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Strength training for hammer throwers

Some anatomy as a reminder...

The human motor system consists of bones, joints and muscles.

- Muscles can be further subdivided into: skeletal muscles, cardiac muscle and smooth muscles. Yet, only the skeletal muscles are controlled by humans voluntarily whereas other muscles work independently of human will.
- The human body is composed of nearly 440 muscles (Morecki A., Ekiel J., Fidelus K. Bionika ruchu. PWN, Warsaw 1971.), of which 140 are involved directly in the movements performed by humans.
- Considering the skeletal muscles as a "drive" for the motor system, their function is stimulated by impulses generated by the nervous system, causing contraction and relaxation, or muscle work.

Muscle strength

- "ability to overcome the external resistance or counteract at the expense of the muscular effort"

(Zaciorski 1970)

The term "force" should also be emphasized as a basic concept of the dynamics, defined by the Newton's second law, which says that:

- "If a constant force F acts upon an object with mass m , the object moves with acceleration a , which is directly proportional to the magnitude of the force and inversely proportional to the mass of the object.'

$$F = m a \text{ [Newton]}$$

Characteristics of the muscular system

I would like to present another approach to the concept of muscle strength.

The characteristics of the muscular system can be divided into:

- strength
- power
- local strength endurance
- muscle mass

with strength and power being the most important to sport.
(Trzaskoma, Trzaskoma 2001)

Force (F)

- **Force (F)**

- is an ability to overcome the maximum external resistance or to counteract the resistance [Newton].

Power (P)

- **Power (P)**
 - ability to overcome the specific external resistance with the highest velocity possible.

$$\text{Power}(P) = \text{Force}(F) \times \text{Velocity}(V)$$

Muscle mass (M)

- Muscle mass (M)

- dimensions of the muscle expressed by its cross-sectional area.

Local Strength Endurance (LSE)

- **Local Strength Endurance (LSE)**
 - ability to produce the highest force possible for the longest time possible using selected muscles or muscle groups.

MOTTO I

- MOTTO I

"The lower load used for stimulation of the maximum engagement of the muscular and nervous systems in an athlete, the better" (Trzaskoma,Trzaskoma 2001)

MOTTO II

- MOTTO II

"The load (resistance) should be adjusted to the athlete's abilities and movement correctness, not the other way round" (Trzaskoma, Trzaskoma 2001)

Strength abilities

- Strength abilities

-more specifically, maximum strength abilities of an athlete adequate for correct technical performance of an exercise.

It can be observed that athletes with high strength abilities are more predictable in training, less prone to injury and enjoy longer professional sport careers.

(Trzaskoma,Trzaskoma 2001)

This information provides insights into understanding of the role of strength conditioning and, first and foremost, is likely to improve the coaching practice. Understanding of the function of the motor system with the focus on the muscular strength ensures that coaches can plan adequate training regimes to improve athlete's strength in a well-thought and controlled manner, with consideration for proper development of the human body, which consequently allows for substantial elongation of professional sports careers. This explains the long introduction to this presentation.

Strength training for young athletes

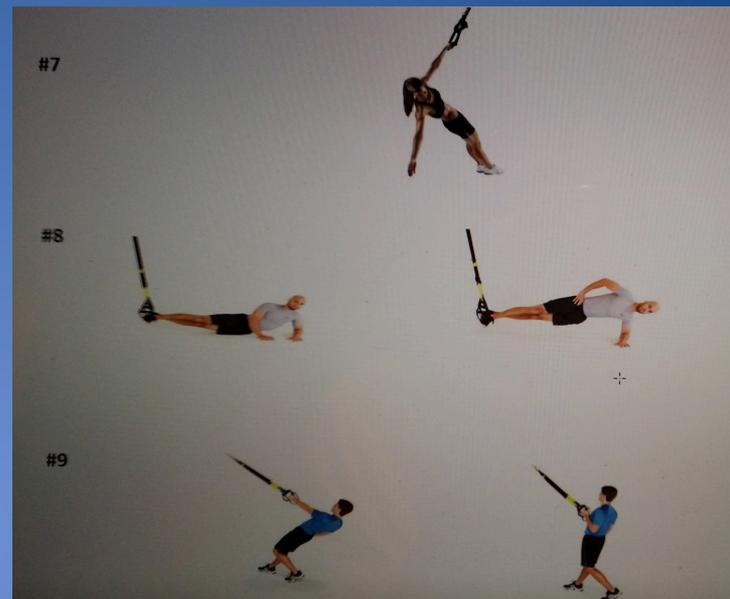
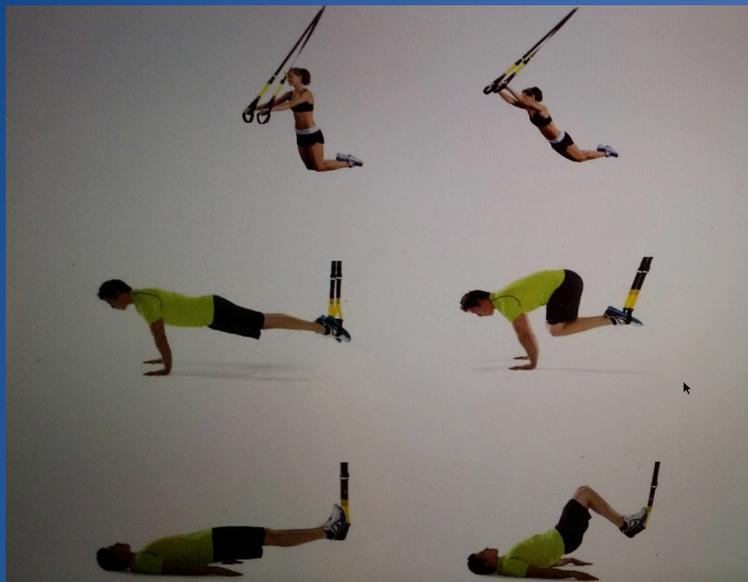
- **Beginner athlete's body should be gradually adapted to extreme load.**

Strength conditioning is typically considered as lifting heavy weights that overload the motor system, especially the vertebral column. I do not recommend such a training for beginner athletes. Let us use the above definitions of the strength as overcoming or counteracting the resistance. Therefore, the question arises whether overcoming and counteracting the resistance means only the exercises with weights?

Strength training for young athletes

- No, the resistance can be also overcome with our own body weight. This is reflected by the increasing popularity of a variety of sports devices and equipment, e.g. **TRX**, where several straps suspended on a bar can be used for strength training for beginners and supplementary training for elite athletes. This training helps develop muscular strength in young athletes and prepare them for lifting weights in the future. Answering to the question of when to start strength conditioning in young athletes, I believe that it should be started immediately and I hope that this presentation will persuade others into starting such training.

Functional TRX suspension training



17. Prone hip extension abduction 04933



1 x 6@

18. Hip abduction 01197



1 x 5@ N w bok

12. Yoga circuit 02589



1 x 4@

13. Single leg reach 02122



1 x 6 @ dytykanie na przemian RL i RP

Strength training for young athletes

- After preparation of the athlete's body for lifting weights, we have to take care about another essential element: learning proper technique. After observation of weightlifters during training camps or competition, I found that they were often not familiarized with how to do a movement properly. This is very sad, because it often means that coaches do not have an idea about how to coach athletes. Is a power clean performed with upper limbs bent considered to be an exercise to condition the muscle group it is intended for!?

Strength training for young athletes

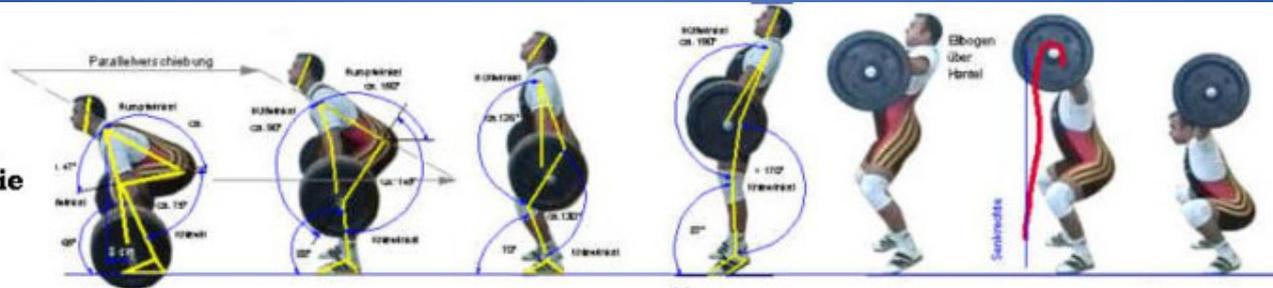
- Load:
 - it should be noted that in young athletes, the process of bone growth has not ended yet and the load should be adapted to their somatic development and current strength abilities. What does it mean? The load should not have a **negative effect** on young athlete's body and the proper technique! Let us remind: Motto I, Motto II

Main exercises in strength training

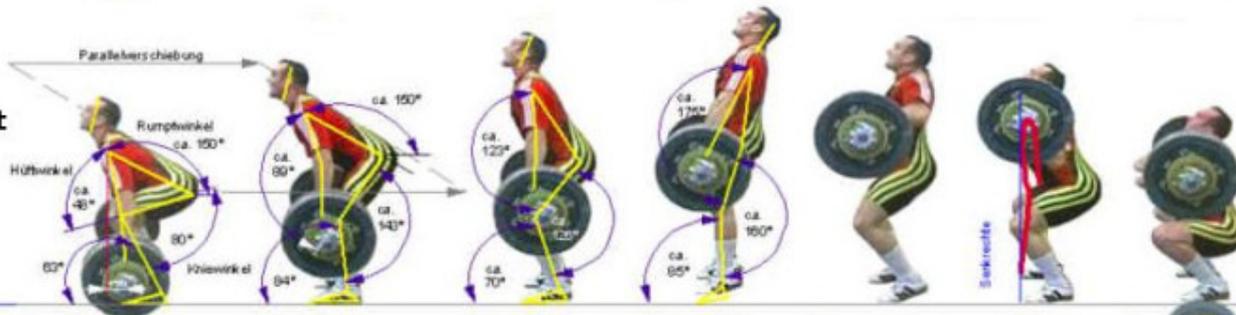
- Snatch
- Clean and jerk
- Lift
- Full Squat
- Half squat
- Bench press
- Lounges
- Twists
- Jumps

Snatch, clean, bar jerk

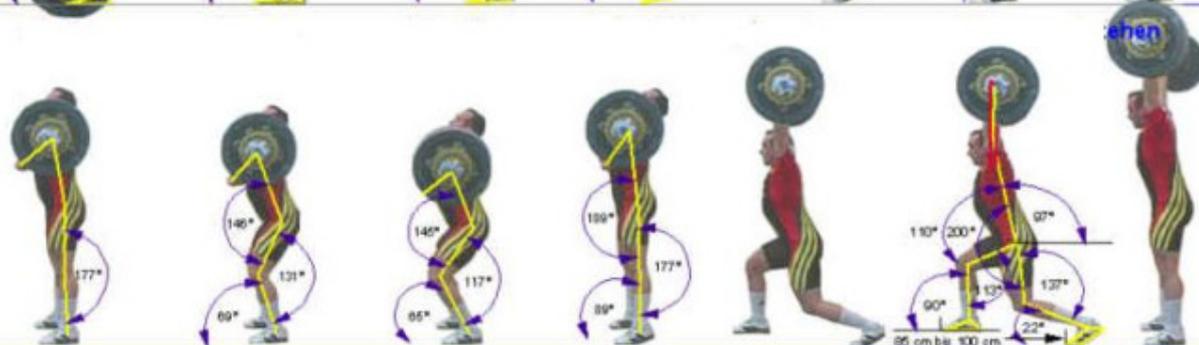
Rwanie



podrzut faza 1



podrzut faza 2



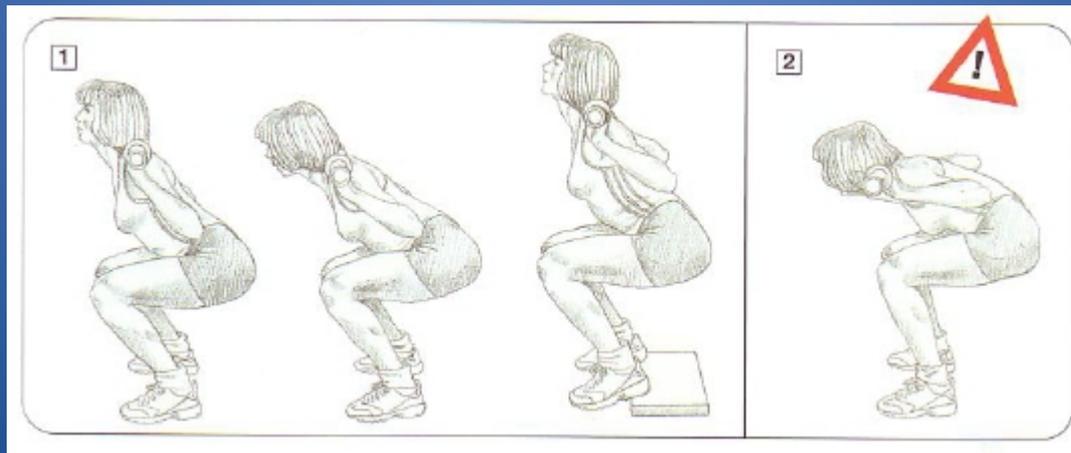
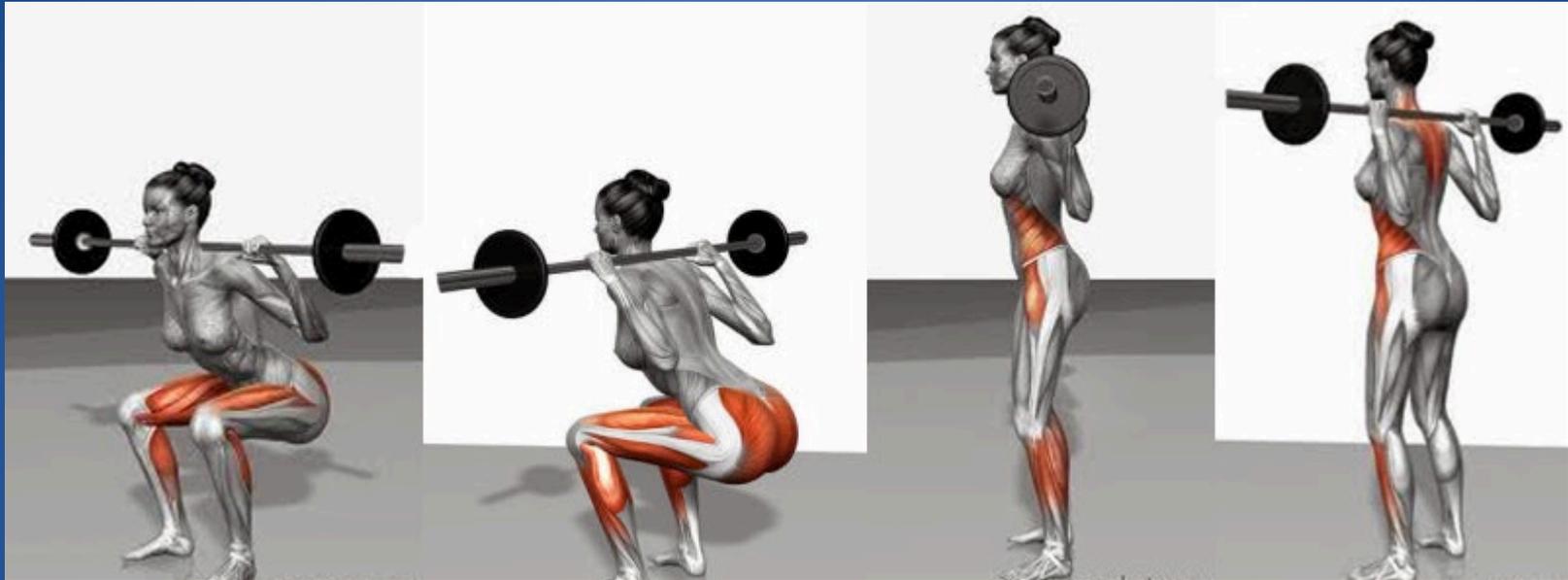
Lift



Lift with frame



Full squat, half squat



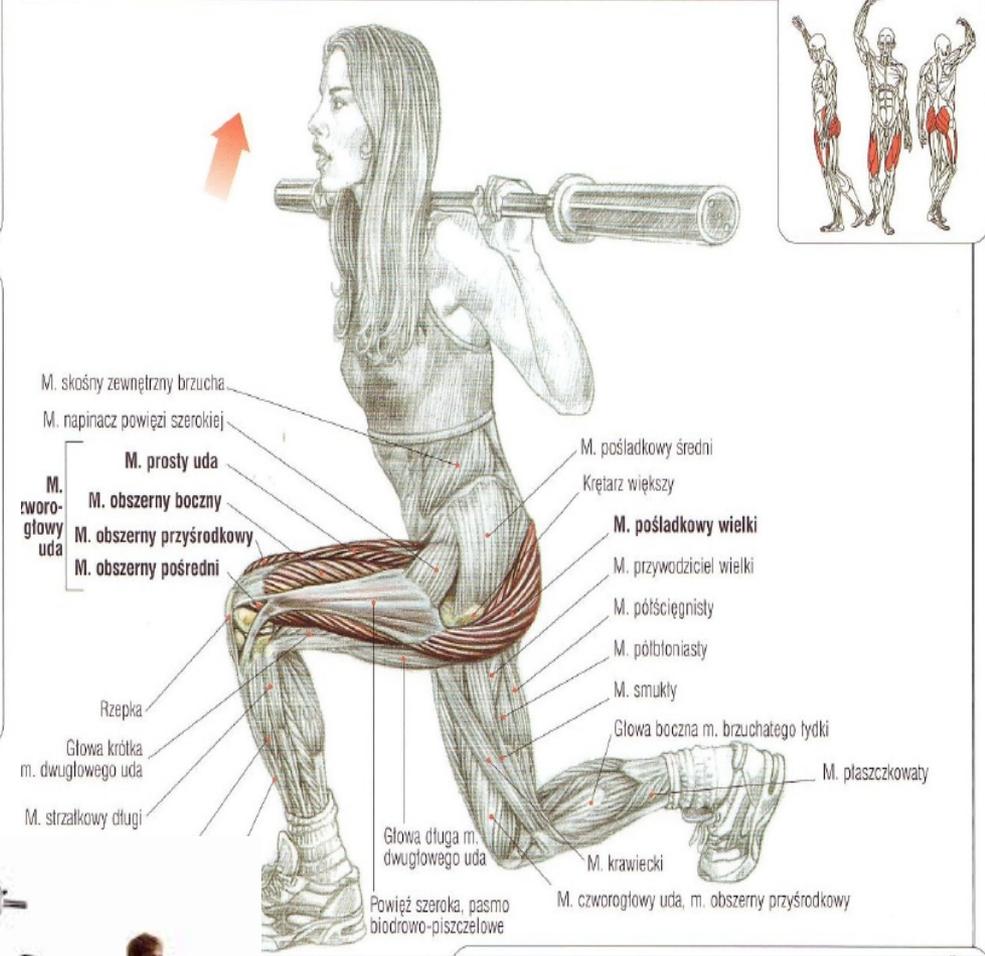
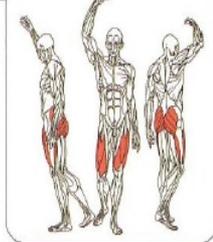
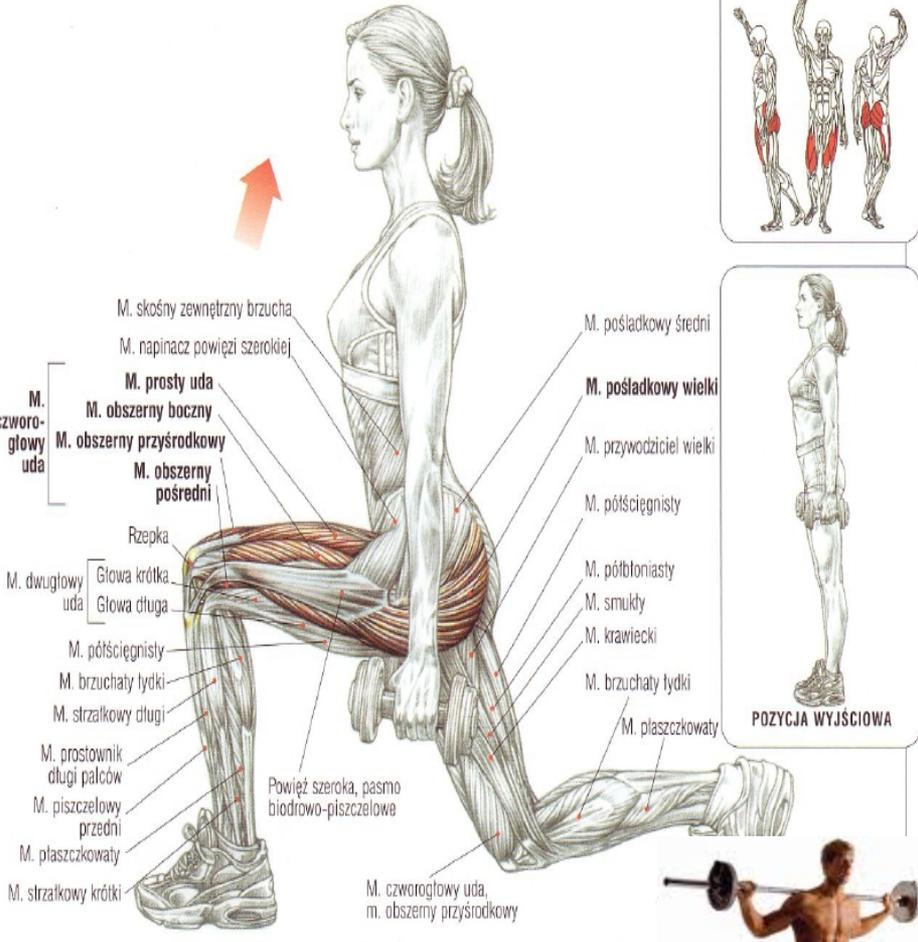
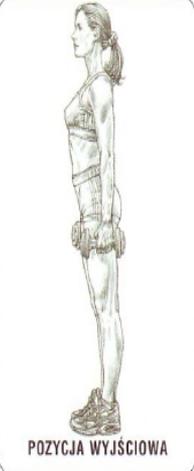
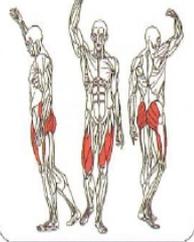
Bench press



Bench press



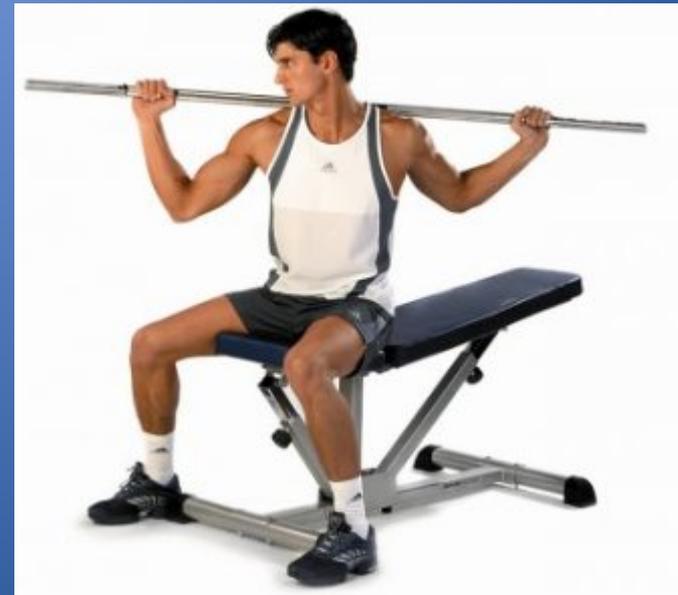
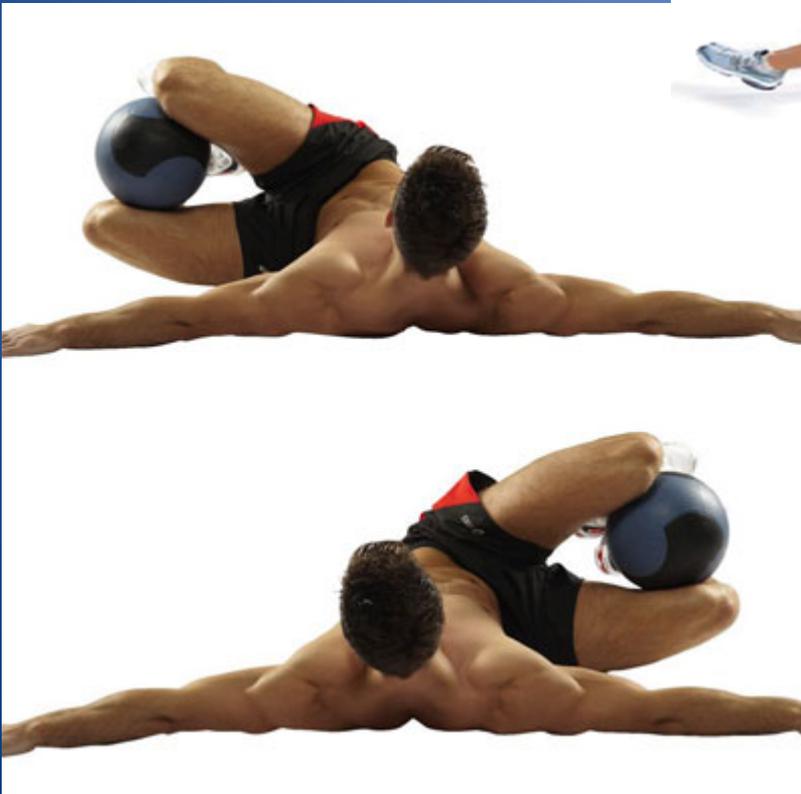
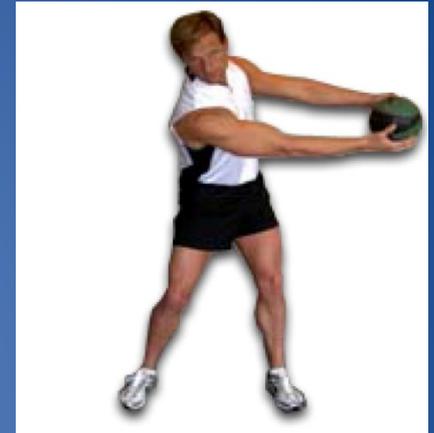
Lounges



Swings, twists



Twists



Number of strength conditioning training sessions in a week microcycle

- I usually administer three strength training sessions a week,
- with 48 hours rest between the sessions to ensure muscle recovery , a more effective work and, consequently, improved effects.
- Depending on the training period, selection of adequate exercises, sets and repetitions, intensity and time intervals between sessions ensures the expected effects of strength conditioning

Stage 1: Local Strength Endurance

- **Method:** circuit training: performing exercises in individual stations; one set of the first exercise, then you start another exercise until all the exercises are completed (all the exercises mean one set, or one circuit).
- **Rest time:** several ten dozen seconds for changing the station; 3 minutes between the stations
- **Note!** - after the workout, it is necessary to perform **sport-specific drills**(several minutes of sport-specific movements e.g. turns).

Stage 1: Local Strength Endurance

- **Guidelines for athletes** – *do each exercise quietly, at your natural speed, without a hurry. Control your range of motion, emphasize the beginning and the end of the motion in each repetition, do not hit, do not bound, do not do any "cheat moves"!*
- **Abbreviations:** **UL**– upper limbs, arms, **LL** – lower limbs, legs, **B** – upper body

LSE training program

- **Number of training sessions** – 3 times a week every other day, ca. 10 weeks
- **Load** - number of basic sets (circuits) and repetitions in a set:
NOTE! Reduced number of repetitions in sets in consecutive training sessions is intended to increase the weight
- workouts 1-2: 2 x 15 reps, workouts 3-4: 3 x 15, workouts 5-6: 3 x 14, workouts 7-8: 4 x 14, workouts 9-10: 3 x 12, workouts 11-12... : 4 x 12 reps for each exercise (each station); number of repetitions in exercises 8 and 13 (abdominal muscles) – add a few repetition to the above numbers for each training session; **test** during the first and the last training session for exercises 4 and 10 – maximal number of repetition with the weight of ca. 80% RM (repetition maximal) evaluated during the first and maintained during the second test (last training session)

Example training session (LSE) in a week microcycle

- **Exercise**

- 1. Lying prone body lifts on a mattress*
- 2. Seated cable column pulldowns behind the neck*
- 3. Seated single leg extensions (armchair without back rest) or double leg extensions (armchair with back rest)*
- 4. Barbell bench press (middle grip)*

Example training session (LSE) in a week microcycle

5. Lying leg curls (two legs)

6. Seated dumbbell (alternate) or cable column (two arms) chest press

7. EZ Bar Preacher Curl

8. Lying (mattress or incline bench) bent leg raise to upper body

Example training session (LSE) in a week microcycle

*9. Prone bench row or half-incline cable column row
(middle grip)*

10. Leg Press

11. Seated leg abduction (machine)

12. Seated leg adduction (machine)

Example training session (LSE) in a week microcycle

13. Sit-ups with legs bent on a mattress (feet on a mattress or on a ladder) - short movements

14. Kneeling push-up exercise (on a soft ground e.g. mattress or a large ball)

Stage 2: Strength

- **Methods:** MHL (medium and high load) and SML (submaximal and maximal load), exercises performed separately in the specified order.
- **Rest time:** 2.0-2.5 minutes between sets.
- **Note!** - after the workout, it is necessary to perform **sport-specific drills**(several minutes of sport-specific movements e.g. turns).
- **Guidelines for athletes – *be maximally focused on each exercise, perform the exercise carefully, emphasize "start" with activation of the muscles from the very beginning of the movement, return slowly to the initial position!***

Stage 2: Strength

- **Abbreviations:** **LL** – lower limbs, legs, **UB** - upper body, **[SuperS]** - superset: two exercises combined into a single set i.e. after completion of a set of one exercise, the athlete immediately starts (with the break only for changing the station) another exercise, then rests for 1.5 to 2 minutes and repeats the whole procedure.
- **Test** in the first, seventh and last week in exercises 1 and 2 – evaluation of the repetition maximum (CM).

Strength training program

- **Number of training sessions** – 3 times a week every other day, ca. 40 training sessions

NOTE! Reduced number of repetitions in sets in consecutive training sessions is intended to increase the weight.

Load - number of basic sets and repetitions in a set:

• Workout	Exercise (No)					
• (No.)	1	2	3	4	5	6 i 7
• 1-4	3 x 10	3 x 10	3 x 10	3 x 12	3 x 12	3 x 15
• 5-8	4 x 8	4 x 8	4 x 8	4 x 10	4 x 10	4 x 15
• 9-12	4 x 7	4 x 7	4 x 6	4 x 8	4 x 8	4 x 15
• 13-16	3 x 6	3 x 6	3 x 5	3 x 7	3 x 7	4 x 15
• 17-20	4 x 6	4 x 6	4 x 5	4 x 7	4 x 7	4 x 15
• 21-24	3 x 5	3 x 5	3 x 4	3 x 6	3 x 6	4 x 15
• 25-30	4 x 4	4 x 4	4 x 3	4 x 6	4 x 6	4 x 15
• 31-36	3 x 3	3 x 3	3 x 2	3 x 6	3 x 6	4 x 15
• 37 - 42	3 x 3	3 x 3	3 x 2	3 x 6	3 x 6	4 x 15

Example week microcycle for strength conditioning (F)

- **Exercise**

*1. Prone bench row or half-incline cable column row
middle grip*

*2. Barbell bench press (optimal grip i.e. the grip that is
comfortable to lift the highest weights)*

*3. Barbell back squat (workouts 1-18), barbell back half-
squat (workouts 19-42) or Leg Press (workouts 1-42, if the
squats or half-squats cannot be performed safely)*

Example week microcycle for strength conditioning (F)

- 4. Standing barbell upright row – body rests on the wall, hips in contact with the wall, feet away from the wall by several centimetres (Note! This exercise can be performed only if the athlete does not feel any discomfort in shoulder joints and wrists)*
- 5. Seated bench weight moving to the left and to the right with body twist – legs stabilized, body position as during rotations*

Example week microcycle for strength conditioning (F)

6. Lying prone body lifts on a mattress [supersets with exercise 7]

7. Lying (mattress or incline bench) bent leg raise to upper body alternately (every other set) with sit-ups with legs bent on a mattress (feet on a mattress or on a ladder) – short movements [supersets with exercise 6]

Stage 3: Power

- **Methods:** MSR (maximal speed repetitions) and SML (submaximal and maximal load), exercises performed separately in the specified order
- **Rest time:** 2.5-3.0 minutes between sets.
- **Note!** - after the workout, it is necessary to perform **sport-specific drills**(several minutes of sport-specific movements e.g. turns).
- **Guidelines for athletes – *perform each repetition as fast as possible, with full range of motion, without the movement inhibition phase, maximally fast, "to the finish"!***

Stage 3: Power

- **Abbreviations:** UL – upper limbs, arms, RR – lower limbs, legs, UB - upper body, [SuperS] - superset: two exercises combined into a single set i.e. after completion of a set of one exercise, the athlete immediately starts (with the break only for changing the station) another exercise, then rests for 1.5 to 2 minutes and repeats the whole procedure.
- **Test** in the first, seventh and last week in exercises 1 and 3 – evaluation of the repetition maximum (CM).

Power training program

- **Number of training sessions** – 3 times a week every other day, around 40 training sessions

NOTE! Reduced number of repetitions in sets in consecutive training sessions is intended to increase the weight, but only if high speed of movements is maintained!

Load - number of basic sets and repetitions in a set (Note! In exercises 1 to 3, the following variant can be used: 3 sets on a week with competition and test, 4 series on a week without competition).

Example of week microcycle for power conditioning (P)

- **Exercise**

1. *Power clean from knees*

2. *Back barbell half squat jump*

3. *Barbell chest jerk, arms extended, scissor lunge under the barbell*

Example of week microcycle for power conditioning (P)

- *4. Lying prone body lifts on a mattress [supersets with exercise 5]*
- *5. Lying (mattress or incline bench) bent leg raise to upper body alternately (every other set) with sit-ups with legs bent on a mattress (feet on a mattress or on a ladder) – short movements [supersets with exercise 4]*

Load - number of basic sets and repetitions in a set:

• Workout	Exercise (No)			
• (No.)	1	2	3	4 i 5
• 1-4	3 x 6	3 x 6	3 x 6	3 x 15
• 5-8	4 x 5	4 x 5	4 x 5	4 x 15
• 9-12	4 x 5	4 x 5	4 x 5	4 x 15
• 13-16	3 x 4	3 x 4	3 x 4	4 x 15
• 17-20	4 x 4	4 x 4	4 x 4	4 x 15
• 21-24	3 x 3	3 x 3	3 x 3	4 x 15
• 25-30	4 x 3	4 x 3	4 x 3	4 x 15
• 31-36	3 x 2-3	3 x 2-3	3 x 2-3	4 x 15
• 37-39	3 x 2-3	3 x 2-3	3 x 2-3	4 x 15

References

- (Trzaskoma,Trzaskoma 2001)
- (Zaciorski 1970)
- Source: Internet
- Source: author's own collections

Thank you very much for your attention



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