# STRENGTH TRAINING EXERCISE PRESCRIPTION

**Dr. K. PRABHAKARAN MANILAL**
**Senior Scientific Officer**
**Sports Authority of India**
**Bangalore**

# DEFINITION OF STRENGTH

Strength is the ability of the neuromuscular system to produce force

# EXERCISE PRESCRIPTION

- **Prescription of appropriate exercise stress is important for optimal physiological adaptation.**
- **Development of an appropriate strength training programme is a complicated process.**
- **This needs a solid understanding of scientific principles and programme design guidelines.**
- **Knowledge of scientific principles help in developing logical and successive plans.**
- **Should be based on sound rationale.**

# PROPER EXERCISE PRESCRIPTION IS POSSIBLE ONLY WITH:

- Understanding Of Strength Training
- Different Training Variables
- The Training Goals
- The Individual's Needs
- Training Response
- Pre-training Status
- Sports Demands

# MAIN PROGRAM DESIGN COMPONENTS

Needs Analysis

Acute Programme Variables

Chronic Programme Manipulations

Administrative Concerns

# NEEDS ANALYSIS

- **Is the starting point of any programme design**
- **To determine the needs of the individual and sport (establish the primary goal or outcome of training)**
- **Fitness level & training status of the individual.**

# NEEDS ANALYSIS: GENERAL FOCUS

- **Training goal/Sports demand**
- **Individual's need (assessment of the Athlete)**
- **TRAINING GOAL**
- **Establish the primary goal or outcome of the training (improvement of strength, Power, size, muscular endurance etc)**
- **EVALUATION OF SPORT**
- **Unique characteristics of the sports helps to design specific training programme**
- **Movement Analysis (muscular involvement, body and limb movement pattern, Type of muscular contraction, Speed of contraction).**
- **Sports demand strength/ power, hypertrophy, Muscular endurance)**
- **Physiological Analysis (Sports Metabolism)**
- **Injury Analysis (Common injuries associated with sports)**
- **Needs analysis, is essential for the selection of exercises, deciding the intensity**

# NEEDS ANALYSIS: GENERAL FOCUS cont.

- Assessment of the Athlete (Individual assessment)
- Athlete's needs and goals
- Individual’s current fitness level
- Training background
- Exercise technique experience
- History of injury

# ACUTE PROGRAMME VARIABLES

- Choice of Exercise
- Order of Exercise
- Intensity of Exercise
- Number of Repetitions and Sets
- Rest Intervals between Sets

# ACUTE PROGRAMME VARIABLES: GENERAL FOCUS

- Acute programme variables concerns the design of a single specific strength training session
- Allow the quantification of the load
- Make it possible to predict the training response and adaptation
- By manipulating these variables, numerous different workouts can be created

# CHOICE OF EXERCISE

- Training goal
- Muscle groups to be trained
- Sports demands (SAID principle)
- Movement pattern to be trained
- Muscle balance (left & right, upper/lower body , agonist antagonist)
- Exercise technique experience (free wts, Machines, other modalities)
- Performance level (Beginner, Intermediate& Elite)
- Training phase( PP,CP TP)
- Availability of equipment and training time
- Age and fitness level

# CLASSIFICATION OF EXERCISES

- **Structural (multi-joint, weight bearing)**
- **Supplemental (multi-joint, non-weight bearing)**
- **Isolation (single joint)**
- **Unilateral, bilateral**
- **Con, ecc, isometrics**

## STRUCTURAL EXERCISE

- Multi-joint exercises
- Weight bearing
- High skill involvement
- Stressing more muscle mass, High metabolic demand, Neural response, Hormonal response.
- Directly or indirectly loading the spine

## AUXILLARY EXERCISE

- Also multi-joint but
- not weight bearing
- Involve less muscle mass compared to structural ex.

## ISOLATION OR SINGLE JOINT EXECISES

- Involve only one joint, less muscle mass
- Reduced skill level .

# ORDER OF EXERCISE

- **Proper sequence of exercise for best training effect, order of exercise affects the quality of effort or technique of another exercise and to optimize the preservation of exercise intensity)**
- **There are three basic workout structures**
    1. **Total body workouts**
    2. **Upper/Lower body split workouts**
    3. **Targeted Muscle group**
- **Large to small muscles**
- **Structural-supplemental-isolation**
- **Priority system**
- **Push-pull exercises (Alternated)**
- **Upper body –lower body**
- **classical-semi- classical-power ( highly complex/ technically demanding to least complex)**

# EXERCISE INTENSITY

- Most important variable
- Major stimulus for training adaptation
- Depends on training goal, exercise order, volume, frequency, repetition speed and length of rest interval.
- Intensity is relative
- Selection of intensity depends on:
  1. Exercise selected
  2. Individual's training background
- Intensity is always calculated from maximum
- 1RM (percentage of the 1 RM)
- Repetition maximum
- RM range (goal repetition)

# INTENSITY

- Methods of increasing resistance exercise intensity
- 1.Increase relative percentage
- Week 1-3 -70%
- Week 4-6 -75%
- Week 7-9-80%
- Increasing relative % is common in periodized programme
- % can be used to vary intensity from set to set or to quantify a training cycle (hypertrophy cycle 65-75% strength 80 > 0f I RM

# WAYS TO INCREASE INTENSITY: EXAMPLES

1. **Increase Absolute Amount**
   - **Desired work zone= 8reps**
   - **Increase weight when 8reps are performed for all sets**
   - **Week 1-2 x 8 reps 50 kg**
   - **Week 2-4 x 8reps 52-5 kg etc**

2. **Train within a RM range**

3. **The absolute increment depends on the character of exercise(large muscle mass can tolerate more increase than small muscle mass exercise)**

# WAYS TO INCREASE INTENSITY: EXAMPLES cont.

4. **Train within a RM Range**
   - **Target Rep Zone**
   - **Target Zone= 8-12 reps**
   - **Week 1-2 =8reps**
   - **Week 3-4 =10 reps**
   - **Week 5-6 = 12 reps**
   - **Increase weight for next 8 reps.**

# LOAD INTENSITY BASED ON TRAINING GOAL

| Training Goal | Load (% of 1 Rm) | Goal reps |
|---|---|---|
| Strength | >80 | 1-6 |
| Power | 75-85 | 3-5 |
| Hypertrophy | 70-85 | 6-12 |
| Muscular Endurance | <60 | >12 |

# NUMBER OF REPETITIONS AND SETS

- For proper training effect, select optimum no of repetitions and sets
- Number of sets/reps do not have to be the same for all exercises
- Depends on training goal, intensity of exercise, training status of the individual, number of muscle groups trained per workout.
- Several systems are sensitive to training volume (Nervous, Metabolic, Hormonal and Muscular)
- single set may be appropriate for beginners and multiple set for advance athletes
- When multiple sets are used, its structure is to be determined (pattern of loading and volume prescription from one set to the next)
- Optimum number of reps and sets are important for proper training outcomes
- Higher intensity-low reps
- Depends on the type of exercise
- Low intensity-large reps

# SETS AND REPS BASED ON TRAINING GOAL

| Training Goal | Reps | Sets |
|---|---|---|
| General fitness | 8-15 | 1-2 |
| Muscular endurance | >12 | 2-3 |
| Muscular hypertrophy | 6-12 | 3-6 |
| Muscular strength | 1-6 | 2-6 |
| Power | 3-5 | 3-5 |

# LENGTH OF REST INTERVAL BETWWEN SETS

**Length of the rest interval influences the hormonal, metabolic responses to resistance training**

- **Depends on training goal**
- **(strength& power, hypertrophy& muscular endurance**
- **Intensity of exercise**
- **Athlete's training status**
- **Targeted energy system**
- **ACSM recommends 2-3 minutes rest between structural exercise and 1-2 minutes between assistance exercises.**
- **Strength Endurance (High reps 25-20 reps 1-2minutes rest and for high intensity strength endurance 10-15 reps, less than one minute RI.**

# REST INTERVAL BASED ON TRAINING GOAL

| Training Goals | Rest interval |
|---|---|
| General fitness | 30-90 |
| Muscular endurance | <30sec |
| Hyper trophy | 30-90sec |
| Muscular strength | 2-5minutes |
| Power | 2-5 minutes |

# THANK YOU