

Healthy Piano Technique and the Prevention of Professional Injuries: Exploring the Work of Anna Schmidt-Shklovskaya and Ivan Kryzhanovsky

Although widely known in the Soviet Union for her work with pianists with playing-related injuries, Anna Schmidt-Shklovskaya (1901-1961) developed a teaching approach that greatly benefited her many uninjured students as well. In the foreword to Schmidt-Shklovskaya's only book, *On the Development of Piano Skills* (2002), her student Galina Minsker (b. 1935) writes that Schmidt-Shklovskaya's intent was to develop methods appropriate for all pianists, methods that aimed to help students "get rid of discomfort and tension during playing, overcome technical lags, and find necessary means for expressing their [musical] individualities" (p. 5).

Schmidt-Shklovskaya (2002) explained that it was her own professional injury that triggered her interest in the physical and technical problems of other pianists. She believed that erroneous ways of teaching were to blame for the faulty technique she acquired during her childhood:

I was taught to play with elbows kept tight to the body, claw-like fingers, rigid static hands; wrist was tense, elasticity of hands was absent. The ear control was underestimated in the process of learning. With advancement of repertoire, [I started experiencing] fatigue [and] severe pain in the hands. On the outside, I seemed to play well and even virtuosically, but the pain I felt was at the limit of my tolerance. Doctors [...] could not help (p. 16).

In her search for ways to heal and maintain her professional career, Schmidt-Shklovskaya met Professor Ivan Kryzhanovsky (1867-1924), a physiologist and musician who worked with pianists' playing-related injuries. As a result of this work with Kryzhanovsky, as well as her subsequent studies in physiology, not only did Schmidt-

Shklovskaya rebuild her own playing technique, she developed a full system of teaching that promotes healthy piano skills for all players.

In this paper, I explore the Schmidt-Shklovskaya approach and its historical foundations, as well as my personal experience of learning with Minsker, and the pedagogical insights and findings I gained from following the Schmidt-Shklovskaya-Minsker Method.

The Fundamental Principles of the Schmidt-Shklovskaya System

Schmidt-Shklovskaya's fundamental principles, such as her attitude to sound and intonation, her prioritization of musical conceptions and aural control in technical work, and her close attention to the individual abilities of her students, were rooted in the best traditions of piano performance and pedagogy. Minsker (2002) regards Schmidt-Shklovskaya's method as "the system of principles of organization and improvement of pianists' playing apparatus, based on clear understanding of its [the apparatus's] nature and functional abilities" (p. 6). Nevertheless, Schmidt-Shklovskaya's careful attention to the pianist's apparatus does not obscure the high musical purposes that these technical skills serve. Rather, she subordinates fine muscular work to constant ear control, thus incorporating musical and technical sides of piano playing into one process.

On a historical scale, this understanding of piano technique as an integral and indispensable aspect of pianists' musical self-expression is closest to that of Franz Liszt and his followers, such as Claudio Arrau. Charles Rosen writes that, for Liszt,

Physical execution or virtuosity is not transparent or peripheral to expression; nor is the musical experience itself exclusively aural, intellectual, or emotional. Rather, virtuosity takes on a broader significance, certainly as generator of sound, sensation, and emotion, but

also as a unifying force that grounds all three in somatic experience (As retold in Von Arx, 2014, p. 31).

Von Arx (2014) also notes that this conception of piano performance as a musical and technical unity counters the views of some other pianists, who encourage treating musical and technical sides of pianist's development separately. For example, pianist Josef Lhévinne (1972) advised practicing technique and musical pieces in two separate sessions and compared technique to the grimy engine of an automobile, which has nothing beautiful about it but is nevertheless the only means to take you to "the musical dreamland of interesting execution and interpretation" (pp. 43-44). In contrast to this understanding, Schmidt-Shklovskaya's teaching stemmed from the Listzian notion of the significance of both the physical and spiritual sides of piano playing and their mutual and absolute integrity to the process.

Sound and Touch

The first and the most important element of Schmidt-Shklovskaya's system is piano sound. In piano pedagogy, sound often loses its primary position, perhaps because it becomes obscured by other elements of the learning process, such as sight-reading or technique. This may be further exacerbated because some features of the piano, including equal temperament, abstractedness of timbre and the physical remoteness of the player from the source of sound (the strings), can make it challenging for the pianist to focus on expressive sound. Nevertheless, we may find it surprising that piano sound is, as pianist Boris Berman (2000) writes, "frequently neglected by teachers and students or ... receives only perfunctory attention. For music, this omission is as strange as ignoring colour in visual art or body movement in acting" (p. 3). Minsker (2002) points out that Schmidt-

Shklovskaya followed her teacher Felix Blumenfeld (1863-1931) in her aspiration to achieve a singing tone, which she described as "the clear sound of the string, as much as possible without any extraneous noises from the colliding wooden parts of the piano mechanism or from the 'flopping' finger strokes" (p. 7). In other words, Schmidt-Shklovskaya did not tolerate "white" meaningless sound, and required that students convey music's contextual meaning through expressive, colourful tone.

Minsker further explains that this attitude to sound underlies all of Schmidt-Shklovskaya's guidelines for the development of students' technical skills, beginning with those pertaining to touch. Schmidt-Shklovskaya worked on a variety of tactile sensations to instil in students a feeling of fusion of fingers with piano keys, so that the fingers become imaginary "extensions of the string" (p. 7). With this philosophy, Schmidt-Shklovskaya was not inventing an entirely new concept, but rather creating a more systematic and intentional way to broach a much older understanding of playing "beyond the keys." In fact, ever since Beethoven's time pianists have cultivated the notion of perceiving piano sound from the strings, and many renowned pedagogues have promoted close-to-the-key touch to achieve a deeper cantabile tone. This way of sound production became especially notable in the 19th and early 20th centuries when Romantic composers and performers realized that piano sound opened great opportunities to create broad melodic lines through singing tone. Rachmaninoff expressed the idea of the integration of performer and instrument as well, when he compared pianist's fingers to the roots of the tree growing into the keys.

Schmidt-Shklovskaya, then, is best understood as a successor of this tradition.

Intonation

After sound production Schmidt-Shklovskaya's next-most significant principle, pertains to intonation. In order to achieve the desired singing sound and expressive intonation, many pianists put a lot of effort into overcoming the percussiveness of the piano. As Hungarian pianist Andras Schiff commented, even though the piano cannot produce "a perfectly smooth legato [...], the art of piano playing rests on the ability of a musician to create the illusion of these things [diminishing sound and legato]" (As quoted in Isakoff, 2011, pp. 197-198). Although Schmidt-Shklovskaya does not fully explain her views on intonation in her book (recall, she wrote only one), we can understand the concepts behind her practices by way of the similar insights of Nadezhda Golubovskaya, a famous 20th century Russian pianist and pedagogue. Golubovskaya (2007) writes that while melodiousness is an essential concept for working on sound, it is not necessarily the legato touch or the character of each individual tone that contributes to melodious playing: *legato* on the piano is an acoustic concept, while melodiousness is a creative one. Therefore, when attempting to create expressive sound, pianists should work first of all on intonation, or inflection of the melodic interval (p. 152).

Because the piano is an instrument with a fixed pitch and equal temperament, deviations from a pitch are impossible, so pianists are deprived of this natural way of expression. Moreover, the physical effort that is involved in the production and expression of sound by a vocalist or an instrumentalist is also different on the piano.

Leon Fleisher (1987) says:

As a pianist, we have a built-in difficulty that is unique only to us, and that difficulty is that every other instrument...is physically involved in the production of sound, the maintaining of the sound. A wind player keeps breathing out the life's breath in order to maintain a

sound. A string player must keep the bow in movement ...Me, push down a key, and somehow, through magic, we have to pretend that we are hearing it, supporting it, maybe even making a crescendo, until- boom- we push down the next lever which is what this keyboard is (As quoted in Noyle, 1987, p. 94).

Thus, a pianist must understand that the physical ease of producing the sound of a required pitch on the piano is both a benefit and a drawback when one wants to create expressive intonation, and this should make pianists "terribly aware of the amount of tension or density that's involved in the interval" (Fleisher quoted in Noyle, 1987, p. 94). Golubovskaya (2007) extends this idea by adding that pianists should treat a melodic interval not like a space on the keyboard, but like an effort to overcome this space. To realize this effort as expressive intonation, pianists have to employ subtle changes of volume and timing, among other means of expression. However, Golubovskaya (2007) continues, the attention to sound and intonation is not meant to teach exact measurements of these slight changes, but rather to nurture the player's ability to follow the live curves and breaths of a melody and to express these when playing.

Schmidt-Shklovskaya, then, once again follows Blumenfeld's traditions of touch, where the touch, which not only helps make an interval more expressive, emotionally charged, and spacious, also creates those subtle time variations that Golubovskaya talked about. In order to put this concept into practice, Schmidt-Shklovskaya taught her students to open the fingers from the palm to reach for the key. In other words, as Minsker (2002) explains, not only is this way of touch anatomically reasonable, but it is musically justified, too (p. 8). This example is one of many clever ways that Schmidt-Shklovskaya invented to address significant and complex musical ideas with brief physical instructions.

"From within outward"

In the 20th century, pianists and pedagogues became aware of the leading role of the mind in the development of piano technique. George Kochevitsky (1967) associates such pianists as F. Busoni, G. Prokofiev, G. Kogan, A. Schnabel, and W. Giesecking with the new school of thought, which he calls the "psycho-technical school" (p. 15). The proponents of the "psycho-technical school" appealed to the "brain-ear-movement" connection and believed that it is musical purpose that should define and promote pianists' movements. As Kochevitsky explains, "The more our consciousness is diverted from the movement, and the stronger it is concentrated on the *purpose* of this movement, the more vividly do artistic idea and tonal conception persist in the mind" (p. 17).

Schmidt-Shklovskaya, too, worked toward overcoming the technique-driven traditions of the past. In particular, she followed the concept "from within outward," the term coined by Grigory Kogan¹ (1966) when he analyzed Martienssen's book *Individual Piano Technique* and described the latter's philosophy of musicality. German pianist Karl Adolf Martienssen (1881-1955) insists that teaching has to be based on the development of the student's aural abilities: the ability to listen, to recognize, and, most importantly, to *want* to create the sound that reflects the individuality of the particular person. He calls this complex *schöpferischen Klagenwillens* and concludes that the development of the *creative sound volition* should be the guiding principle of instrumental pedagogy (Martienssen, 1966, pp. 22-25). Describing the process of tone production based on the development of the *creative sound volition*, Martienssen places an aural conception of the sound image at the top of the pattern (chart 1):

¹ Grigori Kogan (1901-1979), Russian pianist and pedagogue.

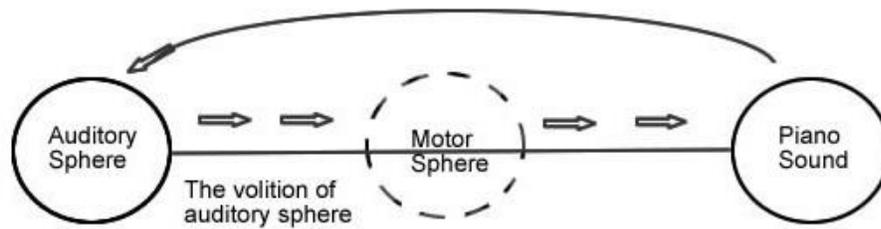


Chart 1. Engaging *creative sound volition* in tone production (Martienssen. 1966, p. 24).

According to this chart, the impetus of the sound image, activated by *creative sound volition*, realizes into motor activity, which, in turn, results in the production of piano sound. The actual sound is immediately evaluated by ear, and the pattern continues in a circuit.

Martienssen, however, believed that instead of nurturing students' aural and musical abilities by building individual piano technique (what Kogan would call "from within outward"), teachers of his own time prioritized the physical aspect of playing, that is, they focused on the movement first. The following pattern (Chart 2) shows the process "from outward within," in which sound is not conceived aurally but happens as a result of movement and often does not even reach the ear control ("Auditory sphere"), therefore leading to mechanical playing:

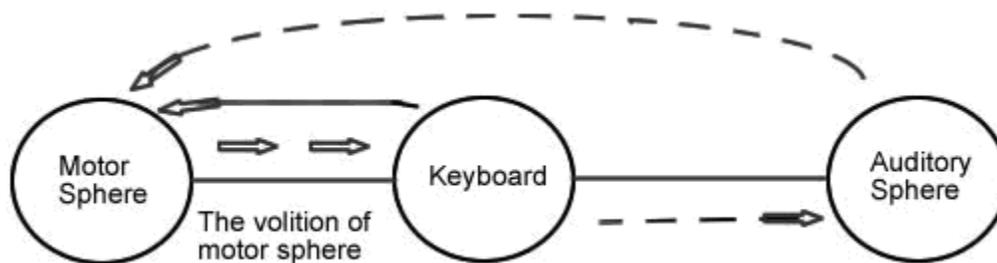


Chart 2. Prevalence of the motor volition (Martienssen, 1966, p. 25).

Along with other advocates of the "from within outward" concept, Schmidt-Shklovskaya searched for expressive piano sound that would always originate with the ear and only then she would connect it to a specific muscle tone and sensation. Russian pianist Heinrich Neuhaus (1993) defines his idea of any technical work as following: "The clearer the goal (the content, music, the perfection of performance), the clearer the means of attaining it" (p. 3). In other words, the pianist has to envision the musical image clearly at any stage of working on a piece, be it the colour of one sound, the shape of a phrase, or an overall form of the piece. The technical means will follow in the integrated process of searching deeper for the meaning of the piece. Schmidt-Shklovskaya, in her turn, saw one of her main tasks as encouraging her students "not to copy a [teacher's] movement, but to find sound" (Minsker, 2002, p. 10), thus building students' technique "from within outward." As a result, Schmidt-Shklovskaya's students developed a strong bond between the conception of a certain sound colour and a corresponding muscular feeling in the hand.

Specific Guidelines and Exercises

As we saw, Schmidt-Shklovskaya's fundamental principles, followed from the best traditions of piano performance and pedagogy. Her original contribution, then, is the

specific methods of practice and the unique exercises she came up with to realize those principles.

The exercises developed by Schmidt-Shklovskaya and compiled by Minsker in *On the Development of Piano Skills* are "rather rudimentary technical formulas, in which various ways of sound production and working methods are encoded" (Minsker, 2002, p. 9). Minsker (2002) points out that these exercises are brief patterns, which piano teachers can take as a basis to design their own combinations and versions (p. 9). In spite of the brevity and rather simple design of the exercises, Schmidt-Shklovskaya not only outlines the position and movements or puts together note examples but she describes in detail *what* pianists should feel when executing each exercise and *how* to connect and subordinate this feeling to ear control. For example, in one of the very first exercises at the piano, involving playing one sound at a time, Schmidt-Shklovskaya advises that students be encouraged to focus on sonority and listen for the rich deep sound produced by each finger. At the same time, she wants teachers to attract students' attention to the feelings of the arm, which ideally become a channel for an unobstructed flow of sound. For this, she recommends that, before playing, the pianist raises his or her arms up and thinks of their weight flowing down into the back, so that the arms become light; next, during playing, the pianist is enjoined to reverse the feeling, transferring weight from the back, through the fingertip, into the key.

Body Position and the Role of Bigger Muscles

One of the cornerstones of the Schmidt-Shklovskaya system is the proper balance of the working of the big and small muscles. Schmidt-Shklovskaya insists that players

should support their arms by the muscles of the back, underarms, and by the lower muscles of the shoulder bones. Such support prevents the arms' fatigue and creates the working tone of the torso (Minsker, 2002, p. 11). Schmidt-Shklovskaya specifies that the arms should work not from the shoulders but from the torso, so that the main workload is assigned to the strong muscles of the back and chest. Pianists can imagine a vertical "stem" going through the spine to help them maintain the correct body position. Schmidt-Shklovskaya (2002) therefore emphasizes that attention and care of players' posture should be the teacher's first task when organizing students' movements (p. 24). In addition, she points out, correct position of the back promotes freedom of the neck and a higher position of the head. In its turn, a high head allows the player to hear sound from further away, "from the hall," rather than from the spot at the piano, thus contributing to better overall control of performance (p. 24).

From his viewpoint as a physiologist, Kryzhanovsky (1922) also insisted on the importance of engaging larger muscles. In a discussion about the difference between the state of alertness and tension he recommended that piano teachers start with the larger muscles such as biceps, triceps, deltoid and pectoral muscles and teach students to notice, observe, and distinguish tension in those muscles first, gradually moving to the smaller muscles of the forearms and hands (p. 22). Kryzhanovsky further maintained that the main condition for this free-from-tension working state is the position of the body. Therefore, by adjusting and changing the position of torso, shoulders, arms, and hands, a pianist will be able to find the best state for free and comfortable playing.

The above recommendations followed from one of the laws that Kryzhanovsky derived from the physiological features of bones, joints, and muscles: a law stating that

the bigger levers and muscles should be the sources of pianists' moving power². In order to use muscle energy efficiently, Kryzhanovsky (1922) further argues, pianists should understand that the strength required from different muscle groups has to be proportionate to the physiological capacities of those muscles (p. 34). For example, the production of louder sound would need the work of the larger levers of the pianist's apparatus, such as the shoulders and forearms, while the more delicate power of the hand and fingers would be most appropriately used to produce a quieter sound (p. 18). Kryzhanovsky (1922) criticizes the old "finger school" because he considers its requirements to create, for example, powerful *forte* by using the strength of fingers alone to be ill-founded from the physiological point of view: "[We] cannot demand from interosseous or vermicular muscles the work that needs the strength of biceps or triceps" (p. 18).

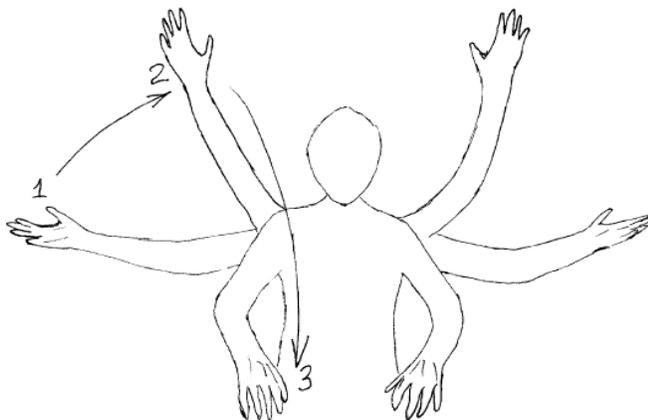
To activate and strengthen muscles that participate in pianist's work and to promote the correct posture and interactions between all parts of the pianist's apparatus, Schmidt-Shklovskaya designed a special group of exercises, which she called "Gymnastics," to be practiced away from the piano bench. The following is an example of one of the "Gymnastics" exercises:

Stand with feet at shoulder distance apart. Slowly bring the arms up on either side of the body, palms facing forward. Look up at the fingers and rise on your toes feeling the whole body connected from the heels, through the spine, to the fingertips. Lower the heels, turn hands so the palms face each other; then lower the arms half-way and turn palms up. Shoulders and elbows should not be locked; the arms can "bounce" slightly and feel as they are resting on the sturdy "stand" that the back provides. After attaining this non-tiring state, slowly bring the arms down (adapted from Schmidt-Shklovskaya 2002).

² With his understanding of the bones as a system of levers, Kryzhanovsky foreshadows the work of Otto Ortmann, an American pianist, the author of *The Physiological Mechanics of Piano Technique*.

The next exercise brings the player back to the piano bench helping to establish the support of the back in playing position when working on octave and chord technique. This exercise also helps to switch the player's attention from finger preparation on the keys to the fullness and volume of sound and movement.

The player brings her arms up, checks that they are well supported by the back ("grow" from the back), then opens the arms wide to the sides, and brings the arms and hands to the keyboard in a slow semi-circular motion, as if embracing something big (*Picture 1*). Once an octave or a chord is played, the hand should feel steady on the keys, but the arm can bounce slightly like a suspension bridge. The tone is deep but not harsh.



Picture 1. "Open arms" exercise.

Schmidt-Shklovskaya was not alone in using preparatory exercises before playing. American pianist Seymour Fink (1997), for example, provides exercises to help pianists develop muscular sensations and to prepare the player for the specific movements of piano technique, such as rotation and swings. Hungarian pedagogue, Geza Kovacs (2015) also developed an interesting system, which included alternating activities at the piano and away from it, as well as games with a ball, which he believes help students develop

dexterity and precision of movement. Likewise, physiotherapists recommend doing warm-up stretches before and cool-down exercises after playing, similar to those described by Csurgai-Schmitt (2002) and Horvath (2002). It is unfortunate that all these useful recommendations have so far had very little impact in modern piano pedagogy, where not only students but teachers themselves, are bound to a sitting position for long hours, and would greatly benefit from more movement.

Tension and Relaxation: Ivan Kryzhanovsky vs. Rudolf Maria Breithaupt

Schmidt-Shklovskaya notes that in each of the cases of playing-related injuries that Kryzhanovsky worked with, he carefully studied the cause of the injury and then used exercises, which he had designed for treatment. However, in his book, *The Physiological Basis of Piano Technique*, Kryzhanovsky does not describe any such exercises. Nevertheless, considering the theoretical foundation that he lays out and the exercises that Schmidt-Shklovskaya later developed in her teaching, we can see that Kryzhanovsky's principles were of a physiotherapeutic nature and were directly connected to piano playing. For example, while Kryzhanovsky writes how important it is for pianists to support their arms using the back muscles, Schmidt-Shklovskaya designs exercises that can help players establish this connection. Likewise, based on Kryzhanovsky's emphasis on the necessity to strengthen the smaller muscles of the hand and increase elasticity and flexibility in the hand and fingers, Schmidt-Shklovskaya developed many specific exercises to address these issues.

When Kryzhanovsky wrote *The Physiological Basis of Piano Technique* in 1922, the "finger system" was still one of the leading methods of piano teaching and practising.

It was widespread in Russia in both professional and amateur worlds, and it dominated in the German conservatories where it originated. The "finger school" emerged in the 19th century in response to the new challenges that piano-playing presented compared to the older keyboard instruments, harpsichord and clavichord. To solve the problem created by the greater resistance of the piano keys, teachers continued to employ the old harpsichord technique, which consisted mainly of isolated finger work. Instructors insisted on the development of finger strength to the utmost degree. Many exercises for the fingers were invented and written down (those by Hummel, Czerny, as well as the notoriously famous ones by Hanon are among a vast literature of finger exercises). Students were required to spend hours practicing these pure mechanical drills. Supposedly, this type of practicing would help to build a necessary technical foundation for further musical development.

The mechanical approach of the "finger school" culminated in the establishment of the Stuttgart school. Even though its founders, German pedagogues Sigismund Lebert (1822-1884) and Ludwig Stark (1831-1884), proposed the priority of artistic goals such as beauty of tone and melodious *legato*, in practice they focused exclusively on mechanical training of the fingers. In their approach they required players to curve and lift fingers high in order to strike each key with force and produce loud sound. Kochevitsky (1967) recalls Heinrich Ehrlich's comparison of high bent fingers to soldiers marching in goose step (p. 4). Amy Fay (1888), an American pianist who studied in Europe, described the way Louis Ehlert (1825-1884) taught her at the Tausig's conservatory: "Ehlert makes me play them [Cramer's Studies] tremendously *forte*, and as fast as I can go. My hand gets so tired that it is ready to break, and then I say I cannot go on. 'But you *must* go on,' he will say" (pp. 21-22).

It took a few decades and a number of injured pianists to unwind the wrongdoing of the "finger school" approach, in particular its chief beliefs that a) all fingers should be developed to become mechanically equal, b) the curved fingers were the prescribed position once and for all, and c) the participation of the rest of the body in the playing process should be limited as much as possible so that the fingers can work in isolation. Beginning from the second half of the 19th century and to the present day, pianists, pedagogues, and physiologists who have studied the coordination required for piano playing have proved the inefficiency and harm of the finger approach. For example, German pianist Rudolf Maria Breithaupt (1873-1945), the founder of the "natural weight" system, wrote in 1909:

It is wrong to start training the fingers from a strictly curved position. A free, natural style of movement or action can only be acquired from a free, natural pose (exempt from any strain) of the hand, and from a natural curve of the naturally straightened fingers. Long, flexible fingers having the natural swing in extension and flexion may with impunity be "curved" in playing, but not the other way about. [...] the curved pose paralyzes the fingers and prevents their free co-oscillation (Breithaupt, p. 66).

Kryzhanovsky (1922) mentions that injuries that resulted from misuse or overuse of the groups of muscles and tendons associated with a curved high position of the fingers became so common in European music schools in the second half of the 19th century that they received a special term -- the "pianists' spasm." He further referred to the famous surgeon of the time, Theodore Billroth, who called "pianists' spasm" the newest disease of the 19th century (pp. 54-55).

Not surprisingly, then, when Kryzhanovsky evaluated and compared the new "natural system" and the old "finger school," his comparison balanced out completely against the "finger school," which Kryzhanovsky denounced as physiologically wrong

and which he blamed for an upsurge of professional injuries at the turn of the 20th century. Kryzhanovsky clearly and emphatically appealed to pianists and pedagogues to abandon injurious approaches and to follow the "natural system."

By "the natural system of piano technique," Kryzhanovsky meant Breithaupt's theory of natural weight, in which the latter considered a completely relaxed, loose and heavy arm with its natural weight applied to the key, to be the cardinal principle for acquiring a healthy and effective piano technique. In spite of the initial popularity of Breithaupt's ideas, many contradictions in his writing raised concerns and misunderstandings among pianists and teachers. Apart from the lack of scientific basis of his physiological descriptions, the biggest flaw in the ideas of the "school of natural weight" was the missing connection between movement and its purpose -- musical expression as Breithaupt focused almost entirely on the physiology of the movement. Kryzhanovsky, however, seemed to have been able to read between the lines and understand details of Breithaupt's theory with sympathy for how they could be productively applied to practical teaching. He writes that it would be faulty to refer to proponents of the "natural system" as advocates of completely relaxed hands:

It would be a mistake to conclude that in playing by the 'natural system,' hands should be relaxed like rags. On the contrary, at certain moments, there is more muscle contraction and fixation of the joints than in playing by other methods. The essence is in conscious application, *in the ability to control one's neuromuscular apparatus* and obtain from it everything it is capable of (Kryzhanovsky, 1922, p. 38, italics in the original).

From Kryzhanovsky's explanation, it follows that the tension and relaxation of different groups of muscles are closely intertwined in piano playing, and are in constant alteration.

Although Kryzhanovsky insists that a certain amount of muscle contraction is necessary, he is very clear that pianists should avoid excessive tension. He analyses the following physiological and mechanical consequences of such tension. First of all, by tensing muscles more than necessary, pianists use more muscle energy than required. This leads to rapid fatigue of the muscle. Kryzhanovsky (1922) writes that from among the many different movements and positions that pianists use, only those that require contractions of the least amount of muscles are correct from the physiological point of view (p. 25). Such physiologically justified positions and movements allow for the rest of the muscles to be free, and therefore ready for the next move.

The second negative effect of excessive muscle tension is the physiological imbalance in the work of antagonist muscles: while one extended muscle is over-tensed, the complementary flexed muscle is overstretched. This imbalance causes extra pressure of the surfaces against each other in the corresponding joint, which in turn leads to a reduced range of motion of tendons in the tendon sheaths and to overall rigidity. To overcome the reduced range of motion and inflexibility, the player has to use even more tension and muscle energy for the movements of hands and fingers, thus creating a vicious cycle that could lead to injury (Kryzhanovsky, 1922, p. 39).

Finally, Kryzhanovsky emphasises that for pianists, a keen spatial muscular feeling is of utmost importance, because it is this proprioceptive sensation rather than visual orientation that guides the position of the hand and arm on the keyboard. He insists that only a minimum amount of contraction of the working muscle along with quiet of the other muscles will provide the necessary condition for achieving the refined muscular feeling so indispensable for freedom of motion in piano playing (p. 39).

In spite of Breithaupt's influence on Kryzhanovsky's views, there is a significant difference in their theories. Unlike Breithaupt, who searched for universal movements suitable for every pianist, Kryzhanovsky (1922) believed that it is impossible to pre-plan the work of pianist's muscles in all details. He writes that the chains of movements in piano playing are so complex that even experimental studies cannot result in an exact picture of all the contractions and relaxations of the working muscles (p. 20).

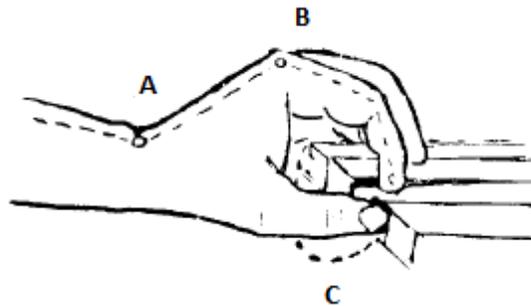
Needless to say, nowadays, almost 100 years since Kryzhanovsky's writing, there are a number of studies that aim to accomplish those measurements. By using modern technology researchers are trying to obtain the data, which, they hope, will help pianists to better monitor their muscular work. For example, Dr. Kathleen Riley uses a variety of tools to analyze and correct pianists' technical problems. The equipment includes MIDI-connected pianos, digital video recording, and electromyography.³ These biofeedback tools provide a means to record and evaluate information on the timing and velocity of finger movements as well as on muscle conditions, i.e. contraction and relaxation. Riley et al. (2005) argue that the benefits of such multimodal feedback are two-fold; it helps pianists and pedagogues "to become [more] aware of body alignment, muscle movement and muscle tension," and it provides "feedback on the sounds resulting from these [movements] and any changes in them, particularly changes leading to sought-for improvements in the muscle outcomes" (p. 87). Still, Kryzhanovsky's point that it is impossible to access all the fine neuro-muscular work during playing remains credible.

³ "Electromyography, the recording of the electrical activity of muscle tissue, or its representation as a visual display or audible signal, using electrodes attached to the skin or inserted into the muscle (Oxford Dictionary online).

He foreshadows later scientific quests into the complexity of these neuro-muscular connections and motor control, such as those explored by Nicholai Bernstein.⁴

"Palm" vs. "Bridge" Position and Stretching Exercises

While Kryzhanovsky lists multiple benefits of the "bridge" position (as in *Picture 2*),⁵ Schmidt-Shklovskaya (2002), advocates a flatter position with the support of the whole palm (p.22). She explains that the "bridge" fixates the position of the hand to a certain extent, which makes the work of the fingers more difficult, whereas the flatter "palm" position (as in *Picture 3a*) with wide springy "dome" inside the hand provides the best condition for independent work of fingers.



Picture 2. Angles in "bridge" position: the fingers and hand form an open angle in the metacarpal joints (angle "B"), the hand and forearm form an open angle in the wrist (angle "A"), (Kryzhanovsky, 1922, 27).

To engage and strengthen smaller muscles of the palm, Schmidt-Shklovskaya (2002) recommends careful stretching of fingers, another idea she adopted from Kryzhanovsky (p.21). She insists that stretching should never be forced, but should rather

⁴ Nicholai Bernstein (1896-1966), a Russian scientist, famous for his studies of motor control and the theory of multileveled construction of movement.

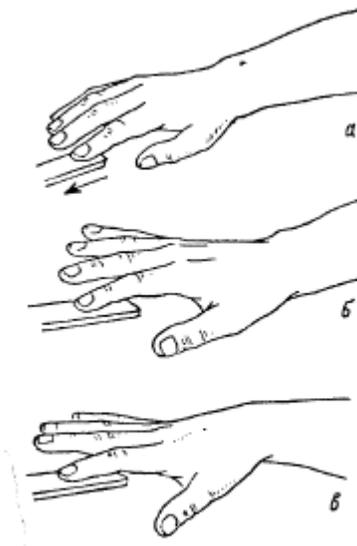
⁵ American Seymour Fink (1997) and Canadian Alan Fraser (2011) advocate similar positions (Fink, p. 36, Fraser, p. 51).

be an effortless spreading or expansion of fingers. It is important that a pianist feel the stretch inside the palm and not in the extensor muscles.

In his turn, Kryzhanovsky (1922) argues that although the separation of the fingers is limited by the hand ligaments, the span and flexibility of the hand can be increased (p.48). He writes, "One of the essential conditions in piano playing is a sufficient span of [pianist's] fingers, the ability for a maximum abduction from the middle line [of the hand] in order to play wide intervals and chords" (p. 48). By careful exercising, pianists can stretch hand ligaments to make them more supple and elastic, which will not only promote a wider span of the hand, but will also make the fingers more flexible, mobile, and better equipped for their sideways and circular movements.

Kryzhanovsky (1922) notes that all too often pianists lack flexibility in their hands and fingers in spite of many years of finger exercises. In his opinion, this paradox occurs because of the players' often incorrect approach to the development of finger mobility and independence, which is an important condition for virtuoso playing (p. 46). Many methods (including the notorious "finger school" discussed above) emphasise high finger lifts in order to develop independence and strength in the fingers. However, while these methods aim to give fingers more mobility, because of inevitable build-up of excessive tension and fatigue in the extensor muscles, the result of such finger workouts is exactly the opposite and often lamentable: rigidity of the hand and difficulties in fast and precise finger movements. Instead, Kryzhanovsky (1922) insists, correct distribution of the working load between the larger levers of the pianist's apparatus, that is, the large muscles of the back, will create ideal conditions for gradual stretching of the hand ligaments, which in turn will promote flexibility and mobility in the fingers (pp. 49-50).

One of the Schmidt-Shklovskaya's exercises that addresses these issues, the "Glove," involves sliding with a finger "into the key" toward the fallboard ("toward the string") while slightly expanding all fingers out and feeling their separation inside the palm (as if slipping fingers into a glove), then bringing fingers back together and resting while still holding the key down (*Picture 3*). Along with the movement, the player has to actively listen to the sound during the entire pattern.



Picture 3. Finger expansion in "Glove" exercise: correct position shown in "a" and "b," incorrect (wrist pushed up) in "c" (Schmidt-Shklovskaya, 2002, p. 37).

Along with some other slow exercises, in the Glove, Schmidt-Shklovskaya employs an "exaggeration technique," which Minsker (2002) compares to ballet practice, when dancers expand their technical abilities by gradual stretching (p. 9). She calls this type of work "practicing through a magnifying glass" where, by exaggerating the movement and touch, a player perceives a more definite and clear sensation, thus reinforcing and maintaining the correct feeling.

Arm as Channel

Schmidt-Shklovskaya (2002) compares the arm to a channel, through which sound flows. This image helps to deliver music, or "breathe it out," in an unconstrained effortless way (p. 12). She suggests that a player should feel such free fluidity, that is, the absence of any tension, spasms, or fixations, not only in the arms, but also in the whole body. Consequently, this state of "channelling" sound through the body and arms can help the player to connect with the piano so that the performer and the instrument become one unified organism and the player almost does not sense the arms physically, but instead is free to focus on listening, feeling, and controlling the flow of music (p. 25).

The "Swing-and-add" exercise is based on the "arm-as-a-channel" vision and helps to achieve full and even *legato* sound with the weight of the arms projected equally into every key.

Sitting at the piano, a student starts with an arm down along the side of the body, swinging it freely back and forth a few times and perceiving the arm as a whole unit from shoulder to fingertip. With the last swing, the student brings the hand to the keyboard feeling that the back "lifts" the arm, and plays the first note of the scale. After taking time to listen to the sound and "breathe out" any residual tension, the student repeats the whole pattern, every time adding one more note to *legato* scale. The exercise can continue for as little as three notes or for as long as four octaves, depending on the task.

In addition to freeing up the arm muscles, this exercise promotes precision of touch, eliminates unnecessary preparation of the finger and extraneous movements of the hand, and facilitates comfort and freedom in controlling the keyboard space field. Yet another important benefit of practicing this way is the perception of the melodic line as a continuous "seamless" *legato* flow.

"Grasp and hold," the Most Natural Function of the Hand. Imagery.

Another element of Schmidt-Shklovskaya's teaching was employment of associations and imagery. She believed that when students associate the work of the hands and fingers in piano playing with everyday object actions, such as holding something flat, picking up something light, taking something out, flicking fingers, et cetera, they develop their hand position in the most natural way. In many of her exercises, she associated pianist's movements with manipulation of different objects, thus allowing players to transfer their everyday experience to piano playing. In this way, rather than treating the piano hand position as a rigid and static form, as in the traditional "apple" approach, students start viewing the hand as a working medium that can be adapted to many different technical situations at the piano.

The "grasp and hold" idea is also a part of the Schmidt-Shklovskaya's concept that touch should involve focus on the inner feeling rather than the outer form of movement. Schmidt-Shklovskaya and Minsker teach that by directing students' attention to what they should *feel* when making sound at the piano, players will achieve the required results of rich tone and comfortable hand posture faster than if students are asked to monitor the hand position itself. This is where imagery can help both teacher and student. For example, teachers can ask a student to imagine their finger to be an extension of the whole arm, thereby encouraging a feeling of unity. Or, ask students to think of breathing the sound out through the arm, which will help them to eliminate any extraneous tension in the body. Or, suggest students obtain a sound "right-from-the-string," for a close-to-the-key touch. Through imagery, students relate to sound expression more readily and start developing ear control, as well as the necessary "audio-muscular fusion." An

American pedagogue Abby Whiteside (1961) beautifully describes the idea of imagery in piano teaching:

All we need is a desire, an imaged result, and we move and act expertly to get the things we desire. [...] for instance, you are dealing with a hand that is flabby or a hand that is tense. Either condition will change instantly if it is suggested that a delicate flower be held in the palm in a manner which will not crush it (p. 60).

The following examples could be grouped into the category "Exercises with imaginary objects." They are modifications of similar exercises designed by Schmidt-Shklovskaya and Minsker:

- Play a blocked "Chopin position" (right hand E-F#-G#-A#-B, left hand F-Gb-Ab-Bb-C) or a blocked whole tone position; think of taking and holding a flat object (eyeglasses case, for example). This exercise helps students to feel the strength of the inner muscles of the hand without extraneous contractions in the forearms.
- Play any melodic pattern *non legato*, slowly sliding down toward the edge of a key and imagining "a bear getting honey from a jar with its paw" (personal communication, lessons with Minsker). The image helps to include the whole arm in the movement, develop a sensitive finger pad, and obtain deep singing sound "from the strings." This exercise is also used in work on differentiation of sound in chordal or polyphonic texture.
- Play a *staccato* note, "grasping" it into a fist as if catching a mosquito. A fast supination turn promotes dexterity and active engagement of the hand. The movement can also be performed after a series of *staccato* or *legato* notes.

The "grasp and hold" concept includes a requirement to avoid isolated wrist movements. Schmidt-Shklovskaya (2002) insists that the function of the wrist in piano playing is to complement the movements of the arm and to serve as an absorbent "spring"

(p. 24). She writes that integral movements of the large parts of the arm promote better control and precision, while isolated movements of the wrist are less precise and might cause unwanted "wooden" and flopping noises. Moreover, this unity of the whole arm from shoulder to finger tip will help to avoid unnecessary and unclear movements, which could disconnect a player from immediate contact with the keyboard (p. 24).

The following "flying" exercise helps to establish the unity of the arm and hand, avoid isolated wrist movements, and improve precision of touch.

Open the hand and fingers pushing off the key lightly as if you flicked off a speck of dust. The finger opens from its initial position of **touching the key**, not by moving onto the key. The opening has to be effortless, without abrupt movements as if fingers fly open by themselves. "Land" with the same finger on the key two octaves apart (right hand goes up, left hand down). Variants of this exercise include use of "click-and-land" movement on the same key, in a distance, in different melodic patterns (scales, arpeggios), with the same or different finger numbers.

Schmidt-Shklovskaya (2002) describes two versions of this exercise: a) using the whole arm that "takes off" and "lands" along with fingers (promotes lightness in the arm), and b) using fingers only, which "fly up" easily and drop down fast (p. 39).

Schmidt-Shklovskaya (2002) pointed out that by no means is her method the only one that promotes healthy piano technique (p. 19); however, through my own research, as well as my extensive experience teaching, I have come to believe that this method has something significant and valuable to offer piano pedagogues. Attention to the principles of Kryzhanovsky and familiarity with the methods and specific exercises developed by Schmidt-Shklovskaya and Minsker could help teachers and piano players achieve the complex goals required by the instrument. These methods can provide physical comfort

at the piano, attend to development of students' musicality, and instil habits of mindful practicing, encouraging players to pursue creative musical goals and build a strong foundation for their life-long enjoyment of making music at the piano.

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