



## 19th NACACTFCA CONGRESS

OLD SAN JUAN, PUERTO RICO

Sheraton Old San Juan

October 8-11, 2009



# Klaus Bartonietz: Technique and Training of the Throwing Events – Problems and Prospects

- technique of the World's best athletes
- training of technique, maximum and special strength

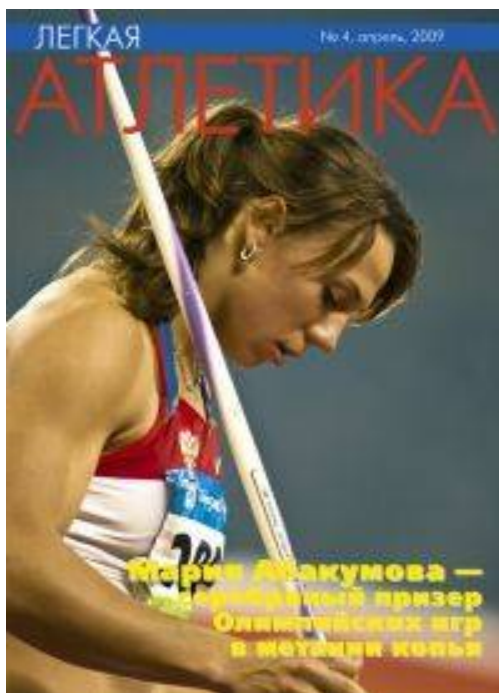
Revolutions in Athletics –  
Coaches and Training Principles  
That Have Changed the Sport Forever

„On the one hand, I am glad that I got my first medal at a World Championships.  
On the other hand, to repeat the result from the qualification round  
would have brought Gold.“

С одной стороны, рада получить первую медаль мировых первенств в карьере.

С другой, повторение результата квалификации принесло бы мне золото.

[http://news.sportbox.ru/Vidy\\_sporta/light\\_atletics/metanie/Legkaya-atletika-Abakumova-mechtaet-o-pobede-v-Moskve-2013](http://news.sportbox.ru/Vidy_sporta/light_atletics/metanie/Legkaya-atletika-Abakumova-mechtaet-o-pobede-v-Moskve-2013)



<http://www.rusathletics.com/nov/novm.php?ind=4226>



<http://www.mk.ru/sport/publications/336961.html>



[http://news.sportbox.ru/Vidy\\_sporta/light\\_atletics/Legkaya-atletika-Abakumova-pobedila-v-CHehii](http://news.sportbox.ru/Vidy_sporta/light_atletics/Legkaya-atletika-Abakumova-pobedila-v-CHehii)



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### Averaged results (m) OG 2008 and WC 2009 top athletes

	SP		Discus		Hammer		Event Javelin	
	m	w	m	w	m	w	m	w
OG 1-3	21,21	20,23	68,14	63,66	81,71	75,28	87,79	69,44
all finalists	20,67	18,91	65,17	61,24	79,18	71,88	83,22	62,09
WC1-3	21,77	20,18	68,49	65,31	79,41	76,62	86,32	66,59
all finalists	20,74	19,14	64,92	61,98	76,26	73,16	81,43	61,65





<http://www.daylife.com/photo/OfcXgx5eHL2gB>



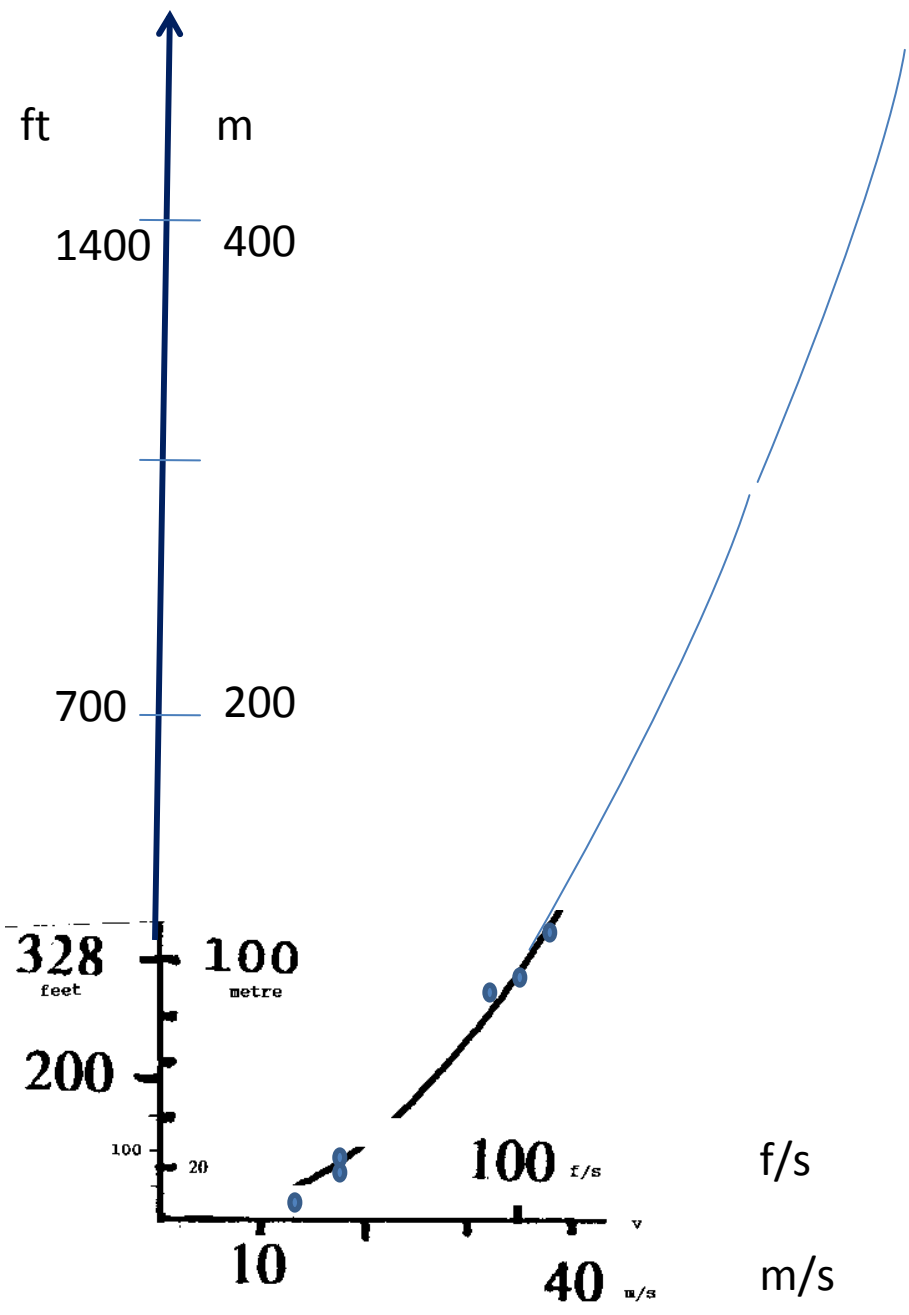
<http://www.gbtc.org/images/pictureoftheweek/060515-SeanFurey2.jpg>

## Finalists with PB or season 's PB at the WC

### Event

SP	m	5	<b>Cantwell, Bartels, Nelson</b> , Lyshyn, Vodovnik
	w	2	<b>Kleinert</b> , Gong
Hammer	m	2	Kozmus, Ziolkowski
	w	5	Wlodarczyk, <b>Heidler, Klaas, Cosby</b> , Zhang
Discus	m	2	<b>Harting</b> , Malachovski
	w	3	Samuels, Barrios, Ma
javelin	m	4	Torkildsen, Martinez, Murakami, <b>Furey</b>
	w	6	<b>Nerius</b> , Abakumova, <b>Stahl</b> , Ratej, Stojan, Menendez

19th NACACTFCA Congress Thu Oct 08 2009 - Sun 11 Oct 2009



distance  
thrown  
vs  
velocity of  
release

**The velocity of release** is the most important parameter to achieve the distance thrown –

because it is the only parameter that can be **maximized** by the athlete's action.

“...any search for an ‘maximum’ velocity of release produces instead an optimal value because of the need for an ‘optimal’ movement direction.

Despite the squared effect of the release velocity..., the linking with the other parameters causes a quasi-linear relationship between release velocity and flight distance of the implement in the window targeted zone...”

(Bartonietz, 2000)



Revolutions in Athletics –  
Coaches and Training Principles  
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Main Motto:

Each throw has to be built  
up from the legs.  
*(coaches' wisdom)*



Al Oerter competing at the 1956 Summer Olympics.

[http://graphics8.nytimes.com/images/2007/10/01/sports/oerter\\_600.jpg](http://graphics8.nytimes.com/images/2007/10/01/sports/oerter_600.jpg)

The most basic principle for the coach  
to analyze any movement:

3rd law of motion by Issak Newton:

For every action,  
there is an equal and opposite  
direction re-action.

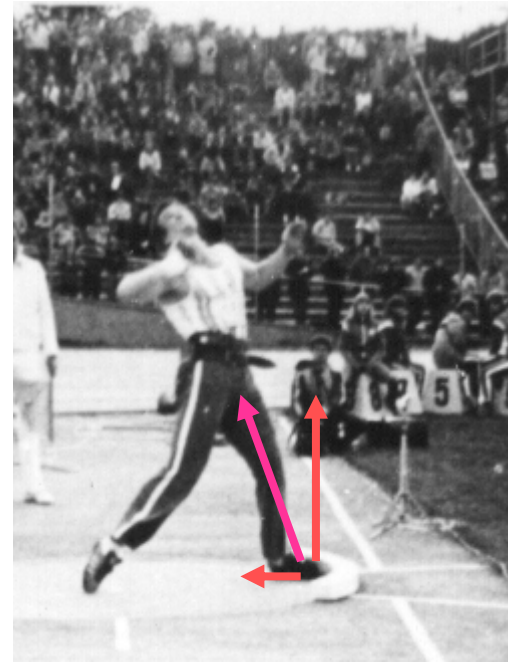
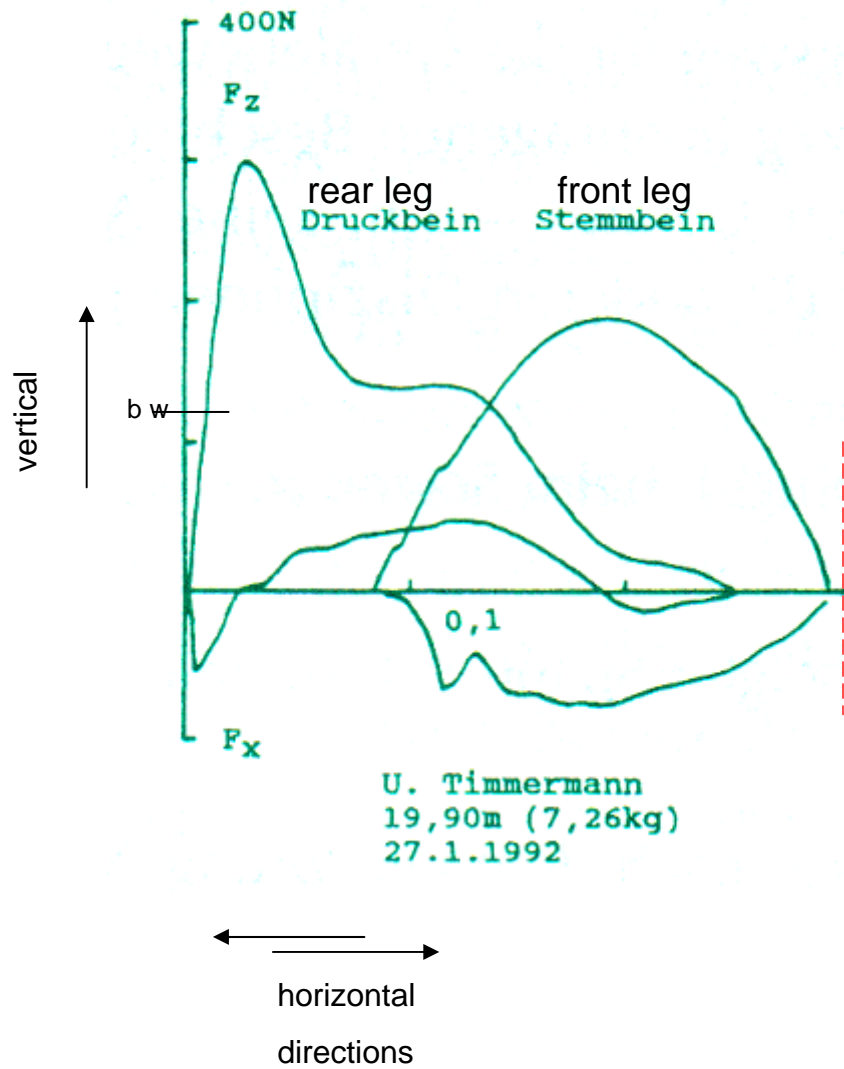
POWER taken from the ground:



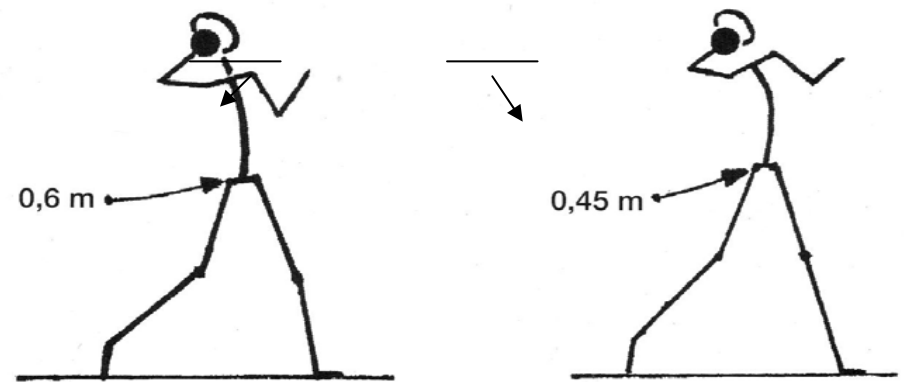
Jan Zelezny  
WR 98.48m

# Shot Put: *ground reaction forces* during delivery (GRF)

*forças de acção - reacção*



19 bis 20 m Stoßweite über 22 m



Shot Put - GRF

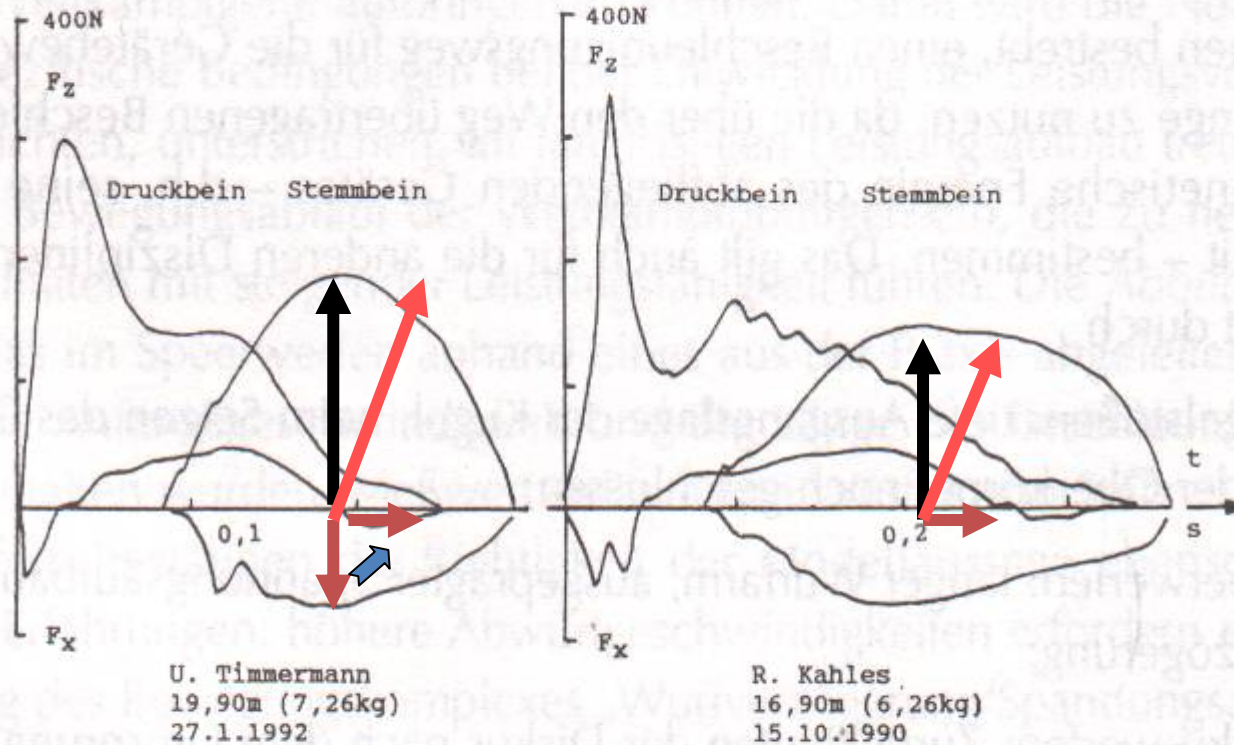


Abb. 22: Kugelstoßen – shot put

–Athleten Ralf Kahles und Ulf Timmermann/Trainer Helge Zöllkau und Werner Goldmann–

from: Amrhein, Adamczewski, Bartonietz, Czingon, Dickwach, Graf, Hirsch, Hommel, Marek, Jeitner, Kühl, Löffler, Losch, Reiß, Rost, Schmidt, Schön, Schubert, Tepper, Wegner, Zerbes (1993). Vom Anfänger zum Top-Leichtathleten, DLV, Darmstadt (modified)

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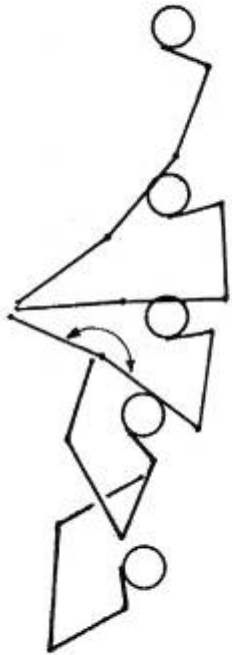


Tobias Hepperle  
born 1987  
PB 7,26 kg  
16,95m (2007)  
18.80m (2009)

*sequence from: It*

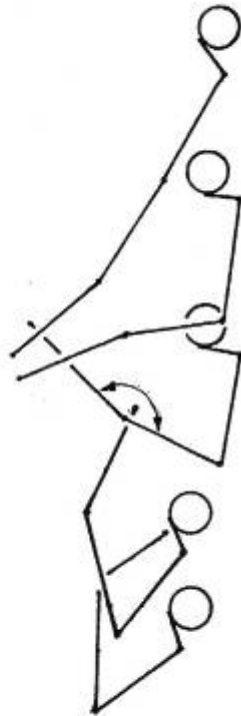
## From a bird's view

Sportler T.  
Weite: 21,41 m



fixiert  
hoch  
> 180°

Sportler P.  
Weite: 19,32 m

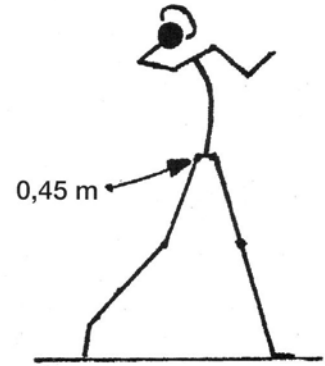
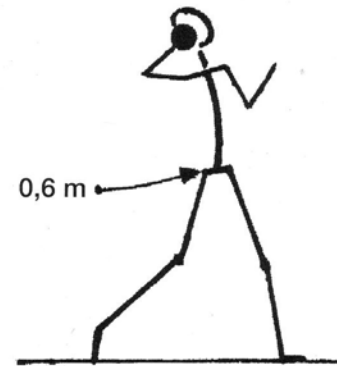


linke Schulter  
Vordehnung  
Schulterwinkel

weicht aus  
gering  
< 180°

The key: stability of the left shoulder

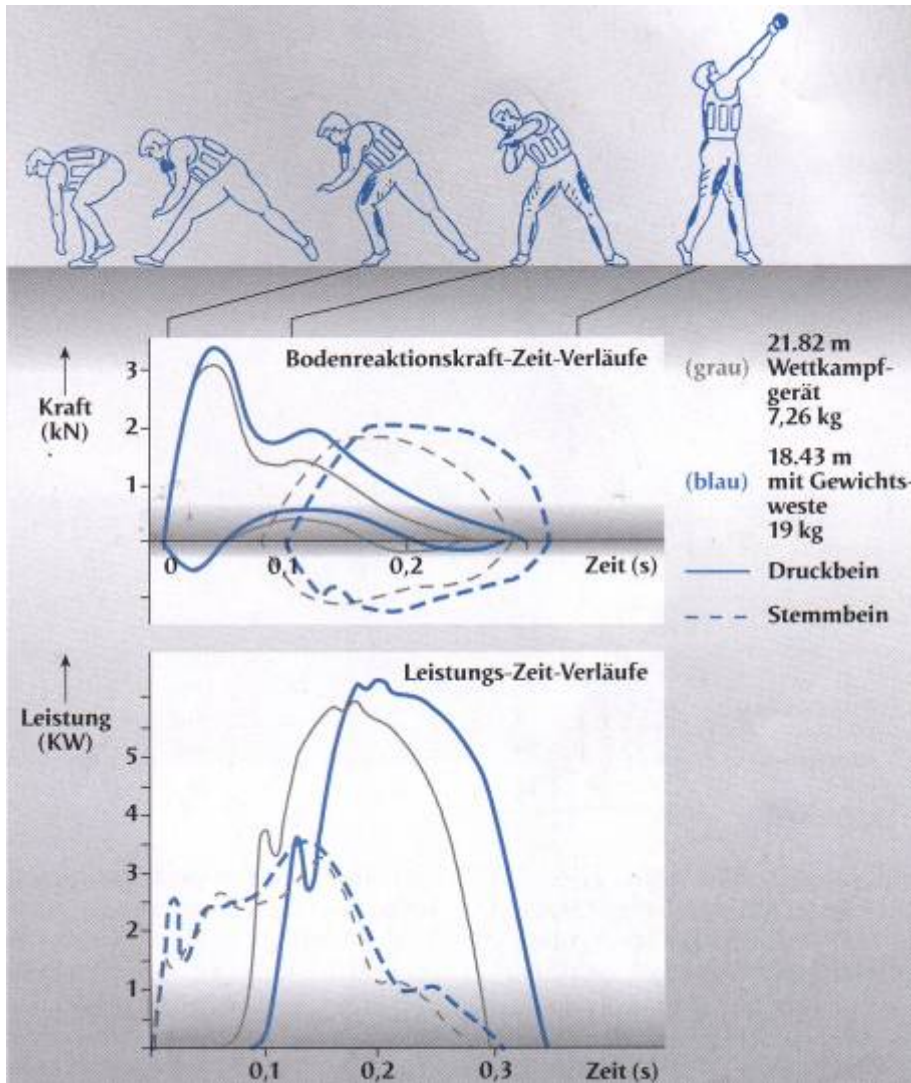
19 bis 20 m Stoßweite über 22 m



The further, the harder:

displacement of the right hip joint  
during the interval „planting right foot –  
maximum body pretension“  
(throws of Ulf Timmermann, 19-22m)

# Developing Leg Power, using a Weight Vest



$P_a$ , kW

*right leg*

*left leg*

3,27

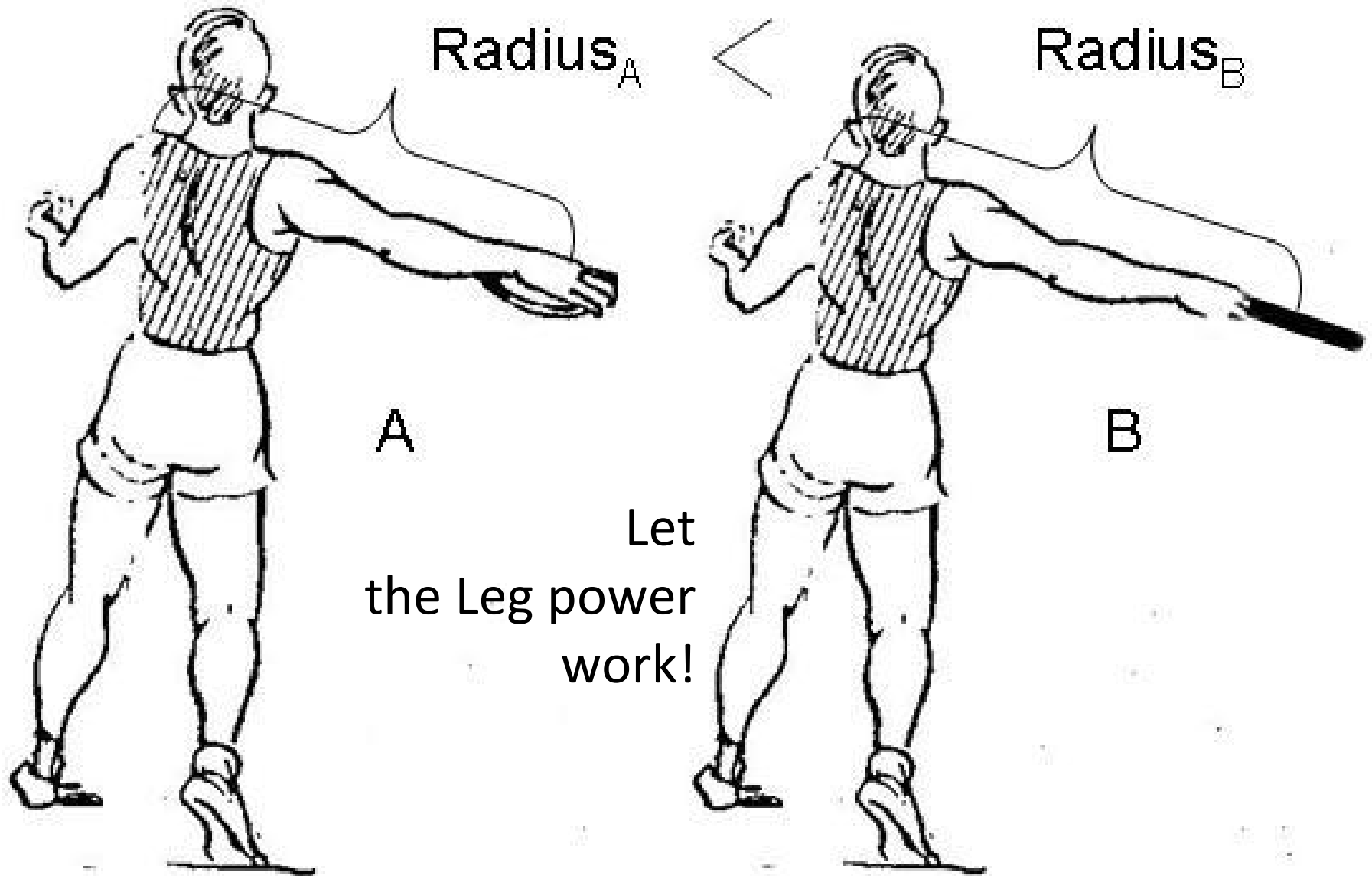
5,91

21,82m

3,88

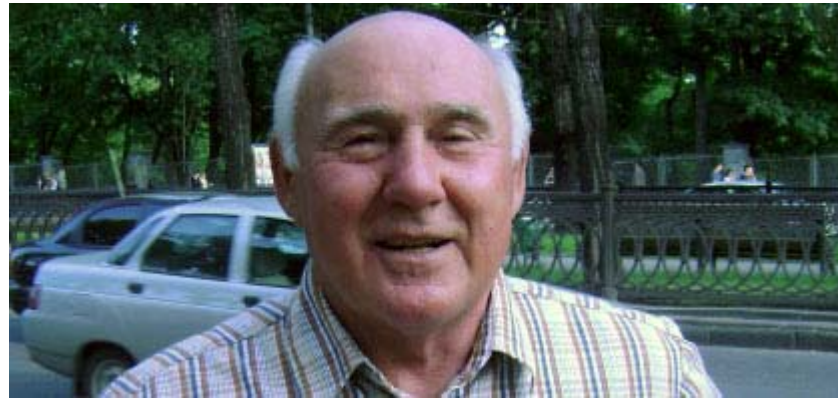
6,52

18,43m  
with  
weight vest  
19kg



ПРОФЕССОР С МОЛОТОМ

12.11.2008, 18:09 // [Олег Востряков](#), газета «Новая»



— Почему рекорд вашего ученика не побит до сих пор?

— Когда-то я был уверен: пройдет немного времени, и спортсмены будут отправлять молот за 90 м.

Но мы в итоге получили регресс. Не буду объяснять подробно, почему, отмечу лишь главную, а мой взгляд, проблему — это все та же техническая оснащенность метателей.

Между нынешними и теми, кто блистал пару-тройку десятилетий назад,

„Between the throwers of these days

— пропасть!

and the two-three ten years ago – chasm!“

Anita Włodarczyk (POL) 77,96m WR (2nd att.)



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# Duration of the support phases

Primož Kozmus, 80,84m

turns	I	II
1	0,33	0,30
2	0,26	0,26
3	0,20	0,23
4 + release	0,23	0,23

$\Sigma$  2,04s

Szymon Ziolkowski 79,30m:

	I	II
1	0,30	0,33
2	0,23	0,26
3	0,20	0,23
4 + release	0,23	0,28

$\Sigma$  2,09s

Alekseji Zagornyi 76,11m

turns	I	II
1	0,33	0,23
2	0,30	0,20
3 + release	0,26	0,30

$\Sigma$  1,62s

Yurij Sedych	86,74m	$\Sigma$ 1,34s
	82,34m	$\Sigma$ 1,47s
	75,40m	$\Sigma$ 1,60s

(Bartonietz, 2000).

## Duration of the support phases

Anita Woldarczyk 77,96m:

Turns	I	II
1	0,33	0,30
2	0,26	0,23
3	0,20	0,23 (early catch)
4 + release	0,23	0,23
	$\Sigma$ 2,01s	

Flight  
duration  
4,02s



Betty Heidler, 77,12m:

Turns	I	II
1	0,33	0,23 (!)
2	0,23	0,20
3	0,23	0,17
4 + release	0,23	0,20
	$\Sigma$ 1,82s	

3,7s



Martina Hrasnova, 74,79m:

Turns	I	II
1	0,33	0,26
2	0,30	0,20 (!)
3 + release	0,26	0,23
	$\Sigma$ 1,58s	



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Martina Hrasnova, 74,79m, 2nd turn





## Aesthetics of the hammer throw (part I)





Aesthetics  
of the  
hammer throw  
(part I II)

**Ivana Brkljačić**  
**PB 75,08m (2007)**

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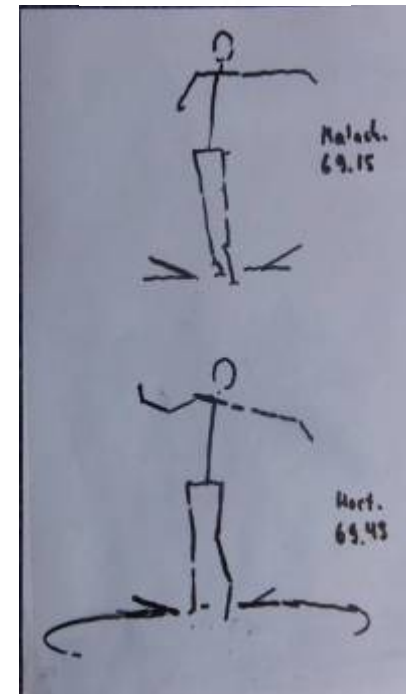


Casey Malone 66.45m (6th att.)

Leistungsentwicklung Robert Harting Diskus und Kugel  
(Oct. 18 1984)



17	2001	1,5kg	63,70		
18	2002	1,75	56,23		
		2	54,25		
19	2003		59,54	6kg	18,53
20	2004		64,05		
21	2005		66,02		
22	2006		65,22		
23	2007		66,93	7,26kg	18,63
24	2008		68,65		
25	2009		69,43		



Mykyta Nesterenko (born 1991)  
 2006: 1kg 77.85m, 81.22m (266ft)  
 2008: 1.5kg 77.50m, 1,75 kg 70,13, 2kg 65,31m  
 2009 7,25kg 18,97m

D. Samuels  
65.44m



N. Mueller  
ab. 62.50m  
(invalid)



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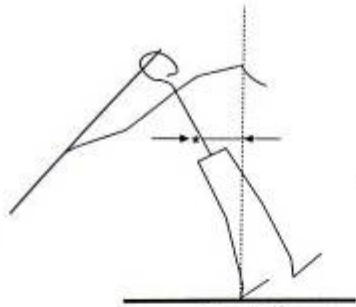


Stephanie Brown Tafton 58,53m (1st att.)

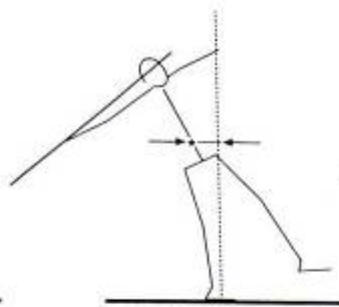


Flight Phase: angle between discus and horizontal before landing  
35-40 degrees  
20 degrees

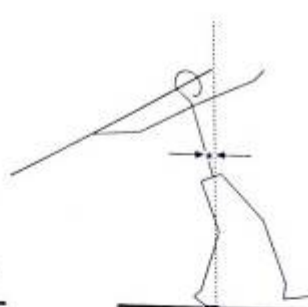
JAVELIN THROWING 419



**Janis Lulis**  
Training throw (about 1972)



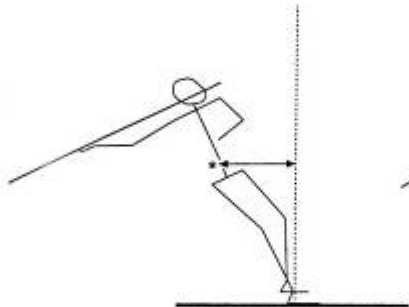
**Uwe Hohn**  
104.80 m (1984)  
World record



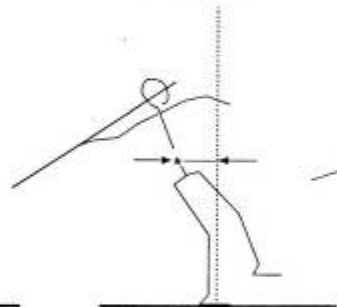
**Jan Zelesny**  
98.48 m (1996)  
World record



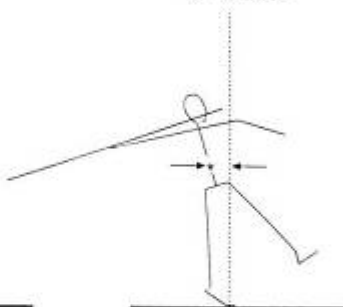
Bartonietz, 2009  
Video: IAAF Research team



**Ruth Fuchs**  
67.22 m (1974)  
World record



**Petra Felke**  
80.00 m (1988)  
World record



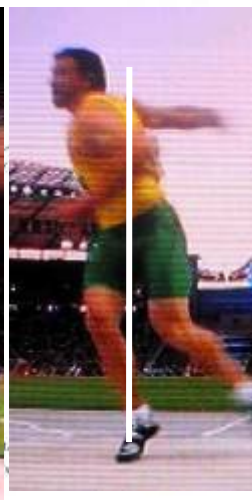
**Trine Hattestad**  
67.06 m (1997)

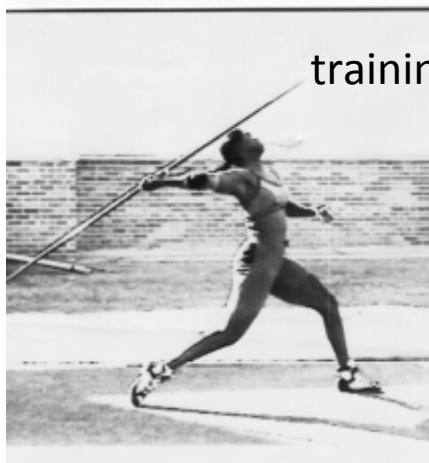
66. 88m

69,58m (2006)

sequence:

[www.team75plus.com](http://www.team75plus.com)



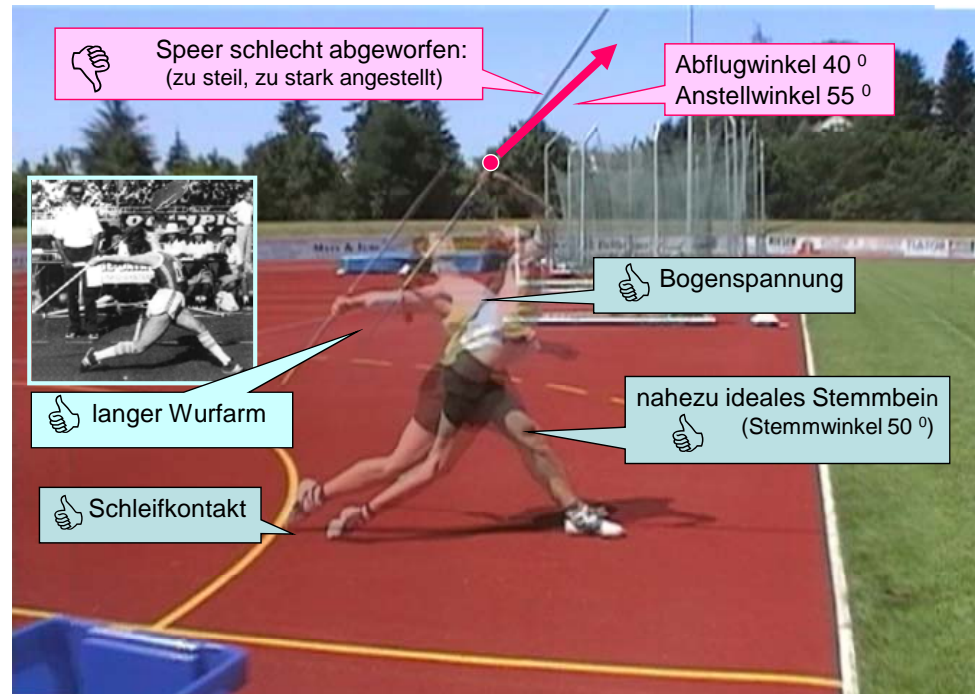


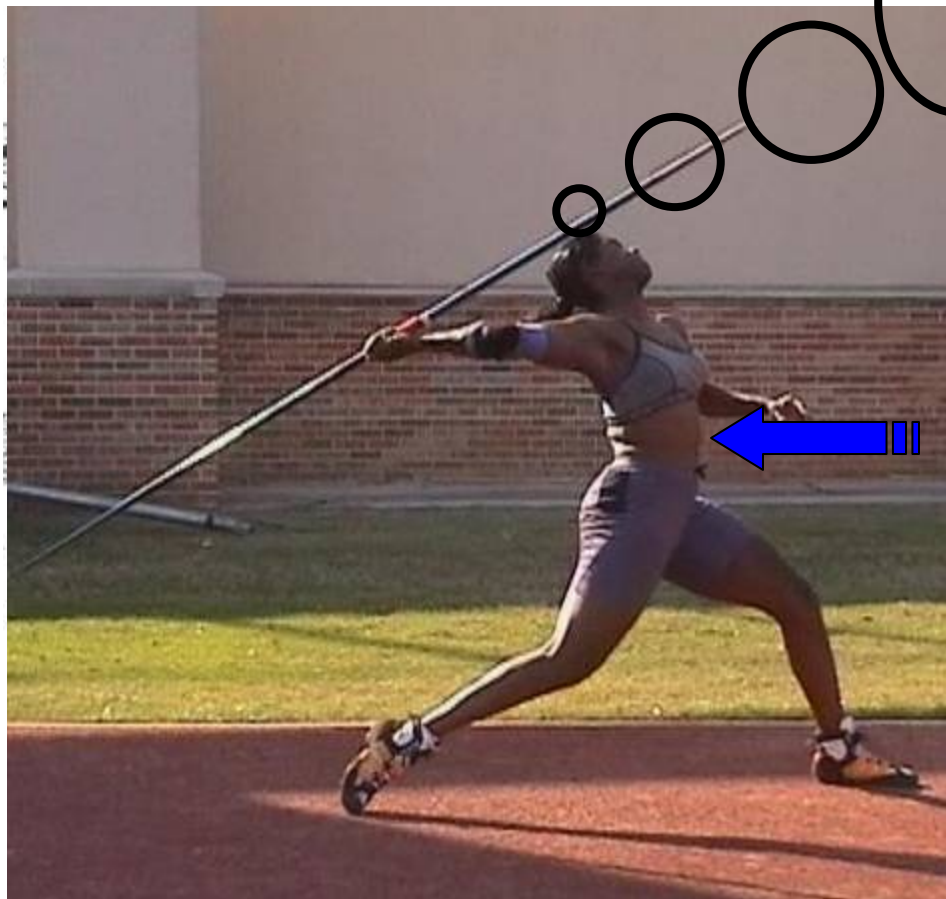
training 55m

target technique  
for 63+



Georg Miller (1956) :  
the short-term memory can hold  
only  $7 \pm$  chunks of information  
(a chunk is any meaningful unit)







**Klaus Bartonietz:**  
**Training of technique,  
maximum and special  
strength**



no brain –  
no gain

ninguèn cerebro  
ninguèn  
progreso

nenhum cérebro  
nenhum ganho

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**„Brain, n,**

An apparatus with which we think that we think.“

Un aparato con el cual pensamos que pensamos

Ambrose Bierce:

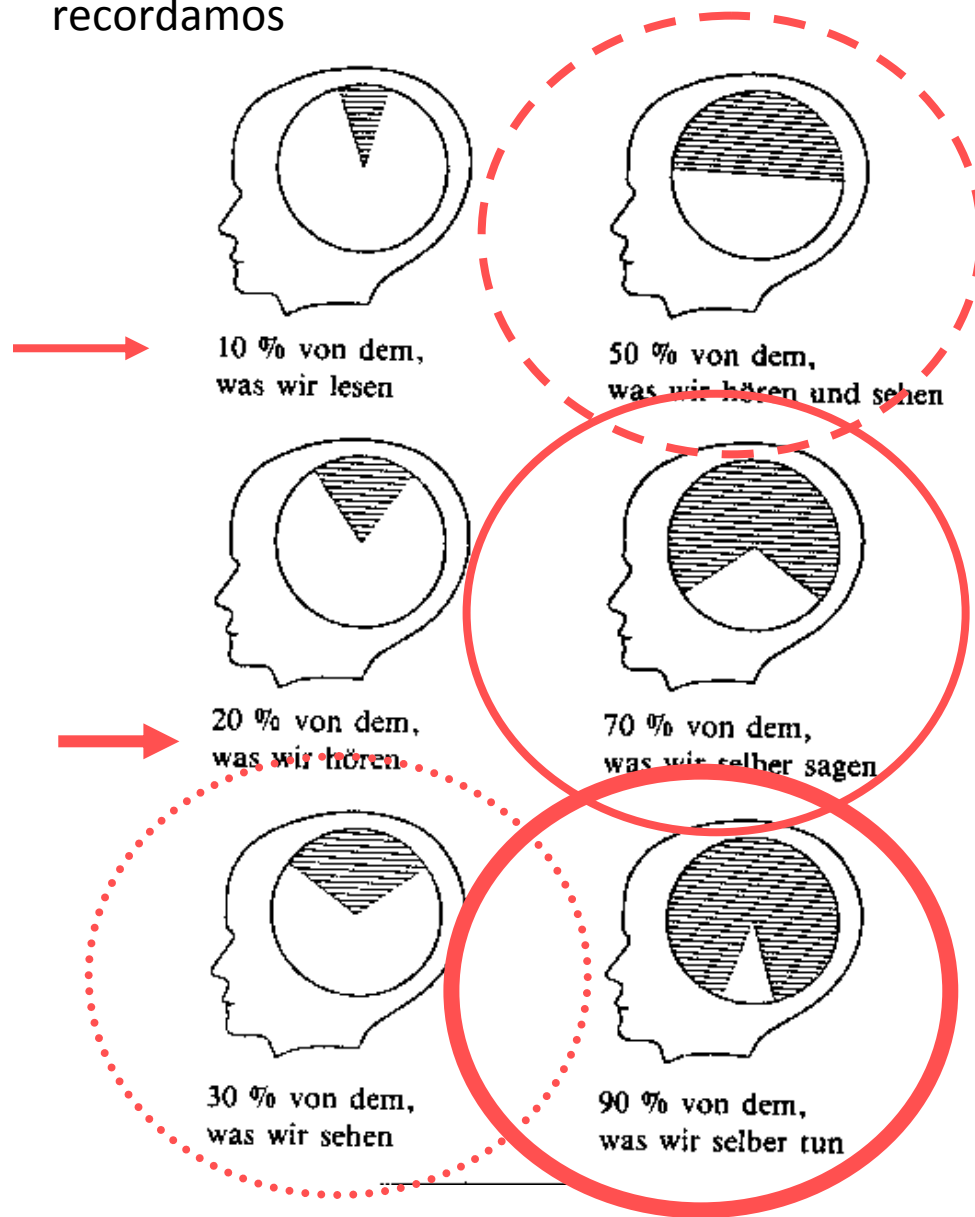
The Devil's Dictionary,

1906

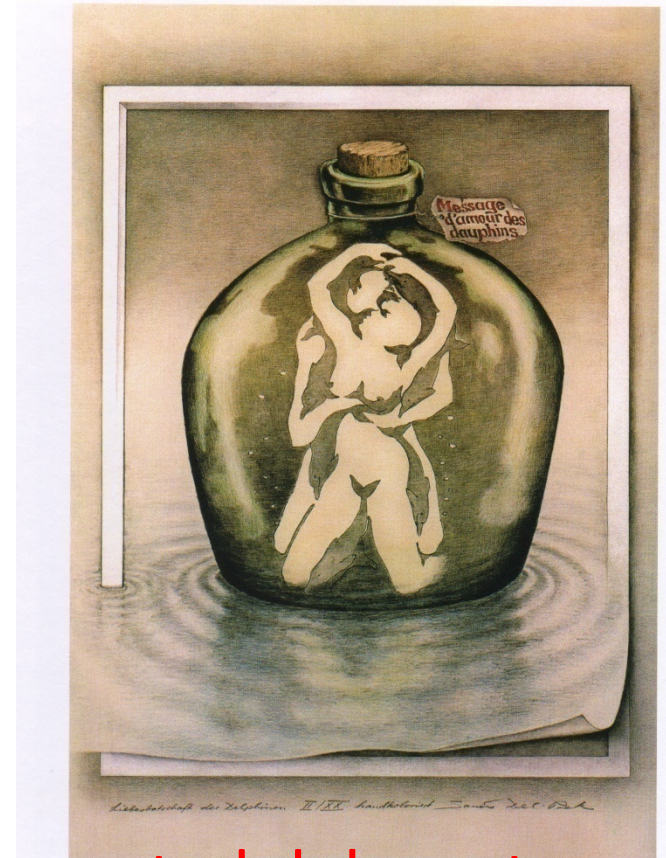


[http://www.time.com/time/specials/packages/article/0,28804,1846670\\_1846800\\_1846845,00.html](http://www.time.com/time/specials/packages/article/0,28804,1846670_1846800_1846845,00.html)

**we remember**  
recordamos



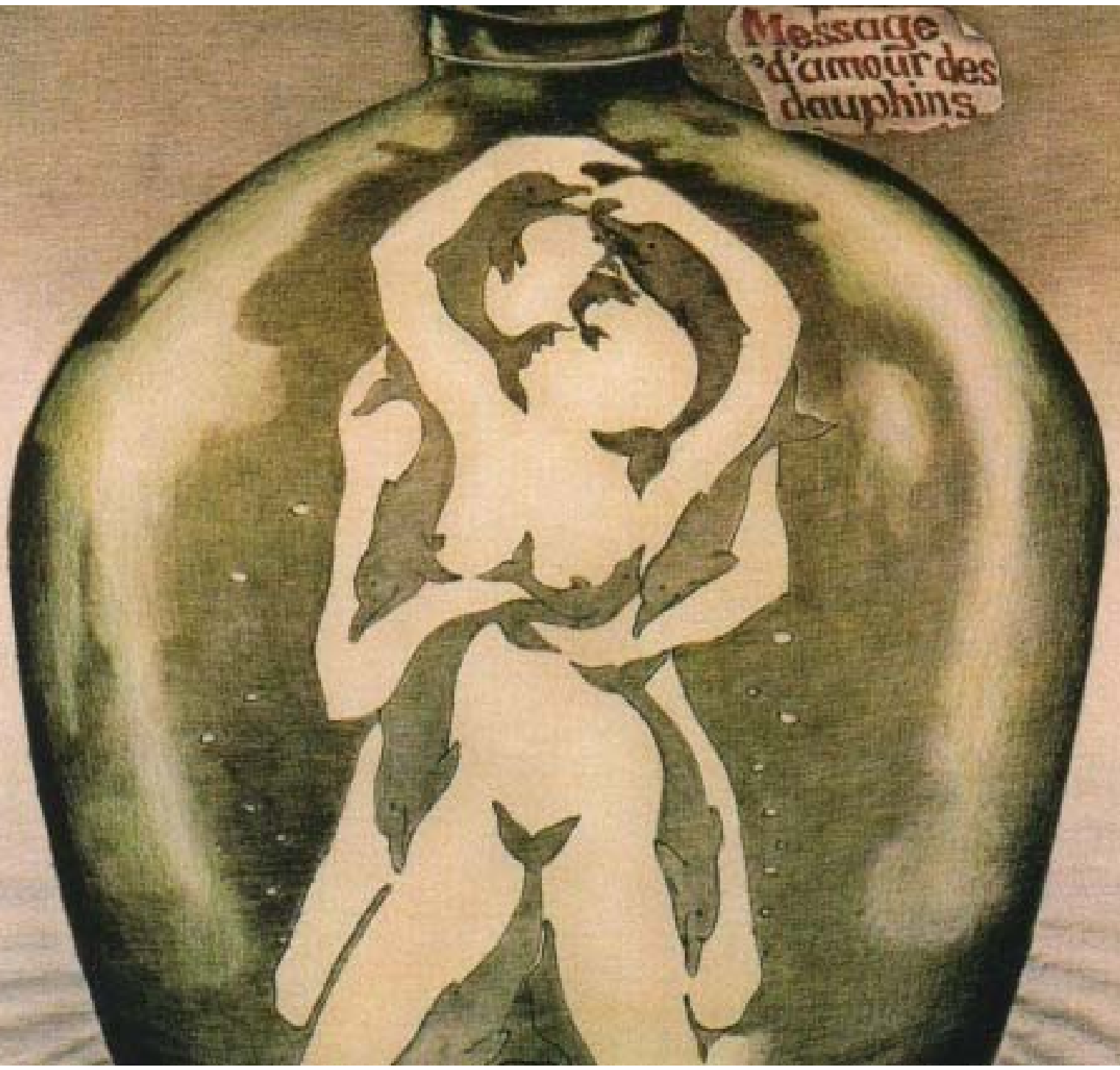
Swiss artist: Sandro Del Prete  
(from:Seckel, 2004)



**usted debe actuar**  
**voçê deve actuar**

see also:  
[www2.le.ac.uk/ebulletin/features/2000-2009/2006/05/nparticle.2006-05-19.8773454530](http://www2.le.ac.uk/ebulletin/features/2000-2009/2006/05/nparticle.2006-05-19.8773454530)

Message  
d'amour des  
dauphins



Tell me and I forget.

Confucius, in 450 BC

Show me and I remember.

*Let me do and I understand.*

Dígame y olvido.

Demuéstrame que y recuerdo.

*Hago y entiendo.*

Eu estou escutando.

Eu vejo e eu recordo.

Eu faço e eu compreendo.



<http://geechat.blogspot.com>

Coach:

„Not the newly learnt movement causes the problems– the old ones do so!“

„Last in – first out“ „ de último en entrar, primero en salir“



Christine Hussong , born 94

GR Javelin 600g 49,93m

GR Diskus 0.75kg 51,66m

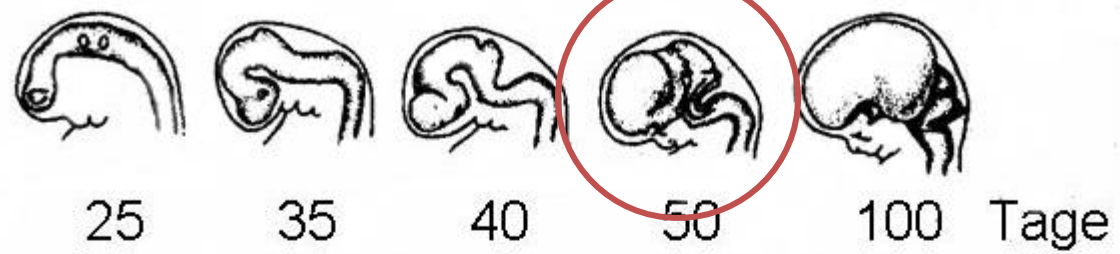
Shot 4kg 14,20m

to learn, you have to forget

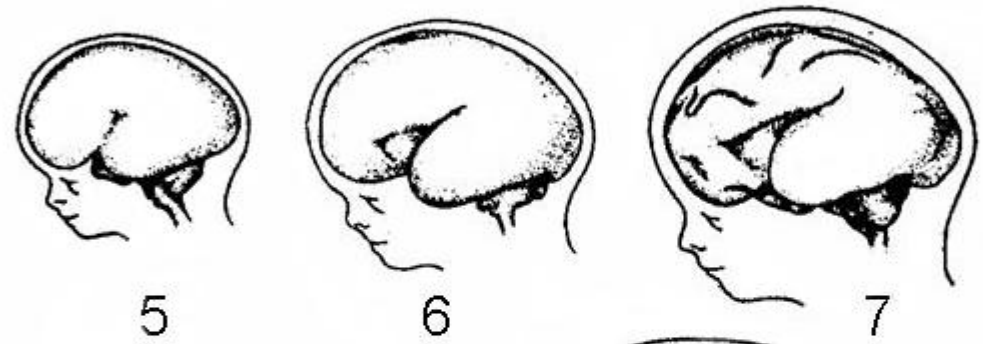
para aprender es olvidar

para aprender é esquecer

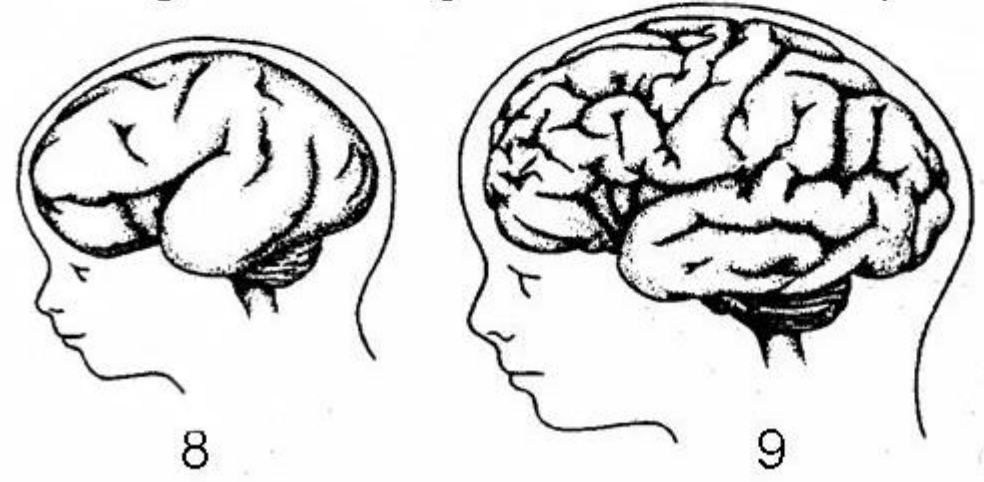
7 weeks semanas



days  
días



Monate months  
meses

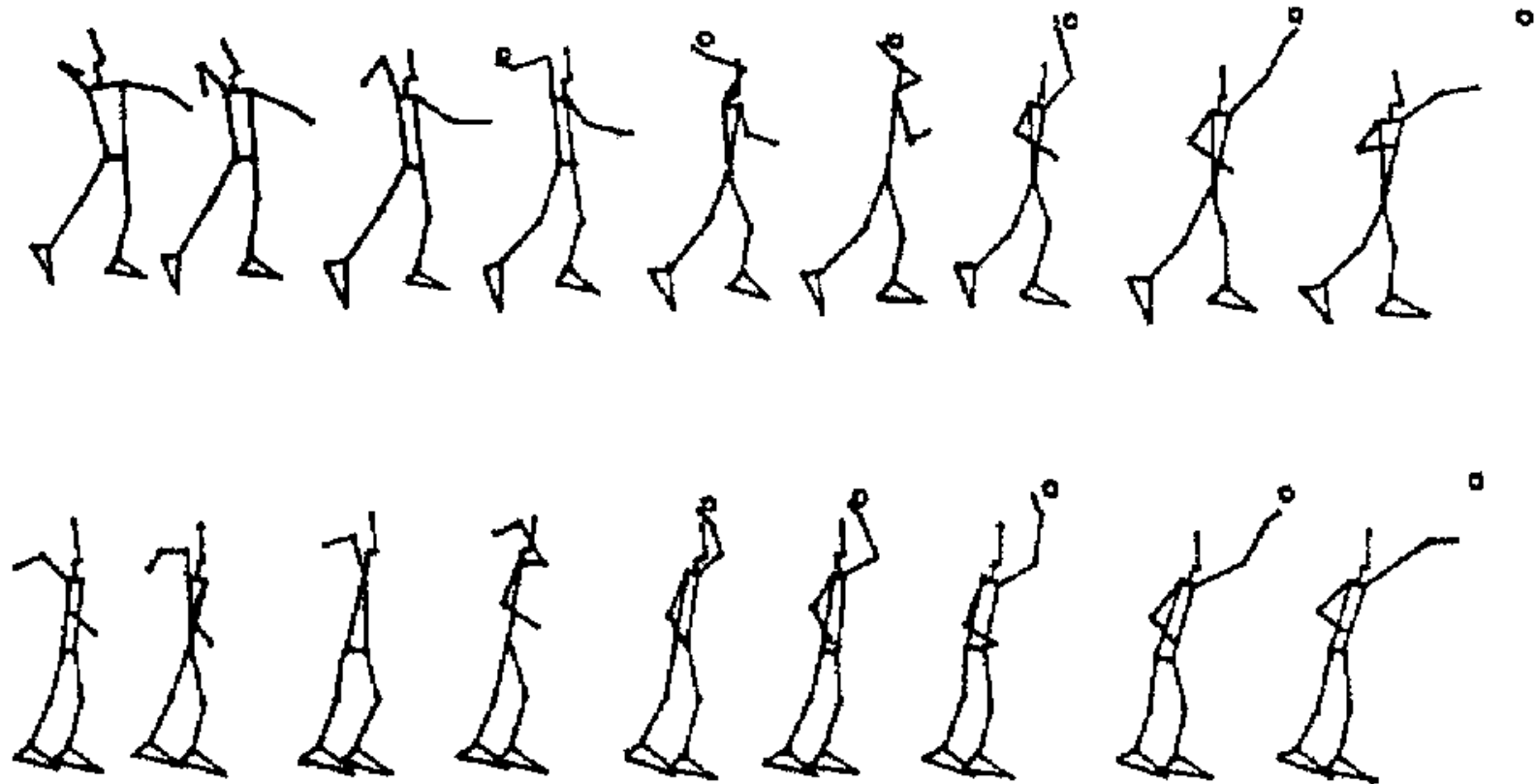


Monate months

Voronova et al. 2006

boys: higher fetal testosterone level than girls (Auyeung et al., 2009)

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Ball throw (age 5 to 6 years): who is the boy, who is the girl?

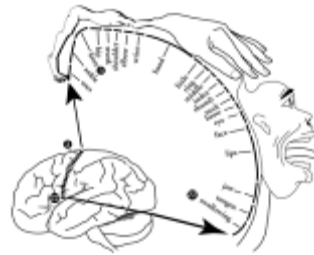
(Geese, 1997)

## Sensory and motor homunculus -

a distorted human figure reflecting the (relative) space human body parts occupy on the somatosensory and motor cortex

based on research of Penfield & Boldrey (1937), Penfield & Rasmussen (1950):  
*The Cerebral Cortex of Man. A Clinical Study of Localization of Function.*  
The Macmillan Comp., New York

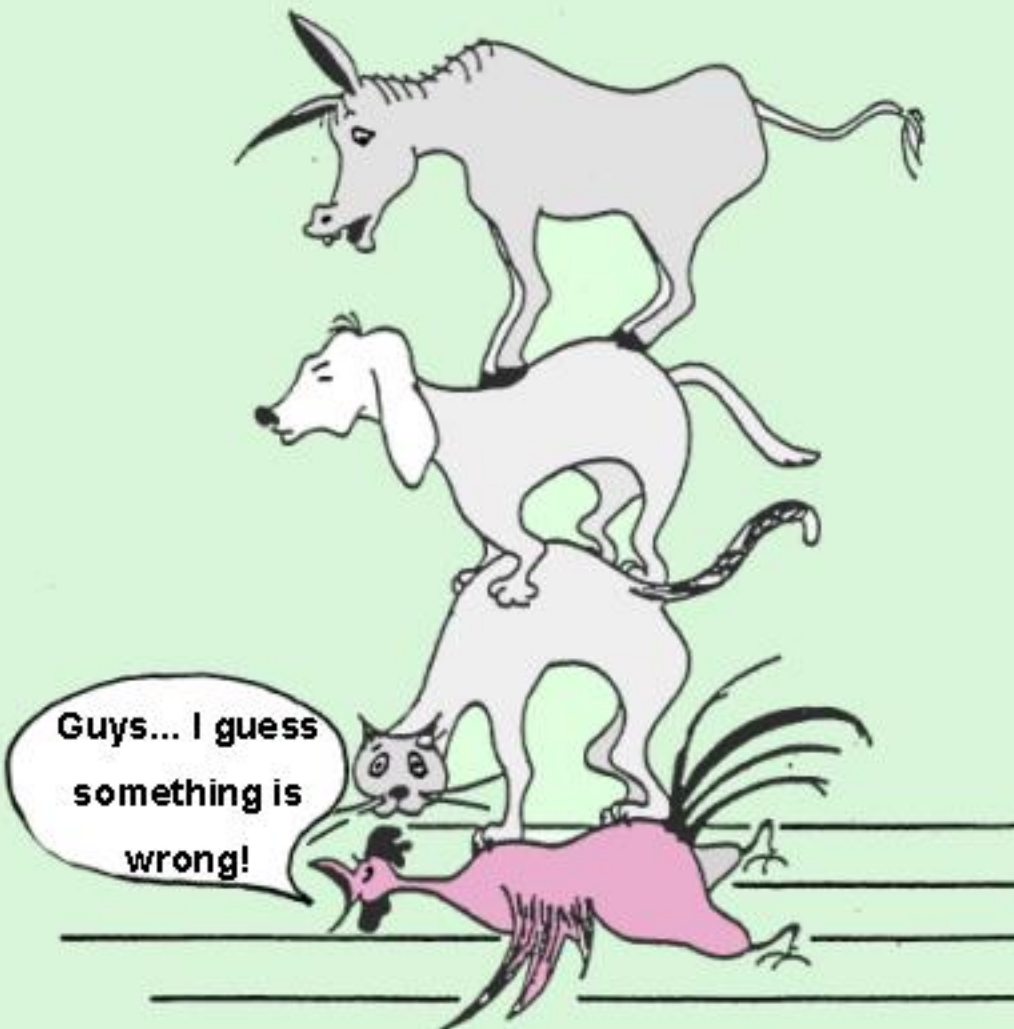
Research on  
**“neuro-plasticity”**  
(Taylor, Graziano, Moore, 2002)



[Http://studentorgs.vanderbilt.edu/neuromajors/homunculus.htm](http://studentorgs.vanderbilt.edu/neuromajors/homunculus.htm)  
(modified)

Ball throw (80gr): As good as demonstrated by the coach... (mirror neurons are working)





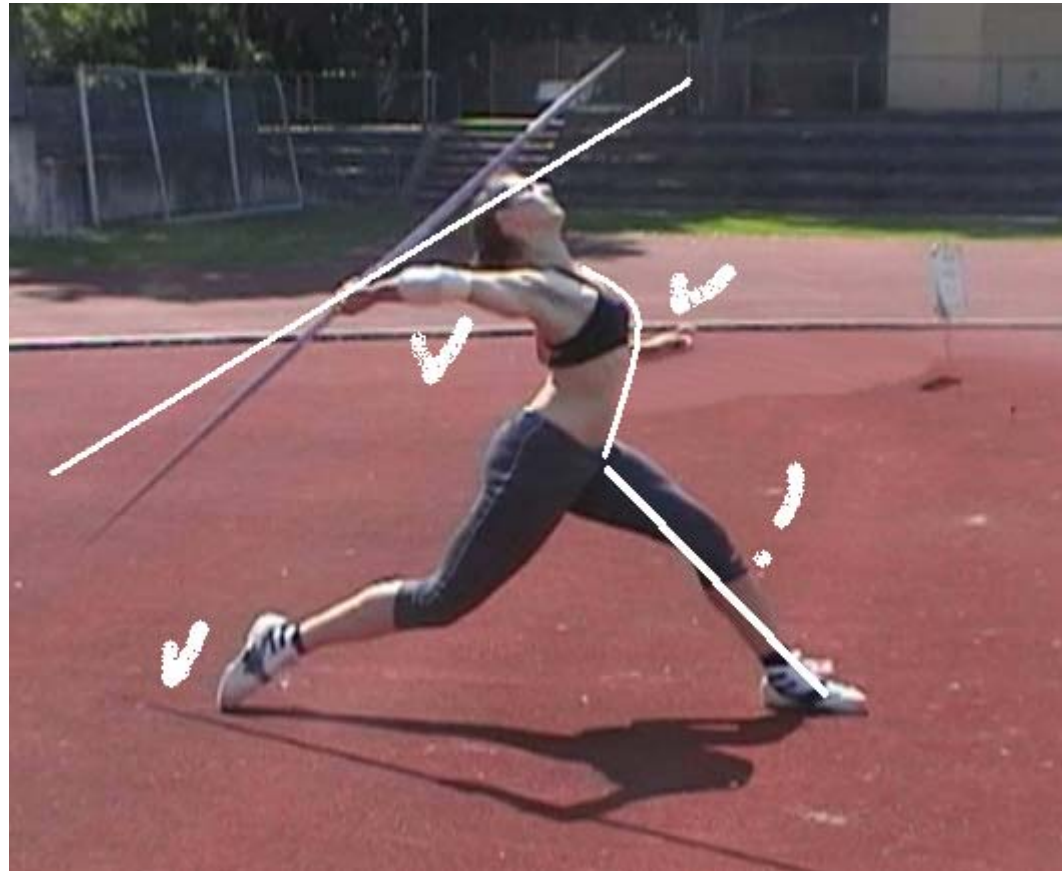
Guys... I guess something is wrong!

ZEICHNUNG: BERT H. METZKOW



*The Bible Of The Sport*

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„The target“



ball throw 80gms



throwing a golf ball

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**Boris Henry**

**Olympia-  
Vorbereitung**

5. Sept. 2000

**Golfball-Wurf**

(aus 5er-Rhythmus)

training 16-2-09 6kg-0,8m



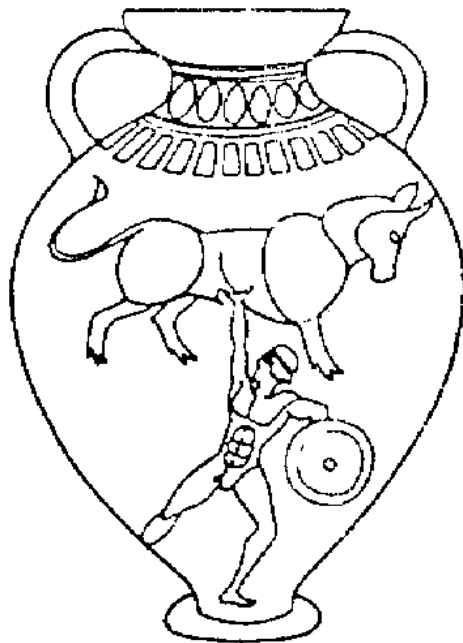
training 16.2.09: 6kg/0,8m

$t_{1-4} = 2,70s$

	I	II
	0,40	0,47
	0,30	0,33
	0,30	0,27
	0,32	0,32

Vania Silva (POR )PB 68.82m (2004), 2009: 68,32m (March 14)



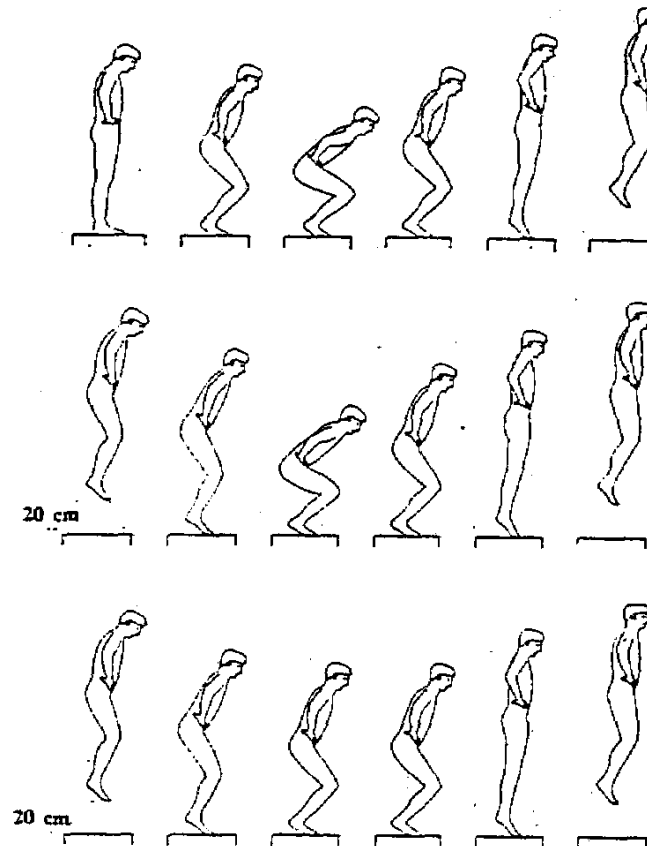


Milo of Croton

six time Olympic victor

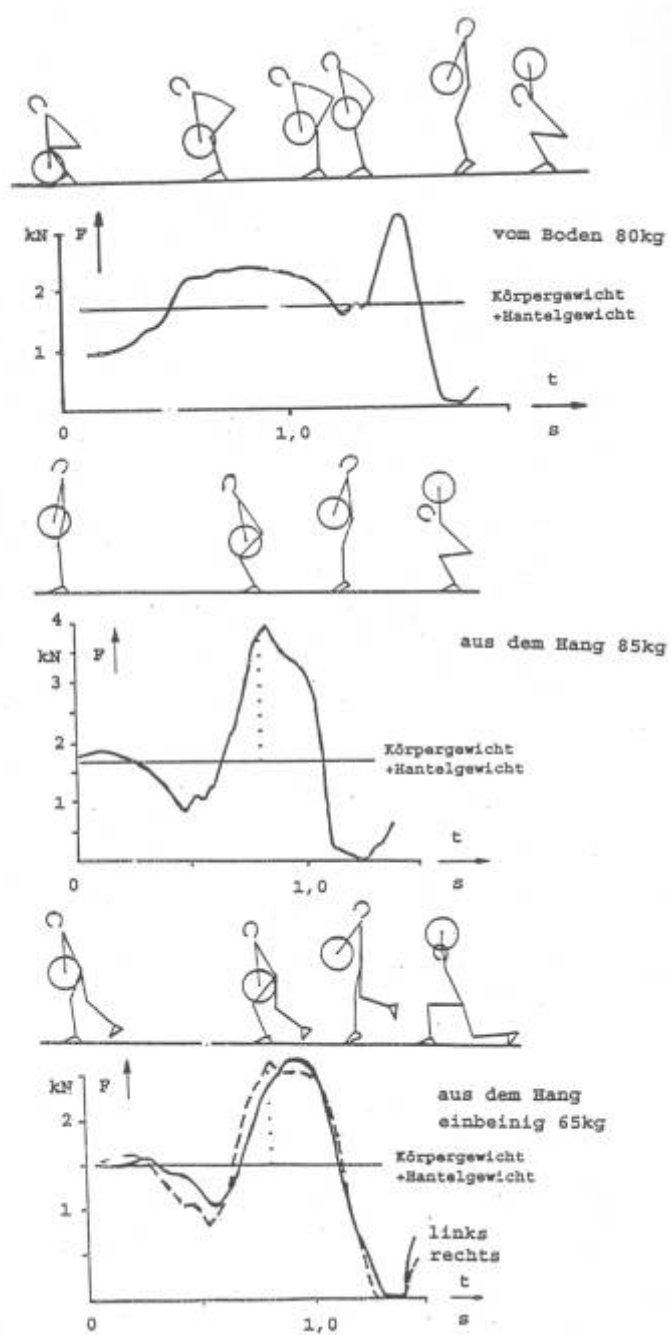
Invention of the **Progressive Load Method:**  
 lifting a bull by starting with a newborn animal, and carrying it everyday

Größe der resultierenden Drehmoment-Maxima bei Sprüngen  
 in Klammern: Streuung  
 (nach BOBBERT/HUIJING/VAN INGEN SCHENAU 1987)



H m	Drehmoment Nm		
	Hüfte	Knie	Sprunggelenk
0.39 (0.06)	422 (56)	366 (64)	310 (50)
0.38 (0.06)	367 (78)	488 (151)	361 (81)
0.34 (0.08)	310 (108)	558 (146)	602 (165)

10 trainierte Volleyballer (23±4 Jahre alt, 1.95±0.06m groß, Masse 84.8±9.5kg)

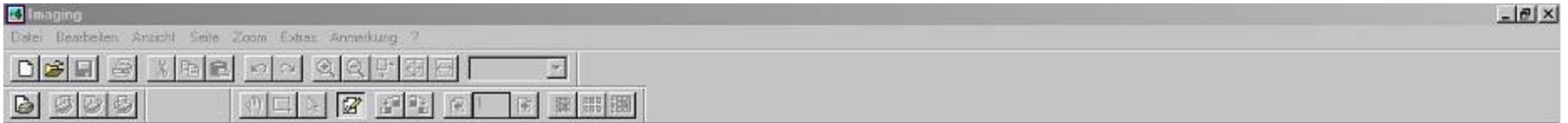


GRF underline the effects of different movement execution:

- snatch from ground (olympic)

- from the hips

- one-legged



## Pull overs

throwing out 30kg (Raymond Hecht)

„classic“ with 95kg (Boris Henry)



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Olympic  
Snatch



$m$	$v_{\max}$	$\Delta s$	$\Delta t$	$P_{SK}$
kg	m/s		s	$(m g v_{\max})$ $kg \text{ m/s}^3 \text{ m}^2 = W$
80	2.0	1.10	0.88	<b>1570</b>

Hip  
Snatch



90	2.3	0.40	0.22	<b>2300</b>
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## 19th NACACTFCA Congress

1990: training experiment using super light implements  
e.g. young athlete Ch. Saage (14 y.)

*1,5kg 25,30m*

*2kg 23,12m*

*3kg 20,50m*

**5kg 15,05m** (*competition implement*)

Ralf Bartels            21,38m 5kg 1995  
                                 21,37m 7,26kg 2009 WC

Markus Esser            5kg 82,04m (u18, German Record )  
2009:                    75,70m 8kg  
                                 86,50m 6,25kg  
                                 76,27m 7,25kg WC

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*Andrey Abduvaliev* in 1992 **100,67m** with 6kg (Gutiérrez & Soto Hermoso, 1995)

Olympic gold medalist (Barcelona, 1992), two-time world champion,  
currently the General Secretary of the Athletic Federation of Uzbekistan

kinetic energy of the hammer 3,4kJ 30.4m/s for 85m with 7,25kg 84,26m

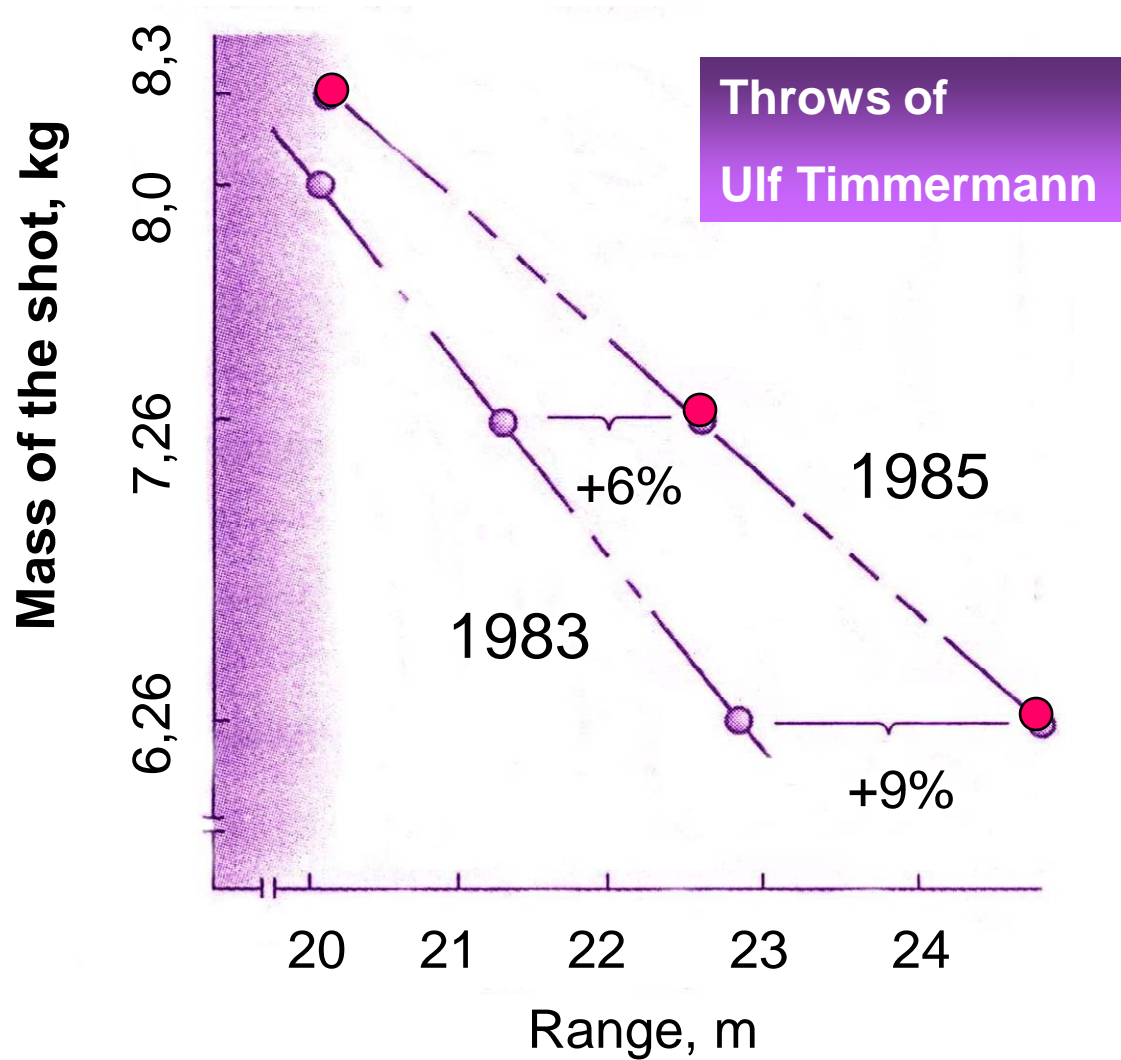
*Boris Henry* 600g **103,50m** (LSU throwing field, into fence)

(currently Head coach javelin men) 800g 90.44m  
golf ball 45g „only“120m

Today:

2009: *Maria Abakumova* - using bamboo sticks – distance thrown **80m**

200-300 gms, up to 70 throws per workout



born 1962  
PB

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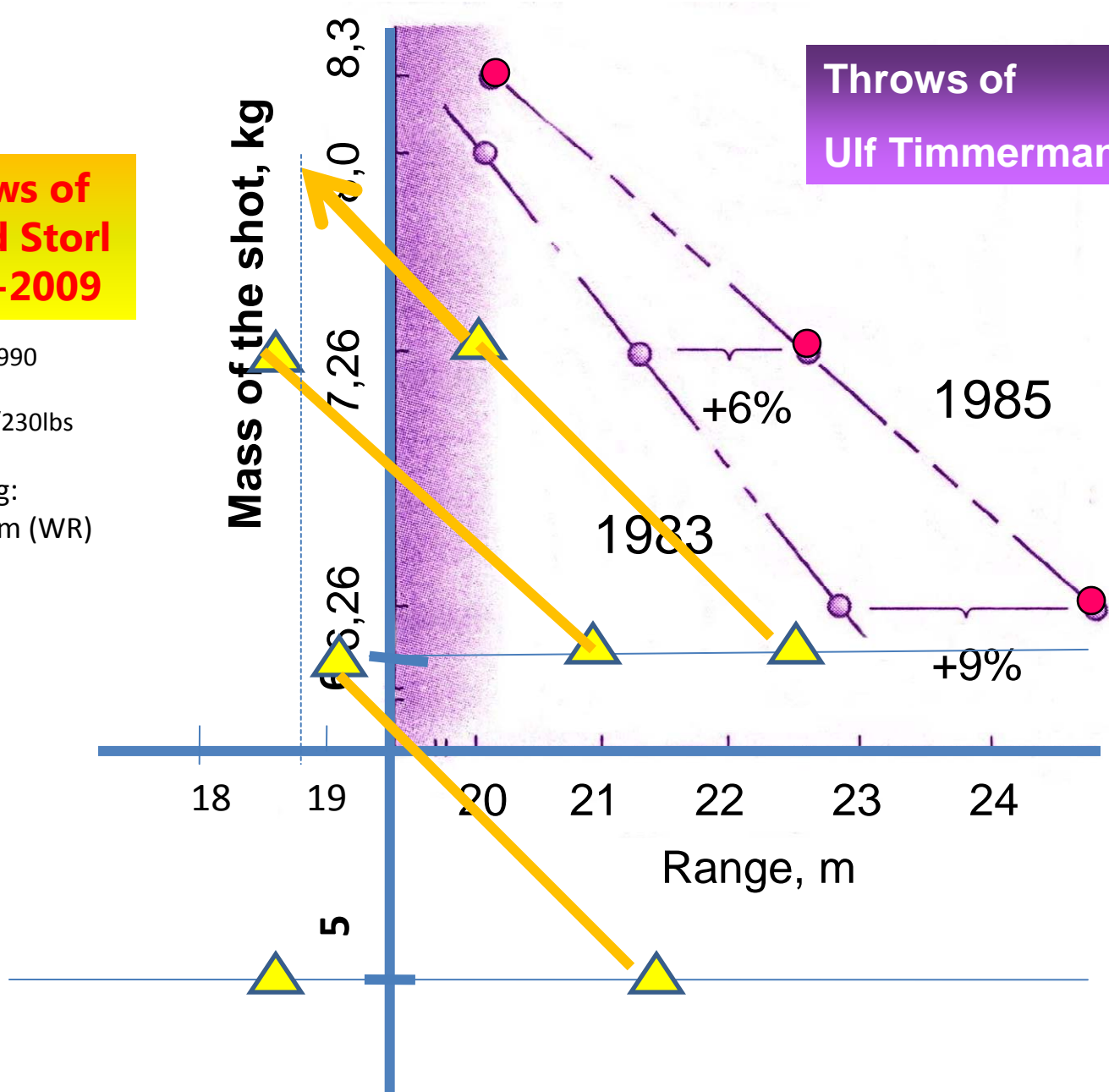
Revolutions in Athletics – Coaches and Training Principles That Have Changed the Sport Forever

**Throws of David Storl 2006-2009**

born 1990  
1,97m  
105kg/230lbs

PB 6kg:  
22.73m (WR)

**Throws of Ulf Timmermann**



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The road to Rio via London has to start somewhere...

