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# RESEARCH INTO ALEXANDER TEACHING METHODOLOGY & EXPLAINING THE ALEXANDER TECHNIQUE TO CLINICIANS & SCIENTISTS

## PSYCHO-PHYSICAL RE-EDUCATION: AN INTRODUCTION TO COGNITIVE-MOTOR SYSTEM-LEVEL CAUSES OF PERFORMANCE-RELATED PROBLEMS

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## This talk presents material from the following sources:

Loram A., (2013).

*Chronic Profession-limiting problems in musicians: Underlying mechanisms & neuroplastic routes to recovery.*

MSc thesis, Division of Surgery & Interventional Science, University College London, UK. <http://dx.doi.org/10.17613/M6CN7R>

Loram I.D., (2015).

*Postural control & sensorimotor integration.*

In Grieve's Modern Musculoskeletal Physiotherapy 4th edn, ed. Jull, G.A., Moore, A, Falla, D., Lewis, J., McCarthy, C & Sterling, M.

Loram, I.D, Bate, B, Harding, P.J., Cunningham, R.J. & Loram A., (2017).

*Proactive Selective Inhibition Targeted at the Neck Muscles: This Proximal Constraint Facilitates Learning & Regulates Global Control.*

IEEE Transactions on Neural Systems & Rehabilitation Engineering 25: 357-369.

<http://dx.doi.org/10.1109/TNSRE.2016.2641024>

Cunningham, R.J, Harding, P.J. & Loram, I.D., (2017).

*Real-Time Ultrasound Segmentation, Analysis & Visualisation of Deep Cervical Muscle Structure;*

IEEE Transactions on Medical Imaging 36: 2. <http://dx.doi.org/10.1109/TMI.2016.2623819>

**Violinist**

**Alexander Teacher**

**Research Scientist**



1985



2013

## How the Alexander Technique is perceived

- Difficulty in communicating what it is about
- Principles not established/demonstrated
  - little documented evidence of effectiveness
- Not taken seriously
  - regarded as alternative therapy, posture/movement discipline
  - perceived as encroaching on other people's "patch"
  - "bottom of the pile"

# The Alexander Technique has a scientific basis & deserves to be taken more seriously

- general mechanism which underlies many problems
- the neck is important in regulating sensory-motor control
- problems are associated with a common pattern of unnecessary movement & muscle tension
- students taught
  - to observe pattern of movement/muscle activity
  - to use as a training signal to regulate thought & activity

# Outline

- **Scientific basis of the Alexander Technique**
- **Research into Alexander teaching practice**
- **Explaining the Alexander Technique to clinicians/scientists**

## Problems: diagnosed & treated specifically

### Musculoskeletal

- **inflammatory conditions**
  - rotator cuff syndrome
  - *supraspinatus* impingement/tendinopathy
  - adhesive capsulitis (“frozen shoulder”)
  - lateral epicondylitis (“tennis elbow”)
  - medial epicondylitis (golfer’s elbow”)
  - de Quervain’s tendinitis
  - non-specific arm pain (“RSI”/”overuse”)
- **nerve entrapment syndromes**
  - thoracic outlet syndrome
  - carpal/radial/cubital tunnel syndrome (median/radial/ulnar nerve entrapment)
- **dystonias**
- **(hypermobility)**

### Non-musculoskeletal

- **cognitive/psychological**
  - (performance) anxiety
  - depression
- **“other”**
  - breathing/respiratory-related
  - ear/hearing-related
  - eye/vision-related
  - embouchure (musculoskeletal?)
  - headache
  - sleep disturbances
- **skill acquisition/technique**
  - inability to progress
  - technical limitations

## A general mechanism:

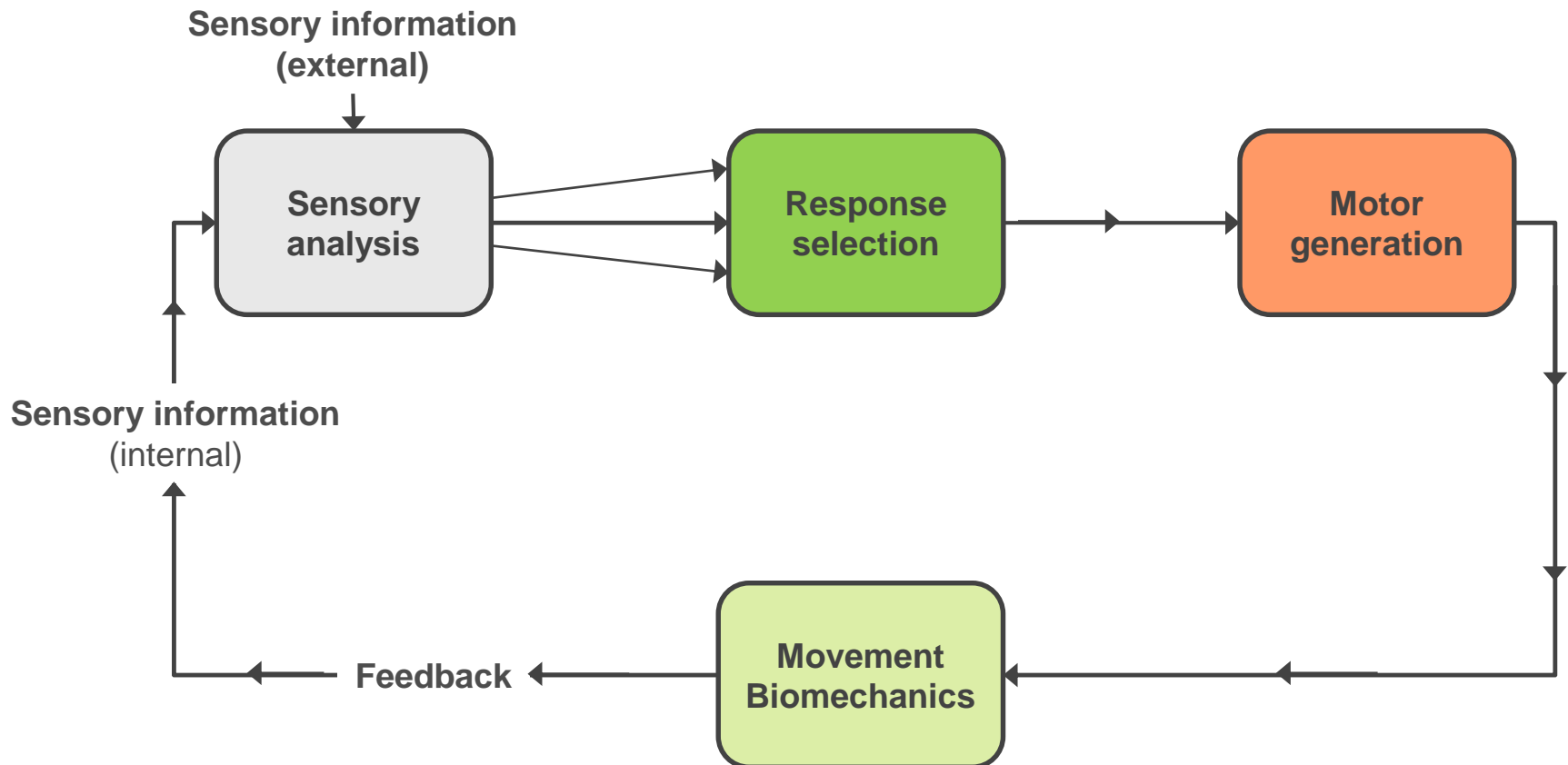
Problems arise from

- misconception,
- the rules of neuromuscular function
- lack of awareness
- reinforcement (wind-up) of symptoms



**A general mechanism:** problems arise from misconception, the rules of neuromuscular function, lack of awareness & reinforcement (wind-up) of symptoms

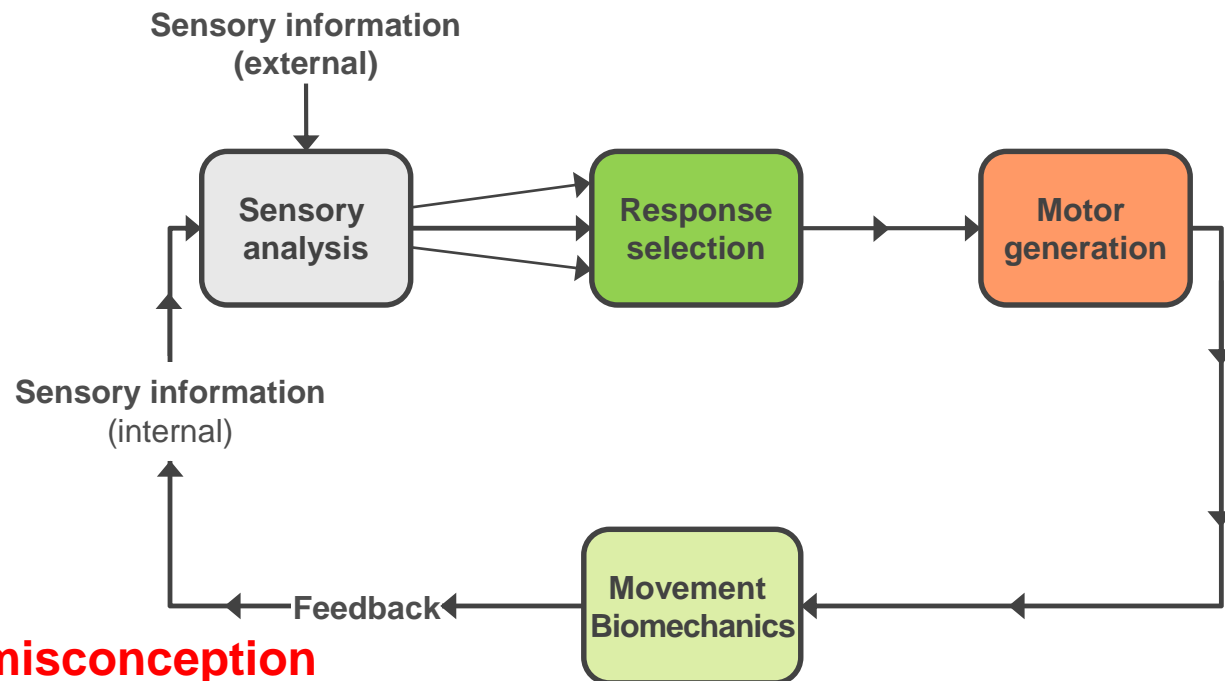
## Perception-Selection-Action Feedback loop



**A general mechanism:** problems arise from misconception, the rules of neuromuscular function, lack of awareness & reinforcement (wind-up) of symptoms

## Responses selected have consequences

- poor selections have adverse effects
  - performance
  - neural adaptation
  - biomechanical loading
  
- feedback can amplify or diminish effects of poor selection



**Cause of poor selection = misconception**

## Working hypothesis:

The mechanical structure of the human body & the organisation of the neuromuscular system ensures that almost any misconception results in a common unnecessary musculo-kinematic pattern

General solution lies in:

- identifying the musculo-kinematic pattern that reveals the “poor” conception & motor response
- external indirect feedback to minimise poor selections of thought & movements which are unnecessary & made *automatically*

# A scientific investigation into violin & viola playing

## Aims

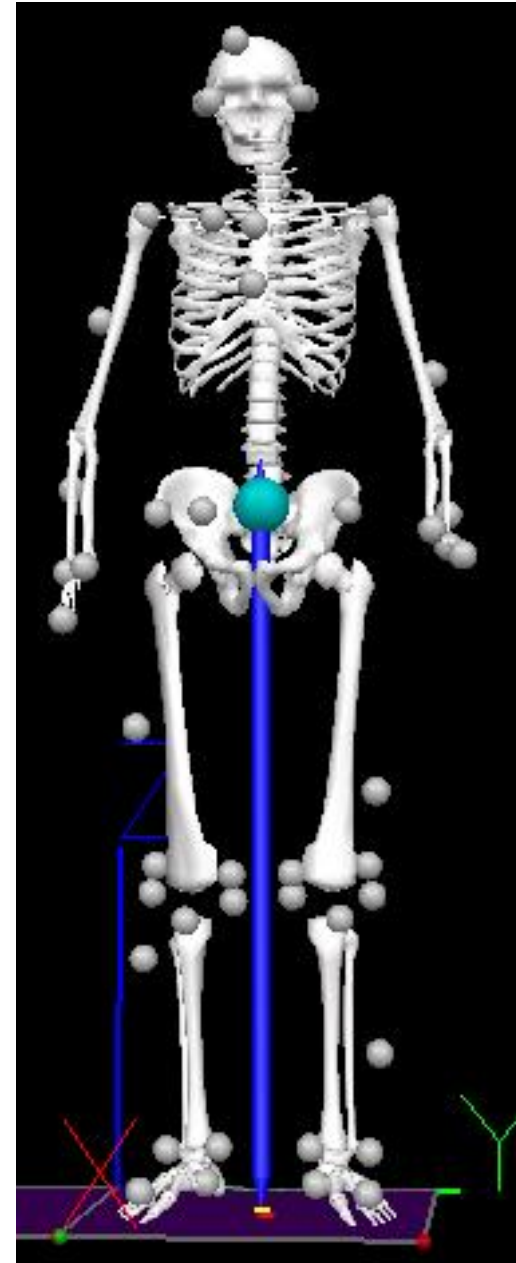
- To establish whether instrumentalists exhibit a common diagnosable pattern of movement & muscle tension
  - i. what do violinists do when raising, supporting & playing their instruments?
  - ii. are all elements normally adopted necessary to playing?
  
- To test methodology for reducing that pattern in individuals
  - iii. the effect of proactive selective inhibition targeted at the neck muscles
  - iv. the effect of verbal feedback of unnecessary movement & muscle tension

## Procedures

### Recorded

- movement
- muscle activity

- 16 violinists/  
5 viola players



# Experimental Design

## Tasks

- picking up & playing violin

## Series

*A - normal playing*

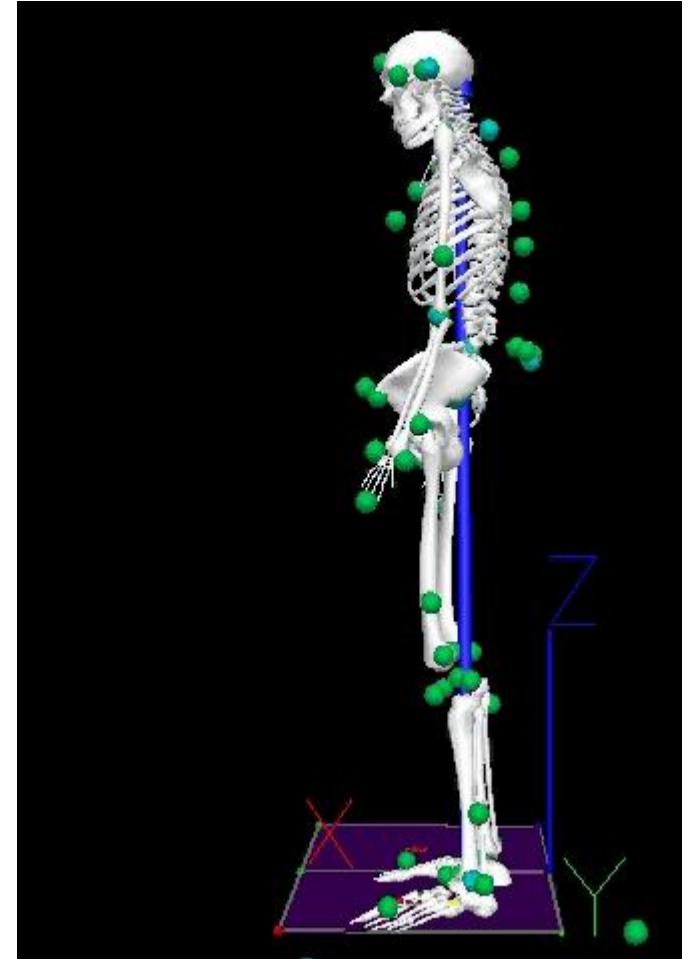
*B - playing laboratory violin with US probe attached*

*C - playing while focussing on an object*

*D - playing while describing the changes in neck muscle shape*

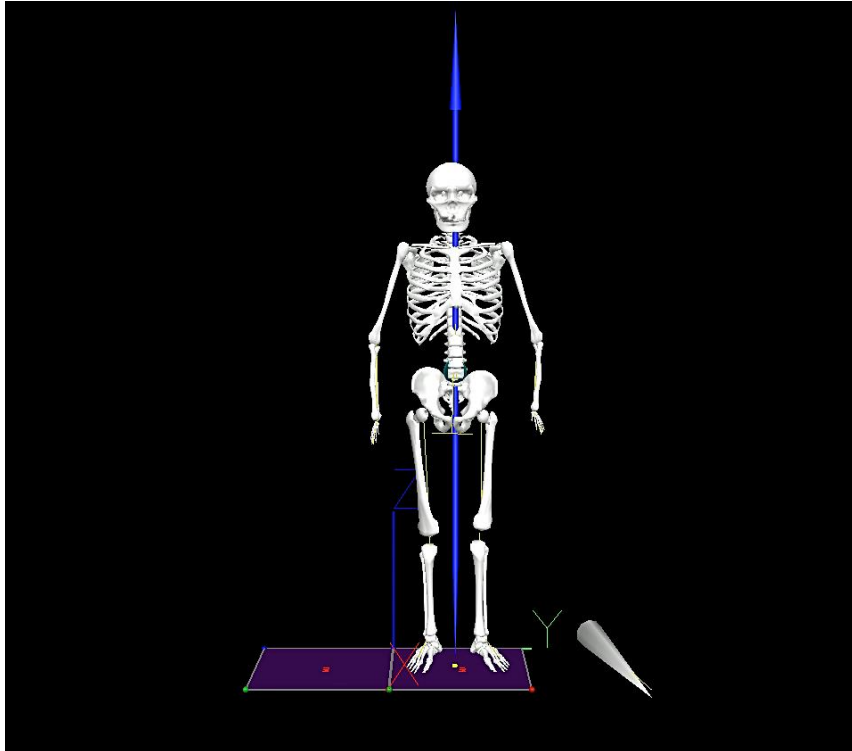
*E - playing using ultrasound feedback*

*F - playing using verbal feedback*

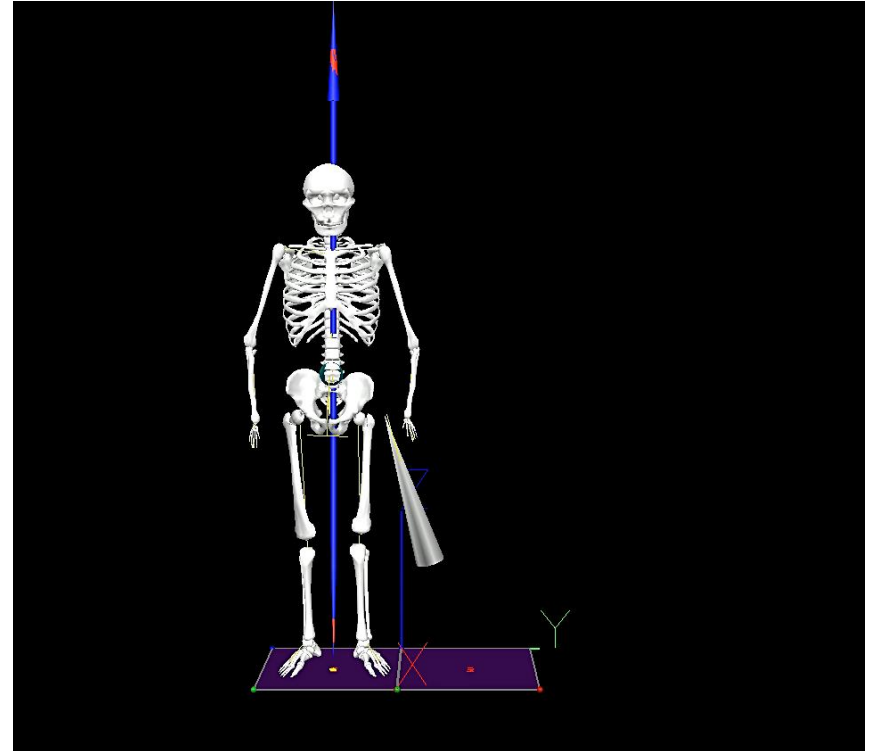


# Testing teaching methodology used with musicians

Series A: normal playing



Series F: verbal intervention

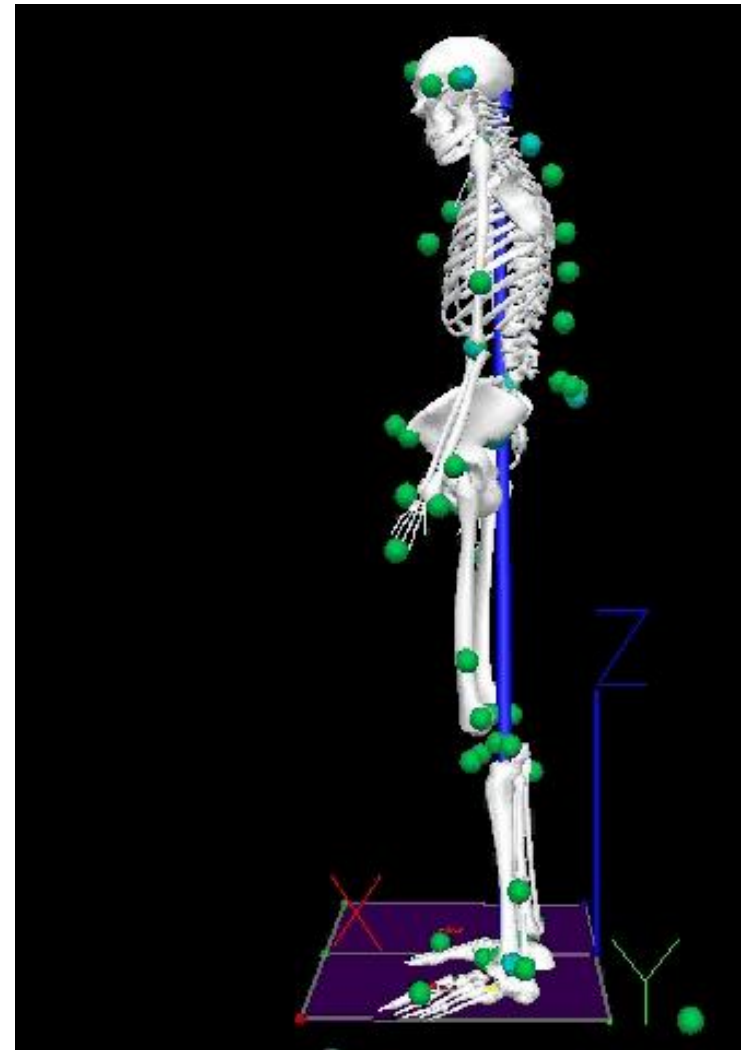


# Representative musculo-kinematic pattern: transition from standing to playing configurations

## Series A: normal playing

- Raising & pulling forwards the shoulders
- Axial rotation of the torso
- Flexion of the neck
- Increased kyphosis
- Increased lordosis

Series A (normal playing) without intervention – one participant



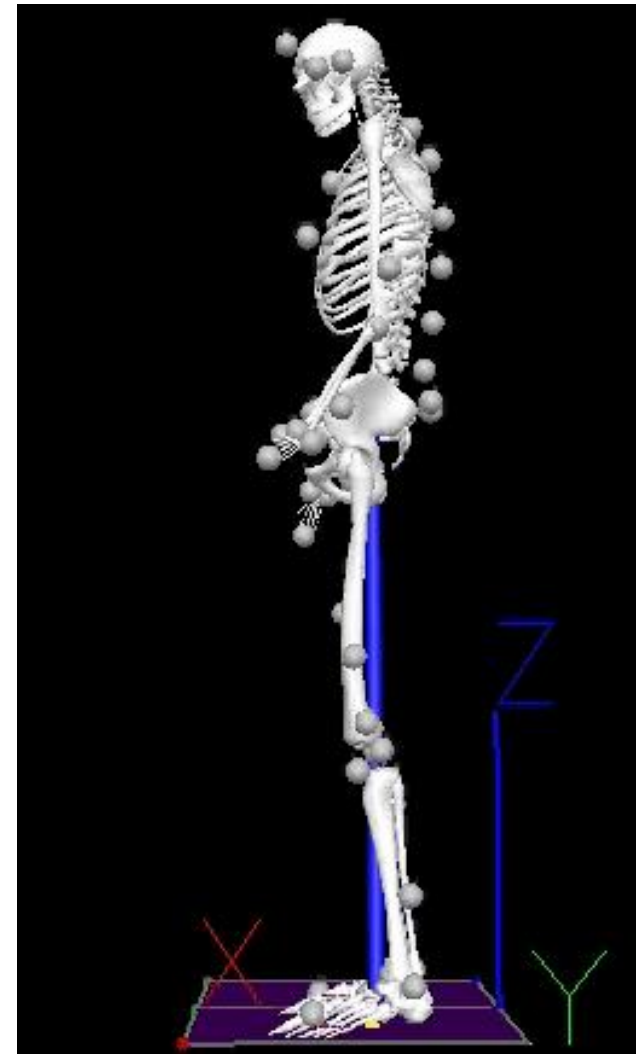


# Common musculo-kinematic pattern: transition from standing to playing configurations

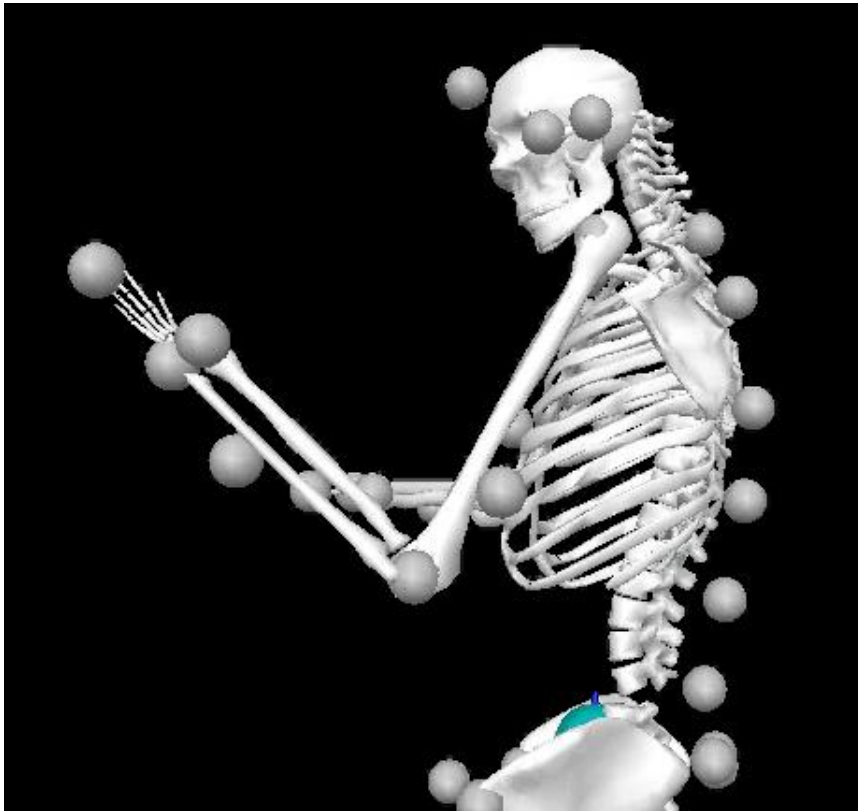
## Series A: normal playing

- Raising & pulling forwards the shoulders
- Axial rotation of the torso
- Flexion of the neck
- Increased kyphosis
- Increased lordosis

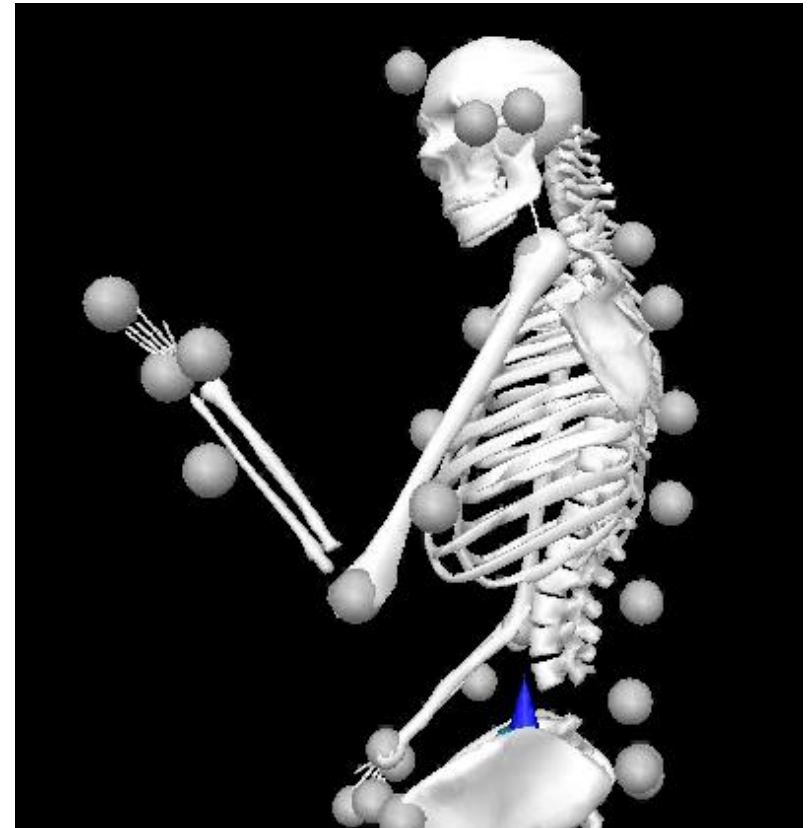
**Series A (normal playing) without intervention – mean**  
(n = 105 i.e. 21 players, 5 tasks)



**Mean - Series A:**  
normal playing

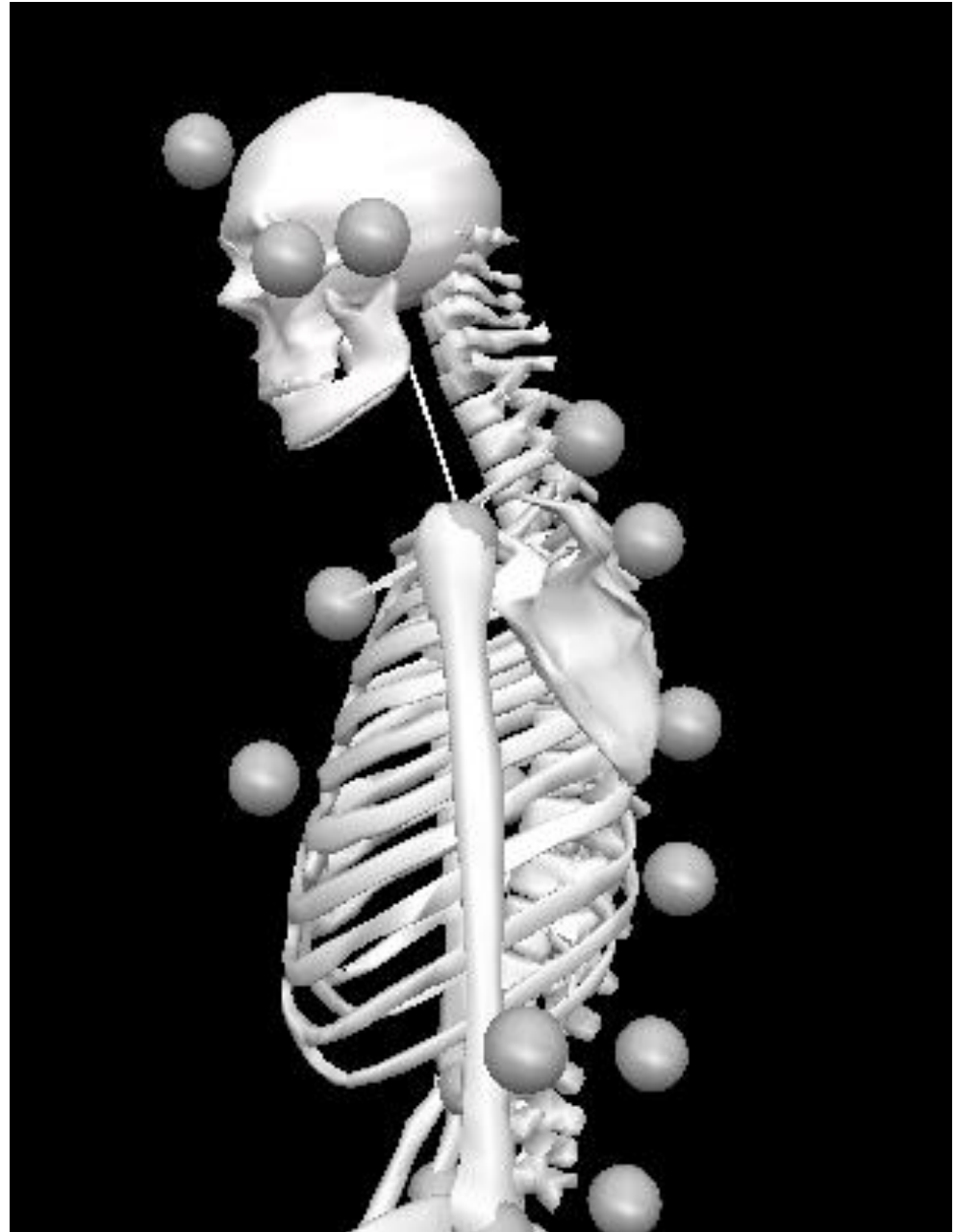


**Mean - Series F:**  
playing after verbal feedback



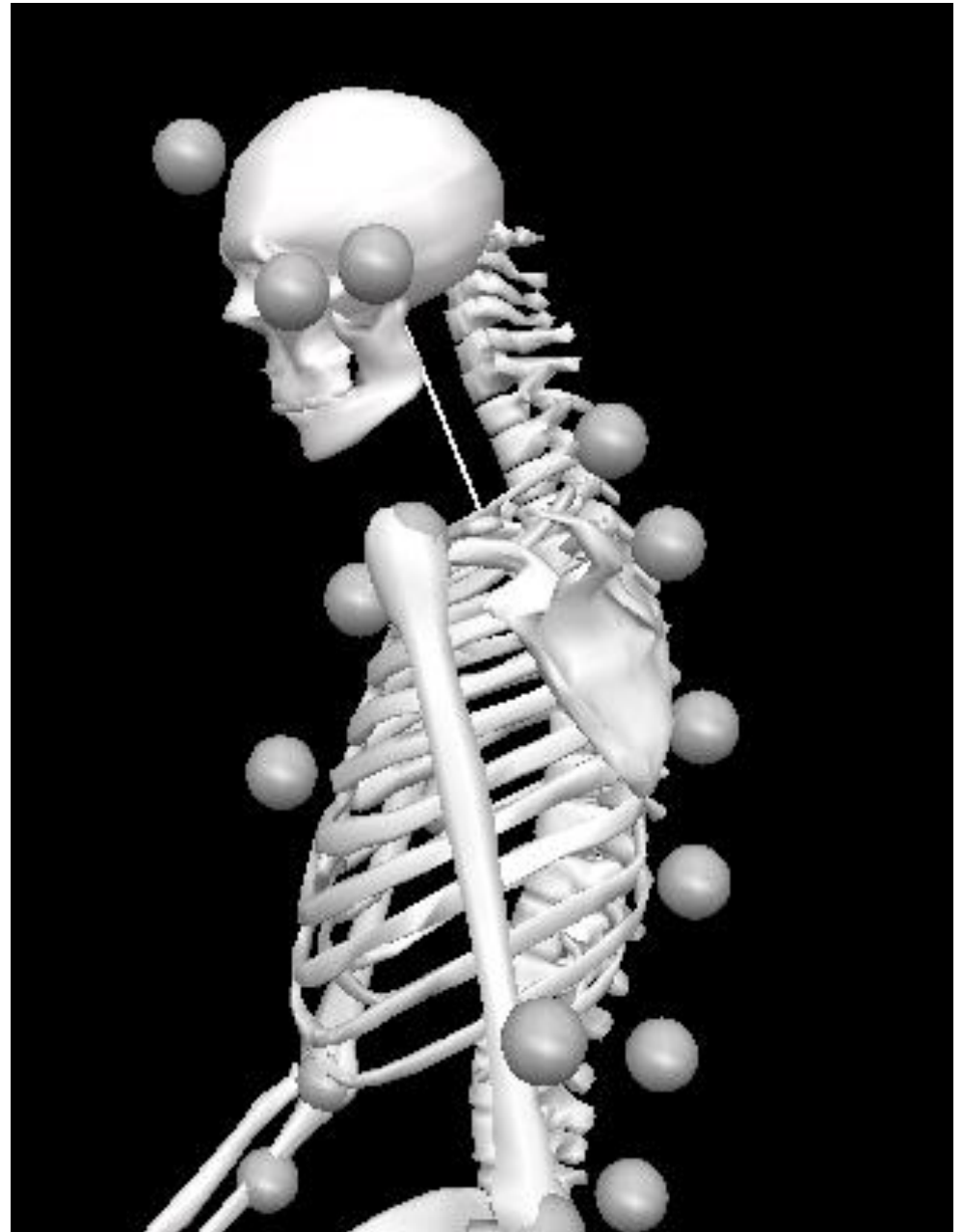
# Pattern of unnecessary movement removed by verbal feedback

Neutral



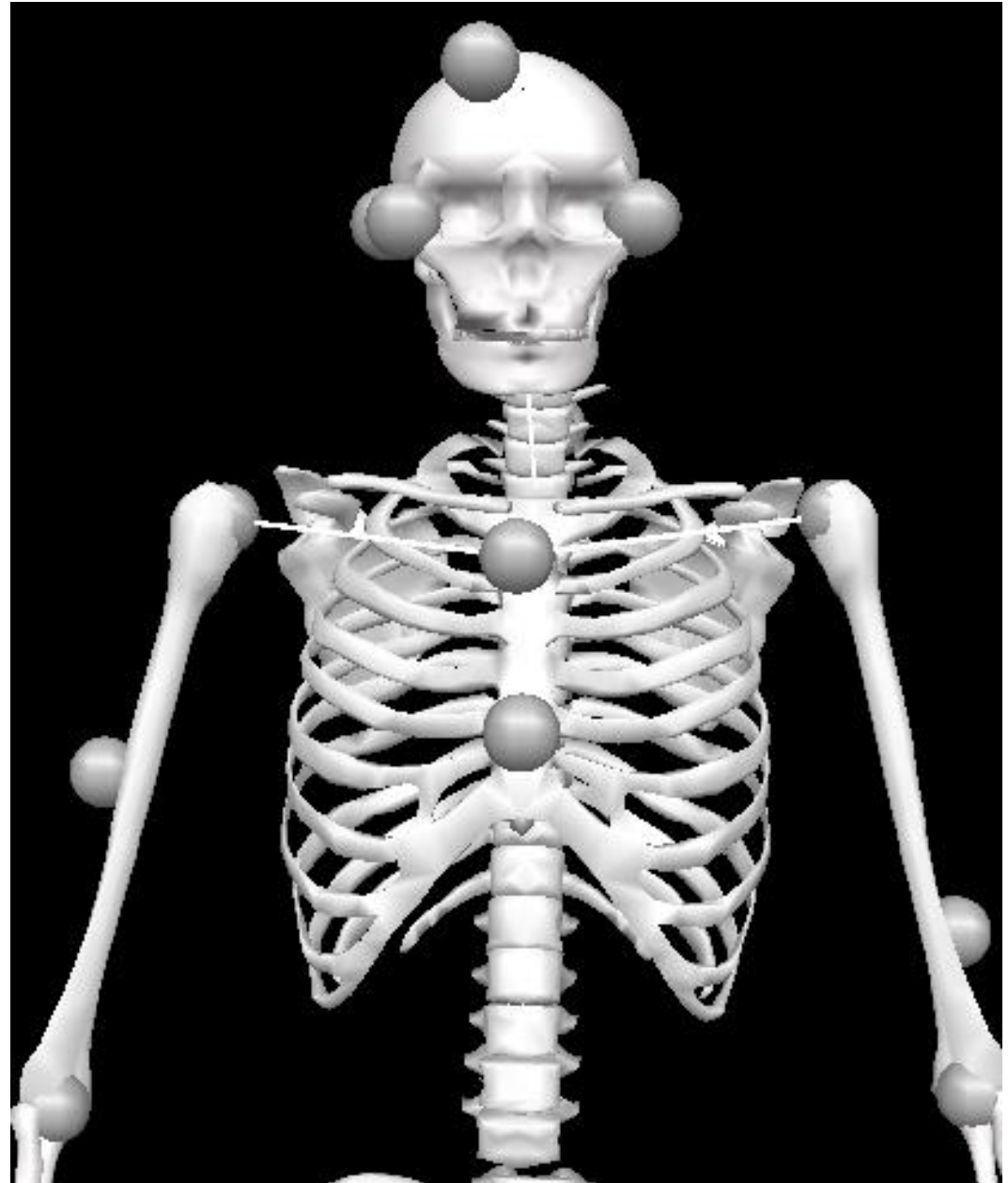
# Pattern of unnecessary movement removed by verbal feedback

Unnecessary movement



# Pattern of unnecessary movement removed by verbal feedback

Neutral



# Pattern of unnecessary movement removed by verbal feedback

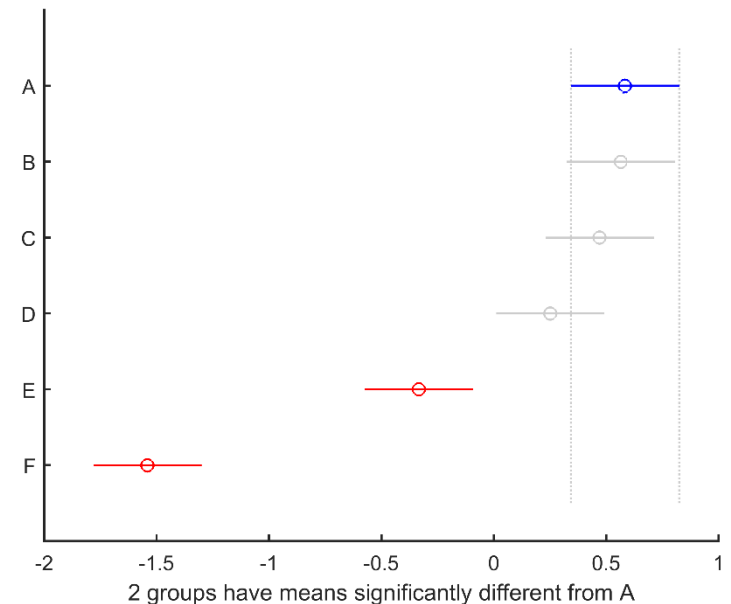
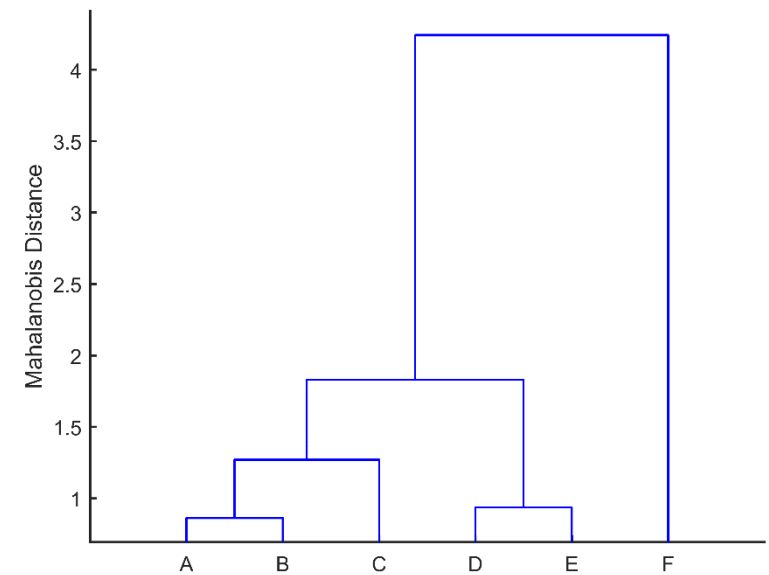
Unnecessary movement



# Ultrasound & verbal interventions reduce cost of movement

## Discriminant Function Analysis

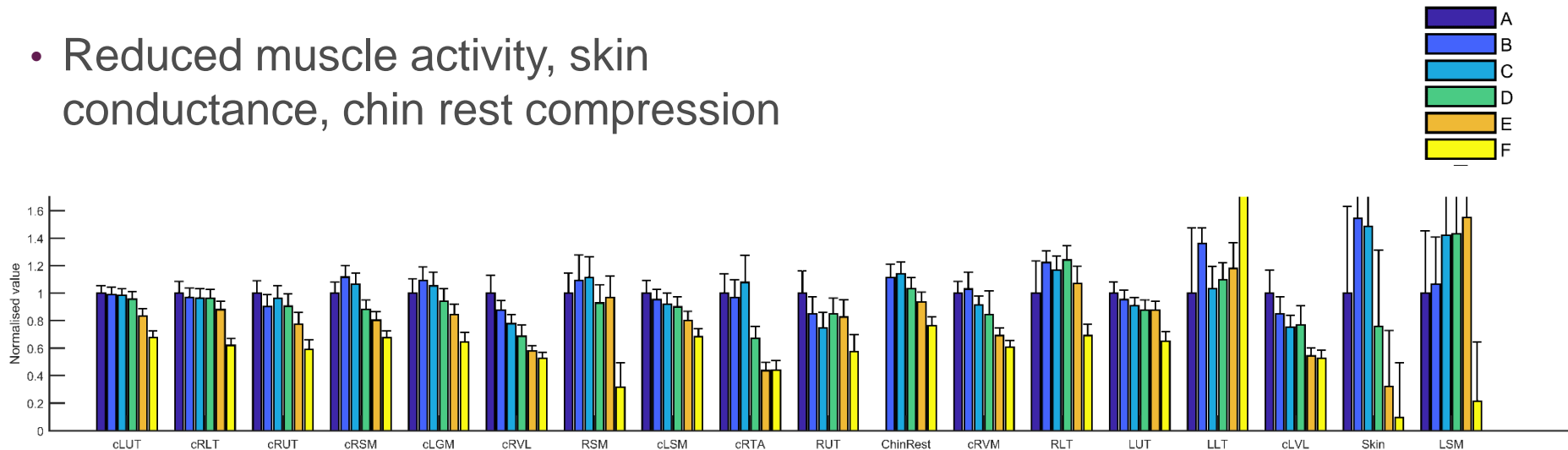
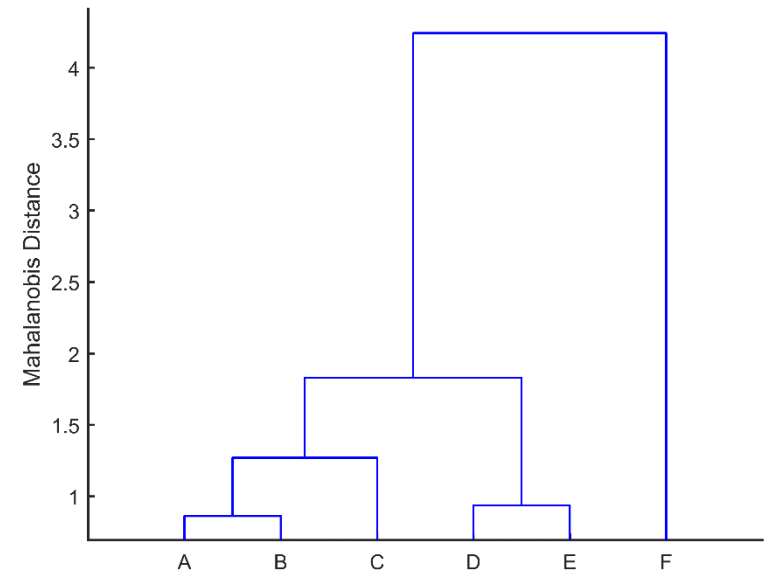
- Verbal feedback has a greater effect than ultrasound feedback



# Ultrasound & verbal interventions reduce cost of movement

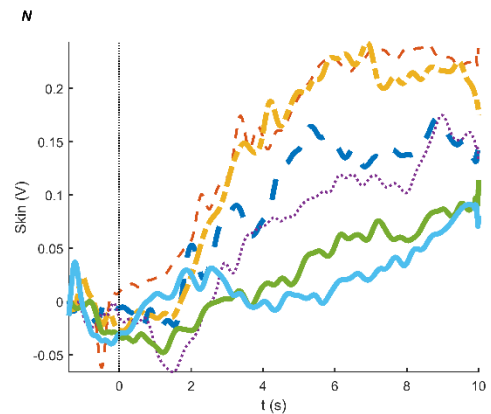
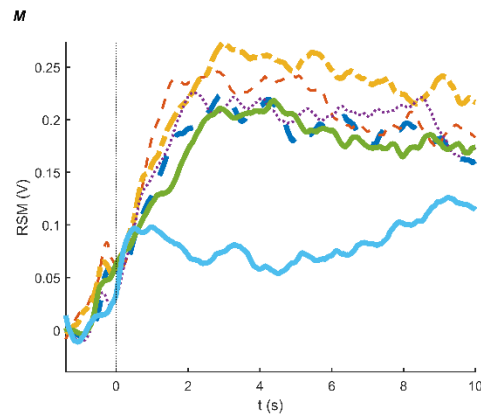
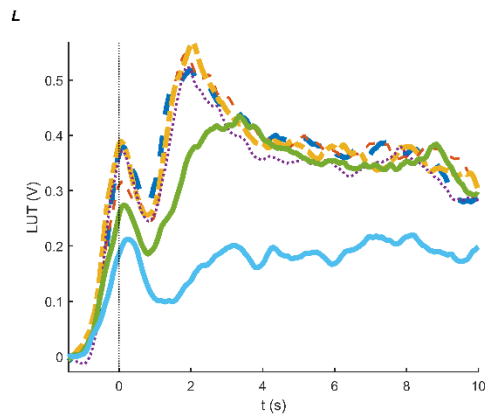
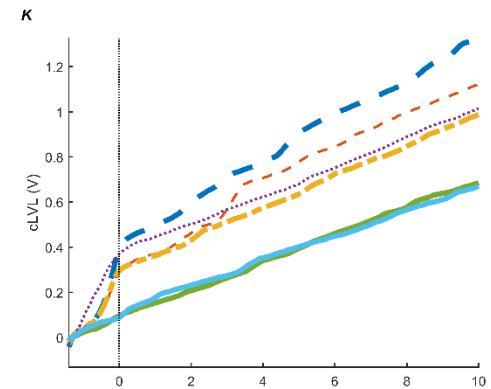
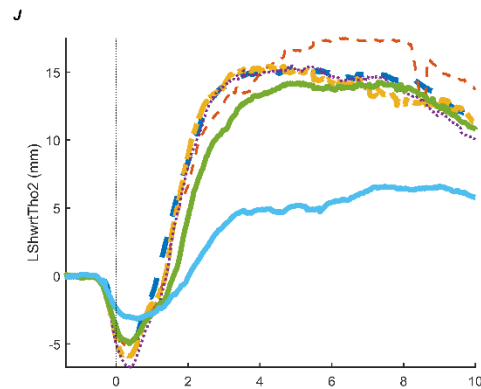
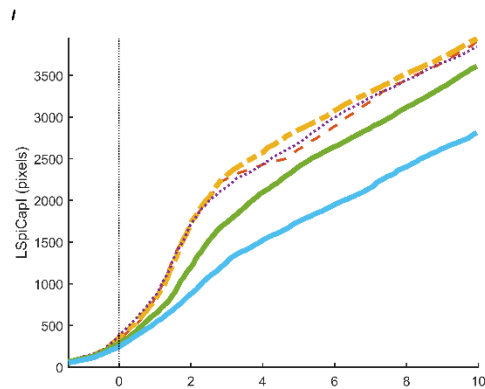
## Discriminant Function Analysis

- Verbal feedback has a greater effect than ultrasound feedback
- Reduced muscle activity, skin conductance, chin rest compression





# Reductions in neck muscle action, most muscle activities & skin conductance



# A scientific investigation into violin & viola playing

## Demonstrated

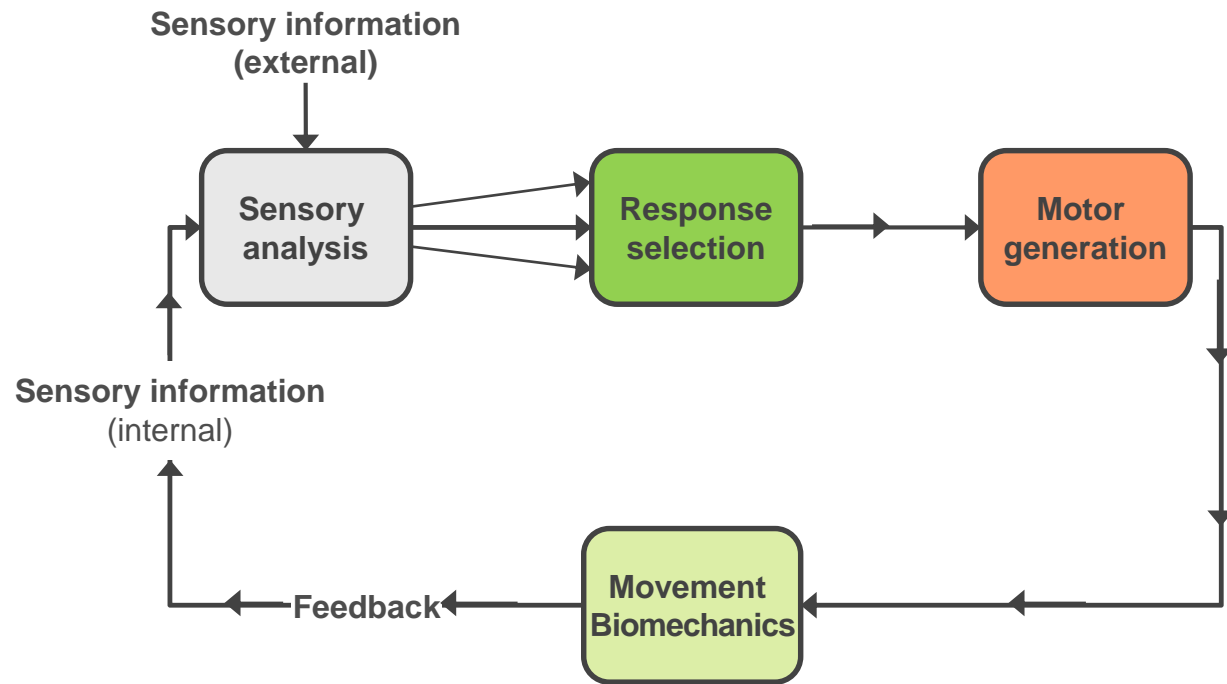
- Violinists exhibited a common observable pattern of unnecessary movement & muscular tension
  - associated with chronic pain, injury, lack of facility
- Proactive selective inhibition targeted at the neck (US) reduced the pattern
- Verbal feedback was more effective in achieving same result

# Explaining the Alexander Technique to clinicians & scientists

- Difficulty in communicating what it is about
- Principles not established/demonstrated
  - little documented evidence of efficacy
- Not taken seriously
  - regarded as alternative therapy, posture/movement discipline
  - perceived as encroaching on other people's "patch"
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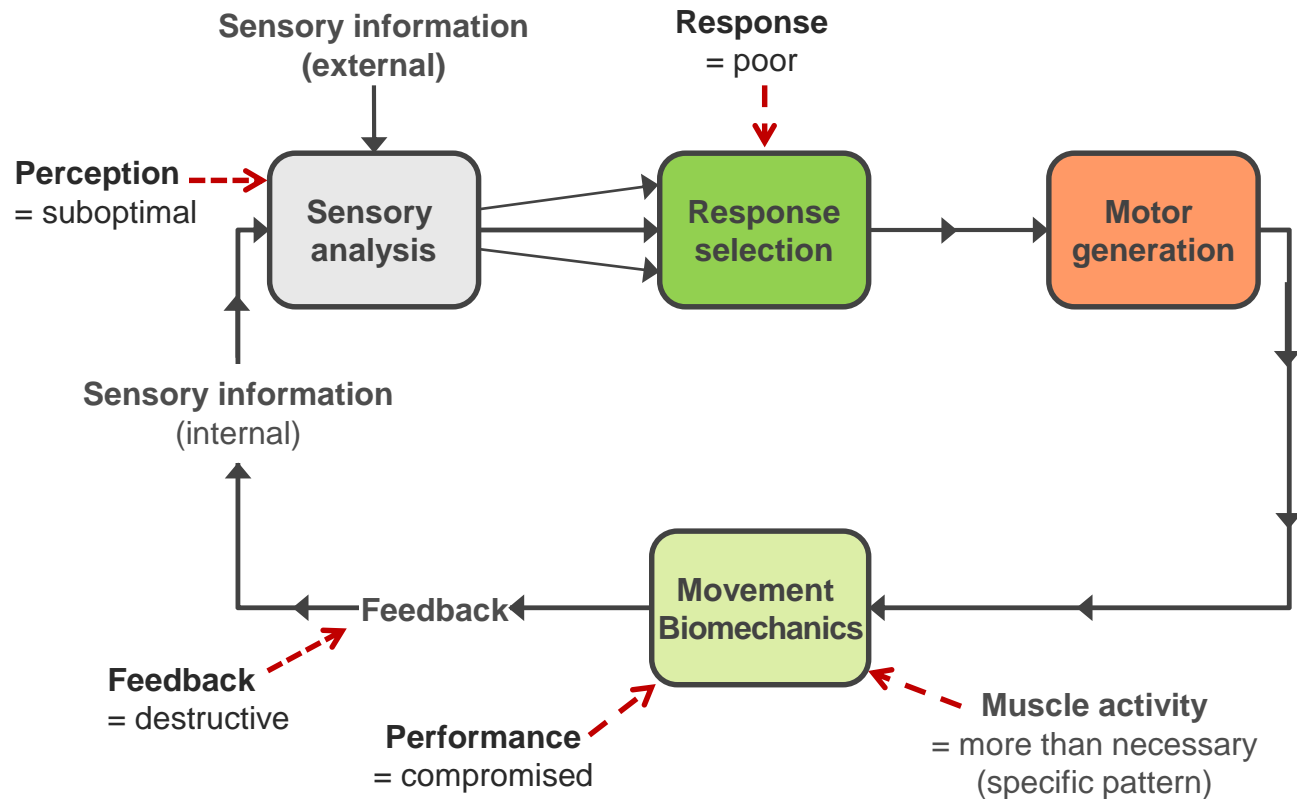
# “Use”

is the processes of sensory analysis, response selection, motor generation & movement biomechanics acting simultaneously & adapting through time according to their input



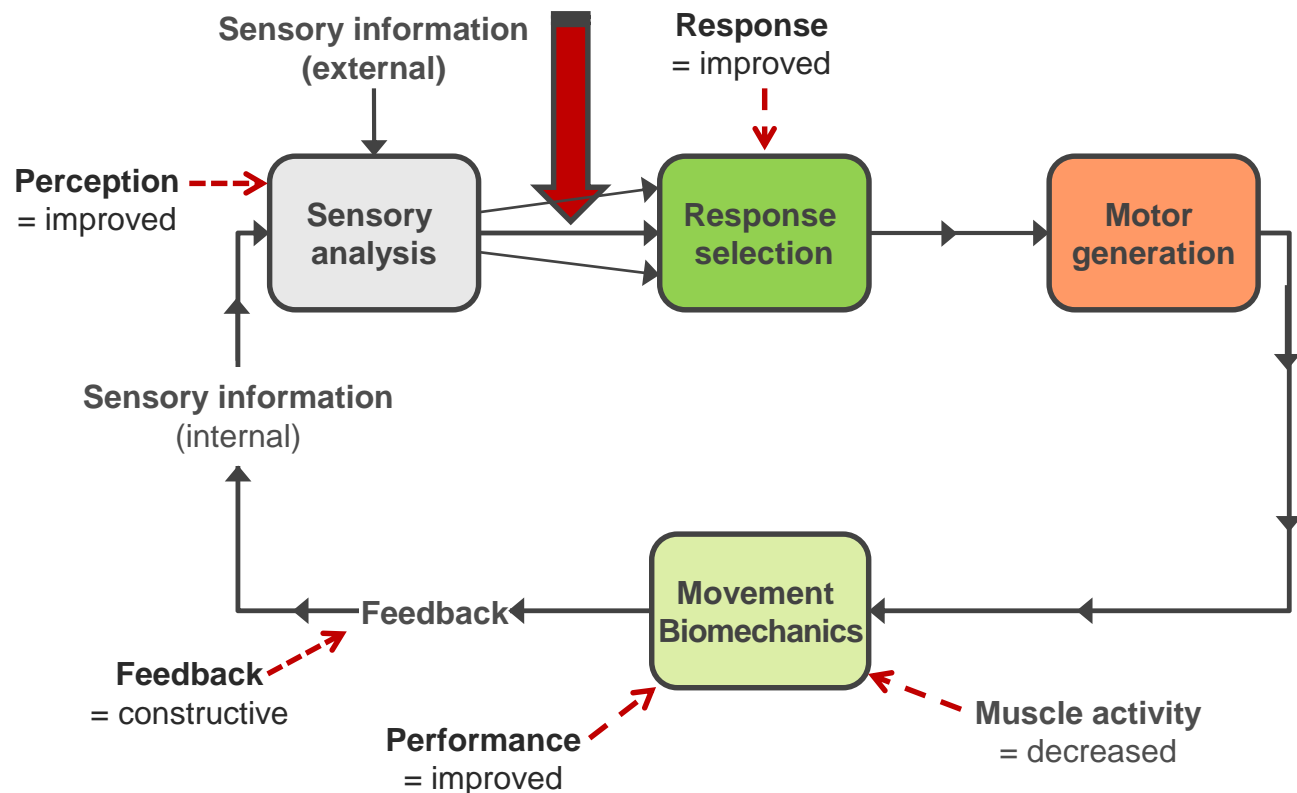
# “Misuse”

= suboptimal processes of sensory analysis, response selection, motor generations & movement biomechanics amplified by misconception of the feedback



# The Alexander Technique brings about change by external input into perception, & inhibition of automated responses

- breaks loop at point of selection
- indirect external inhibitory feedback removes poor, *a priori* selections
- problems resulting from misuse ameliorated/overcome/avoided



# Definition of the Alexander Technique?

## Psycho-physical re-education on a *general basis*

- **Technique** - rather than a philosophy  
(based on observation of mechanical efficiency/movement)
- **Education** - learned  
(not a treatment or a therapy)
- **Re-education** – refining, regulating & relearning what you have already learned
- **Psycho-physical** – processes (perception, selection (choice), motor action, mechanical performance) are simultaneous
- **General basis** – our system works as a whole

# The Alexander Technique has a scientific basis & deserves to be taken more seriously

- general mechanism which underlies many problems
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- students taught
  - to observe pattern of movement/muscle activity
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