

**TEACHING PIANO TO ADULT STUDENTS WITHOUT MUSICAL
TRAINING: BIOMECHANICAL ASPECTS**

**PREDAREA PIANULUI PENTRU STUDENȚII ADULȚI FĂRĂ PREGĂTIRE
MUZICALĂ: ASPECTE BIOMECHANICE**

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Playing the piano is a mind and hand task that needs interactivity of muscles, joints and nerves etc. It is necessary to be aware of hand biomechanics, the complicated physiology and anatomical structure of the hand, in order to reach a correct hands position in playing the piano, therefore the importance of our current study is situated in the field of biomedical hand performance.

Keywords: Human Hand, Biomechanics, Anatomy, Physiology, Nerves

Cântarea la pian este o sarcină a minții și a mâinilor care necesită interactivitate a mușchilor, articulațiilor și nervilor etc. Este necesar să fim conștienți de biomecanica mâinii, fiziologia complicată și structura anatomică a mâinii, pentru a ajunge la o poziție corectă a mâinilor cântând la pian, deci, importanța și actualitatea studiului nostru constă în aplicarea conceptelor împrumutate din domeniul biomedical.

Cuvinte-cheie: mâna omului, biomecanică, anatomie, fiziologie, nervi

Introduction

For achieving comfort playing the piano, the pianist (beginner adult or young, experienced performer or pedagogue) has to understand how physically the playing process is done by getting some essential knowledge of doing it, not only the role of the hands but, also the function of the whole upper limb and physiologic-anatomy. If playing the piano technically does not happen naturally, it means that natural playing does not exist in some students (young or adult), then it has to be learned. When the student feels any fatigue while playing, it means misuse of the mechanism. When a piano technical problem occurs, it does not mean a lack of talent, but lack of analytical knowledge about the natural form and structure of the hands and lack of arm-upper arm-fingers coordination. As the adult piano student begins learning to play the piano in late age, it means the age of range motion limitation, serious physiological problem flexibility in hand and fingers joints, tendons, muscles...hence the importance of hand biomechanical knowledge. The objective that has to be for a piano professor is to understand the basics of the hand's biomechanics, to explain and understand, to correct the gesture of the piano student (young or adult) in order to optimize it.

Human Hand Structure The hand is an exceptional (or freaked) member in the human body. The hand is composed of 27 bones on which are attached more than 30 muscles, tendons, and 29 joints. Hand bones include the sections:

- The carpus or carpal bones (Trapezium, Trapezoid, Capitate, Hamate, Pisiform, Triquetrum, Lunate, Scaphoid) called wrist. By the three bones of Scaphoid, Lunate and Triquetrum, the hand is joining the forearm two bones (radius and ulna) (**Figure 1**).
- The metacarpal bones (M1 – M5), called hand palm, serve to connect the carpal bones with the phalanges (fingers).

➤ The phalanges are called the five fingers (Thumb, Index, Middle, Ring, Little). Each of the 2nd, 3rd, 4th and 5th fingers has three phalanges (proximal, intermediate, distal), while the first finger (Thumb) includes only two phalanges (proximal and distal) **Figure 1**

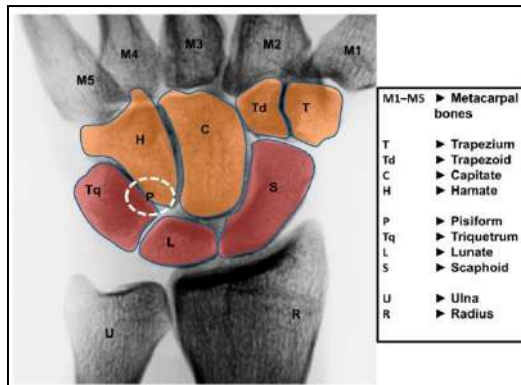
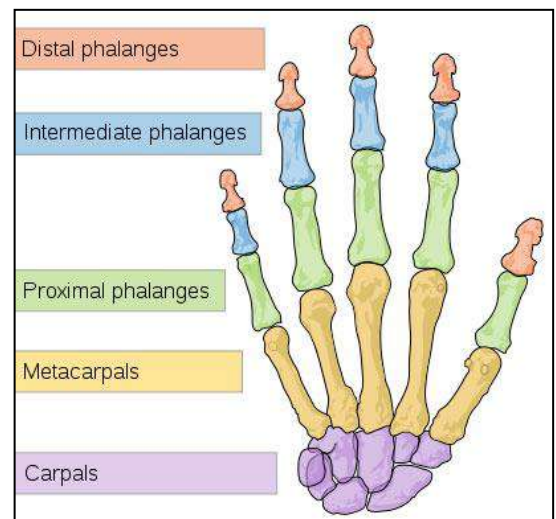


Figure 2



The Carpus (Wrist) Joints

It is almost the most important joint for pianists that they must use correctly, to solve an amount of technical problems in specific passages. This joint between the carpal bones and the radius long bone of the forearm, provides the hand to execute flexion toward the hand palm and extension movement toward the hand's back, as well as the most important movement rotation, and flexion – deflection toward the thumb or toward the fifth finger. The joints the Carpal bones and metacarpal bones are five; between them the thumb joint with the carpal bone have the most extensive motion of abduction, adduction, flexion, extension, circumduction. Between the metacarpus bones and the proximal phalange there exist joints, as well as betwixt other bones proximal – intermediate and distal, but for the thumb only the joint between proximal and distal (because there is no intermediate bone), these articulations execute only flexion and extension.

The Motion of the Human Hand Finger Each finger has its own natural motion on every level of its bones joints.

1. Movement of the four fingers - the index, middle, ring and little, includes the following joints that have been measured and described in some research [1] as the following:
 - Carpometacarpal (CMC) joint has flexion/ extension.
 - Metacarpophalangeal (MCP) joint with 2 degrees of freedom: Abduction/Adduction and flexion/ extension.
 - Proximal interphalangeal (PIP) joint with flexion/ extension.
 - Distal interphalangeal (DIP) joint with flexion/ extension.
2. Movement of the thumb that is composed of four bones, trapezium, metacarpal, proximal and distal, with the following joints:
 - Trapeziometacarpal (TMC) joint, with 2 degrees of freedom: Abduction/Adduction and flexion/ extension.
 - Metacarpophalangeal (MCP) and Interphalangeal (IP) joints.

The Middle, Ring and Little finger have common flexor tendons which explain the involuntary motion. The thumb, due to its independent muscles, has the most flexibility movement. The little 5th finger, in some motion, is moving more easily than the middle and ring fingers, because of its some independent muscles. The index finger, between all the other fingers, has the most comfort motion, because one tendon of the forearm muscles is attached on it (*Figure 3*).

The thumb, index, and little fingers have their independent extensors. The middle and ring fingers possess neither independent flexors nor independent extensors muscle, their moving depends on all the other fingers muscles, using the same muscles (*Figure 4*). But still, the ring finger is the weakest, because the ring finger is not only related to the other fingers by the same muscles, but also because the same ulnar nerve connects the ring finger with the little finger and the half side of the middle finger; while the radial nerve connects the thumb, index and the other side of the middle finger. Therefore, the middle finger is moving more easily than the ring finger, despite of sharing the same muscles, but the middle finger is receiving signals from both the radial and ulnar nerves, while the ring finger receives signal from only one nerve: the radial nerve. [2].

Figure 3



Figure 4



After an anatomy and biomechanics review, we realized how limited are the natural range and movement of the human hand fingers, therefore there exists the necessity of preventing any unnatural movement out of the natural range and natural motion of the hand form; wherefore to get more vast comfortable movement we require the use of the carpus radial joint (wrist) that is rich in movement in all directions, with the contribution of the forearm, arm and shoulder for reaching a correct piano playing, well described by Dorothy Taubman (August 16, 1917 – April 3, 2013), American piano teacher, and creator of the Taubman Institute of Piano. The Taubman Approach is an entire method to resolve piano technique by making the body and the mind work together. The pianist should understand that the whole body is one unit, and the mind should guide the parts – forearms, hands, fingers – for helping each other, in acting together at the same time; and to understand the physiological structure of the forearm - hand - fingers – as well as the physiological piano [4].

Edna Golandsky, renowned pianist and student of Dorothy Taubman, declared the fundamental principle of Taubman's Approach: "fingers, hands and arms always operate as a synchronized unit, with each part doing what it does best". Taubman detected that the use of coordinated motion of wounded pianists not only treats and reduces the problems but develops a higher performance level, "it is correct motion, not muscular development that produce great technique" [3]. According to Taubman's Approach, playing the piano is not impossible, each problem, technical or any other, can be solved by analyzing it and by the diagnostic of the issue, Taubman stated: "We are talking about dedicated, earnest, gifted people. There should be no reason why they can't do what they want to do" [3]. Taubman demonstrated the conception of mid movement between relaxation and tension, "Relaxation is the result, not the cause, of correct playing". Taubman Approach's key consisted in: – rotation from right to left or from left to right, in order to match an effective motion on the piano without tension. – avoiding awkward movements. – Using the natural alignment of our hands, fingers and arms constantly [4].

Taubman's central technique is the rotation, beside with in and out motion, introduces to a healthy virtuosity.

Conclusions

For a piano adult beginner student, for lack of having a basic piano music instruction, everything is new to him in a piano lesson, he does not know where to seat, or what should be the distance between the piano and the adult student; the most important thing is to learn the position of his hands fingers- arm- forearm. Taking into consideration that piano adult students are generally feeling nervous and the shyness which reflects on their hands positions (grasping fingers, or sleepy fingers) may cause serious problems in learning to play, therefore we must find a way to relax the adult student psychologically. The adult beginner piano student always asks lots of questions like for example: "why my 3rd, 4th, 5th fingers are the weakest? Or, why my thumb and index are stronger and have more freedom motion? Or, what is the meaning of natural and relaxed position? Why is my thumb finger shorter than all the other fingers? Etc..". Obviously, only biomechanics study can answer all these questions, hence the necessity of our current article study.

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