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The role of the Alexander technique in musical training and performing

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Most students enter music conservatoires with long-standing inappropriate habits in their manner of using themselves in activity. These habits hamper the smooth operation of postural support systems, which are fundamental to all skilled movements. By learning and applying the Alexander technique (AT) individuals are able to avoid unwanted reactions. Performance improves and activities are seemingly effortless. The first scientific study uses a whole body Magnetic Resonance Imaging system (MRI and fMRI) to investigate reorganizations of the structure and function of the human body and, in particular, the brain during Alexander "directing." The second study is of student pianists playing scales. Key velocity and timing data are collected and analyzed to show a significant difference in touch before and after the AT lesson.

Keywords: Alexander technique; musical performance; MRI scanning

During twenty-two years of teaching the Alexander technique (AT) to music students, the first author has observed that most enter music conservatoires with long-standing inappropriate habits in the way they use themselves in daily activities. Maladapted tension patterns hamper the self-regulating neuro-muscular systems for postural support, balance, and coordination. This lowers the individual's ability to perform optimally in whatever he or she is doing.

This paper reports on two different approaches to studying the effects of the AT. The first seeks to provide a scientific description of the systematic approach at the heart of the AT and to obtain measurements of its effects. To

achieve this we are using a whole body Magnetic Resonance Imaging (MRI) system to measure the reorganization of the structure and function of the human body and, in particular, the brain that occurs during a series of AT lessons. The second uses a MIDI keyboard to investigate the effect of Alexander lessons on pianists' accuracy in playing musical scales.

Many difficulties experienced in "how to" learning are caused by the individual's inadvertent interference with underlying mechanisms that are vital for smooth coordinated activity, including breathing function. It is clearly observable that in normal, healthy conditions all vertebrates tend to lengthen head-to-tail in activity (Magnus 1924; reported by Charles Sherrington in his anniversary addresses to the Royal Society, London, 1924, 1925). Integrated activity in the back, neck, and shoulders is fundamental to skilful arm and hand movements (Ballard 1996, p. 42) and breathing and vocal functioning (Davies and Jahn 1998). Before considering the specifics of a task, therefore, it is reasonable to ensure the best general conditions of psychophysical functioning (Alexander 2000, p. 8).

For we humans, *balance* is a prerequisite for every activity carried out during waking hours (Davies 1985, cited in Trew and Everett 2001). Routine stiffening and bracing interferes with the appropriate automatic postural adjustments. In particular, most people tend to overuse the muscles of the upper torso, which disrupts its concerted activity (Alexander 1996, 2004). By learning how to prevent one's too quick and unthinking reactions it can be understood in practice how satisfactory working of the postural mechanisms can be restored (Alexander 2004).

In time, with better use and functioning, old feelings are outmoded. The individual develops a more reliable "[sense] register of the due and proper amount of so-called 'muscular tension' necessary at a given time" (Alexander 2004, p. 109) and the "right degree of action" and "co-ordinative management" (Alexander 2000, p. 119). A precise description of what is involved is impossible to convey in words alone. When done as intended however, it ensures a satisfactory standard of general functioning on which to build and develop a reliable musical technique. Activities are more skilful, controlled, and seemingly effortless.

MRI STUDIES

The first scientific study investigates the possibility of using Magnetic Resonance Imaging to study the AT and to measure its effects and, in particular, to test a hypothesis regarding brain function. If we perform an fMRI study in which an AT teacher is attending (proprioceptively) to the

"directions" being given by a second AT teacher we will observe activation of neurons in the brain stem or spinal cord.

Body structure and function

With regard to studying the well-known effects of the AT on body structure, using MRI it is possible to depict the musculoskeletal system of a living human subject in exquisite detail. Studies of body function may also be performed including voice production. It is intended to report on this at a later stage.

Brain structure and function

In a feasibility study, we used fMRI to study the effect of an AT teacher giving himself "directions" whilst his hands were in contact with a second teacher who lay quietly attentive within the MR system.

The brain images were statistically analysed using SPM99 (Functional Imaging Laboratory, Queens Square, London) and indicate significantly greater neural activity in the brain stem of the "receiver" when he is experiencing the effects of the other teacher's directed thinking. The result is shown in the right hand panel of Figure 1.

This finding of brain stem activation is potentially important since it is likely that the ability of the AT to access the brain stem is one of the key reasons why it is effective in altering automatic postural coordination and "central set" (Cacciatore 2005).

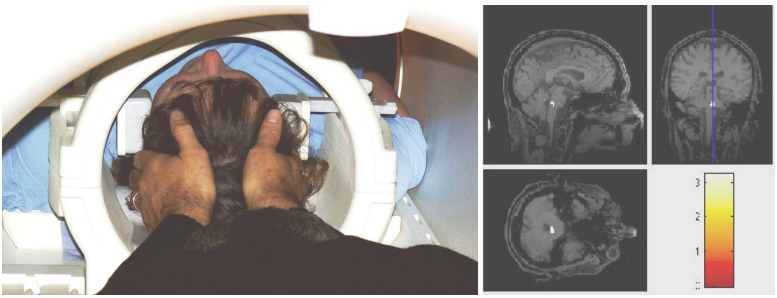

Figure 1. MRI set-up and brain images collected as part of the study. (See full color version at www.performancescience.org.)

MEASURING AND IMPROVING PERFORMANCE

Several recent studies have been carried out by masters and final year bachelors students of acoustics at the University of Salford, in which pianists were recorded playing scales before and after some form of intervention. The aim of two recent studies was to quantify the difference in musical skill before and after an AT lesson (Fletcher 2005, Bennett and Morris 2006).

In the most recent study, music students were recorded playing scales immediately before and after an AT lesson. The students from the Royal Northern College of Music were monitored for between two and five sessions. An electric piano had a MIDI output connected to a computer so that note timing and key velocity data could be easily downloaded and stored for later analysis. Students were asked to play four octave scales, hands separately, ascending and descending, three times in succession to a metronome. There are clear advantages in using scales (Jabusch *et al.* 2004) rather than "real" music where expressiveness is involved, which is much harder to quantify. The hypothesis to be tested was whether there was a difference in the evenness of scales played before and after the lesson.

We looked initially at the time between notes. Later it was shown that key velocity data rather than note timing gave more significant results. Key velocity is the speed at which the key hits the stop, so is related to touch. The variability in touch for one of the participants is shown in Figure 2. This participant attended five sessions. The data in Figure 2 are averaged over these five sessions, and the error bars show how much variation there was from one session to the next (±1 SD between sessions). It is seen that for every scale, except F harmonic minor, the variability of key velocity reduced after the AT lesson. Similar results were obtained for the other three participants.

Since in every case the variability decreased, it is reasonable to call this an improvement, the significance of which was confirmed using a student *t*-test. The results of the *t*-test for participant 1 are summarized in Table 1 and indicate that the improvement for the first three scales is statistically significant. Again, similar results were obtained for other subjects. We can therefore conclude that evenness of touch was significantly improved after the AT lesson.

As always, we need to be careful about exactly what has been demonstrated, but we have now reached the stage where we are satisfied that the scale analysis has been sufficiently refined to demonstrate improvements in musical technique, and we can consider further improvements to the methodology.

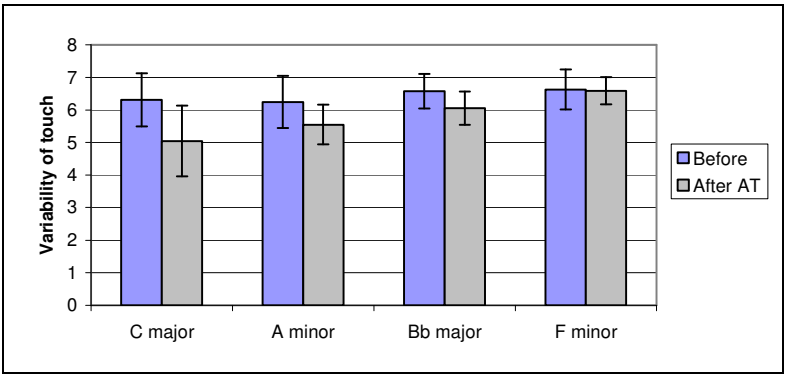

Figure 2. Variability of touch (key velocity) for participant 1 before and after AT lessons. Data are averaged over five sessions, and error bars give ±1 SD over these sessions. (See full color version at www.performancescience.org.)

Table 1. Student *t*-test significance for participant 1. The numbers indicate the probability that the improvement after AT could have occurred by chance alone, e.g. for Bb major there is only a 2% probability that the improvement is by chance.

C major	*A minor*	*Bb Major*	*F minor*
0.42%	2.07%	1.97%	44.56%

The scientific study of the AT is likely to lead to our obtaining a more full understanding of how the technique works, which will surely assist the teacher to teach and the pupil to learn more efficiently, catalyzing the further development of the AT and lead to the development of methods for measuring and monitoring its efficacy.

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References

Alexander F. M. (1996). *Man's Supreme Inheritance*. London: Mouritz. (Original work published in 1918.)

Alexander F. M. (2004). *Constructive Conscious Control of the Individual*. London: Mouritz. (Original work published in 1923/1924.)

Alexander F. M. (2000). *The Universal Constant in Living*. London: Mouritz. (Original work published in 1941/42.)

Ballard K. (1996). The nature and behaviour of postural support systems and improvement of their performance by a rational approach: The Alexander technique. *Performing Arts Medicine News, 3*, pp. 41-47.

Cacciatore T. W., Horak F. B., and Henry S. M. (2005). Improvement in automatic postural coordination following Alexander lessons in a person with low back pain. *Physical Therapy, 85*, pp. 565–578.

Calvert C. (2006). *Investigating the Use of the Alexander Technique to Improve Musical Performance*. Unpublished undergraduate dissertation, School of Computing Science and Engineering, University of Salford.

Davies D. G. and Jahn A. J. (1998). *Care of the Professional Voice*. Oxford: Butterworth Heinemann.

Fletcher N (2005). *Improvement in Musical Performance due to Application of Alexander Technique*. Unpublished masters dissertation, School of Computing Science and Engineering, University of Salford.

Jabusch H. C., Vauth H., and Altenmüller E. (2004). Quantification of focal dystonia in pianists using scale analysis. *Movement Disorders, 19*, pp. 171-180.

Morris P. (2006). *Investigating the Use of the Alexander Technique to Improve Musical Performance*. Unpublished undergraduate dissertation, School of Computing Science and Engineering, University of Salford.

Roberts N. (2006). Measurement science and the Alexander technique. Paper presented at the *6th International Conference for Alexander Teachers Working in Music Institutions*, Royal Northern College of Music, Manchester, UK.

Trew M. and Everett T. (eds.) (2001). *Human Movement*. London: Churchill Livingston.