



# The basic principles of conditioning

Valentin Uzunov

Hataitai Gymnastics, Wellington, New Zealand

---

## ABSTRACT

Conditioning is recognized by most coaches as one of the most critical components to the training of any athlete for any sport. In gymnastics this is even more so as for a majority of the skills a high level of strength/power and flexibility is required to even attempt them. The importance of conditioning in gymnastics is clearly observable in the performance of the actual skills which seem effortless but at extremely physically demanding. There is an abundance of scientific research in the field of strength and conditioning, however there is very little specific to gymnastics. This article discusses only 4 of the most fundamental training and conditioning principles in strength for the design of gymnastics conditioning program: *specificity, overload, individual differences, and variation*. By understanding how these principles apply to the conditioning of athlete's, coaches will be better able to control the acute training variables in their programs to produce better results. This is only a short discussion on the topic of strength and conditioning, which will best serve the beginner coaches.

Key Words: *Strength, program design, training principles*

---

## INTRODUCTION

Ask any elite coach what is the most important aspect of their athletes training to gain the edge over the competition, and I guarantee you, most if not all will say it's their physical preparation aka the conditioning of their athletes. Designing and planning a conditioning program is one of the most important aspects of a coach's job.

Designing a conditioning program is a complex process that incorporates several acute program variables that are dependant on 4 fundamental training principles (1,2,3). The effectiveness of the conditioning program to achieve a specific training outcome (i.e. muscular endurance, hypertrophy, maximal strength, or power) depends on the manipulation of the acute training variables (1). It is therefore essential for coaches to acquire a fundamental understanding of the basic training principles, and the acute training variable that are dependant on these principles.

- exercise selection and order (always compound/multi joint exercises first)
- rest periods; (appropriate rest period for the desired training outcome)
- repetition velocity
- frequency.

For coaches to be able to design a program to achieve certain training outcomes, such as power, strength, endurance etc the coach must first understand the fundamental training principles that govern the effects of the acute variables toward certain outcomes. There are four fundamental training principles (2,3):

*Specificity* - This principle states that a specific exercise/movements elicits a specific training adaptation, bioenergetically and biomechanically.

*Overload* - Improvements in performance occur as a result of providing a regular stimulus above the level of that a performer usually experiences, in order to elicit a desired physical or physiological adaptation.

*The Principle of Individual Differences* - No two individuals are the same, which suggests that every individual presents a unique motor performance profile. Conditioning programs should be customized to match

## DISCUSSION and REVIEW

A conditioning program is designed using several acute training variables. The acute training variables are:

- muscle action (concentric, eccentric, isometric)
- loading (resistance/intensity)
- volume (repetition and sets per exercises)

individual's rates of improvement, strengths and weakness.

*Variation* – The need for regular appropriate manipulations of acute training variables for the prolongation of adaptations over a continuous training regime.

The specificity principle simply means that gymnastics specific conditioning programs should involve similar movements as those done in gymnastics skills (4). This assures that exercises have greater 'Transfer of training effect or specific adaptation'. Transfer of training effect deals with the degree of performance adaptation which results from doing a particular exercise. For exercises to have the most benefit, the exercise movements needs to be as specific to the range of motion of the limbs, the speed of movement, the type of movement, the duration of the movement, the tension, and so forth of the skill/s which the exercise is desired to help with.

A practical example of the application of the specificity principle is. Imagine 3 gymnasts, same age, height, weight, experience, etc (in order to demonstrate that all things been equal, the mode/specificity of the exercise is the key factor to improvement) who want to improve their L-sit hold over a 3 week training program. Each gymnast was prescribed an exercises specific to the L-sit. Gymnast 1 did L-hang holds of a high bar (fig 1b), gymnast 2 did leg raises (fig 2a) and gymnasts 3 did L-sit holds with ankle weights (with or without assistance) (fig 1c). After the a 3 week training period it would be expect gymnast 3 who L-sit holds with the ankle weights would show the greatest improvements, followed by the gymnast 2 who did the L-hang hold, and than gymnast 1 who did the leg raises. The reason for this is because the L-sit hold is the most similar in biomechanical and bioenergetics (same muscle contraction, joint angle movements, segment positions, duration etc). Thus the L-sit with ankle weights had the greatest transfer or training effect. Even though there are other factors involved which will be discussed later, it does

exercise's specificity (4). It could stand to reason that doing the actual skill itself is the best way to maximize training effect transfer, however in gymnastics this not always practical like in the example. For some skills this would be an effective training means, unfortunately for many of the difficult elements doing the skill, or simply doing gymnastics will never be enough, especially for a skilled athlete (5). Research suggests that just by attempting skills, there is no guarantee that the athlete will develop the required strength or flexibility to perform the skill (5). The main reason for this is because; skills in themselves are only effective at providing a training stimulus up to a certain point, after that they no longer provide the necessary overload, and variation to induce the necessary muscular adaptations to elicit improvement. This is know as a plateau in training terms, which is associated with potential overtraining

The overload principle is another fundamental concept to designing effective conditioning programs particularly with the development of strength and power (which are the key fitness components for gymnastics). Overload is predominantly dependant on 3 acute variables: Frequency, intensity, and duration (3). These 3 variables can be manipulated to exert control over the overload stimulus and specificity of training. *Frequency* of training indicates how often an athlete trains, or does a particular specific exercise. *Intensity* is estimated using the formula: duration x work. The higher the workload or the less time available to do the required work(or a combination of both) the greater the intensity. For example a weightlifter performing a snatch is an example of a very high intensity exercises, a marathon runner having unlimited amount of time to complete a marathon is low intensity. *Duration* of training or exercise, movement etc. is fairly self explanatory.

It's important to acknowledge that the amount of overload necessary to elicit a training response depends on the state of the individual athlete (3). The level of overload required to elicit benefits in elite athletes is far greater then for the recreational or lower level athletes (3). One major problem that does come about as a result of the nature of gymnastics is that it is very hard to overload most gymnastics skills. This partially explains why skills on their own are not effective conditioning exercises. The use of weight vests, ankle weights, spotting, are common training aids that can be used to increase overload, but it does require careful consideration as how they are used, so that the characteristic of the skill, such as speed, range of motion limb motion, duration etc. are not altered to the point that the skill. The solution to this problem is to use specific exercises to target specific movements and muscle groups, which can be progressively overloaded. The benefit of this approach is that performance improvements from these conditioning exercises directly benefit the skill performance without risking overuse injuries, overtraining etc. This is the preferred method of conditioning for skills.



**Figure 1** - 3 possible exercises used to train the L-sit hold. In progressive specificity, (c) is the most specific, than (b) and than (a) illustrate the basis of the principle.

Coaches should be careful about adding weights to skills and movements, as this can change the movement pattern by delaying reaction times for tumbling, or change mass distribution of limbs and thus effecting the position of the centre of mass, and essentially reduce the

Coaches need be always considerate of the principle of *individual differences* when designing their conditioning programs. One conditioning program for everyone in most cases will not be appropriate. For low level athletes generic conditioning programs are effective, for the time invested. However for elite or high level athletes, coaches need to spend the time to identify individual differences, such as areas of weakness, potential limitations, potential injury risks etc. The best way to do this is to do regular physical fitness testing in order to evaluate strength (dynamics, static) power, flexibility (active, passive, dynamic). The coach should then use the results to create appropriate conditioning recommendations. This information is also vital in order to correctly adjust the acute training variables to elicit the desired training outcomes.

*Variation* is concerned with the manipulation of the acute training variables, particularly the volume (which is a product of duration and frequency), intensity, and exercise selection (2). The appropriate sequencing and cycling of volume, intensity, exercise selection (from basic and compound movements to skill specific) leads onto what is known as periodization. Research has shown clearly that using a periodized training program with adult athletes results in greater changes in strength, power, motor control (skill performance), total body weight, lean body mass, and body fat percentages over non- periodized programs. This has also been demonstrated with children, however much more research is still needed in the field of periodized training for children, and female athletes (6).

According to Major (1996) there are four goals that coaches should evaluate their training programs against.

1. Appropriate and consistent, special strength training necessary for maximum performance in gymnastics.
2. Training to increase muscle size and strength is important, but maximum strength from minimum size is the most important goal

3. Appropriate rest and recuperation during and between trainings.

4. Strength training that is integrated with the gymnastics skill training.

These recommendations are fairly simple, but require lots of planning and an solid understanding of the basic training principles. Conditioning, and physical preparation is a complex and fascinating subject, and this article only touches on the subject. From here I would encourage coaches to seek further reading on the subject, and to carefully examine their conditioning programs against the objectives prescribed by Major (1996).

## CONCLUSIONS

It is indisputable that conditioning is an important part of any successful gymnastics program. Four of the most important training principles for a good program design are: *Specificity, Overload, Individuality, and Variation*. The training principles work in conjunction with one another to constantly challenge the athlete to reach for new levels of performance. By understanding how these principles work together and what role they play in the program design, the coach can effectively manipulate the acute training variables to achieve the desired training outcome (speed, power, strength, endurance etc.). Essentially these training variables are associated through effective periodization which is the planned cycling of various aspects of a training program during a specific period of time. To the beginner coach this should be a short introduction to effective conditioning program design.

*Every care is taken to assure the accuracy of the information published within this article. The views and opinions expressed within this article are those of the author/s, and no responsibility can be accepted by The Gym Press, Gym Coach or the author for the consequences of actions based on the advice contained herein*

---

Address for correspondence: Author AB, Club, City, Country, Email. AuthorA@abc.edu. Please provide contact details. This will greatly aid in expanding networking and communication between coaches, and scientists.

---

## REFERENCES and RECOMMENDED READINGS

- 1- Bird S. P., Tarpenning K. M., & Marino F. E. (2005). Designing Resistance Training Programmes to Enhance Muscular Fitness: A Review of the Acute Programme Variables. *Sports Medicine*, 35(10), 841-851.
- 2- Stone M., Plisk S., & Collins D. (2002). Training Principles: Evaluation of Modes and Methods of Resistance Training – A Coaching Perspective. *Sports Biomechanics*, 1(1)79-103
- 3- Kamen. G. (2001). *Foundations of Exercise Science*. PA Philadelphia: Lippincott Williams & Wilkins
- 4- Sands W, McNeal J & Jemni M. (2002) Seven Fundamental Movements and Circuit Program Design. International Society for Biomechanics in Sports Coaches Education web site. (ISBS) February. <http://www.sportcoach-sci.com>
- 5- Major. J.J. (1996). Strength Training Fundamentals in Gymnastics Conditioning. *Technique*, 16 (8).
- 6- Fleck S.J. (1999). Periodised Strength Training: A critical review. *Journal of Strength and Conditioning Research*, 13(1), 82-89