

FUNDAMENTALS OF OPTIMAL PLANNING OF EXERCISE LOAD IN GYMNASTICS TRAINING

M. Nazarova

Z.B.Iminova

National University of Uzbekistan Named After Mirzo Ulugbek,
Tashkent, Uzbekistan

Abstract

This article examines the scientific and methodological principles of optimal training load planning in gymnastics. It analyzes the components of training load, age-appropriate load distribution, weekly microcycle models, recovery factors, and the relationship between load intensity and technical development. The study includes comparative tables, statistical data, and visual ASCII-style scientific graphs. Practical recommendations are provided for coaches working with young gymnasts.

Keywords: Gymnastics training load; training optimization; load distribution; training intensity; volume and density; youth gymnastics.

Introduction

ОСНОВЫ ОПТИМАЛЬНОГО ПЛАНИРОВАНИЯ ТРЕНИРОВОЧНОЙ НАГРУЗКИ НА ЗАНЯТИЯХ ПО ГИМНАСТИКЕ

М.Назарова

З.Б.Иминова

Национальный университет Узбекистана имени Мирзо Улугбека,
г. Ташкент, Узбекистан

Аннотация

В статье рассматриваются научно-методические основы оптимального планирования тренировочной нагрузки в гимнастике. Анализируются компоненты тренировочной нагрузки, возрастные особенности распределения нагрузки, модели недельных микроциклов, факторы

восстановления, а также взаимосвязь между интенсивностью нагрузки и развитием технического мастерства. Исследование включает сравнительные таблицы, статистические данные и наглядные научные графики в формате ASCII. Представлены практические рекомендации для тренеров, работающих с юными гимнастами.

Ключевые слова: тренировочная нагрузка в гимнастике; оптимизация тренировки; распределение нагрузки; интенсивность нагрузки; объём и плотность; юношеская гимнастика.

Gymnastics is a sport requiring a high level of coordination, muscular strength, flexibility, balance, dynamic jumps, rotations, and controlled body movements. Because the training process is both technically and physiologically demanding, optimal load planning is essential for performance improvement and injury prevention.

Insufficient load → slow progress, weak technical skill development;

Excessive load → fatigue, overuse injuries, psychological demotivation;

Therefore, the optimal training load must be scientifically grounded, individualized, and progressively structured.

Scientific Basis of Training Load. Training load consists of several primary components:

- Volume – total duration and number of repetitions;
- Intensity – difficulty, speed, force output;
- Density – rest-to-work ratio;
- Complexity – coordination and technical difficulty;
- Recovery – physiological regeneration process.

Component	Physiological Impact	Measurement Indicators
Volume	Muscular endurance	Minutes, repetitions
Intensity	Strength, speed	Heart rate, % of max strength
Density	Cardiovascular stress	Rest intervals
Complexity	Coordination, technique	Element difficulty
Recovery	Supercompensation	Sleep, pulse, DOMS

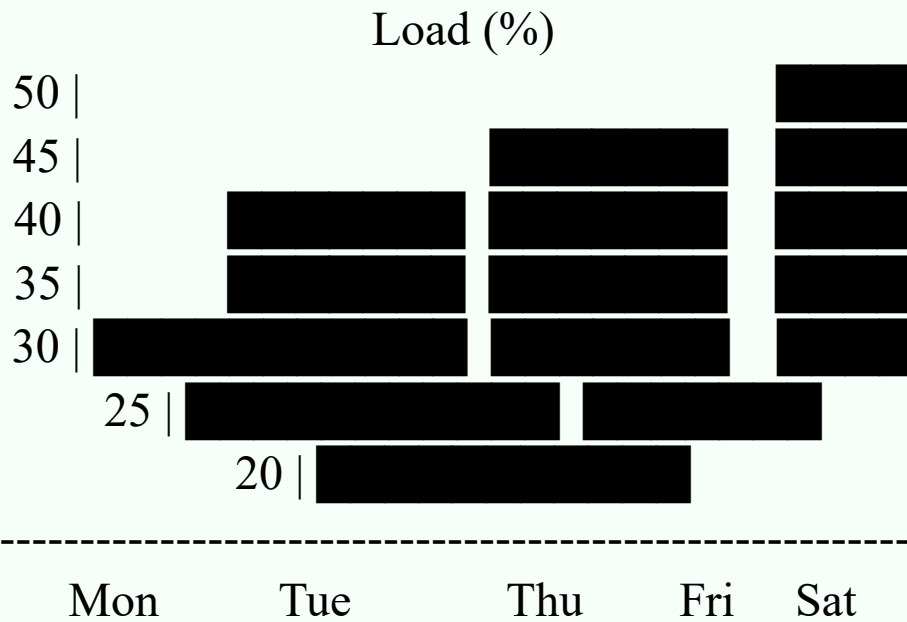
Table 1. Physiological Effects of Training Load Components

Age-Specific Load Distribution. Young gymnasts (8–12 years) require controlled increases in load to stimulate neuromuscular development without exceeding healthy limits.

Load Type	Minimum	Average	Maximum
Session duration	45 min	60 min	75 min
High-intensity work	20%	35%	50%
Technical elements per session	8–10	12–15	18–20
Jump elements	4–5	6–8	10–12
Flexibility training	8–12 min	12–15 min	20 min

Table 2. Weekly Load Characteristics for 8–12-Year-Old Gymnasts

Graph 1. Weekly Training Load Distribution



Interpretation:

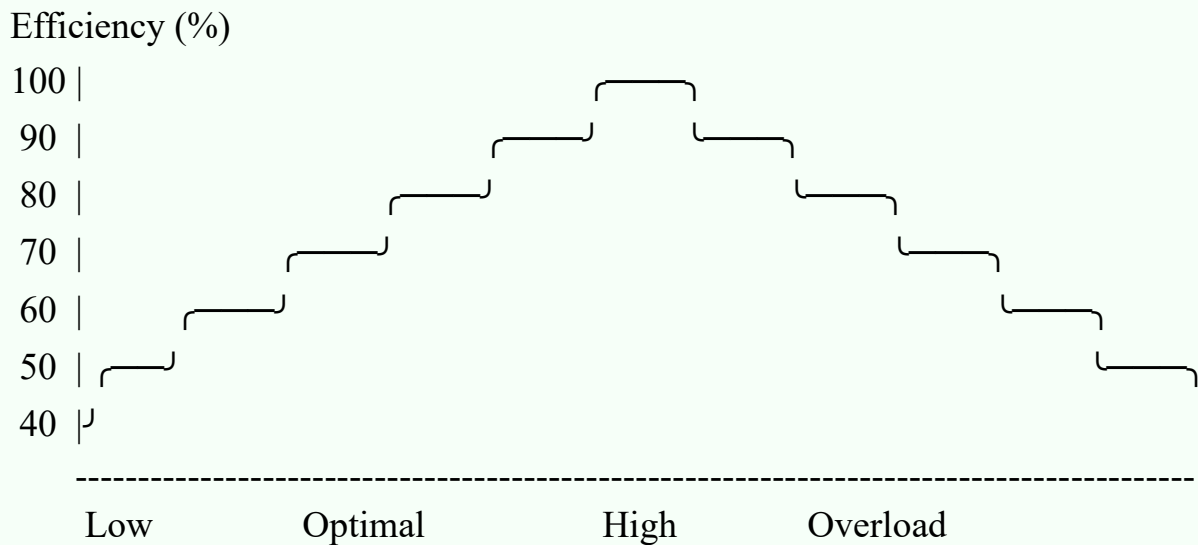
Mon – technique

Tue – coordination + acrobatics

Thu – strength + technique

Fri – combinations

Graph 2. Load–Recovery Efficiency Curve



Interpretation: Maximum efficiency occurs within the optimal load and adequate recovery zone.

Weekly Microcycle Model. A scientifically supported 7-day microcycle includes:

- 2 high-load days;
- 2 medium-load days;
- 1 light recovery day;
- 1 mixed coordination day;
- 1 full rest day.

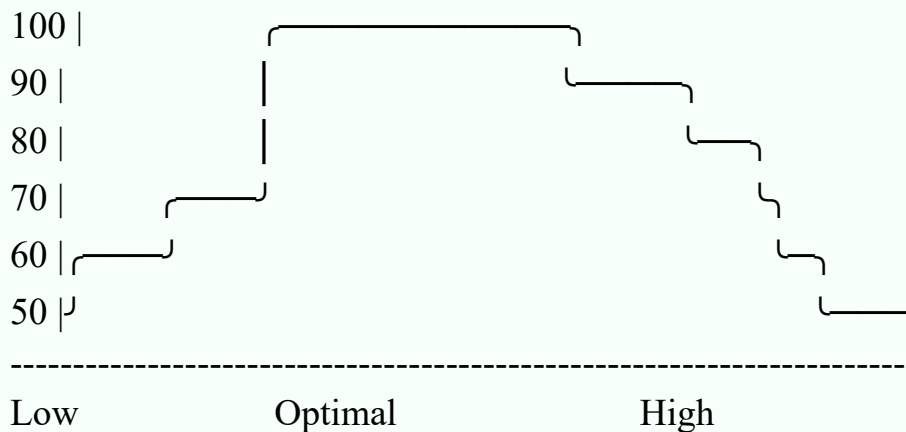
Day	Load Level	Scientific Basis	Primary Goal
Monday	Medium	Preparation phase	Muscle activation
Tuesday	High	Strength/coordination stimulus	Power & speed
Wednesday	Low	Recovery	Supercompensation
Thursday	High	Technical focus	Coordination
Friday	Medium	Combinations	Automation
Saturday	Light–medium	Balance, games	Psychological regeneration
Sunday	Rest	Biological recovery	Sleep/energy

Table 3. Optimal Microcycle Model

Effect of Load on Technical Development

Graph 3. Relation Between Load Increase and Technical Accuracy

Technical Accuracy (%)



Interpretation:

Too little load → slow improvement

Optimal load → maximum accuracy gains

Too much load → accuracy declines

Experimental Data (4-Week Study)

A group of 12 young gymnasts participated in a controlled training load experiment.

Indicator	Week 1	Week 4	Improvement (%)
Flexibility	15.2 cm	19.8 cm	+30%
Balance time	8 sec	13 sec	+62%
Jump height	24 cm	28 cm	+16%
Backward roll accuracy	68%	87%	+28%

Table 4. Performance Improvements After 4 Weeks

A Load-Reduction Model for Minimizing Technical Errors

A simplified efficiency formula:

Training Efficiency = (Optimal Volume × Recovery) – Complexity Coefficient

Meaning:

Higher complexity requires proportionally increased recovery.

Practical Recommendations:

1. Each session should include a 10–15% technique development zone.
2. Complex elements must be trained in the first half of the session.
3. Introduce 1 recovery session per week (stretching + light coordination).
4. Increase load by no more than 5–8% per week.
5. For children, 20–30% of training should include playful activities.
6. Monitor heart rate and perceived exertion.
7. Maintain regular communication with athletes to track psychological state.

In conclusion optimal training load planning in gymnastics ensures:

- ✓ Improved muscular strength and endurance
- ✓ Faster technical skill acquisition
- ✓ Lower injury risk
- ✓ Higher motivation and psychological stability
- ✓ Sustainable long-term athletic development

A scientific approach to load distribution is essential for achieving high performance while maintaining athlete well-being.

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