

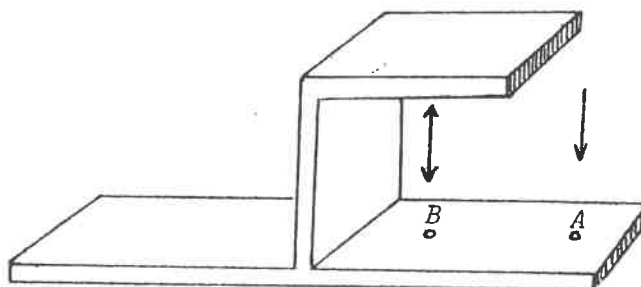
BALANCE IN REPETITIOUS MOVEMENTS

Cycle series resemble circular motion in that cycles have no definite beginning except the first one, and have no definite end-point except the last one.¹


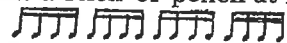
Repetitious movements are frequent and important in string playing. *Détaché*, *spiccato*, *sautillé*, and tremolo bowings are repetitious actions, as are the vibrato and the trill. Since these movements often occur in long passages of music, they can become tiring, causing stiffness and breakdowns when poorly done.

These problems are often caused by overstimulated action. The mental image of fast notes tends to cause anxiety and stiffness; simultaneous action impulses are sent to the opposing muscles, causing tension or even complete binding of movement.

The realization that a group of two notes may be played with only one action impulse has a surprisingly good effect on the technique. Motion experiments with tapping can dramatize this principle.



The click board

Tap with a stick or pencil at A, producing the rhythm:  At point B, the rhythm  can be produced with the *same* effort. However, when the player begins the experiment by tapping the sixteenth notes at B, he tends to use much more effort. The same is true in various types of repetitious bowings. *Détaché*, *spiccato*, *sautillé*, and tremolo can be produced by letting the arm and hand coast back without a superfluous action impulse on the return bow. When done in this manner, the movement is less tiring, and if done with a balanced arm movement the tones produced will sound even.

Balanced arm movements resemble the action of a teeter-totter whose imaginary fulcrum is between the elbow and wrist. When slight upper arm rotary movements are combined with the flexion-extension of the forearm or hand, balanced movement ensues: the elbow and hand move in opposite directions, making the action more relaxed. With the bow placed on the string at the middle, the player can visualize a longer teeter-totter whose opposite ends are the elbow and the tip of the bow and whose fulcrum is the string.

The use of balanced arm movements in vibrato greatly aids relaxation and increases stamina. The back and forth movements of the hand and forearm may be balanced by very small, almost invisible, rotary movements of the upper arm. Consequently, the elbow moves very slightly in and out.

The rotary movements of the upper arm are easily observed when a light stick is fastened at a right angle to the upper arm just above the elbow. The experiment dramatizes the presence of these movements in balanced bowing and vibrato.

¹ Szende and Nemessuri, p. 16.

TYPES OF BOWING MOVEMENTS

FREE "BALLISTIC" MOVEMENTS

Some bowing movements are fast and free wheeling, others are slower and controlled throughout the duration of the stroke. Movements of the first type are initiated with a thrust, after which the arm passively coasts until arrested. These light and fast motions resemble "ballistic movements." (They are similar to the flight of a bullet or a dart, although arm movements cannot attain the lightness and speed of unattached objects.) Movements of martelé, spiccato, and fast détaché bowings have a kinship to such ballistic movements. In these, the initial impulse is followed by a passive, relaxed arm movement. In good performance of these strokes, the controlling muscles (antagonists) come into play toward the end of the movement; therefore, they are in a position to reverse the movement. The arm, hand, fingers, and bow all move in the same direction (as in throwing a dart). The lifting muscles of the arm should be as relaxed as possible, and the bow hold and hand should have a passive feel, allowing the weight of the arm to release the desired amount of pressure into the string through the bow. During the downstroke the fingers extend slightly; during up-bows they bend.

SLOW CONTROLLED MOVEMENTS

In the slow-controlled forms of movement the antagonistic muscle groups are continuously contracted against each other, giving rise to tension.¹

In contrast to the "free wheeling" fast strokes, good slow movements require control throughout the stroke. In these, the opposing muscles are not relaxed to such an extent as in fast strokes. The light tension of the controlling muscles lends stability and fullness to sustained slow strokes. When this control is missing, the tone becomes weak and wavering, and bow changes and string crossings tend to become jagged and obtrusive.

Correct bow distribution is essential. When the tone is of even volume, the division of the bow should be even. If crescendo, decrescendo, or swells are required, the bow must change speed in proportion to the change of volume. Lucien Capet's work is noteworthy in this respect.²

The player should hold the bow more firmly in sustained strokes than in faster strokes. In slow strokes, the tone tends to become indistinct without a sufficiently firm (yet flexible) bow hold. In slow strokes the string will tolerate less pressure, and the slightest tremors of the hand, even slight movements caused by breathing, may disturb the sound. Since in slow strokes the bow arm cannot lean, "sink into the string," as in fast strokes, the player should think of pulling against an imaginary resistance that slows the movement of the bow. This is Capet's "horizontal pressure," a concept that greatly aids tone control and steadies the bow arm. Pulling the bow against horizontal resistance, drawing the bow slowly above the string, and practicing portato strokes and evenly measured bow divisions are exercises that help to develop this technique.

As the bow moves faster, the player can increase friction between hair and string, "sink into the string," even at points farther from the bridge, since bow speed deletes friction. This principle is demonstrated with automobiles: the greater the speed, the less the friction between tires and road. (If the speed is too great for the traction, the car will go out of control.) A heavier car or a loaded trunk will increase traction and stability.

The ability to play beautiful sustained strokes (son filé), either at an even volume or with shadings, is a highly coveted art in the history of string playing. Tartini, Geminiani, and Leopold Mozart describe this technique, and Viotti allegedly practiced sustaining a single bow stroke for fifteen minutes! Even the "one minute bow stroke" is an exercise which certainly tests the player's endurance and ability to draw the bow flawlessly. Diligent practice of sustained strokes—if correctly done—will improve tone quality, often to a surprising degree.

¹ Morehouse and Cooper, pp. 194–95.

² Lucien Capet, *La Technique Supérieure de l'Archet pour Violin* (Paris: Éditions Salabert, 1946), pp. 12–22.

CHANGING THE DIRECTION OF MOVEMENTS

Less power is necessary to change the direction of a moving object if the object is kept moving than if the object is brought to a stop before it is moved in the new direction. The turn in swimming is a short circle, not an abrupt reversal of the direction of the movement . . . Hesitation, or the temporary and often minute cessation from motion, should be eliminated from the performance.¹

SEQUENTIAL MOVEMENTS

Summation of internal forces is a direct result of a rapid, timed sequence of aggregate muscle actions moving body parts in such a way that each force is added to the preceding force to provide the desired amount of force at the specific point of application.²

Jerky and angular bowing can be corrected by curving and sequencing movements. According to the principles stated by Steinhausen,³ the large members of the body lead and the small ones follow (in contrast to fast, balanced movements where the movement can be started in the small parts). Thus, in bow changes or string crossings, the change first occurs in the slight transfer of body weight (with the exception of fast or short strokes). Then the chain of motion passes through the upper arm, forearm, hand, fingers, and bow. All this takes place in a very brief time sequence, barely noticeable to the naked eye but quite obvious in slow motion pictures. In ideally sequenced motions, the upper arm changes its direction by a very slight rotary motion (like a ball bearing) while the forearm completes the previous stroke; the hand, fingers, and bow complete the stroke after the forearm has changed direction. In this fast chain of events, the follow-through movements of the hand, fingers, and bow continue the motion for a split second while the upper arm and forearm turn in the new direction.

BOW CHANGES

The technique of changing the bow varies with the speed: in fast bowings (*détaché*, *spiccato*, rapid string crossings, etc.), the movements are of the pendulum type. With the slight interplay of the forearm and rotary upper arm movement, continuous swinging can be induced. As previously explained in the clickboard experiment, this is far more efficient than adding up a series of single isolated movements.

The balanced swinging of the two main limbs results in slightly looped movements in either clockwise or counterclockwise direction.⁴ The wrist and fingers may passively contribute to the movements, but the player should not preoccupy himself with these secondary motions. The use of follow-through movements and sequential actions in slower bow strokes brings about continuity of action and tone during bow changes.

A sequential motion pattern can be compared to the movement of a turning train, in which the engine turns first and the rest of the train follows. Thus, in bow changes of slow or medium strokes, the powerful members lead (slight shifting of body weight, movements of the upper arm and forearm), and the hand and bow follow.

It is impossible to pinpoint the speed where balanced repetitious movements turn into sequential actions. Sequenced movements can be used in fairly swift *détaché* strokes, but these can also be played with balanced repetitious movements. The choice is up to the player. Sequenced actions are conducive to legato and intense sounds, while direct motions akin to "ballistic actions" are more appropriate in light, accented, and swiftly-moving strokes. Even fast strokes contain some sequencing, but the time lapse between the initiation and occurrence of movements is so slight that it escapes the player's volition or control. The criteria for an acoustically and kinesthetically good bow change are smooth continuity of sound and movement and accurate articulation.

¹ L. E. Morehouse and A. T. Miller, *Physiology of Exercise* (3rd ed.; St. Louis: C. V. Mosby Co., 1959), pp. 79–80.

² Logan and McKinney, pp. 170–71.

³ Steinhausen, pp. 117–25.

⁴ For a detailed study of curved and looped bowing patterns, see Hodgson, pp. 26–74.