

Abstracts

William J. Dawson, M.D.

Engle KC, Flanders M, Soechting JF: Anticipatory and sequential motor control in piano playing. *Exp Brain Res* 113:189–199, 1997

In this study, pianists played short excerpts from several pieces on an electronic keyboard. Each piece had two phrases whose notes first were played identically with the right hand, then differently. The study's aim was to determine whether or not hand and finger kinematics diverged prior to the depression of the key for the last common note. Divergence would imply an anticipatory modification of sequential hand movements, while its absence would imply a strictly serial organization of movement sequences with the hand. Time and speed of key depression were recorded via a MIDI interface to a computer. The authors found that this type of piano playing did invoke anticipatory modifications of hand and finger kinematics. The time at which two patterns of movements diverged varied considerably from piece to piece. Playing an ascending scale that required a "thumb under" movement could evoke the anticipatory modification as much as 0.5 seconds in advance of the last common note. Other pieces gave results much closer to the pattern of direct serial ordering. The authors suggest that strict serial execution of a movement is favored, so long as it is compatible with the demands of the particular task.

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Leijnse JNAL: Anatomical factors predisposing to focal dystonia in the musician's hand—Principles, theoretical examples, clinical significance. *J Biomech* 30:659–669, 1997

Several causes of focal dystonia in the musician's hand are considered in this paper: anatomic constraints on joint mobility, and anatomic interconnections between hand tendons and between tendons and their environment. The author proceeds under the hypothesis that focal dystonias arise when the constraints on movement resulting from these anatomic limitations impede playing movements with sufficiently low energy expenditure; the hypothesis is modeled for connections between the tendons of the deep finger flexors. Displacements, forces, stresses, and work per volume in the finger muscles are calculated for some common piano playing movements. Results indicate that, with the connections mentioned, strains may occur with certain movements of the extensors and lumbricals, or with the lumbricals and interossei. In some cases the interossei may become the main power source for loaded instrumental movements. The author closes with a summary of the biomechanical principles of conservative and surgical treatment of the conditions.

Leijnse JNAL: Measuring force transfers in the deep flexors of the musician's hand: Theoretical analysis, clinical examples. *J Biomech* 30:873–882, 1997

Dr. Leijnse, from the Department of Plastic and Reconstructive Surgery at Erasmus University, Rotterdam, re-

ports further research into hand biomechanics of the pianist. In this study, he modeled the anatomic and functional interdependencies that regularly exist between the tendons of the deep finger flexors, and validated the obtained results with measurements on real hands. He found that intertendinous force transfers may be caused by (1) simultaneous activation of muscle fibers inserting into different tendons and (2) passive (anatomic) interconnections between tendons or muscle bellies. The experimental models and the results obtained from this study are being utilized in the diagnosis of hand problems in his musicians' clinic.

Jancke L, Schlaug G, Steinmetz H: Hand skill asymmetry in professional musicians. *Brain Cogn* 34:424–432, 1997

Hand skill asymmetry in two-handed tasks was examined in right-hand-dominant musicians and non-musicians alike, as well as in left-hand-dominant and ambidextrous musicians. Right-dominant musicians demonstrated a lesser degree of hand skill asymmetry than did right-dominant nonmusicians, primarily because of the former group's increased left-hand skills. Keyboard musicians demonstrated superior tapping performance than did string players, although the two groups had similar degrees of hand skill asymmetry. Diminished tapping asymmetry in musicians was related to early commencement of musical training but not to its duration. The authors interpreted the study results as an adaptation process resulting from performance requirements interacting with childhood cerebral maturation.

Zaza C, Farewell VT: Musicians' playing-related musculoskeletal disorders: An examination of risk factors. *Am J Ind Med* 32:292-300, 1997

The authors discuss several studies which show that playing-related musculoskeletal disorders (PRMDs) present a significant health problem for musicians. To evaluate physiological, psychological, and behavioral risk factors of musicians' PRMDs, in 1994 they collected data from classically-trained professional and student musicians in Ontario, Canada, for a case-control study. Hypermobility and hand span data, plus a self-reported questionnaire, were given by 281 musicians. Cases were identified by a PRMD definition previously formulated in a qualitative study by musicians and health care professionals. They compared data from a cohort of 44 prevalent PRMD cases who had no previous history of a PRMD, and from 90 controls who had never experienced a PRMD. Data from all subjects were analyzed to examine the role of a prior PRMD on the risk of a current PRMD. Their study suggested that females and string players were at a higher risk of PRMD; several other determinants were also important in the development of a PRMD. They felt that

warning up before, and taking breaks during, practice sessions protected the subject from a PRMD, and that prevention programs directed to those at risk are warranted and desirable.

Schmuckler MA, Bosman EL: Interkey timing in piano performance and typing. *Can J Exp Psychol* 51:99-111, 1997

In typing, when the fingers executing two successive movements are on the same hand, the time between keystrokes is longer than when the fingers are on different hands. This difference seems to be related to biomechanical limitations within the hands. The generalization of this finding was explored by studying the performance of two successive notes by skilled pianists. Their first experiment, on piano, failed to find any comparable differences in timing as a function of the hands involved. The second experiment employed both a typing task and piano playing; it replicated the previous piano performance results and revealed that the timing differences in typing were limited to sequences of letters that required both lateral and fore-and-aft finger movements. The third experiment produced the same finding during piano performance. Together, the results clarified the na-

ture of biomechanical restraints on the performance of skilled manual tasks.

Ash J, Asher G, Libs JM: Wind instrumentalists' most frequently asked dental questions. *Int Trumpet Guild J Sep*: 31-37, 1997

Drs. Ash and Asher are practicing dentists; Dr. Ash also plays trumpet with the Plymouth (MI) Symphony. They answer questions (posed by Mr. Libs, pedagogical topics editor) covering 11 areas of dental health, including temporomandibular joint difficulties, bruxism, wisdom tooth removal, orthodontia, crowns, root canals, and dental cleaning and prophylaxis. Other covered subjects include playing-related problems such as jaw muscle fatigue while playing, lip protection, and air stream concerns. Both dentists answer each question, and their facts and recommendations are similar and complementary. The information presented is timely, useful, and accurate, and the majority of it is applicable to all wind instrumentalists. However, one dentist answers the questions almost exclusively in scientific language, while the other uses mostly lay terms; in this editor's opinion, the latter's responses are more likely to be clearer and better understood by the readers of this brass-focused journal.