Development of Photogrammetry Techniques to Assess Musicians' Posture

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Background

Musicians have a high rate of performance-related injuries, and posture is thought to be one critical contributing factor. Although research in musician populations is limited, posture has been extensively studied in other areas, such as athletics. Photogrammetry techniques have been used in sports to analyze athletes' movements to identify kinematic parameters, quantify physical load, and identify potential risk factors associated with injury. For this project, photogrammetry techniques used for movement analysis in sport were used to analyze musicians' head posture to determine feasibility. Exemplar measurements included craniovertebral angle (CVA) measurements. Previous research has indicated that CVA measurements less than 48-50˚ are associated with forward head position which is commonly found in those who experience neck pain.

Research Question

To what extent is it feasible to utilize (sport) photogrammetry techniques to assess musicians' position and posture?

Methods

Currently there is no standard way of measuring or assessing posture. A literature review was completed to identify measures and photogrammetry techniques used in populations elsewhere that would be meaningful and could translate and be of use for musicians. **Kinovea**, a free open-source software application, facilitated angle measurement (e.g. craniovertebral angle; CVA) and analysis of musicians' posture.

Pilot Assessment: CVA measurements were obtained from istockphoto web images of numerous pianists performing, all from sagittal view (see **Figure 1**).

Pilot Photogrammetry with Undergraduate Students: Participants were asked to play a scale and then a musical excerpt of their choice while videos were taken from the posterior and sagittal views of each musician (see **Figures 2, 4, 5**). Videos were then analyzed using Kinovea to identify angles of interest.

Figure 1, CVA of pianists from web images**. 1A.** No forward head posture. (Above left). **2A & 3A**. Forward head posture, CVA < 48-50˚ (Above center & right)

Analysis

CVA measurements: Angles were measured using Kinovea software by identifying two landmarks in videos of the sagittal view of each musician, the tragus of the ear and the 7th cervical vertebrae (C7). Each landmark was identified in the still image. A straight line was then drawn through the 2 landmarks. Using a reference within the image, a horizontal line was drawn through C7. The respective angle of the two lines was then measured (see **Figure 1**).

Figure 2a & 2b: CVA of student in neutral position & while playing their 1st note on the trombone.

Figure 3a & 3b: CVA of student in neutral position & while playing their first note on the piano.

Results

A significant difference was observed in the group average CVA measurement when undergraduate participants were in the neutral position versus when playing their first note. Each individual participant also had a lower CVA angle when playing their first note compared to when they were waiting to play (see **Table 1**).

Table 1

CVA Measurements in Neutral Position vs. 1st-note Head Posture

Participant	V1	V2_P	V2_T	V3	V4	V6	V8	V10	V12	Avg	SD
Neutral Position	40.2	43.9	52.2	50.5	51.1	49.4	58.0	42.1	36.7	47.1	6.8
1st note	31.0	35.6	30.5	48.2	35.0	37.5	51.4	30.9	33.7	37.1	7.6

Note: CVA angles presented in degrees.

Conclusions & Future Directions

- Based on study observations, **forward head posture** appears to be prevalent among musicians.
- **Results** indicated lower CVA measurements when playing first notes compared to when in a neutral position which could be a risk factor for neck pain.
- Work is currently underway to **assess other postural angles of interest**. Feedback will be offered to musicians to enhance their practice & performance.
- Development of **musician-specific interventions** (e.g. **strength training; stretches; proprioceptive training**) is underway to facilitate improved posture in practice and performance.
- Initial results indicate that **photogrammetry is a relatively quick and easy way to obtain meaningful information** regarding musicians' posture and position.

References

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