial period of onsite retraining.

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