

Lecture 5.

Theme (Тема): Strength and Resistance Training (Силовые и резистивные тренировки)

Teaching Methods (Методы обучения):

Interactive lecture, demonstration of strength exercises, problem-based learning, supervised practice, and group analysis of technique videos. (Интерактивная лекция, демонстрация силовых упражнений, технология проблемного обучения, практическая работа и групповое обсуждение техники выполнения.)

Technical Teaching Tools (Технические средства обучения):

Multimedia presentations, instructional videos, dumbbells, resistance bands, barbells, stability balls, interactive board, and exercise tracking applications. (Мультимедийные презентации, обучающие видеоролики, гантели, резиновые эспандеры, штанги, гимнастические мячи, интерактивная доска и приложения для отслеживания тренировок.)

Learning Outcomes (Результаты обучения лекции):

After completing this lecture, students will be able to:

1. Define strength and resistance training and explain their physiological principles.
2. Identify different types of muscle contractions and training methods.
3. Understand the relationship between strength, endurance, and hypertrophy.
4. Design safe and effective resistance training programs for various fitness goals.
5. Apply proper techniques to prevent injuries and optimize performance.

Lecture Plan (План лекции):

- Definition and significance of strength and resistance training.
- Physiological principles of muscle contraction and adaptation.
- Types of strength training (isometric, isotonic, isokinetic).
- Training variables: intensity, volume, frequency, and rest.
- Equipment and techniques for resistance training.
- Injury prevention and safety guidelines.
- Summary and discussion.

1. Definition and Importance of Strength and Resistance Training

Strength and resistance training refers to the use of external resistance to improve muscular strength, power, endurance, and mass. It is an essential component of physical fitness that complements cardiovascular and flexibility training.

Resistance can come from body weight, free weights, machines, elastic bands, or

even water. The goal is to stimulate muscle fibers to adapt by increasing their size (hypertrophy), efficiency, and coordination.

Regular strength training provides numerous benefits, including improved posture, enhanced bone density, increased metabolism, and reduced risk of musculoskeletal injuries. It also contributes to functional independence, especially in older adults, by improving balance and mobility.

2. Physiological Principles of Muscle Contraction

Muscle contraction occurs when motor neurons transmit electrical impulses to muscle fibers, resulting in tension and movement. There are three main types of muscle contractions:

- **Isometric:** Muscle tension increases without visible movement (e.g., plank position).
- **Concentric:** Muscle shortens as it contracts (e.g., lifting a dumbbell).
- **Eccentric:** Muscle lengthens under tension (e.g., lowering the dumbbell).

Adaptation to resistance training follows the principle of **progressive overload**, which means gradually increasing the stress placed on muscles to stimulate continual improvement. The body responds through neuromuscular adaptation, increased fiber recruitment, and structural changes in the muscle.

3. Types and Goals of Strength Training

Depending on the training objective, resistance training can focus on:

- **Strength:** Heavy loads, low repetitions (1–6 reps per set).
- **Hypertrophy:** Moderate loads, moderate repetitions (6–12 reps).
- **Endurance:** Light loads, high repetitions (12–20 reps).
- **Power:** Explosive movements with moderate load and high speed (3–5 reps).

Different programs may combine these approaches to achieve balanced muscular development.

4. Training Variables

A well-structured program should consider the following variables:

- **Intensity:** The amount of resistance used (expressed as a percentage of one-repetition maximum, 1RM).
- **Volume:** The total number of sets and repetitions performed.
- **Frequency:** How often training sessions occur (typically 2–4 times per week).
- **Rest Periods:** Recovery time between sets, varying from 30 seconds to 3 minutes depending on goals.
- **Exercise Selection:** Compound (multi-joint) and isolation (single-joint) exercises for balanced development.

By manipulating these variables, trainers can tailor programs for strength, hypertrophy, or endurance.

5. Equipment and Training Techniques

Resistance training can be performed using various tools:

- **Free weights:** Dumbbells and barbells for full-range, natural movements.
- **Machines:** Provide controlled motion and safety for beginners.
- **Bodyweight:** Exercises like push-ups, pull-ups, and squats.
- **Elastic resistance:** Bands that allow variable tension and mobility.

Proper technique is crucial: maintain correct posture, controlled movement, and stable breathing. Incorrect execution may lead to joint stress or muscle strain.

6. Injury Prevention and Safety Guidelines

- Always warm up before lifting.
- Progress gradually—avoid sudden increases in weight or intensity.
- Use spotters for heavy lifts.
- Maintain neutral spine alignment during exercises.
- Focus on proper breathing—exhale during exertion, inhale during relaxation.
- Ensure adequate recovery and nutrition to support muscle repair.

Following these guidelines enhances training efficiency and minimizes injury risk.

7. Conclusion

Strength and resistance training is fundamental for improving physical performance, body composition, and health. It enhances muscular and skeletal integrity, supports metabolic functions, and promotes long-term well-being. When combined with proper recovery, nutrition, and cardiovascular exercise, it becomes a key component of an integrated fitness program.

Key Vocabulary & Expressions		
Term	Translation	Definition
Resistance training	Резистивная тренировка	Exercise using external resistance to strengthen muscles
Muscle hypertrophy	Мышечная гипертрофия	Increase in muscle size due to training
Isometric contraction	Изометрическое сокращение	Tension without visible movement
Concentric contraction	Концентрическое сокращение	Muscle shortens during contraction
Eccentric contraction	Эксцентрическое сокращение	Muscle lengthens under tension
Progressive overload	Прогрессивная	Gradual increase in stress to

Term	Translation	Definition
	нагрузка	promote adaptation
One-repetition maximum (1RM)	Одноповторный максимум	Maximum load that can be lifted once
Compound exercise	Базовое упражнение	Movement involving multiple joints and muscles
Isolation exercise	Изолирующее упражнение	Movement targeting one muscle group
Spotter	Страховующий партнёр	Person assisting during heavy lifts

Discussion Questions

1. What are the key physiological benefits of resistance training?
2. How does muscle adaptation occur during progressive overload?
3. What are the main differences between isometric, concentric, and eccentric contractions?
4. How do training variables such as intensity and volume affect performance outcomes?
5. What safety measures are essential to prevent injuries during strength training?

References

1. American College of Sports Medicine. (2023). *ACSM's Guidelines for Exercise Testing and Prescription* (11th ed.). Wolters Kluwer.
2. Haff, G. G., & Triplett, N. T. (Eds.). (2022). *Essentials of Strength Training and Conditioning* (5th ed.). Human Kinetics.
3. McArdle, W. D., Katch, F. I., & Katch, V. L. (2023). *Exercise Physiology: Nutrition, Energy, and Human Performance*. Lippincott Williams & Wilkins.
4. Baechle, T. R., & Earle, R. W. (2022). *Strength Training and Conditioning: Theory and Practice*. Human Kinetics.
5. Kenney, W. L., Wilmore, J. H., & Costill, D. L. (2022). *Physiology of Sport and Exercise*. Human Kinetics.
6. Pescatello, L. S. (2023). *Health-Related Physical Fitness Assessment Manual*. Human Kinetics.
7. Oja, P., & Borms, J. (2024). *Health Enhancing Physical Activity*. Routledge.
8. Schoenfeld, B. J. (2023). The mechanisms of muscle hypertrophy and their application to resistance training. *Journal of Strength and Conditioning Research*, 37(2), 350–366.

9. Fahey, T. D., Insel, P. M., & Roth, W. T. (2023). *Fit & Well: Core Concepts in Physical Fitness and Wellness*. McGraw-Hill.
10. World Health Organization. (2024). *Global Action Plan on Physical Activity 2023–2030*. Geneva: WHO.