

Title: Motion, Muscle Activation, and Violinists



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BACKGROUND:

Context: String musicians are particularly susceptible to orthopedic conditions such as overuse syndrome, muscle tendon syndrome, focal dystonia, hypermobility syndrome, and compressive neuropathy due to unnatural body movement.

Need: There is a need to analyze the movements performed by string players to determine ideal playing techniques and facilitate development of an ergonomically correct instrument setup.

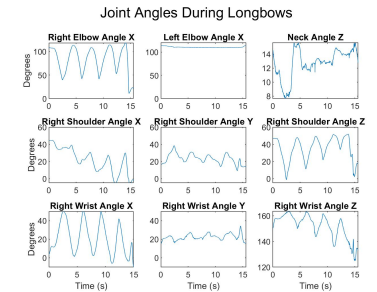
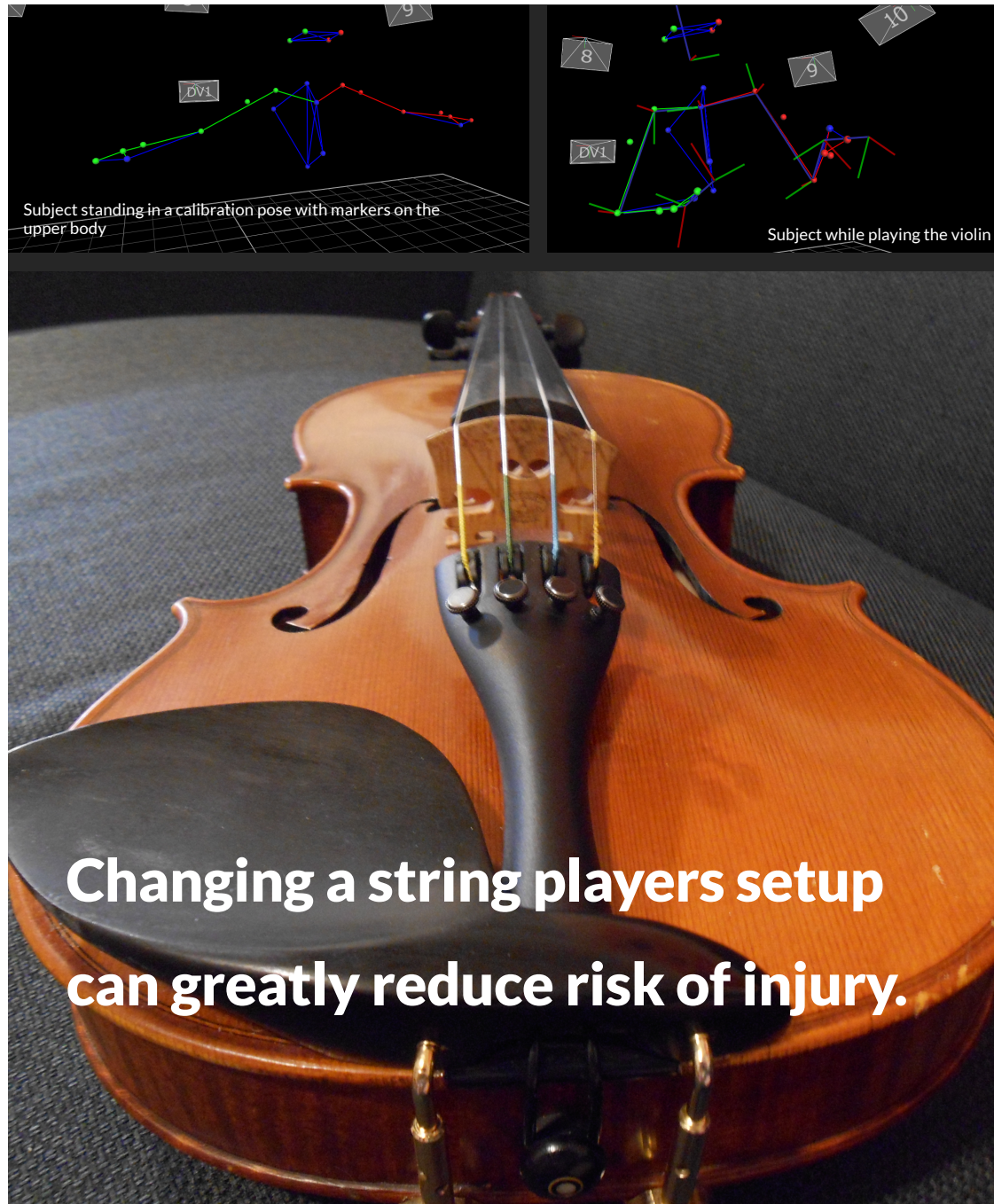
Tasks: A literature review was paired with a theoretical data collection strategy to determine common patterns of motion that limit muscle fatigue and prevent injuries.

METHODS FOR THEORETICAL DATA COLLECTION

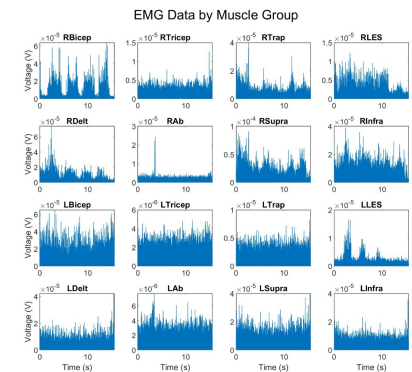
Reflective markers were placed on the upper body to gather information on joint angles, forces, moments and power of the arms and shoulders. Electromyography (EMG) sensors were placed on select muscle groups from the arms, back, shoulders, and abdominals to gather information on muscle activation.

RESULTS

- A review of existing literature shows:
 - String musicians are susceptible to musculoskeletal disorders (as high as 87% of instrumentalists).
 - Techniques, such as the Alexander Technique, greatly reduce injury risk.
- Limited data shows:
 - Distinct patterns of muscle activation when playing on different strings.
 - Large amounts of asymmetry between the left and right sides of the body.



The figure above shows joint angles during longbows on all four strings of the violin. The figure below shows muscle activation during the same trial. The subject played on the strings from the lowest to highest pitch (G, D, A, E).



Note that data was only collected in a trial setting and additional collection is necessary to investigate playing techniques and physical setups. Future work will include additional trials on 5-10 subjects. Demographics, kinetics, and muscle activation will be compared between subjects to identify patterns in the data.

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