

# BIOMECHANICAL CLASSIFICATION OF WRESTLING STANDING TECHNIQUES

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## *Introduction*

Wrestling certainly is one of the oldest sports of the world. If we consider Favre's thesis correct, the "sport" of wrestling was born between the Third and Second millennium B.C. The archaeological discoveries in Egypt (Saqqara necropolis) show a very good agreement with this assumption.

In the grave of Backtas 2500 B.C., the white Oryx King, 220 wrestling positions were found on the walls. We touch lightly upon the stylistic evolution from the Greco-Roman "Pancratius" to the "modern wrestling."

The latter was born in France in the XIX century around Lion, Bordeaux and Marseille where troupes of professional wrestlers were organized. In effect the first of the four European stylistic schools was born in France; the four schools are:

French-Italian	School: Greco-Roman style
Turkish	School: Free style
British	School: Different Free style
Russian-Scandinavian	School: Greco-Roman style

In modern wrestling it is possible to find two different styles; Greco Roman and Free. The difference between them is: in Greco-Roman style it is forbidden, during the contest, to grasp the adversary under the pelvic belt, to trip or to mow with legs. The end of the wrestling-contest is signaled when the opponent's shoulders are pinned on the mat. When this happens, it is considered a "fall" and the attacker will be considered the winner. The aim of standing techniques is to bring the opponent to the mat so that by using well chosen moves to turn him over, a pin could be executed. If the natural naked hands contest was the reason for the world diffusion of the wrestling, then it

produced a lot of practical difficulties in the FILA. In fact, the national schools and local traditions were made useless until the technical terms were standardized. That means one single term overall is accepted instead of local names such as: mill, scarf, top, witch, pendulum, etc. The international classification attempt also solved a lot of difficulties beyond the historical problems, which started from a very pragmatic vision of the contest and its problems.

### *Russian Classification*

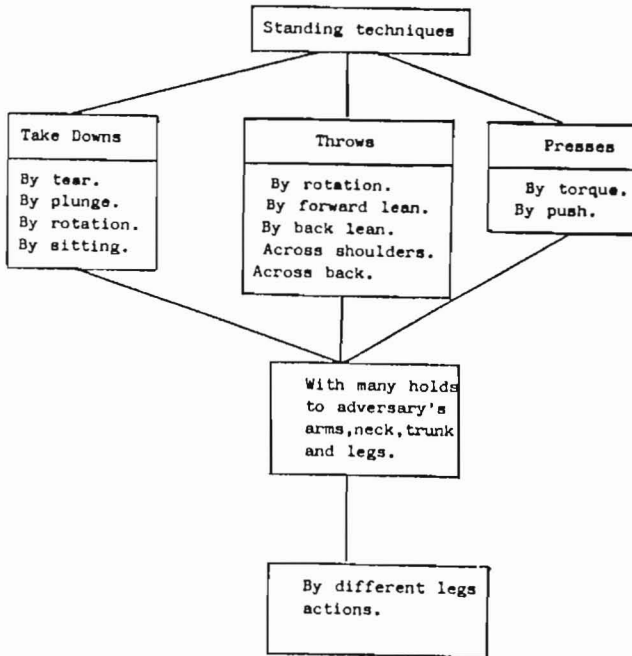
Since wrestling is not defined as is Judo, a short synopsis of technical terms will be presented. Most of the techniques begin with a few basic holds and then add variations. One of the last attempts to compile all the information was by a Russian study group with two main goals:

1. To classify all the wrestling techniques (Greco-Roman and Free).
2. To arrange them for teaching according to performance difficulty.

The goals were to classify all the moves according to their main action and then a detailed analysis would be conducted to place things into subgroups based on their similarities. At the end, different starting holds accounted for different techniques, and all techniques were arranged according to execution difficulty.

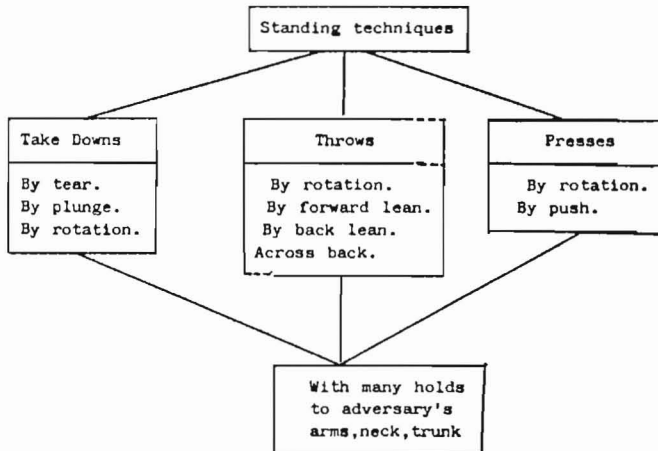
TAB 1

RUSSIAN FREE STYLE CLASSIFICATION.



TAB 2

RUSSIAN GRECO-ROMAN STYLE CLASSIFICATION.



This very interesting attempt, to classify and arrange all the material shows some defects: there is no clear separation between classification and arrangement and a very generic naming of the groups hinders a clear understanding of the technical application.

All wrestling standing techniques can be divided in two groups:

A. Throwings: techniques where the adversary's feet leave the mat when thrown.

B. Landings: techniques where the adversary is carried down without bringing his feet off the mat.

### *Biomechanical Classification*

From the methodologic point of view it is better to separate the classifications and arrangements. At first, to define the basic physical principles, and then classify the techniques and at the end, to arrange them for teaching.

The biomechanical analysis concerns two phases: differential analysis and integration.

1. Differential analysis is a division of technical performance (ex. hold, posture, unbalance, lift, landing, throwing) that is an attempt to understand the problems of how forces act in space. Really it is possible to solve this problem in a quite general and simplified form (considering static athletes, without mutual opposition) called static condition. In this case, it is possible to single out the basic physical principles, usually masked by the dynamic conditions of the contest.

#### Static analysis

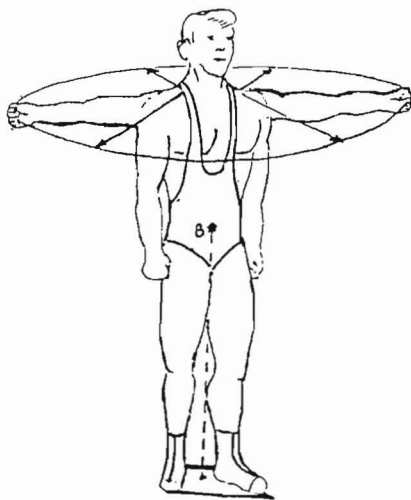
Principle of the resolution of forces: directional study of forces. By splitting the three dimensional problem into two dimensions, the problem is simplified; the right use of forces in the horizontal and vertical planes will satisfy three corollaries.

A)

UNBALANCES.

Forces are effective and can be applied, on the horizontal plane, on the whole round angle. (360°).

In these terms, we consider the problem of defeinder's centre of gravity translation, out the "maintenance surface".  
( hold, posture and unbalance phases).

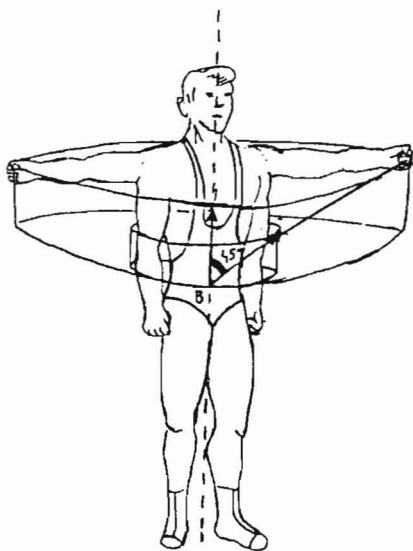


B)

LIFTING OR VERTICAL DETACHMENT.

Forces are effective and can be applied ,on the vertical plane,for an angle of nearly 45 degrees up.

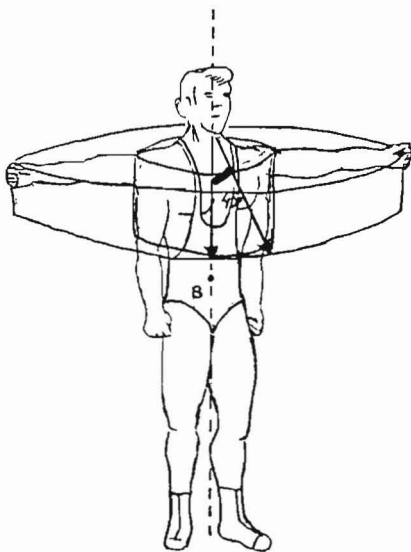
In these terms,we consider the problem of defeinder's vertical detachment. ( lifting phases).



C)                    **THROWINGS AND LANDINGS.**

Forces are effective and can be applied ,on the vertical plane,for an angle of nearly 45 degrees down.

In these terms,we consider the problem of forces resultant direction,for throwing or landing the defeinder.  
( throwing and landing phases).



2. The second biomechanical step is "integration." From here it is possible to approach the dynamic aspect of the problem.

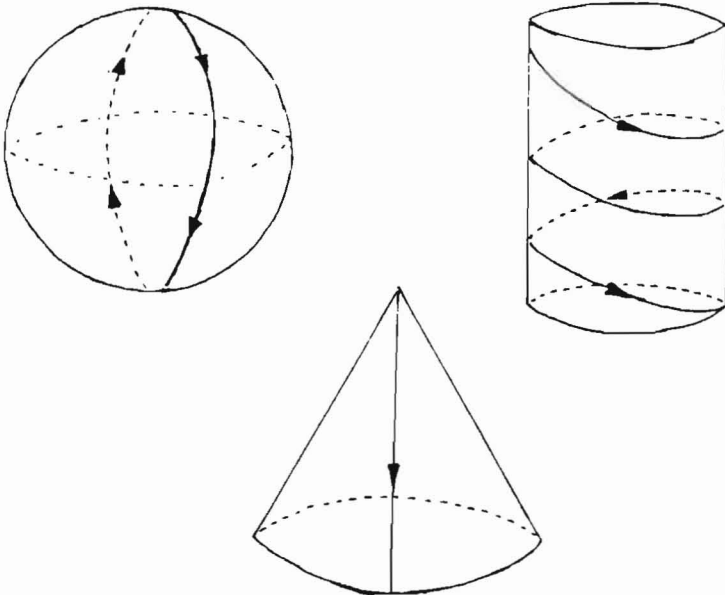
### Dynamic Analysis

Principle composition of forces: study of trajectories and symmetries.

If the forces obey the previous three corollaries, the solution to a dynamic problem (considering the directional change of the resultant with time) goes through the study of trajectories and their symmetries. Paths along which the defender's body moves, can be classified under three simple headings according to their compositions.

- |                     |                      |
|---------------------|----------------------|
| A. Circular path:   | spherical symmetry   |
| B. Helicoidal path: | cylindrical symmetry |
| C. Straight path:   | conical symmetry.    |

These trajectories are the "geodesics" of the founded symmetries.





For the attacker, these are the “paths of least resistance,” or the easiest path for an attacker to take when making a move. If we think of three directional corollaries (statical analysis) and of the trajectories (dynamic analysis) it is possible to state the two dynamic principles which typify all of wrestling standing techniques.

1. Technique in which the attacker makes use of a physical lever for throwing or landing the defender.
2. Technique in which the attacker makes use of force couple for throwing the defender.

All the wrestling standing techniques (Greco-Roman and Free) can be understood on the basis of the two previous biomechanical mechanisms. The techniques of the physical level (or momentum) can be classified by the length of the arm of the physical lever when applied to the defender’s body. Namely:

#### Throwings

#### Landings

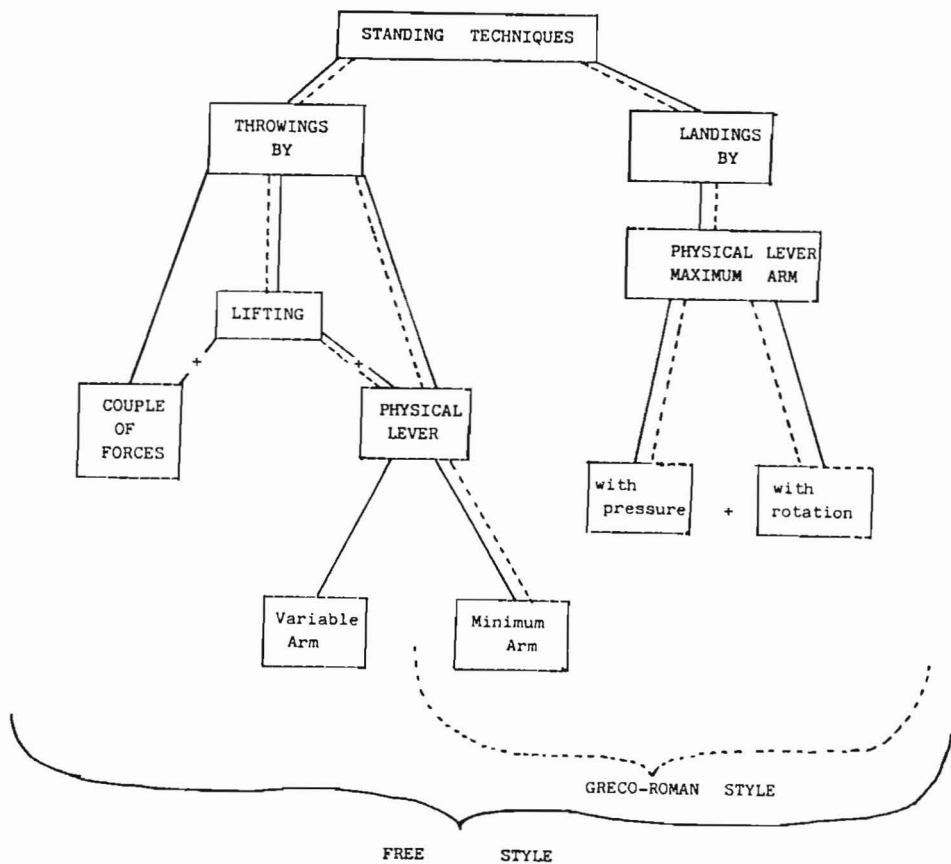
Minimum arm (G-R and F)  
Variable arm (F only)

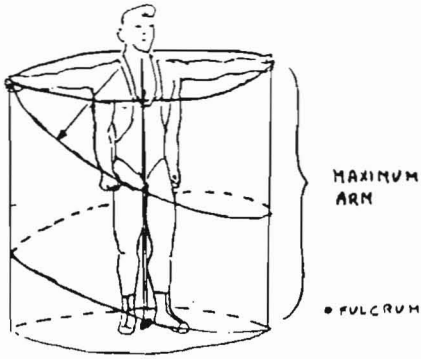
Maximum arm (G-R and F)

Techniques using force couples, can be classified by the parts of the attacker’s body which apply forces to the defenders body. This is only for throwing in Free style: arms, arms and leg, trunk and leg, and trunk and arms.

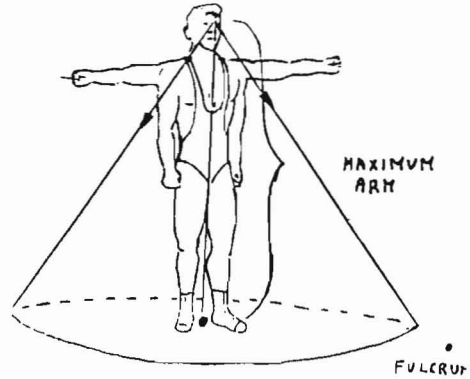
TAB 3

ITALIAN BIOMECHANICAL CLASSIFICATION.

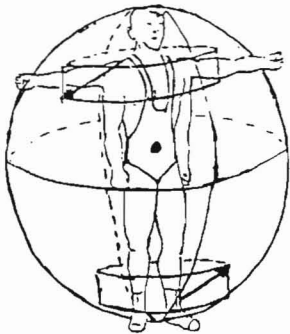




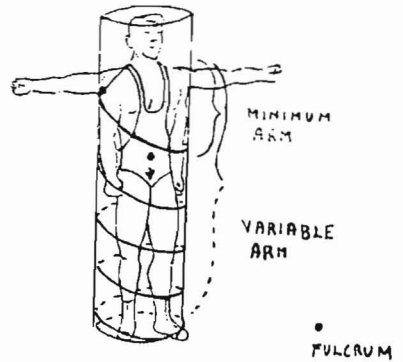
LANDING WITH ROTATION (G.-R. AND F.)



LANDING WITH PRESSURE (G.-R. AND F.)



THROWING BY COUPLE (F.S.)



THROWING WITH PHYSICAL LEVER M.A. (G.-R. AND F.)  
V.A. (F.)

### Techniques of physical lever.

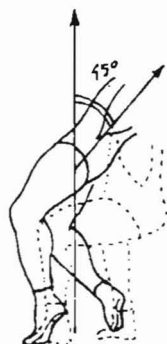
After the attacker puts the stopping point ( fulcrum), the basic mechanism is rotation of trunk on waist around a generic variable axis of rotation.



ARTICULAR BASIC MECHANISMS .

### Lifting.

For this phase the leading role was played by biokinetic lower chain, where ankles' articulations with three degrees of freedom, knees' articulations with two degrees of freedom and coxo-femorals' articulations with three degrees of freedom form a closed chain with only one degree of freedom ( up - down ).



Techniques of couple of forces.

For those applied by the attacker standing on one leg, the articular mechanism is rotation on coxo-femoral articulation with three degrees of freedom.

