

A Musician-Centered-Approach to Assessment of Performance Related Upper Extremity Musculoskeletal Injuries



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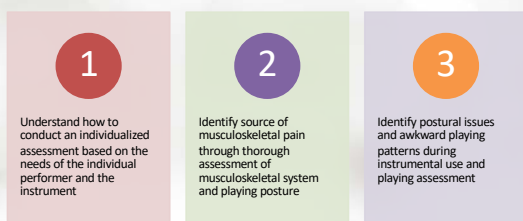
1



Musician Centered Framework for Assessment of Injury

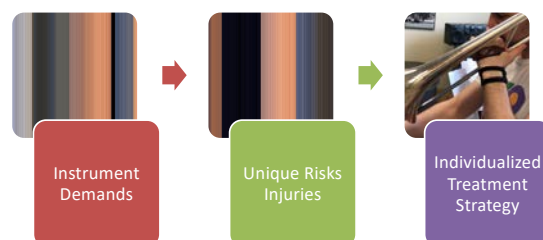
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Objectives: Musician Centered Framework for Assessment of Injury



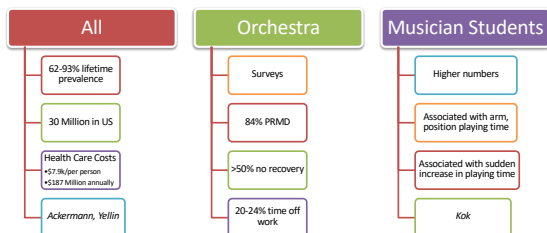
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Approach



4

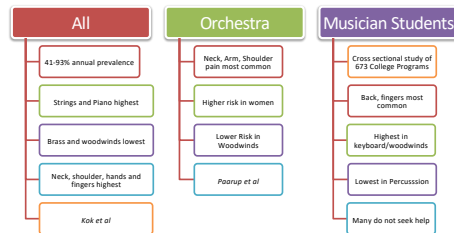
Incidence and Prevalence



Refs: Ackermann, Zaza, Steinmetz, Stanek, Kok, Paarup, Yellin

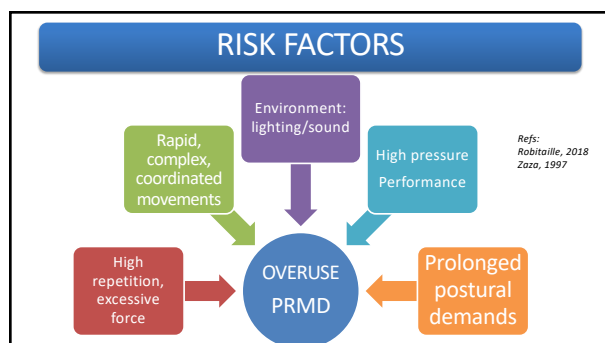
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Incidence and Prevalence

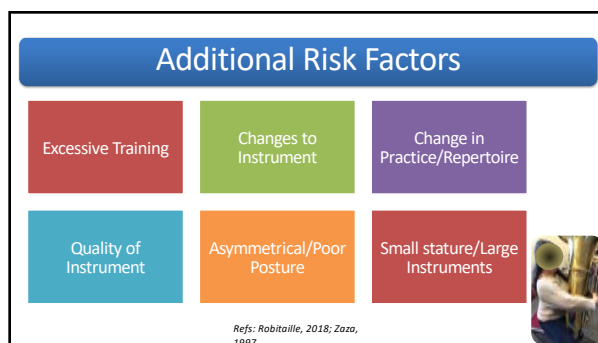


Refs: Ackermann, Zaza, Steinmetz, Stanek, Kok, Paarup, Yellin

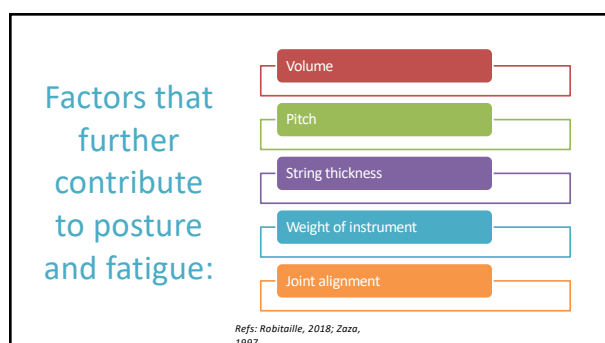
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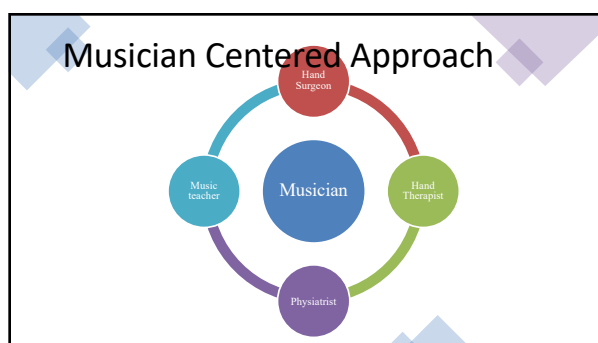
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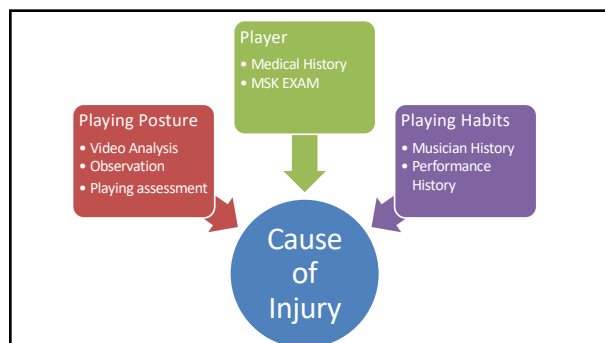
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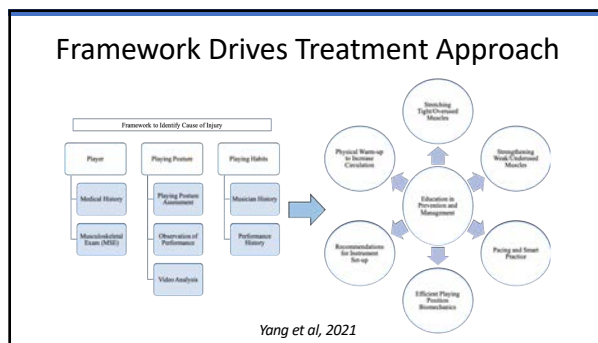
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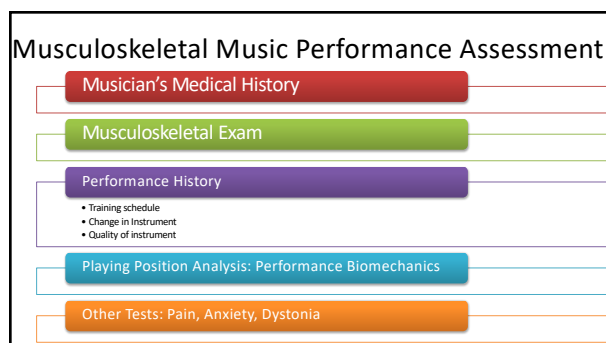
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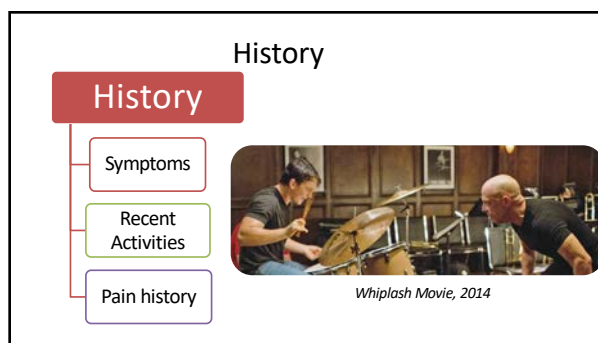
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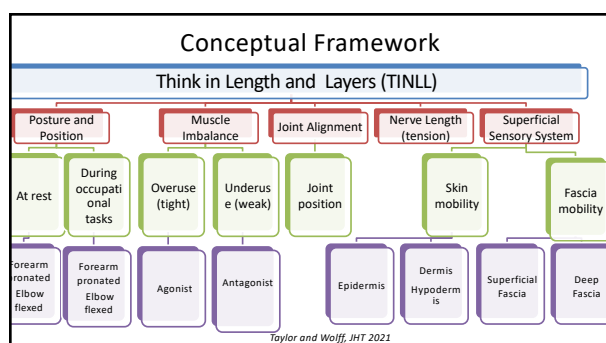
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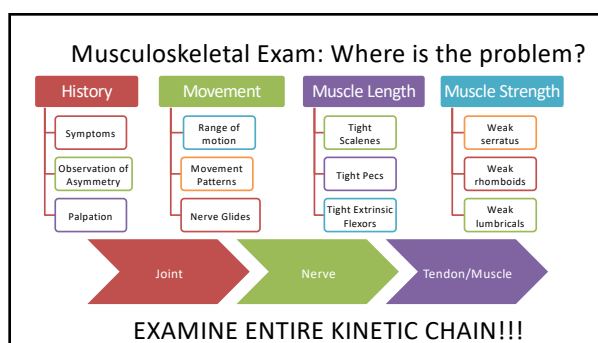
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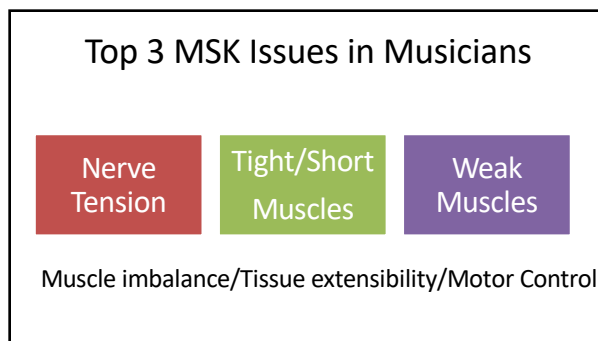
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History/Posture/Position

History

- Symptoms
- Observation of Alignment/Asymmetry
- Pain history



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Movements

Movement

- Range of Motion
- Movement Patterns
- Nerve Entrapment Tests
- Muscle Strength Testing



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Muscle Length

Muscle most efficient

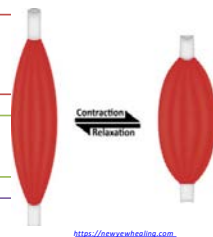
- Generate optimal tension
- Mid range position
- Normal length

Short/tight muscles = Overuse

- Less efficient = physiologic insufficiency
- WEAK

Lengthened muscles = Underuse

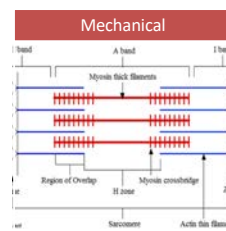
- Less efficient = mechanical insufficiency
- WEAK



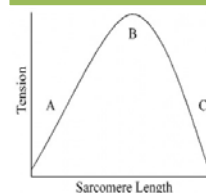
<http://www.physiotherapy.com>

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Muscle Length - Insufficiency



Physiological



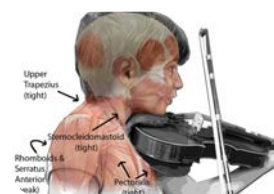
<https://exrx.net/ExInfo/Muscle>

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Functional Movements/Musculoskeletal Exam

Muscle Length

- Tight Scalenes
- Tight Levator Scapulae
- Tight Latissimus
- Tight Upper Trapezius
- Tight Pectoralis
- Tight Extrinsic Flexors



<http://rediscovease.com/>

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Assess Muscle Length



Upper Trap



Pecs



Latissimus

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Functional Movements/Musculoskeletal Exam

Muscle Strength

- Weak serratus
- Weak rhomboids
- Weak lower trapezius
- Weak Triceps
- Weak lumbricals
- Weak Interossei



<https://www.orthobullets.com>

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Weak Serratus/rhomboids



<https://www.bondharyoga.com>

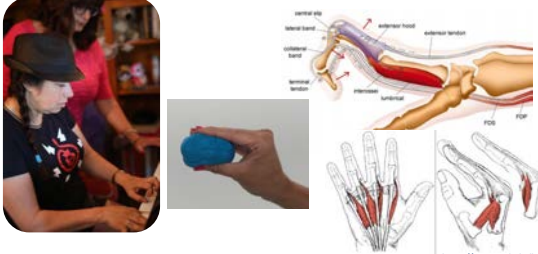


Winged Scapula

[vPainheist.com](http://painheist.com)

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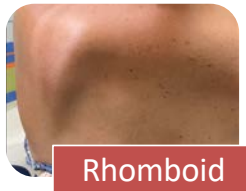
Weak Lumbricals



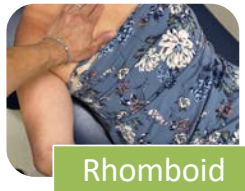
<https://www.orthobullets.com>

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Assess Muscle Strength



Rhomboid



Rhomboid

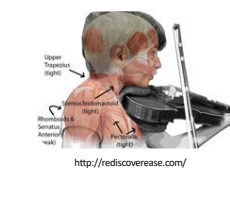
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Bass Player: Functional Movement Assessment

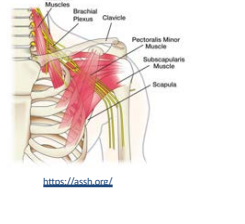


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Nerve Tension – NERVE LENGTH



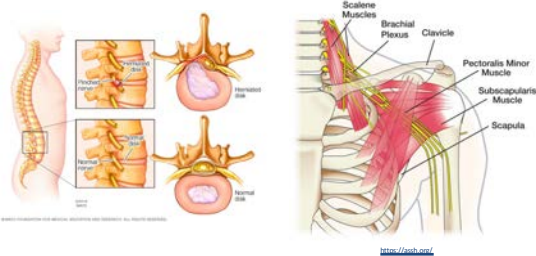
<http://rediscoverease.com/>



<https://aash.org/>

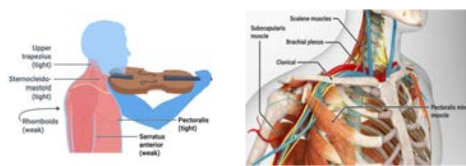
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Nerve Anatomy



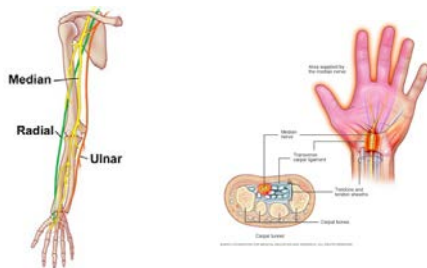
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Nerve Anatomy



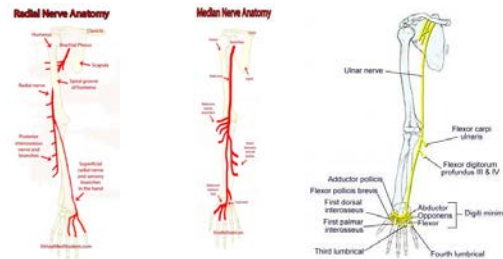
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Nerve Anatomy



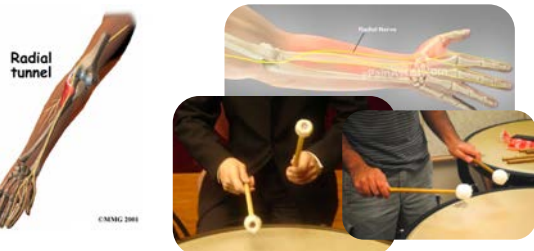
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To Reduce Neural Tension



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Radial Nerve Anatomy Compression



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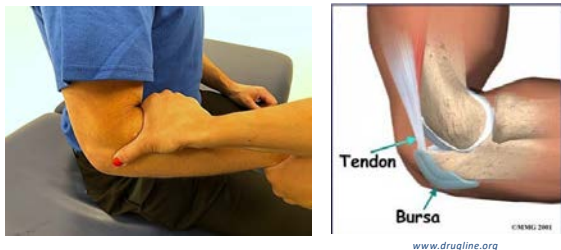
Ulnar Nerve Compression Location: Elbow



<https://www.youtube.com/watch?v=H0Dye+1KmlA>

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Palpation – Skin and Fascia Tension



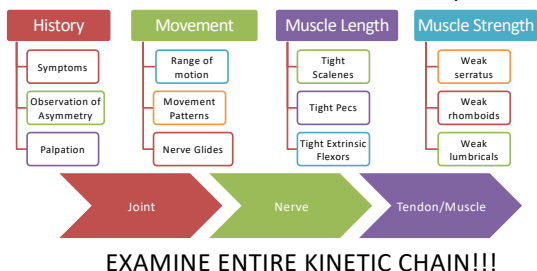
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Assessment of Neural Tension: SRSN



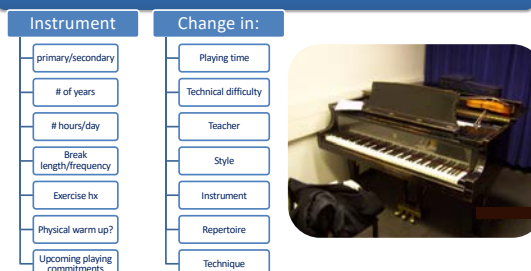
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Musculoskeletal Exam: Where is the problem?



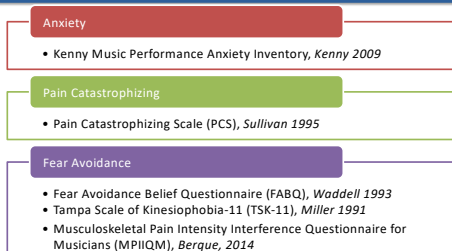
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Performance History (Overuse)



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Stress Management/Psychosocial



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Stress Management/Psychosocial

The left form is the Pain Catastrophizing Scale (PCS) by Sullivan, 1995. The right form is the Fear Avoidance Belief Questionnaire (FABQ) by Waddell, 1993.

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Kenny Music Performance Anxiety Inventory

Rate how often you experience each item. Use the number 0 for 'never' and 4 for 'always' or 'nearly always'. Please indicate the frequency of each item.

Item	0	1	2	3	4
K.1. I experience fear or anxiety in public.					
K.2. I experience a rapid heart.					
K.3. I experience excessive sweating during play.					
K.4. I experience difficulty with my breathing in public.					
K.5. I experience dizziness or lightheadedness in public.					
K.6. I experience a feeling of numbness or tingling.					
K.7. I experience a feeling of weakness or collapse in public.					
K.8. I experience a feeling of panic.					
K.9. I experience a feeling of being out of control.					
K.10. I experience a feeling of being embarrassed.					
K.11. I experience a feeling of being humiliated.					
K.12. I experience a feeling of being ridiculed.					
K.13. I experience a feeling of being laughed at.					
K.14. I experience a feeling of being scorned.					
K.15. I experience a feeling of being despised.					
K.16. I experience a feeling of being hated.					
K.17. I experience a feeling of being persecuted.					
K.18. I experience a feeling of being threatened.					
K.19. I experience a feeling of being injured.					
K.20. I experience a feeling of being killed.					
K.21. I experience a feeling of being tortured.					
K.22. I experience a feeling of being punished.					
K.23. I experience a feeling of being abused.					
K.24. I experience a feeling of being mistreated.					
K.25. I experience a feeling of being wronged.					
K.26. I experience a feeling of being deceived.					
K.27. I experience a feeling of being betrayed.					
K.28. I experience a feeling of being lied to.					
K.29. I experience a feeling of being cheated.					
K.30. I experience a feeling of being deceived.					
K.31. I experience a feeling of being betrayed.					
K.32. I experience a feeling of being lied to.					
K.33. I experience a feeling of being cheated.					
K.34. I experience a feeling of being deceived.					
K.35. I experience a feeling of being betrayed.					
K.36. I experience a feeling of being lied to.					
K.37. I experience a feeling of being cheated.					
K.38. I experience a feeling of being deceived.					
K.39. I experience a feeling of being betrayed.					
K.40. I experience a feeling of being lied to.					
K.41. I experience a feeling of being cheated.					
K.42. I experience a feeling of being deceived.					
K.43. I experience a feeling of being betrayed.					
K.44. I experience a feeling of being lied to.					
K.45. I experience a feeling of being cheated.					
K.46. I experience a feeling of being deceived.					
K.47. I experience a feeling of being betrayed.					
K.48. I experience a feeling of being lied to.					
K.49. I experience a feeling of being cheated.					
K.50. I experience a feeling of being deceived.					

Kenny, 2009

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The Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MIIQIM)

Categories:

- Frequency
- Intensity
- Duration
- Location
- Impact on Playing

Musculoskeletal Pain Intensity Interference Questionnaire Musicians

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Assessment

Dystonic Scales
TCS, ADDS
FAM (Freq of abnormal movement)
(Peterson, 2013)

Score	Tubiana and Champagne Scale (TCS)
0	Unable to produce several notes
1	Several notes then blockage
2	Short sequence with unsteady fingering
3	Cannot execute certain elements
4	Plays without normal speed
5	Return to concert performance

(Tubiana, 2003)

Stage	Arm Dystonia Disability Scale (ADDS)
0	No Dystonia
1	Mild Difficulty Playing
2	Moderate Difficulty Playing
3	Marked Difficulty Playing

(Fahn, 1989)

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Assessment
of Playing
Posture in
Sitting and
Standing

Static Standing

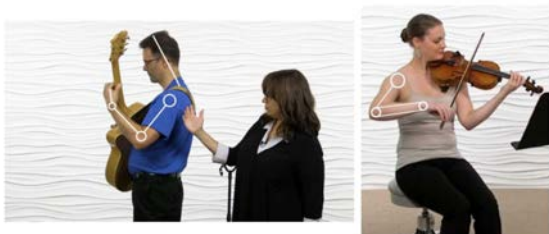
Static Playing

Slow Playing

Fast Playing

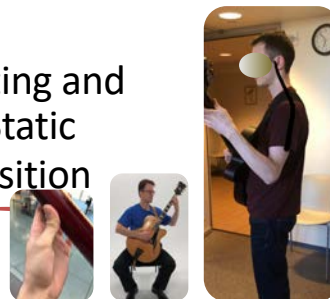
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Assessment of Playing Posture



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Assess Sitting and
Standing Static
Playing Position



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Assess Static Playing Position

- With Music for Awkward Posture
- and Asymmetries



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Quality Movement Assessment of Playing Position

Posture

- Resting, Standing

Posture

- Resting, Playing Position

Functional Movements

- Standing

Playing Posture 1

- Slow, Easy Segment

Playing Posture 2

- Fast, Challenging Segment

Pain

Head

- Forward

Neck

- Lateral

Shoulders (right and left)

- Symmetry, Anterior rotation, elevation

Scapula

- Winging, Ant tilt, protraction

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Quality Movement Assessment of Playing Position

Playing Posture 1

- Slow, Easy Segment

Playing Posture 2

- Fast, Challenging Segment

Elbow

- Excessive flexion

Wrist

- Excessive flexion/extension
- Deviation

Thumb

- Hypermobility – MP/IP

Digits

- Excessive MP flexion
- MP/DIP hyperextension
- Curvature

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Quality Movement Assessment of Playing Position

QUALITY MOVEMENT ASSESSMENT OF PLAYING POSITION (Q-MAPP)

Name: _____ Instrument: _____

Side: _____ Right Left Bilateral

QUALITY MOVEMENT ASSESSMENT OF PLAYING POSITION (Q-MAPP)

POSTURE (resting, standing)	RIGHT	LEFT
PAIN		
Head	Forward head	Forward head
Neck	Lateral tilt	Lateral tilt
Shoulders	Symmetry	Symmetry
	Anterior Rotation	Anterior Rotation
	Elevation	Elevation
Scapula	Winging	Winging
	Ant Tilt	Ant Tilt
	Protraction	Protraction

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Quality Movement Assessment of Playing Position

FUNCTIONAL MOVEMENTS (standing)

PAIN	NO	YES
Head	Forward head	NO
Neck	Lateral tilt	NO
Shoulders	Symmetry	YES
	Anterior Rotation	NO
	Elevation	NO
Scapula	Winging	NO
	Ant Tilt	NO
	Protraction	NO

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Quality Movement Assessment of Playing Position

PLAYING POSTURE (Slow, Easy Segment)

PAIN	NO	YES
Head	Forward head	NO
Neck	Lateral tilt	NO
Shoulders	Symmetry	YES
	Anterior Rotation	NO
	Elevation	NO
Scapula	Winging	NO
	Ant Tilt	NO
	Protraction	NO
Elbow	Excess flexion	NO
Wrist	Excess flexion	NO
	Excess extension	NO
	Excess deviation	NO
Thumb	MP Hypermobility	NO
	IP Hypermobility	NO
Digits	Excess MP flexion	NO
	MP Hyperextension	NO
	DIP Hyperextension	NO
	Curvature	YES

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Quality Movement Assessment of Playing Position

PLAYING POSTURE (Fast, Challenging Segment)			
PAIN			
Head	Forward head	NO	YES
Neck	Lateral tilt	NO	YES
RIGHT			
Shoulders	Symmetry	YES	NO
	Anterior Rotation	NO	YES
	Elevation	NO	YES
Scapula	Winging	NO	YES
	Ant Tilt	NO	YES
	Protraction	NO	YES
Elbow	Excess Flexion	NO	YES
	Excess Flexion	NO	YES
	Excess deviation	NO	YES
Wrist	Excess extension	NO	YES
	IP Hypermobility	NO	YES
	MP Hypermobility	NO	YES
Thumb	Excess MP Flexion	NO	YES
	MP Hyperextension	NO	YES
	OP Hyperextension	NO	YES
Digits	Curvature	YES	NO
LEFT			
Shoulders	Symmetry	YES	NO
	Anterior Rotation	NO	YES
	Elevation	NO	YES
Scapula	Winging	NO	YES
	Ant Tilt	NO	YES
	Protraction	NO	YES
Elbow	Excess Flexion	NO	YES
	Excess Flexion	NO	YES
	Excess deviation	NO	YES
Wrist	Excess extension	NO	YES
	IP Hypermobility	NO	YES
	MP Hypermobility	NO	YES
Thumb	Excess MP Flexion	NO	YES
	MP Hyperextension	NO	YES
	OP Hyperextension	NO	YES
Digits	Curvature	YES	NO

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Playing Analysis - 360



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Learning Activity: View Videos Below and Complete Q-MAPP (see supplementary materials)

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Functional Movement Assessment



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Upright Bass – Slow Segment



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Upright Bass – Fast Segment



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Upright Bass - Challenging



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Complete Q-MAPP

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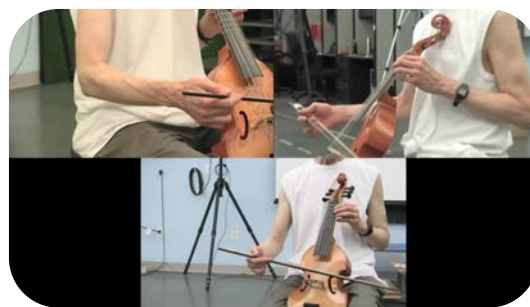
Assessment

Movement Analysis:

Digit displacement, velocity, acceleration metrics



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Assessment of Seated Posture



Seated Posture - Asymmetrical

- Pelvis balanced
- Hips shifted
- Trunk rotated
- Head rotated
- Shoulder internal/external rotated
- Forearms rotated

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Assessment of Seated Posture



Seated Posture – Symmetrical

- Balanced pelvis
- Trunk in ant/post plane
- Shoulders squared
- Head forward
- Forearm Parallel

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Seating Posture Analysis

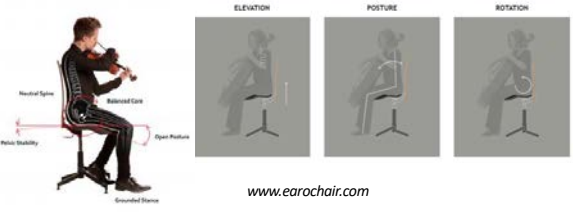


Assess:

- Proper Chairs
- Weight distribution
- Seat and Music Stand Adjusted to proper height
- Chin rests/Shoulder straps/Floor stand

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Seating



www.eurochair.com

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Good vs Bad Posture

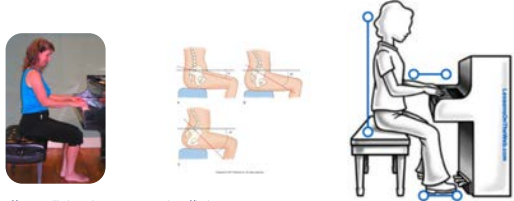


<https://plockcatmusic.com>

<https://www.nature-relax.com>

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Proper Biomechanics

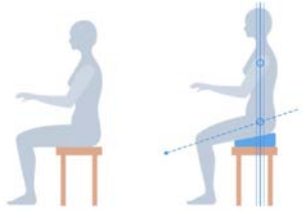


<https://www.wellbalancedpianist.com>

<https://podpointeventyemassage.com>

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Proper Biomechanics



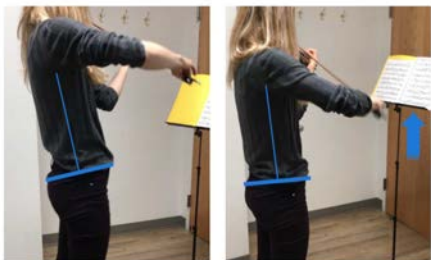
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Assessment of Music Stand Placement



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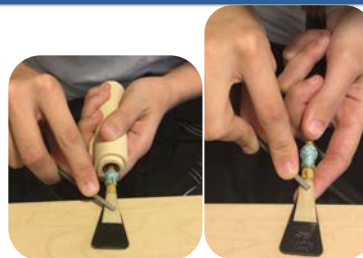
Placement of Music Stand



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Assessment of other related activities : Reed Making

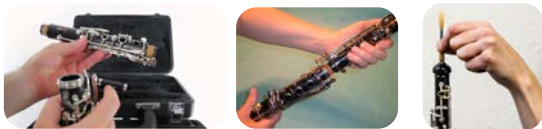
- Instrument specific
 - Bassoon
 - Oboe



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Assessment of other activities : Assembly and Care

- Instrument specific
 - Brass
 - Woodwinds



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Assessment of Instrument Supports



Chin Rests



Shoulder Rest



Carrying Cases



Thumb Posts



Harnesses/Straps

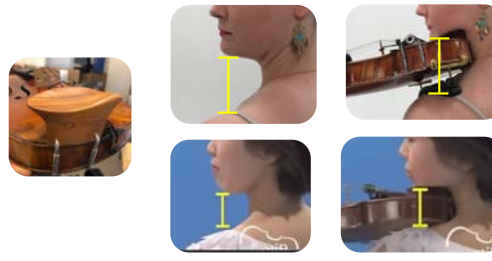
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Assessment of Instrument Support



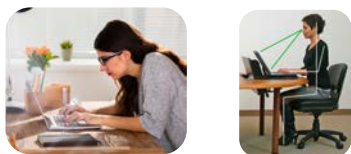
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Assessment of Instrument Supports



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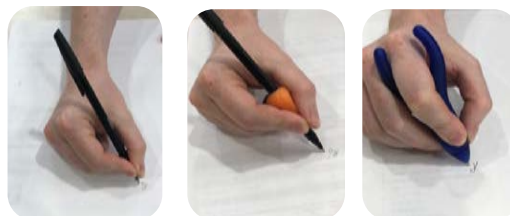
Assessment of posture during other activities



<https://laptopland.com.au>

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Assessment of Writing



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References

- Berque P, Gray H, McFadyen A. Playing-Related Musculoskeletal Problems Among Professional Orchestra Musicians in Scotland: A Prevalence Study Using a Validated Instrument, the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM). *Med Probl Perform Art.* 2016;31(2):78-86. doi:10.21091/mpa.2016.2015
- Fahn S. Assessment of the primary dystonias. In: Munsat TL, editor, ed. *Quantification of Neurologic Deficit*. Oxford: Butterworths; 1989:241-270
- Kenny DT. *The psychology of music performance anxiety*. Oxford University Press;2001.
- Taylor A, Wolff AL. The forgotten radial nerve: A conceptual approach for the treatment of lateral elbow pain. *Journal of Hand Therapy.* 2021;34(2):323-329
- Tubiana R. Prolonged neuromuscular rehabilitation for musician's focal dystonia. *Med Probl Perf Artists.* 2003; 18: 166-9.
- Yang N, Fufa D, Wolff AL. A Musician Centered Approach to Management of Performance Related Upper Extremity Musculoskeletal Injuries. *Journal of Hand Therapy.* 2021;34(2):208-216

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