ANALYSIS OF TONGUE AND BLOWING ACTIONS DURING ARTICULATION ON THE CLARINET

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Background

Referring to the characteristics of the transition between notes in a musical phrase, articulation is one of the playing skills an instrumentalist uses during expressive performance. Articulation in woodwind instruments is achieved by means of the tongue interaction with the reed, combined with the control of blowing pressure, lip force, and vocal tract configuration. The intricacies of articulation remain out of visual inspection, and thus are not straightforward to analyze. Reed bending measurements have been used to analyze the tongue-reed contact on the saxophone and the clarinet. Still, a systematic classification of the observed features is needed to find a link between articulation techniques and playing parameters used for expressive performance.

Aims

We aim at finding characteristic values for tonguing and blowing parameters during clarinetists' articulatory actions. The relationship between these parameters and the properties of the music (dynamics, tempo) are further investigated.

Method

The experiment considers a professional clarinettist from the Vienna Symphonic Orchestra who plays a melody in three articulation techniques (legato, portato or staccato), two dynamic levels (piano, forte), and two tempi (120 and 240 bpm), on a German Bb clarinet. The acoustic pressures inside the musician's mouth and inside the clarinet mouthpiece are measured (Endevco 8507C-2), while the reed bending is captured with a strain gauge to obtain the reed-tip opening. Combined reed-opening and pressure measurements allow us to distinguish the tongue-reed contact (TRC) independently from the influence of the blowing actions during articulation. Once the TRC occurrences are identified in the signals, the reed-tip opening, the blowing pressure (BP) and the duration of tongue-reed contact (TRCdur) are evaluated.

Results

The results show that different combinations of tongue and blowing actions are used during performance. Portato and legato playing show constant BP throughout the musical phrase, which varies according to the dynamic level (piano: 2.5 kPa, forte: 4.5 kPa). In staccato playing, BP is reduced significantly during TRC (by 63% in slow playing and by 37% in fast playing). Moreover, the average BP is larger for staccato (piano: 3.5 kPa, forte: 5.1 kPa) than for portato/legato playing. TRC is only observed for portato and staccato articulation. In portato articulation, TRCdur is independent of tempo and dynamics (mean: 36 ms). In staccato, TRCdur is adapted to the tempo correspondingly to the inter-onset-interval (slow: 342 ms [68.4% of IOI], fast: 144 ms [57.6% of IOI]). Overall, the BP depends on dynamics, tempo and articulation technique, while the TRCdur only varies in staccato articulation.

Conclusions

Different player actions regarding clarinet articulation have been recorded and analyzed. Preliminary results show that tonguing techniques are dependent on the articulation style but are consistent at different dynamic levels. The observed tongue-reed interaction in the clarinet is in agreement with previous saxophone studies. The blowing pressure changes according to the dynamic level and depends on the articulation technique and tempo. Other features such as the influence of the vocal tract and the differences on articulation among registers, as well as an extended study with a larger set of players, are envisaged for future experiments.

Keywords

clarinet; articulation; tongue; single-reed; player-instrument interaction

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