Javelin: Technique, Training, Injury Prevention

Klaus Bartonietz
kbartonietz@web.de

KNAU
Clinic Javelin Throw
May 2nd 2006
Bergen opZoom

Part 2 - Training and Injury Prevention

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, overload (very heavy lifting), tendonitis, excessive repetitive use.
- rupture of muscles/tendons (most commonly to the supraspinatus),

Athletes who suffered from shoulder injuries:

<table>
<thead>
<tr>
<th>Name</th>
<th>Record/Event</th>
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<tbody>
<tr>
<td>“Bud” Held (USA)</td>
<td>WR 1953Mirela Manjani (GRI) WC OG 2000 Gold - bad shoulder pain OG 2004</td>
</tr>
<tr>
<td>Boris Henry (GER)</td>
<td>90.44m OG 2004: rupture of m. supra- &amp; infraspinatus, shoulder dislocation</td>
</tr>
<tr>
<td>Raymond Hecht (GER)</td>
<td>German record 91.20m - capsulæ surgery</td>
</tr>
<tr>
<td>Jan Zelezny (CZE)</td>
<td>WR 98.48m (injury 1998)</td>
</tr>
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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:
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 Kumbernuss)

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
- Lift left arm and right 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

- 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


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!

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

<table>
<thead>
<tr>
<th>Technique - Clean</th>
<th>Institute of Strength Training and Olympic Weight Lifting</th>
</tr>
</thead>
<tbody>
<tr>
<td>170,0 kg</td>
<td>Category -85</td>
</tr>
</tbody>
</table>

### 1st Pull
- Muscles tight
- Back flat
- Shoulders above the bar
- Feet hip width apart
- Feet tips under the bar
- Arms straight
- No rising of the buttocks (deadlift side)
- Knees move backwards
- Back flat
- Arms straight

### 2nd Pull
- Explosive hip and knee extension
- Full body extension, shrug
- Arms remain straight
- Reaching maximum velocity (V max.)

### Drop
- 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

### Receiving and Squat
- 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 (1st pull)
- No bar swing during 2nd pull

Klaus Bartonetz  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

<table>
<thead>
<tr>
<th>average barbell weight</th>
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<tbody>
<tr>
<td>Pullover</td>
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<tr>
<td>e.g. 2006 (Nov/Dec)</td>
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<tr>
<td>best: 70kg</td>
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<tr>
<td>6 x 60kg</td>
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<tr>
<td>10 x 55kg</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>77.5</td>
</tr>
<tr>
<td>2 x 72.5</td>
</tr>
<tr>
<td>3 x 60, 65, 70kg</td>
</tr>
<tr>
<td>mHG 56.9kg</td>
</tr>
<tr>
<td>(March/April)</td>
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<tr>
<td>target: 80kg</td>
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<tr>
<td>69.1kg (+21%)</td>
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</tbody>
</table>

2.3 Special strength training
- throwing heavy implements (shots, medicine balls, nweight plates, one- and two-handed, javelins (up to 1300g), iron sticks, bars to develop “throwing power” (legs, trunk, shoulder, arm)
- throwing light implements (balls, javelins) to set higher demands on movement speed (control), fast driving action of the rear leg, developing the “feeling” for the implement

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, foreward) – to develop (general) throwing power and explosiveness
above: Boris Henry (GER) below: lavern Eve (BAH)
The two-handed overhead throw from stand and 3 strides

Training 28.4.06 LD 2kg

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

Threws 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)

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

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.”

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