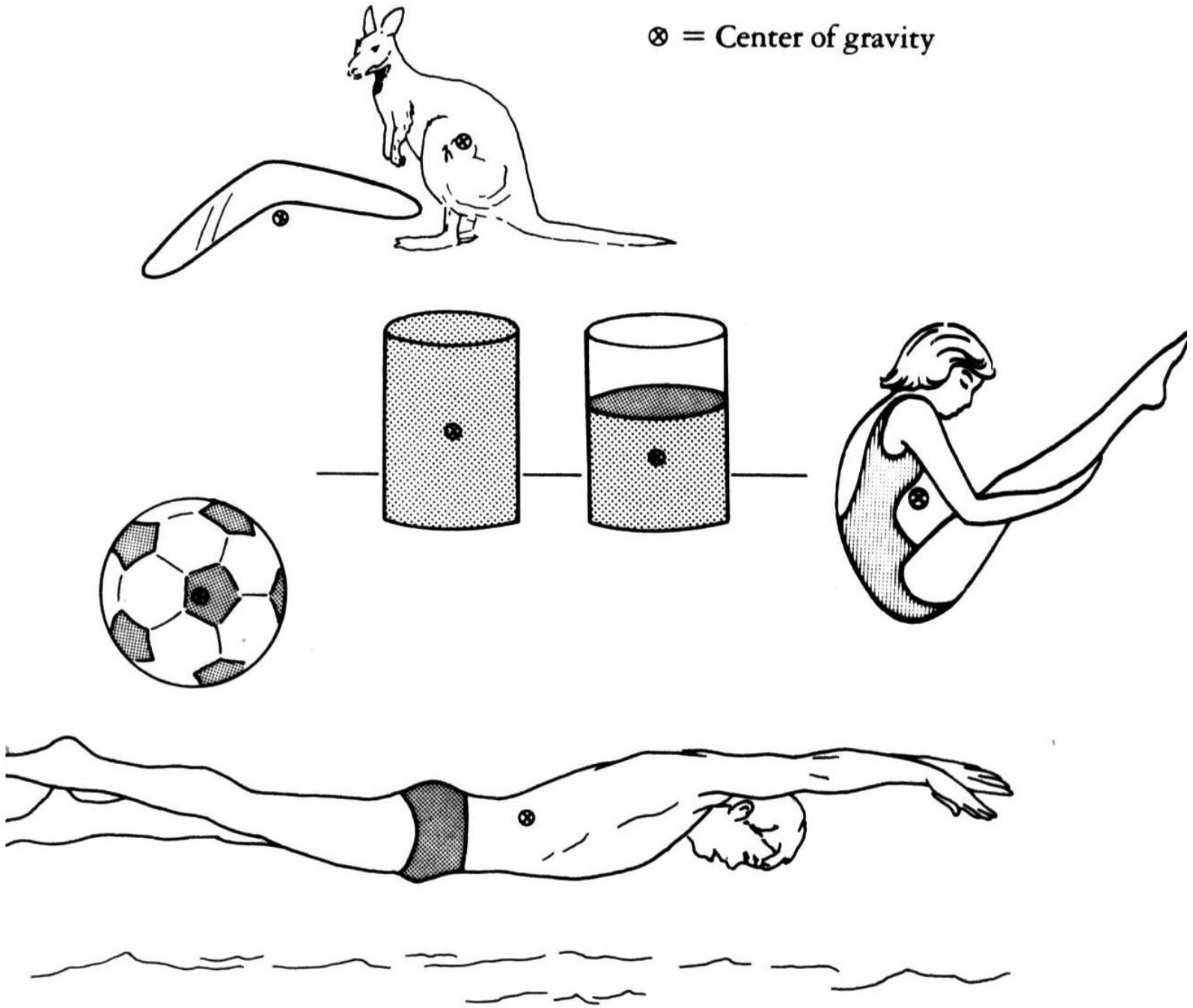
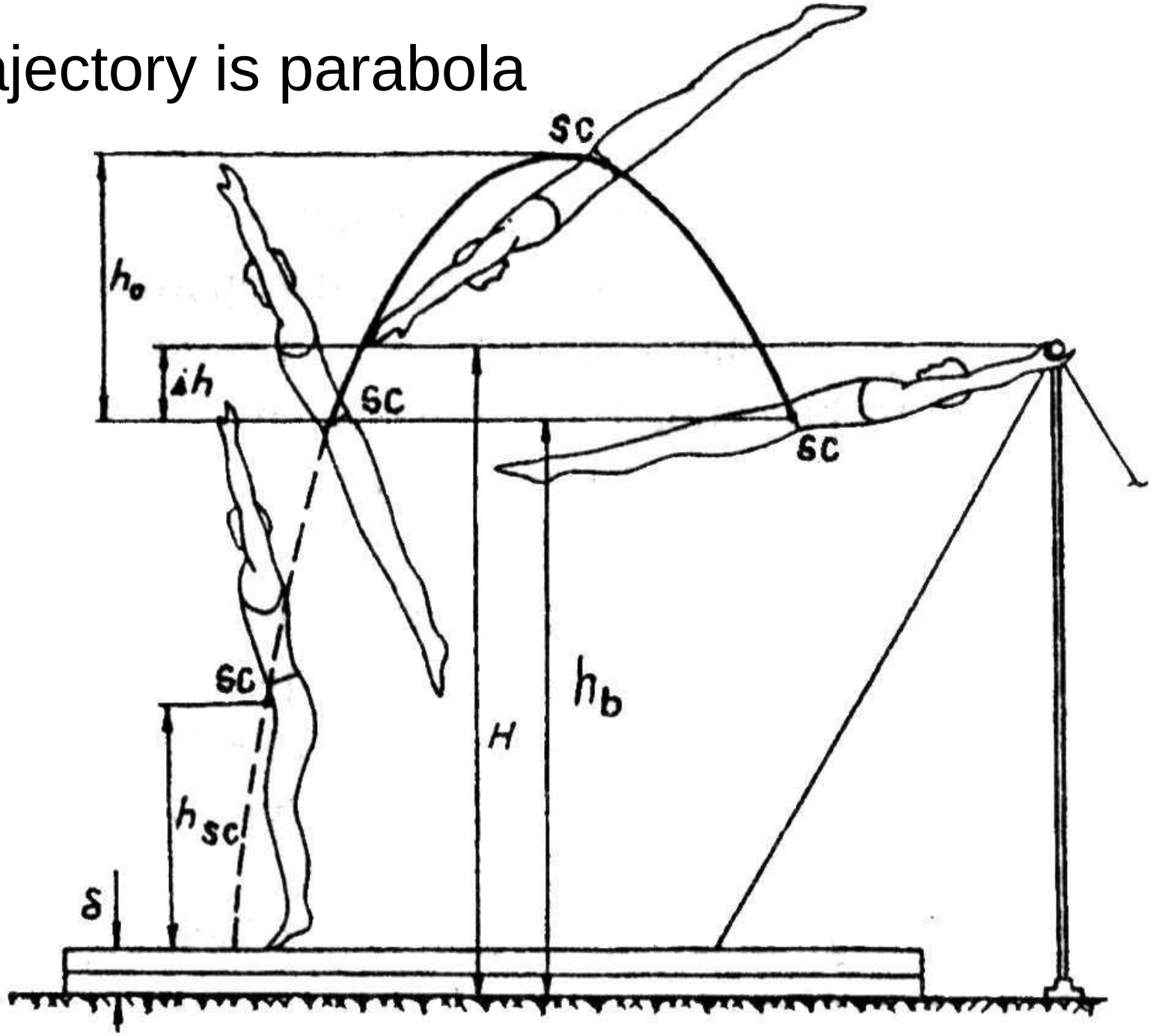
Centre of gravity

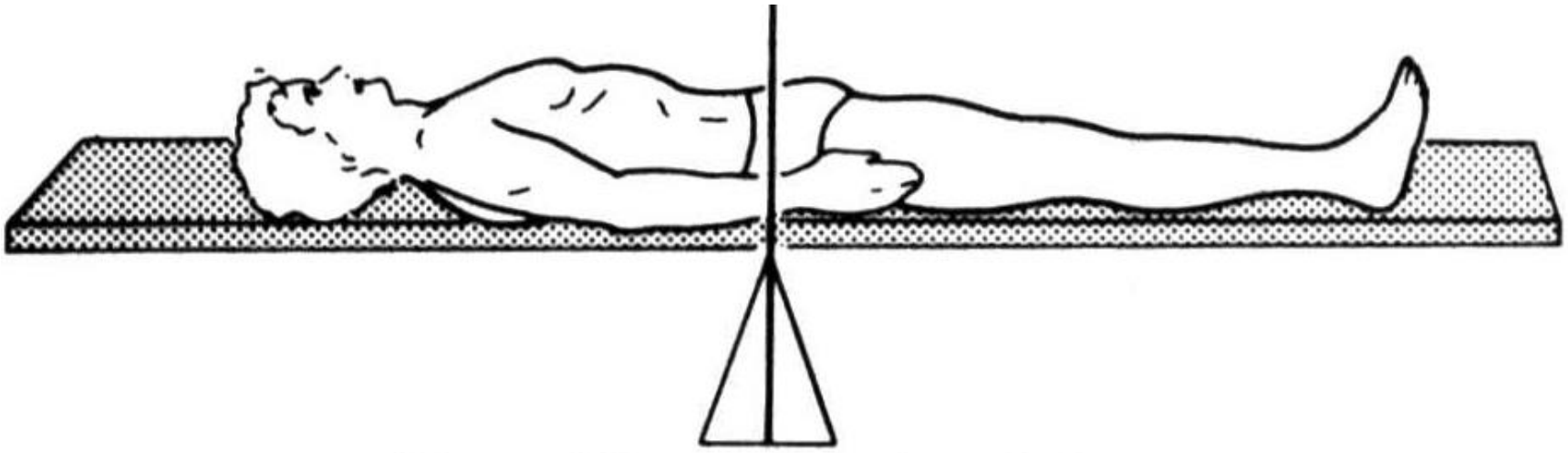
is a point where a vector of gravitational force is applied


⊗ = Center of gravity

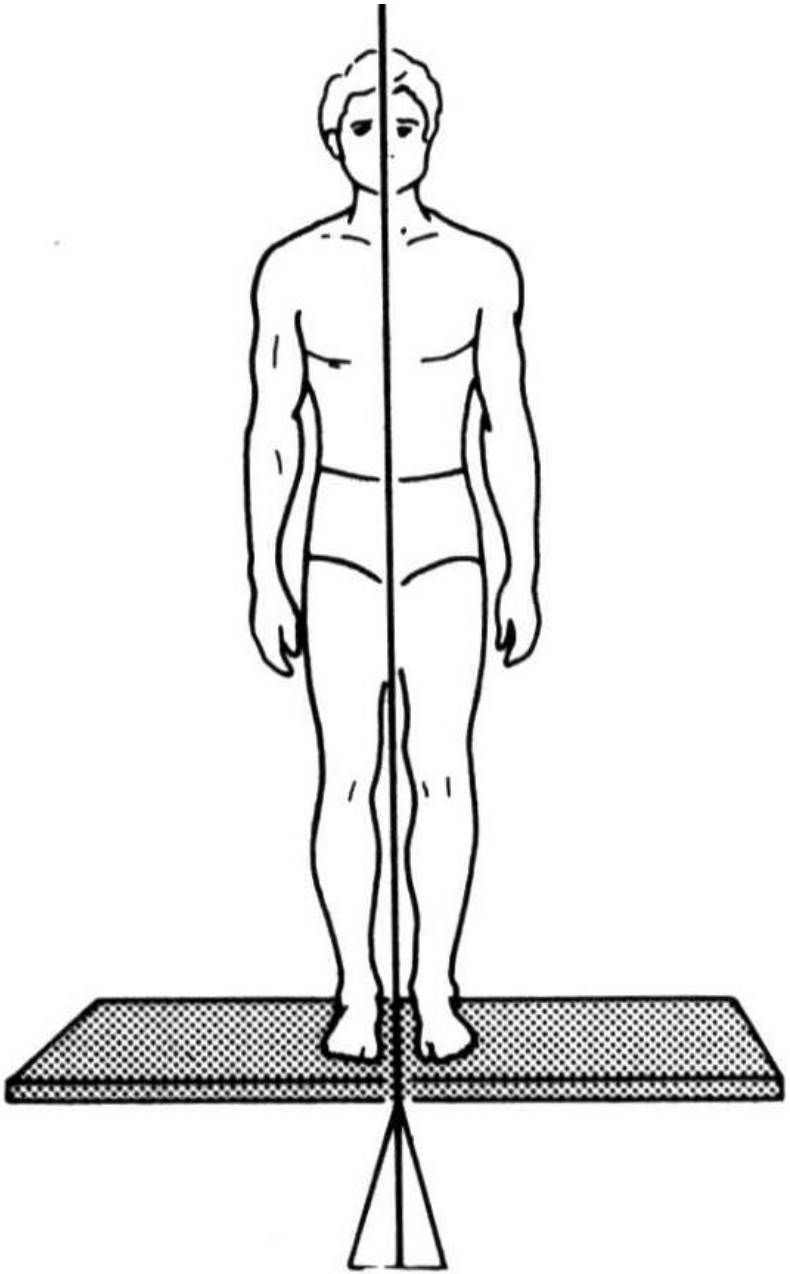
SG trajectory is parabola



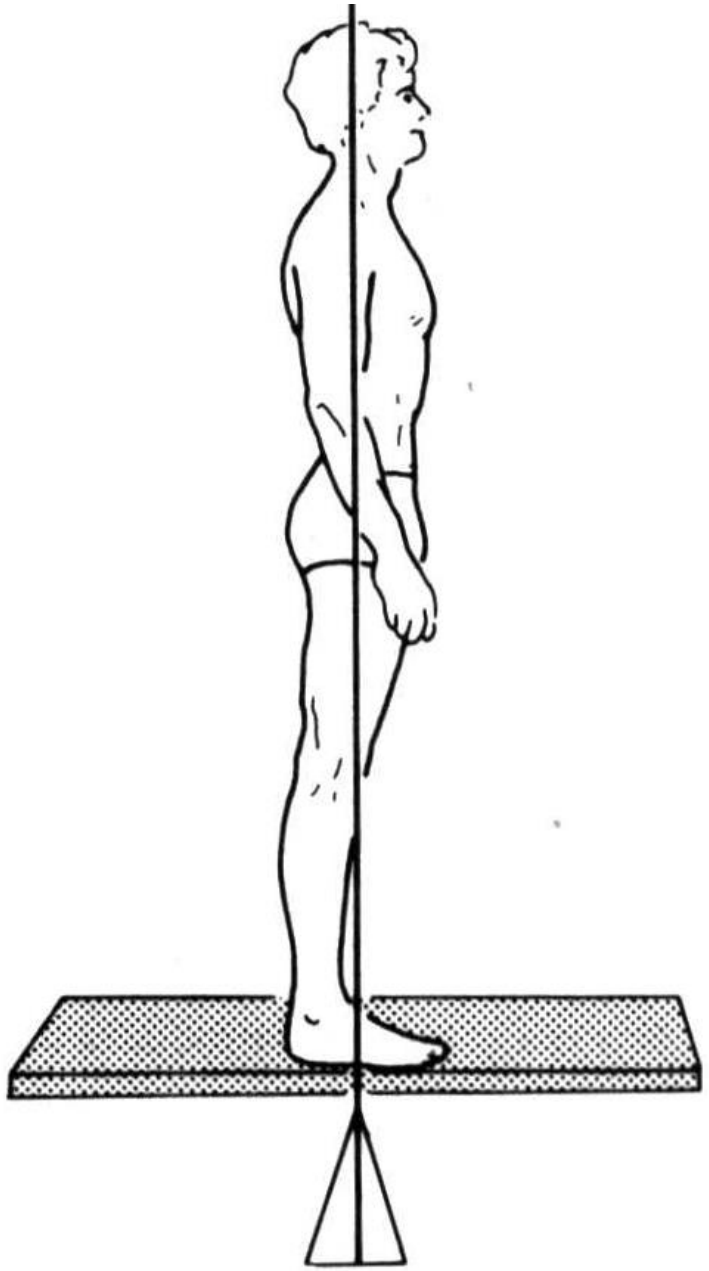
Instrumental methods of CG position determination: balancing platform



Top and bottom portions balance



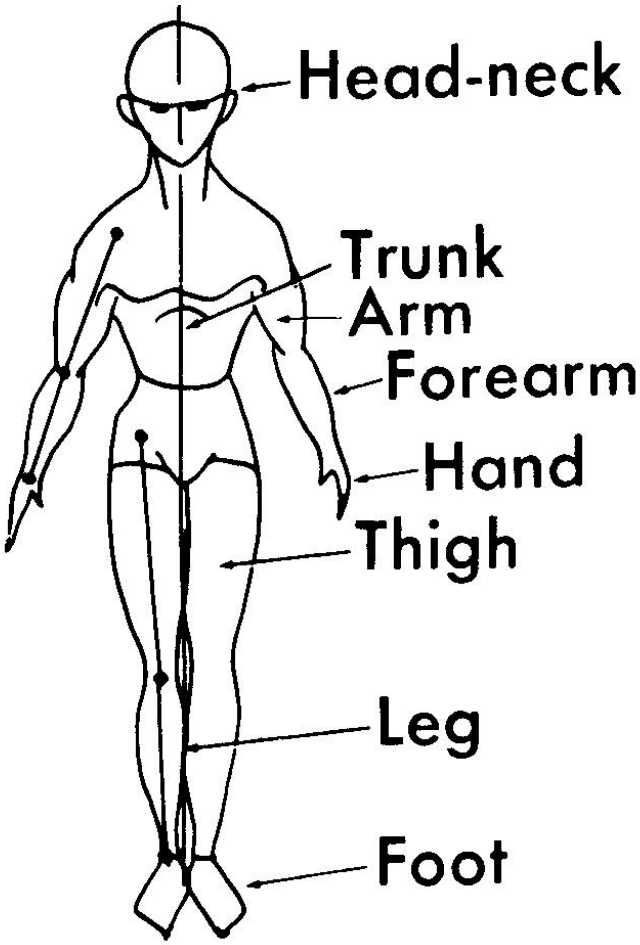
Right and left portions balance



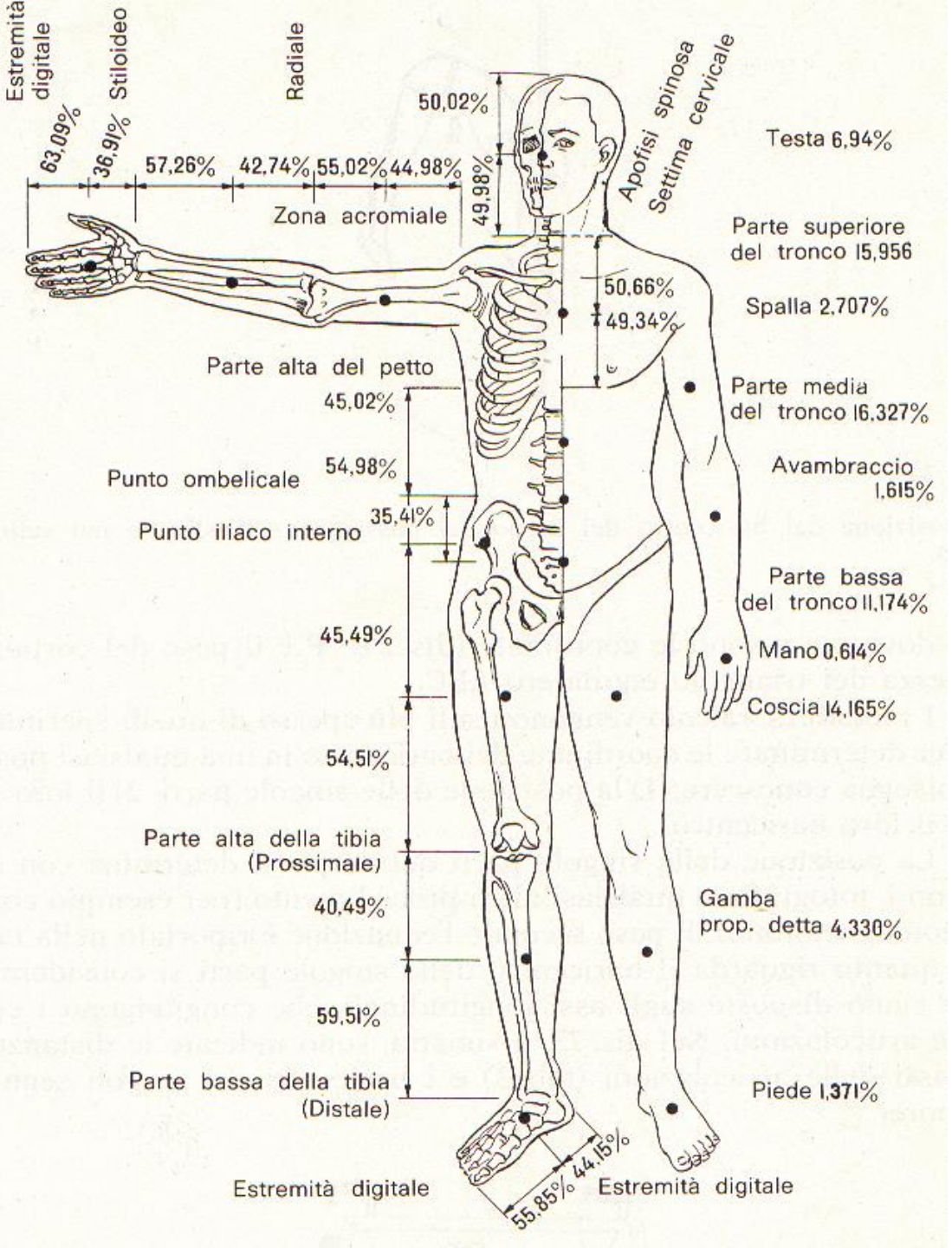
Front and back portions balance

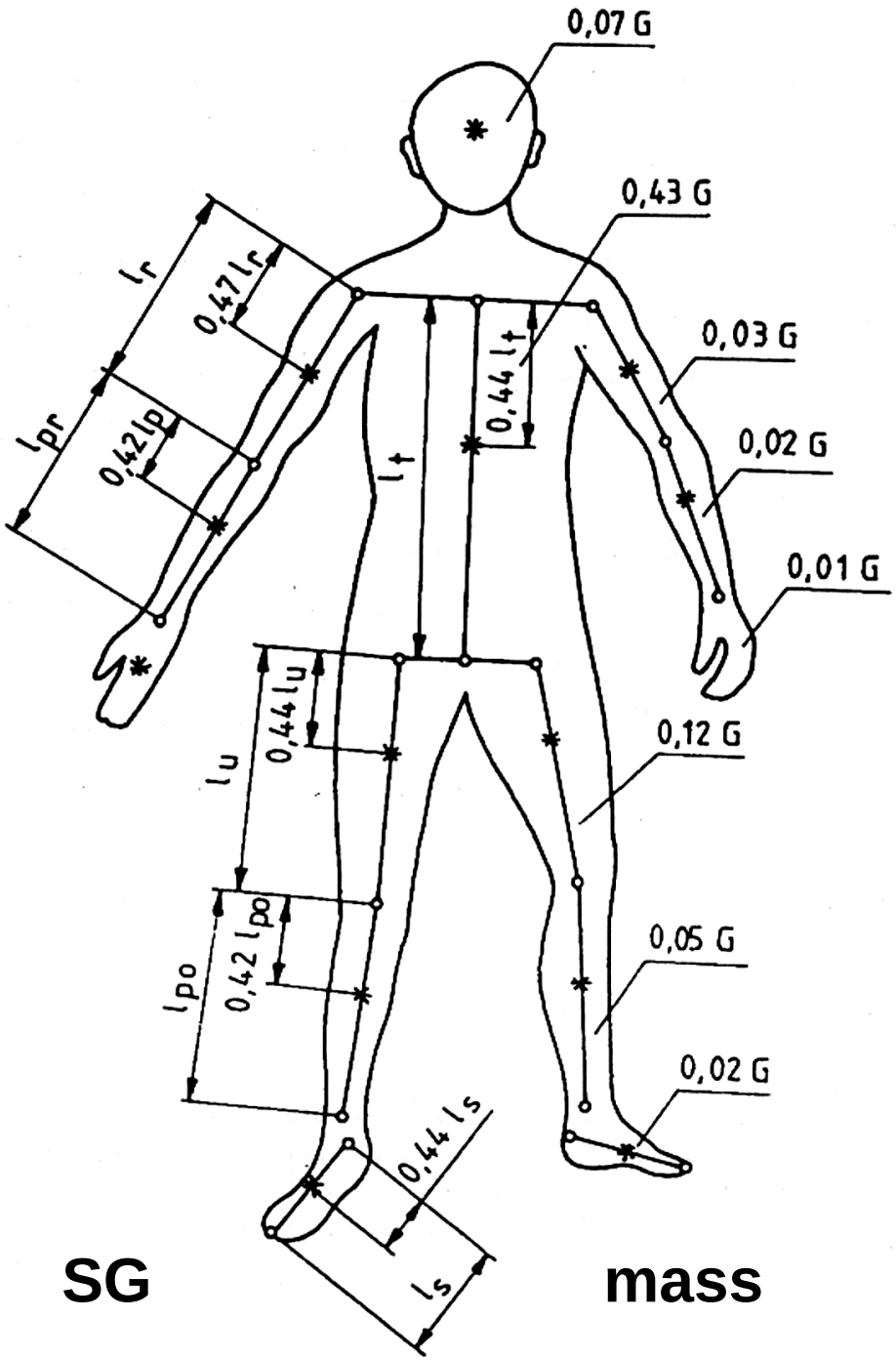
Calculative methods of CG position determination

Body model



Scheme of mass of body segments and centre of gravity localization



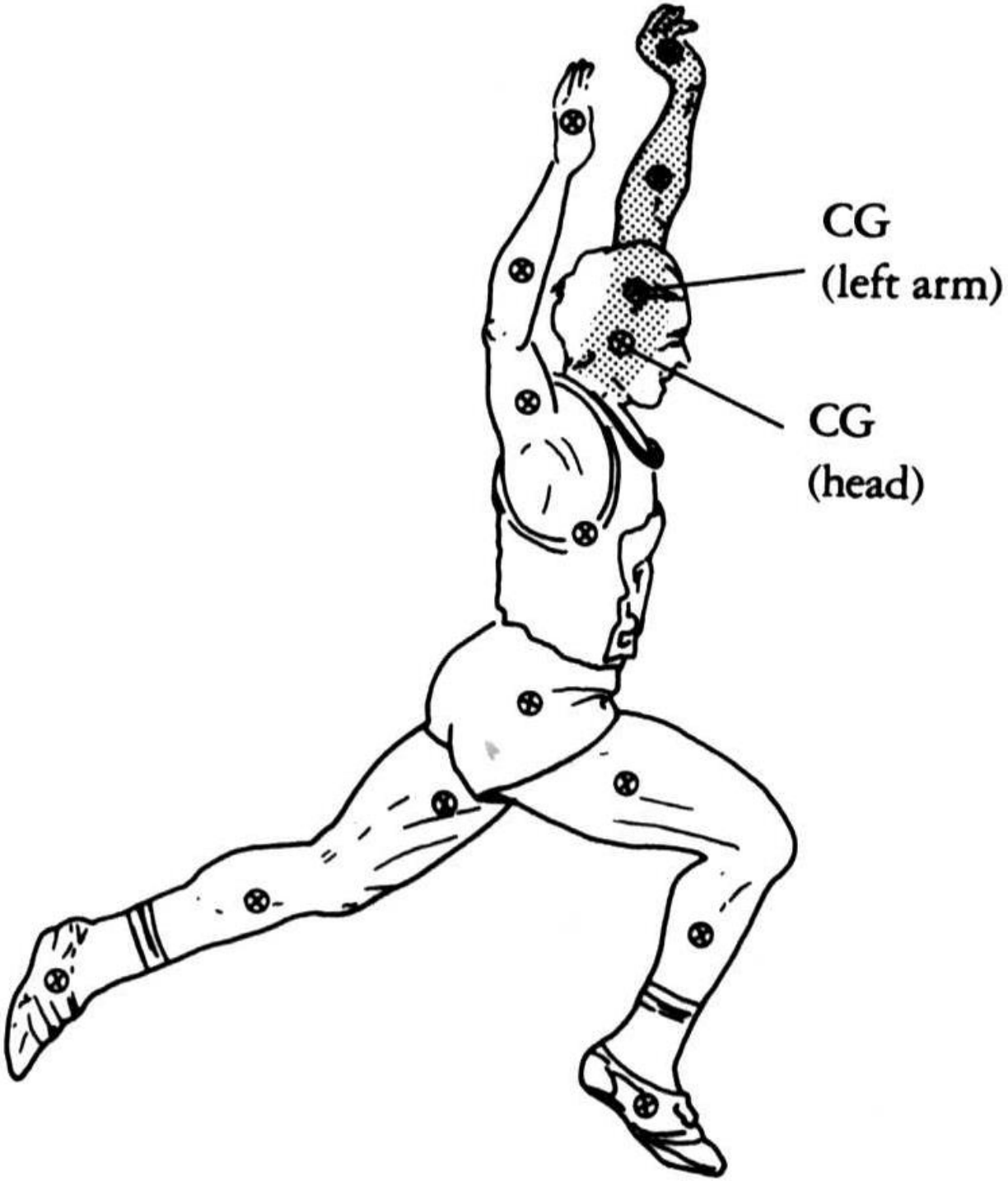


SG **mass**

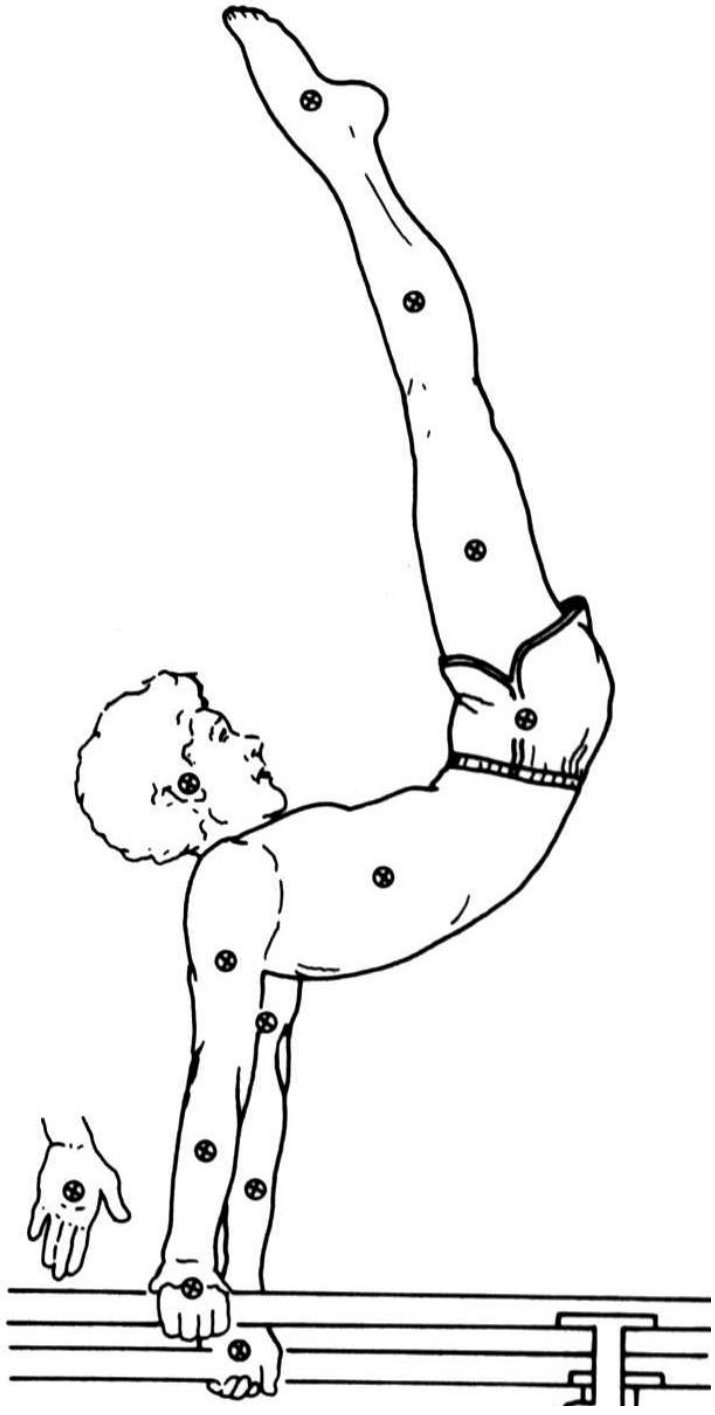
Simplified scheme model

Human body chain:

- head;
- trunk;
- arm;
- hand;
- thigh;
- leg;
- foot.

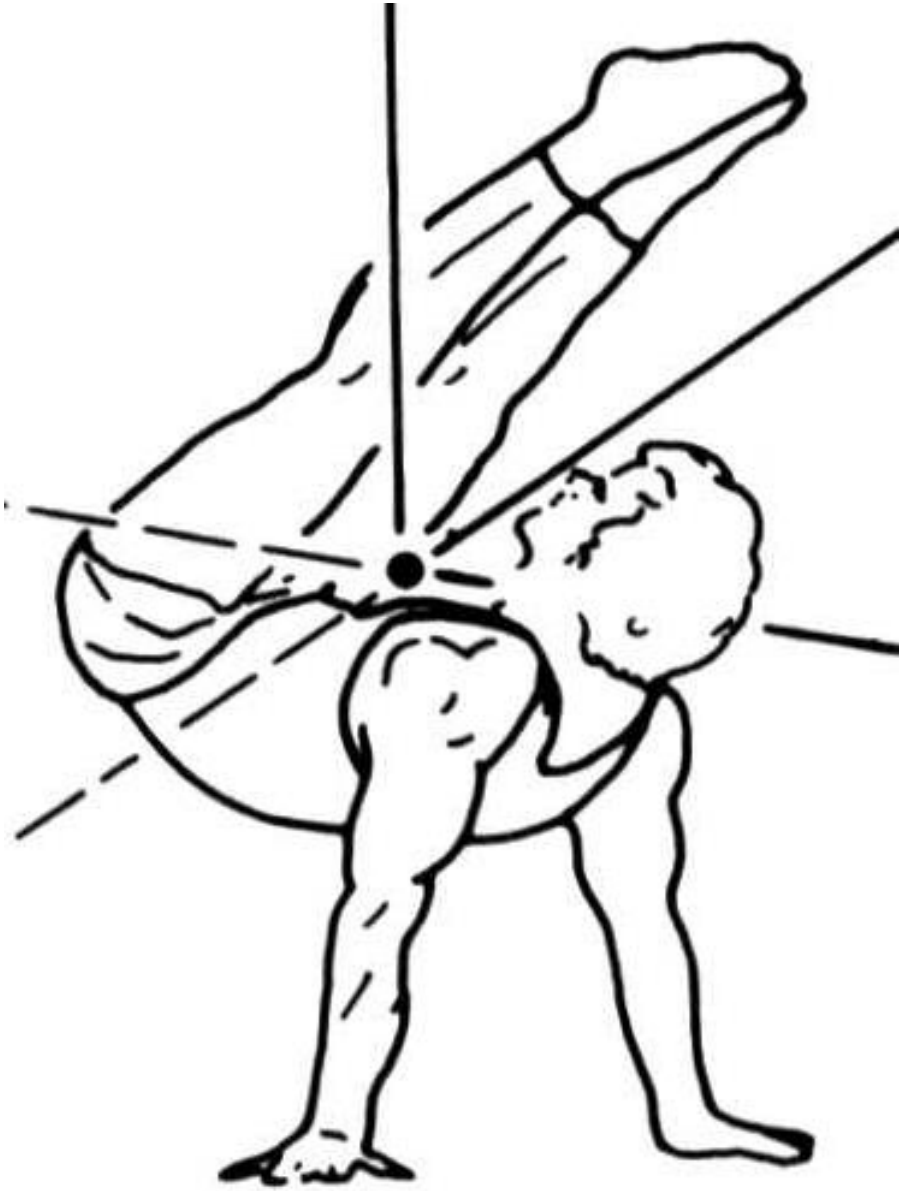


A runner with segmental centres of gravity identified



A gymnast with segmental centres of gravity identified

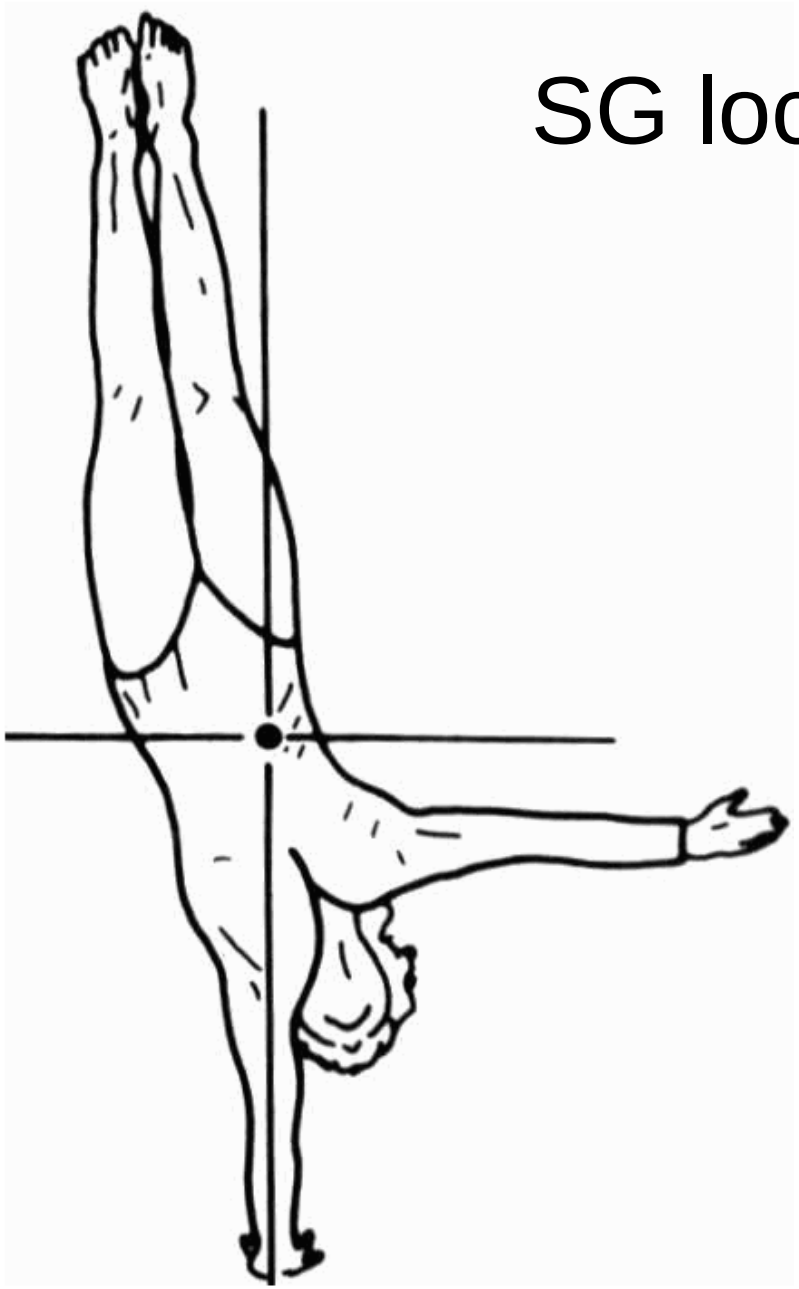
SG localization 1



SG is outside the body in static.

Symmetrical body position.

SG localization 2



SG is inside the body in static.

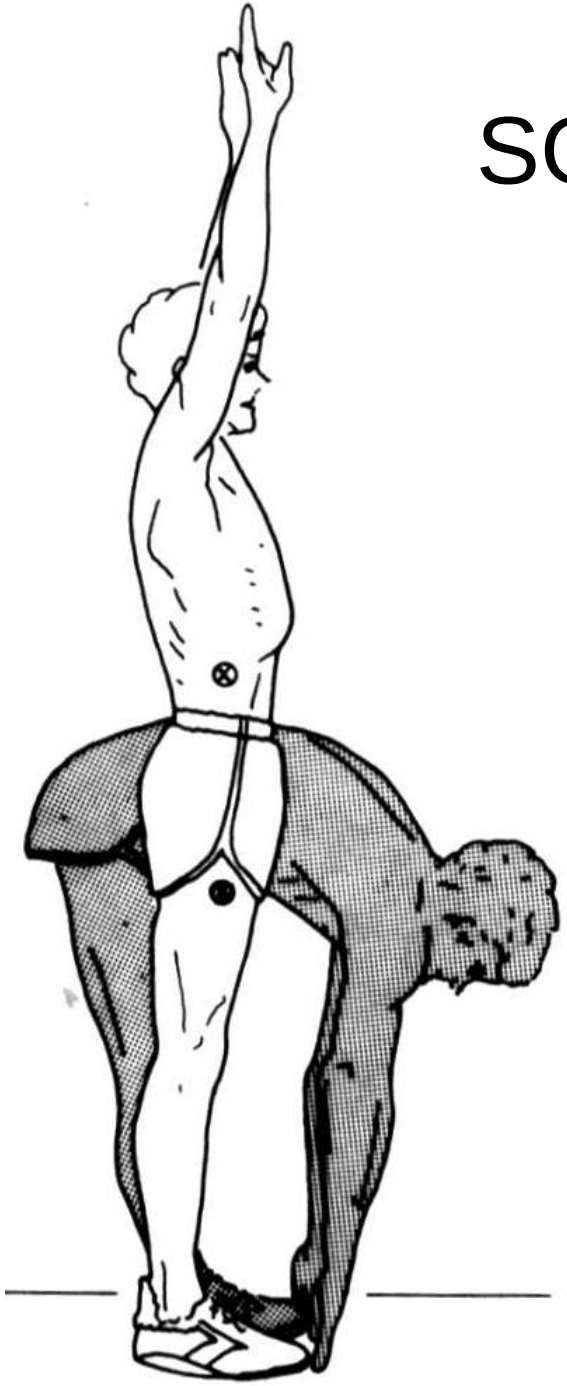
Asymmetrical body position.

SG localization 3



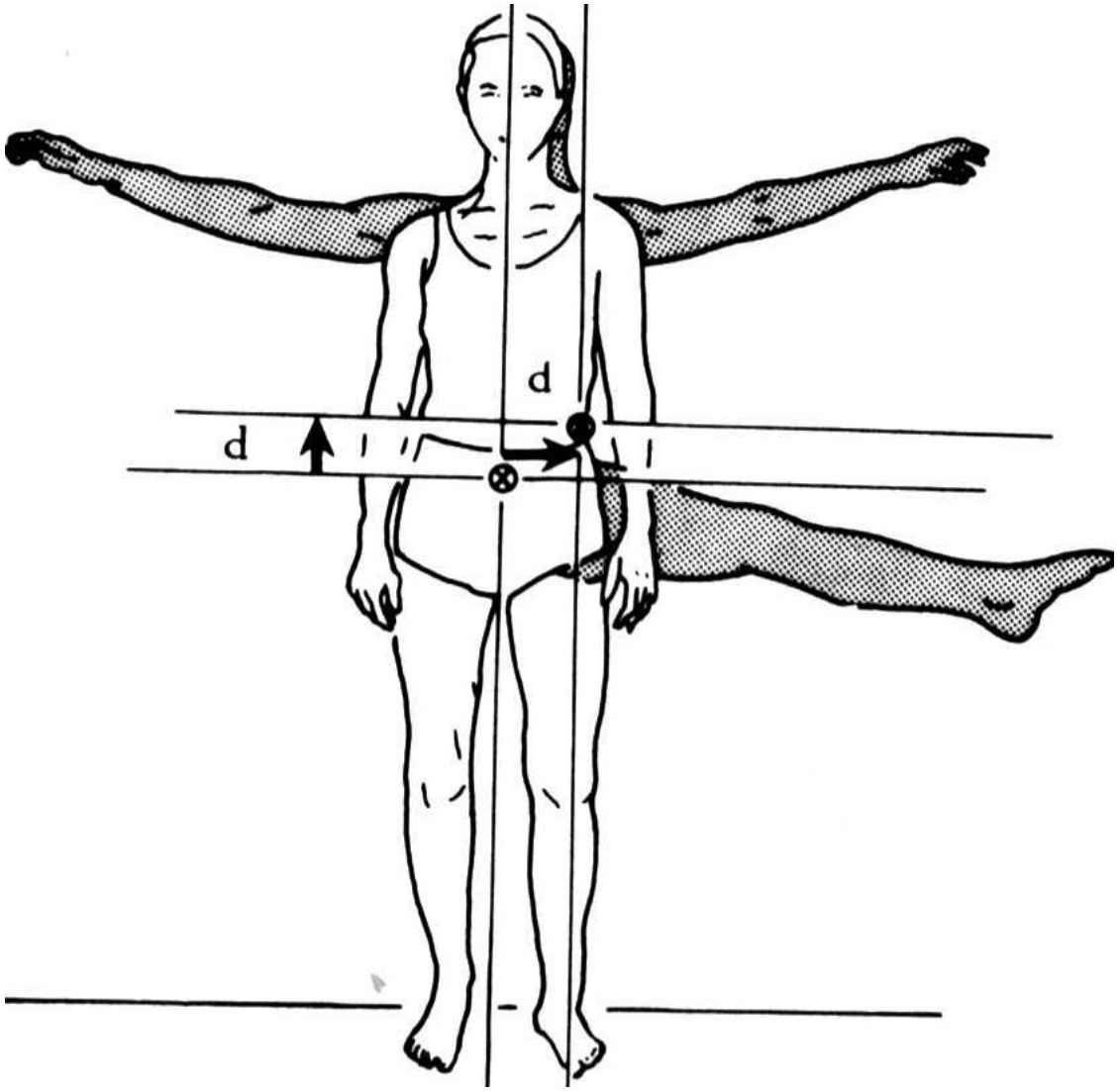
SG is outside the body in dynamics: During the exercise SG doesn’t change its position.

SG localization 4



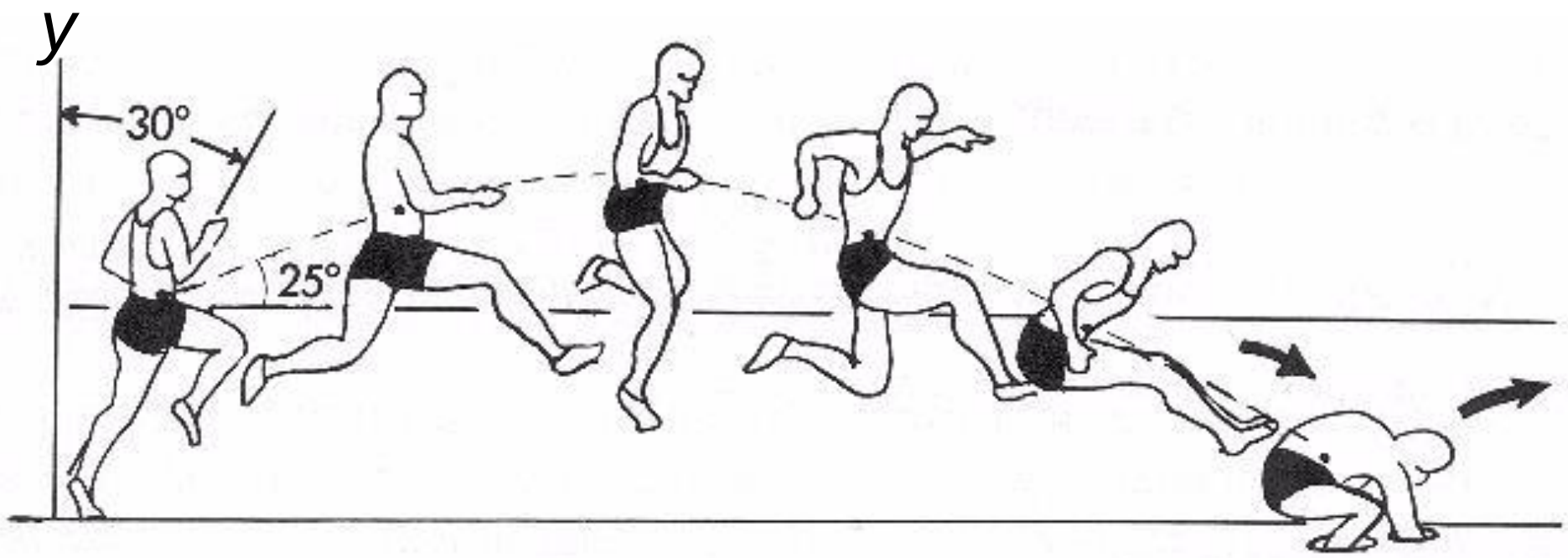
During the exercise SG changes its position: inside-outside.

SG localization 5



During the exercise SG travels inside the body up and side.

Centre of gravity trajectory in the vertical plane *xOy* as a model of a long jump techniques



The trajectory is parabola

i	Body segments	g_i, %	g_i, kgs	l_i	l_{SCi}, %	l_{SCi}	x_i	y_i
1	Head-neck	7	5,04	-	-	-	87	239
2	Trunk	43	30,96	65	44	29	82	174
3	Right arm	3	2,16	17	47	8	51	207
4	Left arm	3	2,16	26	47	12	116	186
5	Right forearm	2	1,44	16	42	7	37	202
6	Left forearm	2	1,44	33	42	14	123	160
7	Right hand	1	0,72	-	-	-	25	195
8	Left hand	1	0,72	-	-	-	129	133
9	Right thigh	12	8,64	51	44	22	67	116
10	Left thigh	12	8,64	49	44	21	87	118
11	Right leg	5	3,60	54	42	23	79	68
12	Left leg	5	3,60	62	42	26	80	65
13	Right foot	2	1,44	33	44	15	93	529
14	Left foot	2	1,44	18	44	8	84	22

SG coordinates:

$$x_{SC} = \frac{\sum_{i=1}^{n} g_i x_i}{G} = \frac{3533}{72} = 49$$

;

$$y_{SC} = \frac{\sum_{i=1}^{n} g_i y_i}{G} = \frac{10752}{72} = 149$$