

ACOUSTICS2008/2133
Why practice scales? Details of fingering transitions in flute playing

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Mastering a wind instrument requires not only expert blowing and embouchure, but also many hours of practice of exercises that improve the fingering speed, regularity and coordination. Many note transitions involve the motion of several fingers, often in opposite directions. The order of finger movement can sometimes affect the transitions between notes and produce short, spurious notes between the original and destination notes.

We adapted a transverse flute for real time measurement (with a resolution of 3 ms) of all key positions using reflected light sensors. Beginner and advanced players were asked to perform a phrase including multi-finger transitions. The detailed motion, average speed and intervals between finger motion were analysed. The comparison among players is not surprising: an experienced player was found to have more regular time intervals between fingers moving in a same direction (within 10 ms) than an amateur (within 25 ms). Contrary fingering motions are slightly less regular (15 ms for an experienced player against 50 ms for an amateur), but still unperceptible to the ear in the case of the experienced musician. A range of details will be reported, for instance the influence of scale exercises.