

Javelin Throw:**Technique,
Training,
Injury Prevention**

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Clinic Javelin Throw
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Part 2 - Training and Injury Prevention

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 - Maximum strength training
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1. Athletes with shoulder injuries

Javelin throwers often suffer from injuries of the lower back, the shoulder and the elbow, just to mention the most affected joints.

Overuse of the soft tissues and an incorrect throwing technique with high impact and shearing forces are the most common causes for shoulder injuries (and other injuries as well) in javelin throwing.

Javelin throwers are often affected by inflammations of the shoulder complex. The shoulder complex is the "bottle neck" of the javelin thrower. The shoulder joint complex with its 4 joints and their ligaments, muscles and tendons works in javelin throwing in very different directions:

- Development of driving **POWER** (energy transfer)
- **STABILITY** (Newton's 3rd law: Action and Reaction)
- **ELASTICITY, FLEXIBILITY, RANGE** of movement ("bow position")
- Arm **DECELERATION** after release



an optimal relationship has to be found in training between these controversial demands in order to prevent shoulder injuries.

Typical shoulder injuries of javelin throwers are:

- **rotator cuff tendonitis** (inflammation of tendons surrounding the shoulder, also known as impingement syndrome or shoulder bursitis).
- **laceration/tears** of the labrum glenoidale,
- **tears** of the rotator cuff, caused by incorrect technique, over load (very heavy lifting), tendonitis, excessive repetitive us.
- **rupture** of muscles/tendons (most commonly to the supraspinatus),

Athletes who suffered from shoulder injuries:

„Bud“ Held (USA) WR 1953 Mirela Manjani (GRI) WC OG 2000 Gold - bad shoulder pain OG 2004
 Boris Henry (GER) 90.44m OG 2004: rupture of m. supra- & infraspinatus, shoulder dislocation
 Raymond Hecht (GER) German record 91.20m - capsulae surgery
 Jan Zelezny (CZE) WR 98.48m (injury 1998)
 Steve Backley (GBR) EC 1999, 2001, 2003 - shoulder problems since 1993, surgery 1997
 Matti Närhi (FIN) 88.24m (1997) 1994 WJ 2nd 1997 E U22 2nd

2. Training and injury prevention

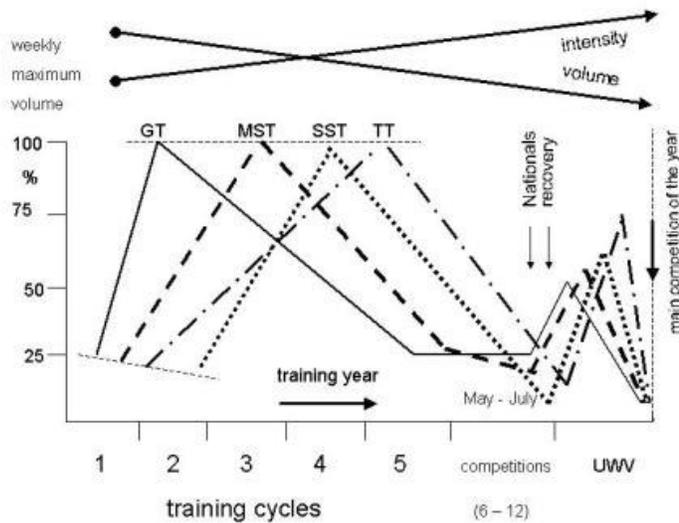
Main principle: all training is motor learning. Energy transfer (i.e. power development) and technique are forming an unity, are two sides of the complex movements.

The general time course of the main training components over the year:

Learning from Nature!



A solid base of all type of specific training- the principle of wave-like periodization



General periodization scheme of the training year in javelin throwing
 GT general training MST maximum strength training
 SST special strength training ST throwing training
 UWW immediate preparation for the main competition of the year
 ("unmittelbare Wettkampfvorbereitung"; the last 6-8 weeks before the main competition)

- Training of technique please see see part I -

2.1 General training (ankle, core, shoulder)

The specific angle/leg work of the rear and front leg has to be learned! The motoric cortex seems to be much more developed for muscle work, necessary for talking (please note the oversized lips and tongue) and hand work (please note the oversized hand)

BALANCE + ANKLE STRENGTH + CORE STRENGTH + CONTROL- core strength/stability to handle the power athletes are capable to generate with legs and arms - NEWTON: Actio et Reactio

- an increase in event-specific power requires an increase in core strength - train this quality throughout the year!- Olympic lifts and squats (front squat!) - fundamental core strengthening exercises.

(„traditional“ abdominal exercises important for „ancillary work“).

- Other types of work (general strength, medicine ball, etc.) are much safer, and can be used very young athletes



- teaching the body to remain stable under impact

-combining balance training and proprioception with core and shoulder training
 -the use of the Galileo-training device for strengthening (e.g., used by Astrid Kumberruss)
www.galileo2000.nl - whole body vibration training - uses the „tonic vibration reflex“ (up to 28 Hz)
 2 sessions, 2-3 min each per week!

Core Strength Test

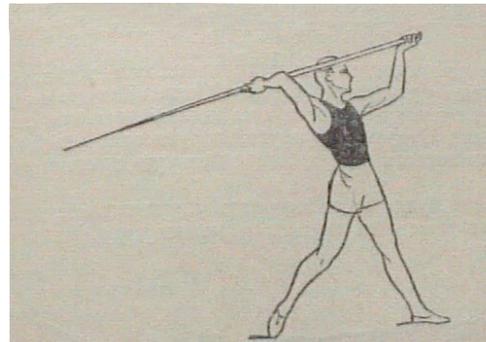
•Start: basic press up position (elbows on the ground) - as in the picture•Hold for 60 seconds•Lift right arm off the ground•Hold for 15 seconds•Return right arm to the ground and lift the left arm off the ground•Hold for 15 seconds•Return left arm to the ground and lift the right leg off the ground•Hold for 15 seconds•Return right leg to the ground and lift the left leg off the ground•Hold for 15 seconds•Lift left leg and right arm off the ground•Hold for 15 seconds•Return left leg and right arm to the ground•Lift right leg and left arm off the ground•Hold for 15 seconds•Return to the basic press up position (elbows on the ground) Hold this position for 30 seconds
 (<http://www.brianmac.demon.co.uk/coretest.htm>)

Rotator cuff strengthening and control: Rotator cuff muscles have to maintain the position of the scapula, the prime mover muscles generate driving power Exercises:

- internal/external rotation with rubber band
 - arm by the side
 - arm at 90° away from body
- end of range flicks with rubber band and ball
- tennis ball squeezes through throwing movement
- XCO-tube (for exercises please visit www.xco-trainer.com)
- flexi-bar (for exercises please visit www.flexi-bar.de)
- Galileo 2000 - www.galileo2000.nl

Steve Backley: “Power comes from width.”

The elasticity of the muscles and tendons is essential to store and use elastic energy. Special stretching exercises, as part of the preparation of the throwing training (warm up) and after the maximum strength training workouts, have to facilitate the elasticity and flexibility of the leg, chest, shoulder and arm muscles.



STRETCHING IMPROVES WEIGHT TRAINING GAINS

Kokkonen, J., Nelson, A. G., Tarawhiti, T., Buckingham, P., & Glickman-Weiss, E. (2000).

Stretching combined with weight training improves strength more than weight training alone.

Medicine and Science in Sports and Exercise, 32(5), Supplement abstract 649.

The effects of weight training alone and weight training plus stretching on lower body strength were investigated in college males and females. The weight training group (M = 7; F = 7) lifted three times per week using a program of 3 x 6 repetitions with 85% 1 RM for 8 weeks. The weights plus stretching group (M = 7; F = 7) was pair-matched for strength with the weight training alone group. Stretching was performed twice per week for the eight-week period.

The weights plus stretching group improved significantly more than the weights alone group in both flexibility and strength measures.

Implication.
Stretching exercises add to strength and flexibility improvements in weight training programs.



Change methods, exercises, and intensities, but never neglect core strength! 2.2

Maximum strength training - The correct lifting technique is essential to avoid injuries.

Technique - Clean

Institute of Strength Training
and Olympic Weight Lifting

170,0 kg
Category -85

V max.					Path of the bar
Muscles tight Back flat Shoulders above the bar Feet hip width apart Foot tips under the bar Arms straight	no rising of the buttocks (parallel back shift) Knees move backwards Back flat Arms straight	explosive hip and knee extension full body extension, shrug Arms remain straight reaching maximum velocity (v max.)	quick drop under the bar active arm pull pull close to the body, do not swing the bar jump into squat feet move low above ground	immediately ground contact Elbows up, fast active break of the falling bar Feet shoulder width apart Stable squat position, muscles tight	Bar moves behind the vertical line (from start) do not move around the knees (1 st pull) no bar swing during 2 nd pull

Klaus Bartonietz Ph D
Günter Renner Coach



Technique - Jerk

Institute of Strength Training
and Olympic Weight Lifting

170,0 kgs
Caretgory -85








START
DIP
DRIVE
DROP
RECEIVING and SPLIT

V max.					Path of the bar
Muscles tight Shoulders support the bar Elbows slightly down	Knees bend forward Upper body upright Elbows maintain controlled downward movement	explosive hip and knee extension Drive upright reaching the maximum velocity (V max)	Fast under the bar Loss of ground contact (jump) Feet move flat above ground active arm press	immediately ground contact Active braking the falling bar Bar, shoulder and hip on a vertical line Front knee above front foot rear leg slightly bend, but solid	Dip: straight downward Drive: straight upward reaching a point above head, slightly behind

Klaus Bartonietz Ph D
Günter Renner Coach



Technique - Snatch

Institute of Strength Training
and Olympic Weight Lifting

70,0 kg
Category - 56
Age 15








START
1st PULL
2nd PULL
DROP
RECEIVING and SQUAT

V max.					Path of the bar
Muscles tight Back flat Shoulders above the bar Feet hip width apart Toe tips under the bar Arms straight	no rising of the buttocks (parallel back shift) Knees move backwards Back flat Arms straight	explosive hip and knee extension full body extension, shrug Arms remain straight reaching maximum velocity (V max.)	quick drop under the bar active arm pull pull close to the body, do not swing jump in to squat feet move low above ground	immediately contact to the ground active break of the falling bar Feet shoulder width apart Stable squat position, muscles tight, Elbows locked	Bar moves behind the vertical line (from start) do not move around the knees (1 st pull) no bar swing during 2 nd pull

Klaus Bartonietz Ph D
Günter Renner Coach

The 3 olympic lifts are the basic exercises, each javelin thrower must be confident with. They will be modified for the javelin thrower's needs (depending on the performance level): e.g. hip snatch, neck jerk, front squat, high pull (with up to 15-20% higher weights than in snatching)

Planning the maximum strength training with the help of the “Average Barbell Weight”
(mHG – mittleres Hantel-Gewicht):

A “law”, derived from training planning in olympic weight lifting: the average barbell weight has to increase over the year (by about 15-20%)

av. Barbell weight = sum of lifted barbell mass (kg) / number of repetitions in the levels I and II of intensity (level I >90%, level II 75-85%, level II 60-70% of the 1 RPM)

experience: maximum strength training gains occur only with loads of level II and I, level III is for warming up and maintaining performances

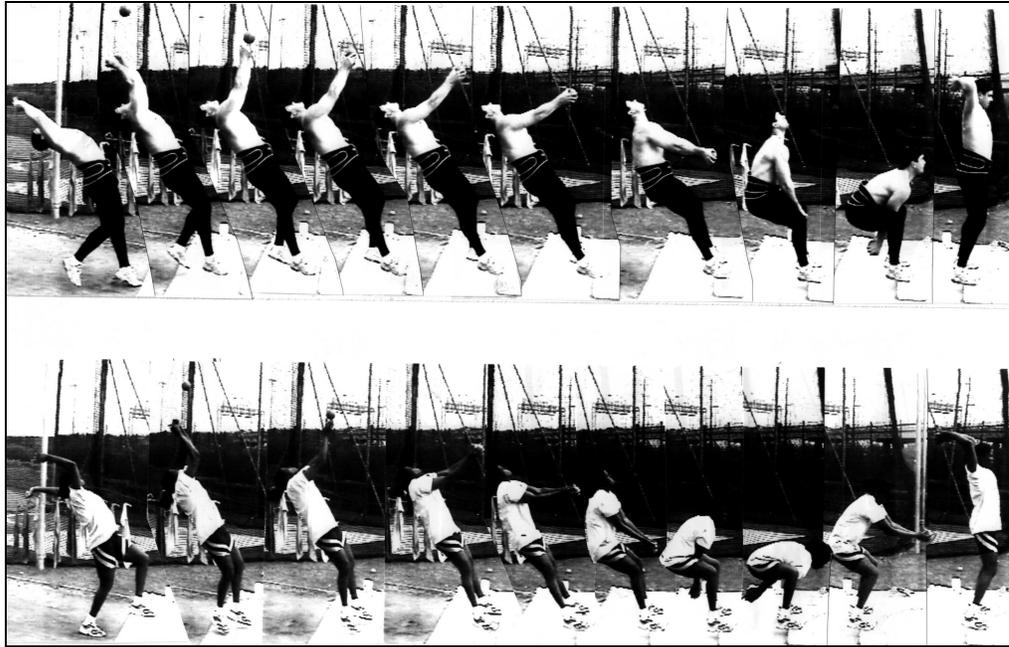
average barbell weight

e.g.	2006 (Nov/Dec)	2007 (March/April)
Pullover	best: 70kg	target: 80kg
	6 x 60kg	80
	10 x 55kg	77.5
		75
		2 x 72.5
		3 x 60, 65, 70kg
mHG	56.9kg	69.1kg (+21%)

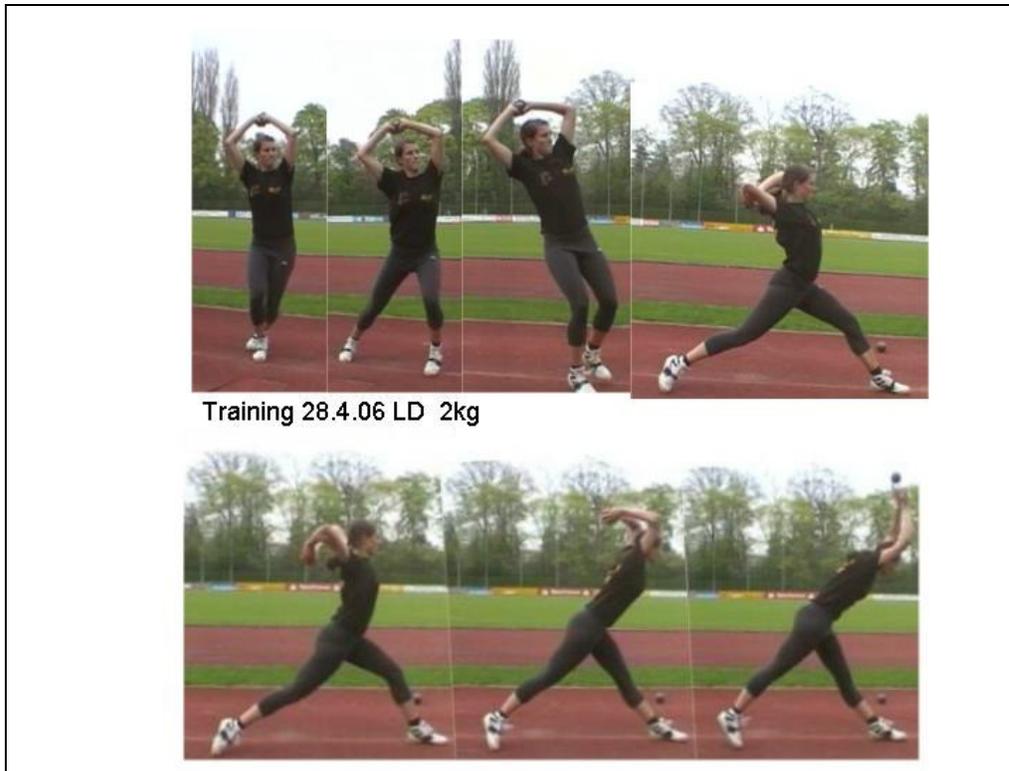
		m	v_{max}	Δs	Δt	P_{SK} (m g v _{max}) kg m/s ³ m ² = W
		kg	m/s		s	
	Olympic Snatch	80	2.0	1.10	0.88	1570
		90	2.3	0.40	0.22	2300
2.3 : - thi (up : - thr drivi	Hip Snatch					

Please note: more mass → more inertia → better conditions to “built up the bow-position”, and vice versa: less mass → less inertia → it is harder to delay the arm strike and to built up the “bow position”.

* Overhead throw (backward, forward) – to develop (general) throwing power and explosiveness
above: Boris Henry (GER) below: Iavern Eve (BAH)



* The two-handed overhead throw from stand and 3 strides



Katharina Gruber, 17 years, BL 48.72m (May 6th 2006)

* Throws on a "throwing machine" (javelin-trainager) with both arms, single arm, on seat and standing – for advanced athletes (medicine balls can have similar training effects for younger athletes)
The advantage of the machine: no physical work is necessary to hold and fix the implement (sled on

Rail, mass of the sled about 6kg, additional weight plates up to 30-40kg)



* Throws with shots – one arm (1kg, 1.5kg, 2kg), from stand and from 3 strides



Boris Henry Training 25.1.01 (aus 3er)



3. Summary

Injury prevention = performance enhancement! The magic formula to prevent injuries:

BALANCE + CONTROL of all training parts, all exercises, muscle groups

General strength: Core stability, Movement control, shoulder stability **Specific leg (ankle!) and core strength**

- ankle strength to drive the right side through before the front leg is planted –
- core strength to handle the power athletes are capable to generate with legs and arms:

NEWTON: Actio et Reactio

- an increase in event-specific power requires an increase in core strength - train this quality throughout the year!
- Olympic lifts and squats (front squat!) - fundamental core strengthening exercises („traditional“ abdominal exercises important for „ancillary work“).
- Change methods, exercises, and intensities, but core strength is never neglected.- Other types of work (general strength, medicine ball, etc.) are much safer, and can be used by young athletes
- **Teaching the body to remain stable under impact** (as requires the planting of the front leg), combining balance training and proprioception with core and shoulder training
- **Shoulder strength** (prime mover + rotator cuff muscles) – the shoulder joint complex is the “bottle neck” of the javelin thrower (most mobile joint complex)
- **Flexibility**, (specific) stretching to ensure a wide range of movement and to prevent injuries
- Maximum strength training: to increase the working capacity of the thrower, using the “average barbell weight” for planning number and intensity of the repetitions
- Specific strength training: “utilizing” the increased working capacity, developing driving power under specific conditions (body positions, involved limbs, muscles)
- **Technique:** Correct technique of *all* training exercises (leg work!)

Avoid OVERUSE as the main reason for injuries– watch REST periods and use physiotherapeutic measures!“Ohne Gefühl wird nichts behalten.”

<p>Eric Kandel, geb. 1929, Neurowissenschaftler aus den USA, Nobelpreisträger für Medizin 2000 Mitglied der <u>National Academy of Sciences</u> der USA (Blech, 2006, 172)</p>
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