

Fingering force in violin vibrato

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This study investigated the spatio-temporal features of the longitudinal (“shaking”) and normal (“press”) string clamping forces by the left hand during vibrato sound production. A violin installed with a 3-D force transducer was used for the measurement of the force at the D5 tone position. Twelve trained violinists produced an A (open) tone for 2 s followed by a D (vibrato and force measurement) tone for 30 s at different vibrato rates (4.5 and 6 Hz, and no-vibrato), dynamics (*p*, *mf*, and *f*), and with the use of different fingers (index, middle, ring, and little fingers). The average, amplitude, and peak-to-peak time of shaking, and press forces, and the longitudinal-lateral shear force relationship were evaluated. During vibrato, an oscillated pattern was observed in each of the three forces, while the longitudinal component demonstrated the largest periodic oscillation. The average press force and the amplitude of shaking force significantly increased with the rate of vibrato as well as dynamics of the sound generated. These force variables did not differ among the four fingers. The shaking force showed considerable inter-player difference (1.0-4.2 N). The feedback training was found to help in some reduction of the force.

Keywords: violin; vibrato; fingerboard reaction force; acoustic parameters; finger difference

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