FIFTH EDITION

PERIODIZATION

Theory and Methodology of Training

Tudor O. Bompa

G. Gregory Haff

training. When structuring the microcycles of the training plan, the coach should consider many factors:

- The objective of the microcycle and the dominant training factors.
- The training demand (e.g., number of sessions, number of hours, volume, intensity, and complexity) targeted during the microcycle.
- The intensity of the microcycle and the intensity fluctuations that are contained in the microcycle.
- The methods that will be used to induce the training stimulus in each training session.
- The days on which training and competition will occur (if applicable).
- The need to alter intensity each day. One possibility is to start the microcycle with a low- or medium-intensity training session and progress with increasing intensity.
- The timing of competitions in the context of the microcycle. When the microcycle leads into a competition, the highest intensity or peak training session should occur 3 to 5 days prior to the event.

The coach must determine whether the athlete should perform one or more sessions per day. If the athlete's development and work, school, or personal schedule allow for multiple training sessions, the coach should plan the timing of such sessions.

It is helpful to begin each microcycle with a meeting in which the coach and athlete discuss the objectives for each training factor contained in the microcycle and how those objectives will be achieved. The coach and athlete should discuss the volume and intensity of training, the number of training session contained in each training day, and where the most difficult training sessions will fall. The coach may want to target performance standards for the microcycle. Additional personalized information can be given to athletes at this time. Finally, if the microcycle is leading into a competition, the coach should give the athlete details about the upcoming contest and motivate the athlete to attain each competition goal.

If there is no competition at the end of microcycle, a short meeting should be held after the last training session of the microcycle to analyze whether the athlete achieved the microcycle training objectives and goals. The coach should use this meeting to critique the athlete's performance during training, making sure to highlight the positive aspects while targeting others for improvement. The coach can strengthen the evaluation of the microcycle by collecting input from the athlete. The coach should then take all information obtained from the meetings and training outcomes to formulate strategies for future microcycles with similar objectives and goals. The meeting following a microcycle is a tool with which coaches and athletes can coordinate their focus on performance outcomes.

Classifying Microcycles

Several different microcycle structures are presented in this chapter, but specific training circumstances result in an infinite number of structural variations. The dynamics of the microcycle is dictated by many factors including the phase of training, the developmental status of the athlete, and the training factor emphasis (e.g., technical, tactical, or physical preparation). One of the most important factors dictating the microcycle structure is the athlete's level of development and training capacity. For example, a highly trained athlete may be able to tolerate a greater density of training sessions performed at higher intensities than a novice or less-developed athlete. Athletes on the same team may have different work capacities and training needs, so individualization of microcycle structure may be warranted.

To create an individualized training stimulus, the coach must eliminate standardization and rigidity when structuring the microcycle. The microcycle should be flexible in the context of the training plan as well, which will allow the coach to change training factors as the athlete progresses through the training plan. This flexibility allows the coach to use information gathered from training, assessments, or competition to modify the training plan to help the athlete meet performance and training objectives.

One method for classifying microcycles centers on the number of training sessions per week. As stated previously, the number of training sessions that the athlete can tolerate without overtraining occurring is dictated by the athlete's level of development and physical preparation. Additionally, the microcycle structure will change depending on the available time for training and whether the athlete is participating in a training camp or undergoing regular training sessions.

There are a variety of microcycle structures: 3 days per week (figure 8.1), 4 days per week (figure 8.2), and 5 days per week (figure 8.3) are common structures. Advanced athletes who have a high work tolerance and can meet the time requirements can undergo eight training sessions per week (figures 8.4 and 8.5). Microcycles with

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.							
p.m.	Training		Training		Training		

Figure 8.1 Microcycle with three training sessions per week.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.							
p.m.	Training	Training		Training		Training	

Figure 8.2 Microcycle with four training sessions per week. A variant is to have the fourth training session on Friday.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.							
p.m.	Training	Training		Training	Training	Training	

Figure 8.3 Microcycle with five sessions per week.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.	Training	Training		Training		Training	
p.m.	Training	Training		Training		Training	

Figure 8.4 Microcycle with eight sessions per week.

additional training session may be used during holidays or during training camps, when more time is available for training, or with more advanced athletes.

There are many ways to increase the number of training sessions. The athlete can use a 3+1 microcycle, training on three successive half days, followed by a half day of rest, for a total of 9 training sessions during the microcycle (figure 8.6). This model can be modified for an athlete whose training tolerance or potential is higher and can tolerate more intensive microcycles. A 5+1 microcycle (five sessions plus 1/2 day of rest) (figure 8.7) and a 5+1+1 microcycle (five sessions plus 1/2 day rest, followed by 1/2 day of work) are intensive microcycles (figure 8.8). The structure of these more intensive microcycles depends on the amount of time that is available and the type of training stimulus used during each session.

The microcycle structure can be further expanded by integrating multiple training sessions throughout the day that target different training factors. For example, a three-component microcycle may be constructed where a sprint–agility or a plyometric session is conducted in the morning and the main training session, which targets tactical or technical development followed by strength training, may be performed in the late afternoon or early evening (figure 8.9).

An additional aspect of the microcycle structure relates to the variations in training intensity and demand. The training dynamics should not be uniform across the microcycle. They should vary depending on the characteristics of the training, the type of microcycle used, the environmental conditions (e.g., climate, weather),

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.						Training	Training
p.m.	Training	Training	Training	Training	Training	Training	

Figure 8.5 Alternative microcycle with eight sessions per week.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.	Training	Training	Training	Training	Training	Training	
p.m.	Training		Training		Training		

Figure 8.6 Microcycle with a 3+1 structure.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.	Training	Training	Training	Training	Training	Training	
p.m.	Training	Training		Training	Training		

Figure 8.7 Microcycle with a 5+1 structure.

Session time	DAY						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
a.m.	Training	Training	Training	Training	Training	Training	Training
p.m.	Training	Training		Training	Training		

Figure 8.8 Microcycle with a 5+1+1 structure.

and the phase of the annual training plan. The intensity of training can alternate between the seven intensity zones, ranging from very high (90-100% of maximum) to a recovery session where no training is undertaken (table 8.1). These alterations are dictated by the objectives of the microcycle. For example, the objectives of an intensive microcycle may require one (figure 8.10), two (figures 8.11-8.15), or occasionally

Session time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00 a.m.	Plyometric training	Sprint and agility training	Plyometric training	Sprint and agility training	Plyometric training	Sprint and agility training	
3:00 p.m.	Main training	Main training	Main training	Main training	Main training		
5:00 p.m.	Strength training		Strength training		Strength training		

Figure 8.9 Microcycle with the integration of multiple training factors.

Table 8.1 Intensity Zones and Training Demand

Intensity zone	Training demand	Percentage of maximum performance	Intensity
5	Very high	90-100	Maximum
4	High	80-90	Heavy
3	Medium	70-80	Medium
2	Low	50-70	Low
1	Very low	<50	Very low
Recovery	Recovery	No training	Recovery

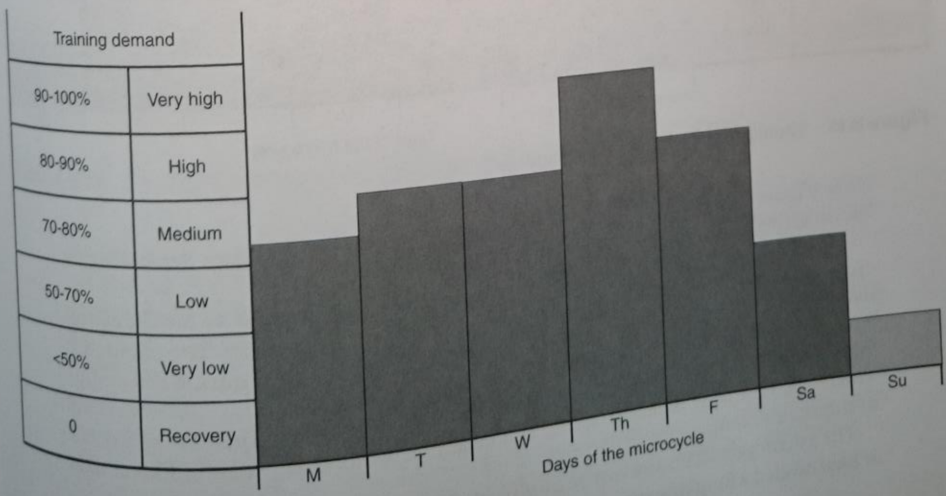


Figure 8.10 Microcycle with one peak.

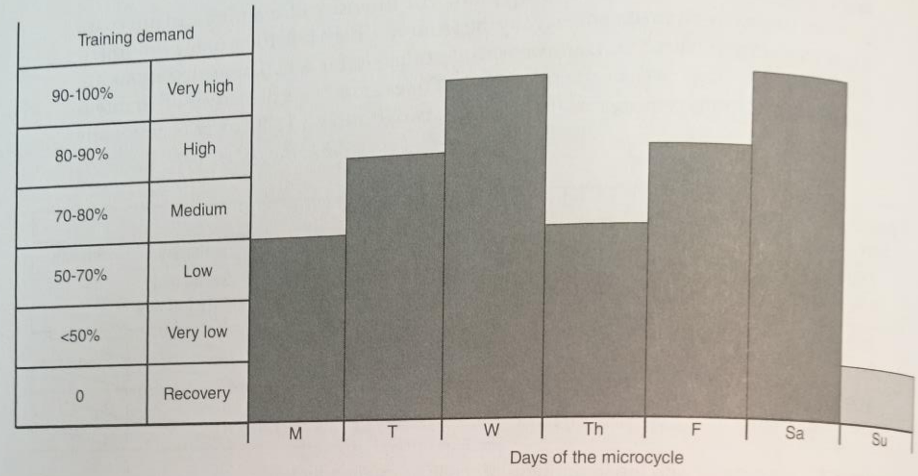


Figure 8.11 Two-peak microcycle.

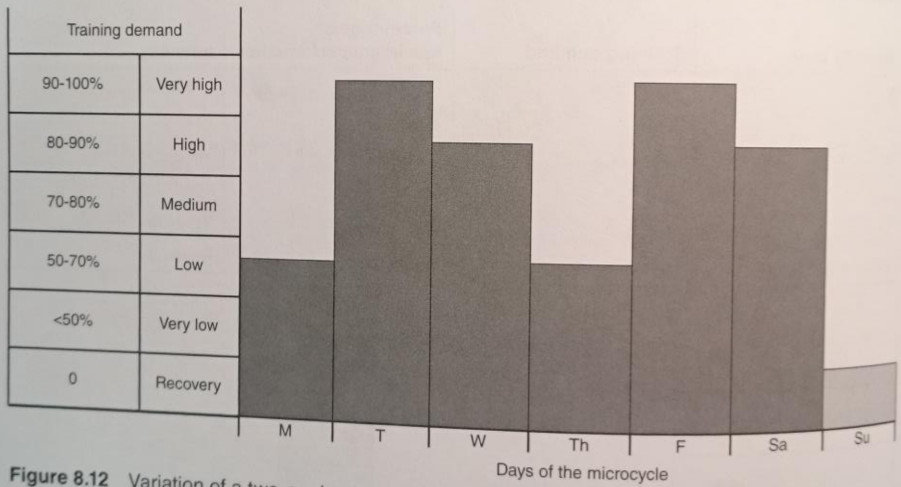


Figure 8.12 Variation of a two-peak microcycle.

three (figure 8.16) high-demand to very high-demand training days depending on the objective of the microcycle.

When planning the modulations of intensity or training demand within the microcycle, the coach should consider the principles of load progression. The microcycle usually should contain only one peak, which occurs somewhere during the middle 3 days of the week. In some instances a microcycle can contain two peaks that are followed by 1 or 2 days of regeneration sessions. An exception to this rule may occur when model training is being used; in this case, two peaks can occur on adjacent days to simulate a competitive situation.

The microcycle structure can be modified if the athlete is training at high altitude or has traveled a long distance and crossed several time zones (5-8 hr time difference).

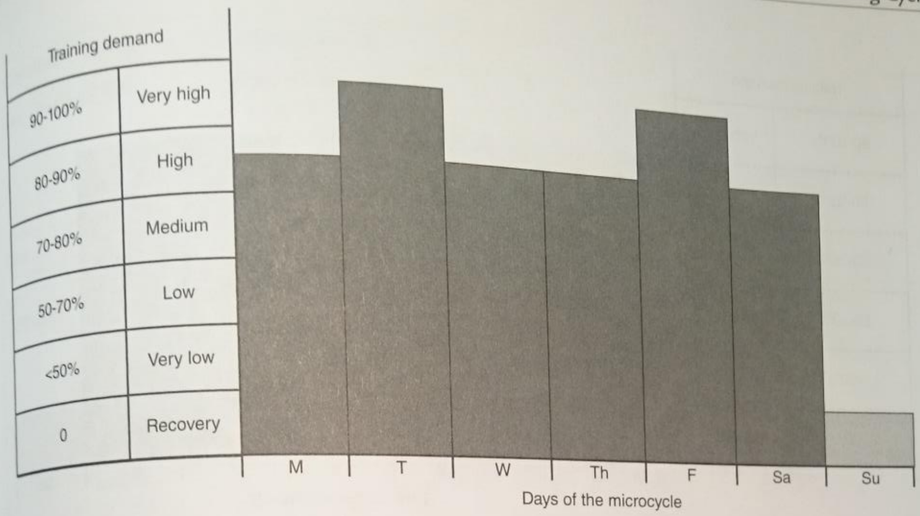


Figure 8.13 Two-peak microcycle with high demand.

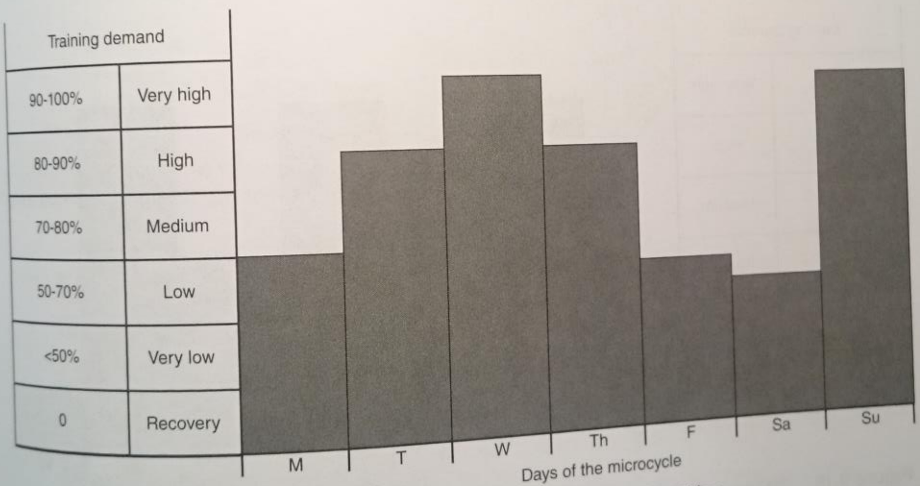


Figure 8.14 Two-peak microcycle in which the second peak is a competition.

In these situations it may be warranted to add an adaptation microcycle that does not contain a peak. The microcycle structure also should be altered when the athlete is training in a hot and humid climate. In this situation it is recommended that the peak occur at the beginning of the week when the athlete has more vigor.

The sample microcycles in figures 8.10 through 8.16 represent **total training demand** rather than the separate variables of volume and intensities. The use of total training demand allows for the microcycle structure to be used in a variety of sporting activities, because sports vary in their area of emphasis, with some being dominated by speed-power, maximal strength, or endurance. Additionally, team sports contain a complex interaction of many factors that can best represented by total training demand.

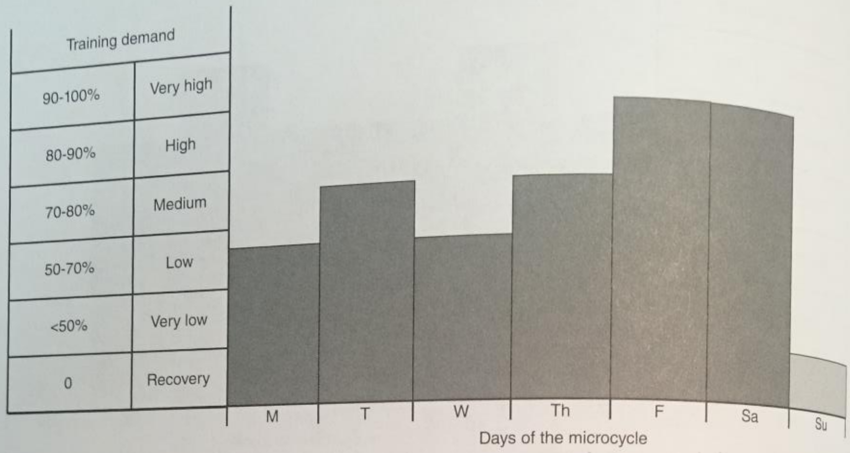


Figure 8.15 Microcycle model for two adjacent peaks.

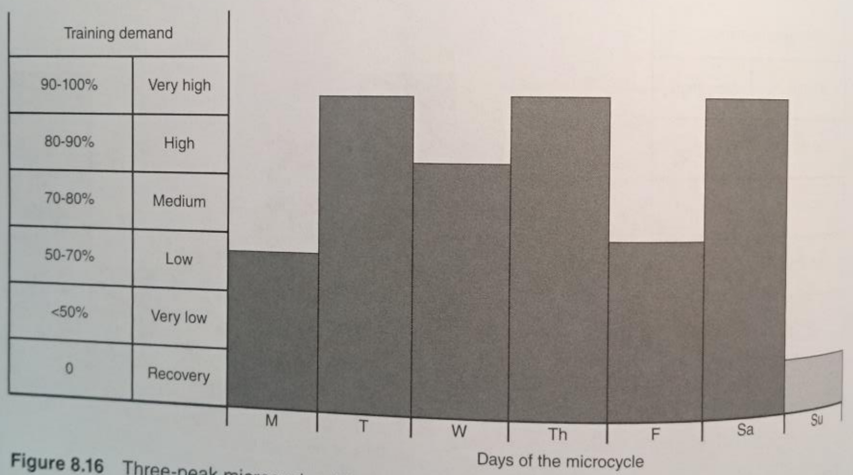


Figure 8.16 Three-peak microcycle with alternating training demands.

A microcycle can be structured many ways; some authors speculate that there are at least 22 possible microcycle structures. This number of microcycle variants may complicate the training and planning process, so it may be better for the coach to use the most common microcycle structures and adapt them to individual training needs.

The microcycle should be functional and, therefore, as simple as possible. The plan should specify the date, objectives, and content for each training session. The content should be succinct and easy to understand and should emphasize major items to target in the training session. Figure 8.17 shows a microcycle plan from the competition phase.

Sport/Event: Javelin Date : 20.07-27-09	Microcyle # 29 Objectives: 1. Perform 67:00 m 2. Perfect the rhythm of the last three strides under higher velocity conditions 3. Develop the ability to concentrate for the morning competition 4. Maintain leg and arm power					
Time	**Mon.**	**Tues.**	**Wed.**	**Thurs.**	**Fri.**	**Sat.**	**Sun.**
a.m. 10:00-11:00	• 15 min warm-up • Sprints: $\frac{20, 30, 40\ m}{\frac{2}{4}, \frac{3}{4}}$ 6	Competition warm-up: 6 throws		Same as Tuesday	Competition warm-up	Competition 10:45	
	• Warm-up: 20 min • Sprints: $\frac{30\ m}{\frac{4}{4}}$ 3 • Technique: • Last 3 strides • 30 throws with baseball • 15 medicine ball throws • 2 × 30 m bounds	• Warm-up: Competition • Throws: • 6 throws 4/4 • 15 throws, 3/4 with short approach • Warm-up: 7 min specific warm-up • Weight training: 30 min • Flexibility: 5 min	Basketball game: 2 × 15 min	Same as Monday	• Warm-up: Competition • Throws: 15 medium approach • Walk & throw: 15 min at different sports in the grass • Relaxation: Special exercises	Basketball game: 2 × 15 min	

Figure 8.17 Competition phase microcycle plan.

Classification of Microcycles Based on Training Objectives and Phase of Training

The structure of the microcycle depends on the training objectives and thus the training phase. From this point of view there are four general microcycle classifications: developmental, shock, recovery–regeneration, and peaking and unloading.

Developmental Microcycles

Developmental microcycles are specific to the preparatory phase of training. The objective is to increase the level of adaptation, improve skills, and develop biomotor abilities. Such cycles could have two or three peaks of medium and high demand. The microcycle can use a step loading or flat loading method, depending on the athlete's classification. Figure 8.18 illustrates a microcycle for the early part of the preparatory phase, presenting training sessions for early adaptation and development.

Shock Microcycle

A shock microcycle contains a sudden increase of training demands beyond those previously experienced. These microcycles may also be considered as planned overreaching (20) or concentrated loading (20-22). A shock microcycle can be characterized by two to four peaks in training demand that most likely occur in the middle and second part of the preparatory phase. A shock microcycle is designed to apply a saturated stimulus that will elevate the athlete's preparedness in subsequent training blocks (16). This type of load will result in a significant level of physiological disturbance, which will facilitate further increases in preparedness and performance (5, 6, 15). However, the greater the training load programmed in a shock microcycle, the longer the delay before performance increases after the athlete returns to normal training loads (16, 19).

An example of a shock microcycle is presented in figure 8.19. In this example a three-peak microcycle has been constructed in which very high training demands are encountered. To facilitate recovery, two recovery days are planned (Thursday and

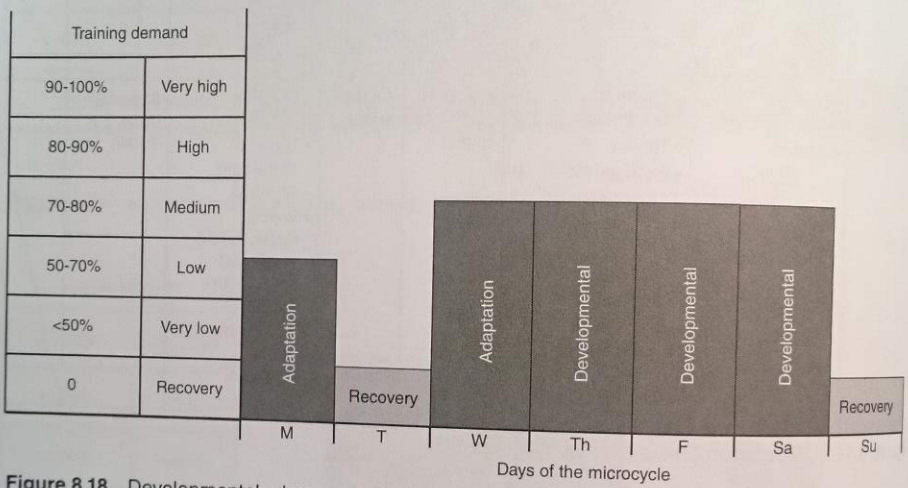


Figure 8.18 Developmental microcycle. The scope or focus of this microcycle is adaptation.

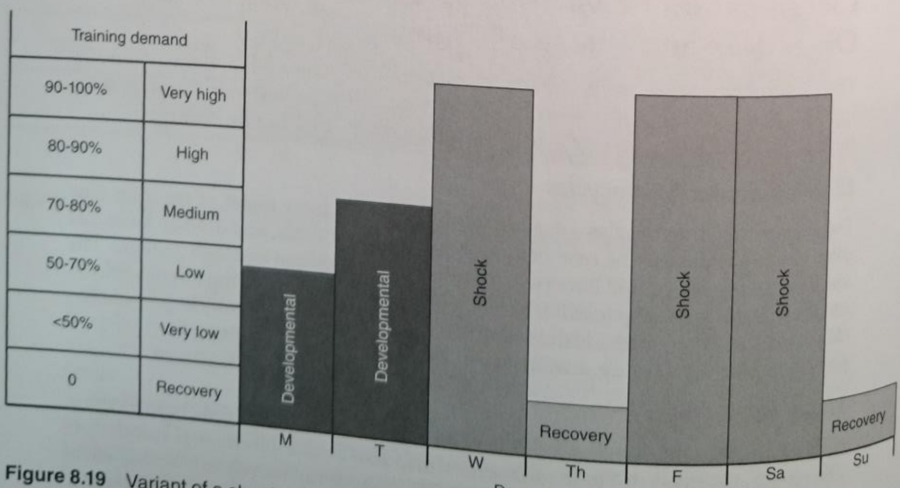


Figure 8.19 Variant of a shock microcycle. A variant of the shock microcycle presented may contain a light recovery training session on Thursday.

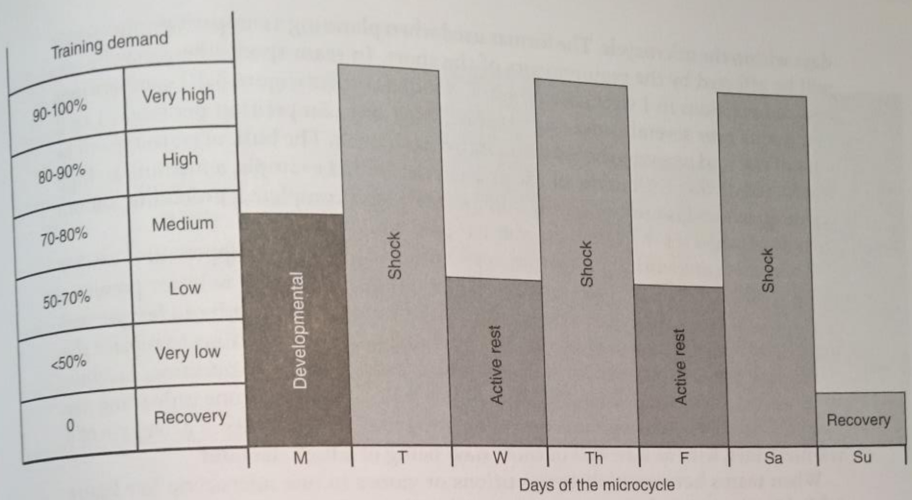


Figure 8.20 Variant of a shock microcycle interspersing high-intensity peaks with lower-intensity active rest.

Sunday). An alternative to this format is to intersperse the high-intensity peaks with lower-intensity active rest or regeneration workouts (figure 8.20). When using these types of cycles, the athlete must allow enough time for preparedness and performance to supercompensate. Therefore, these types of microcycles should not be used immediately before a competition or 2 to 3 weeks after a shock, regeneration, or unloading microcycle, when training intensity should be markedly lower.

Recovery–Regeneration Microcycle

The goal of a regeneration microcycle is to dissipate fatigue and elevate the athlete's level of preparedness, which ultimately will improve performance. This microcycle is marked by a significantly lower training demand, which can be created by decreasing training intensity, volume, or some combination of both. Another approach to using this type of microcycle is to include activities that train similar physiological characteristics as the targeted sport but are different than the typical training activities. The regeneration microcycle elevates performance and decreases the potential for overtraining.

Peaking and Unloading Microcycles

To dissipate fatigue and elevate performance, unloading or peaking microcycles need to be included in the annual training plan. (See chapter 7 for more information on peaking.) This type of microcycle is created by manipulating training demand (volume and intensity) to dissipate fatigue and elevate performance at the appropriate time. The reduction of training demand will result in physiological responses that allow supercompensation to occur.

Microcycle Dynamics During the Competitive Phase

The sequencing of individual microcycles depends on the competitive schedule. Timing of competitions also affects the placement of regeneration and unloading days within the microcycle. The format used when planning a competitive microcycle will be affected by the requirements of the sport. In team sports there may be several competitions in 1 week, whereas in individual sports (figure 8.21) competitions may occur over several consecutive weeks. With one competition per week, 1 or 2 days of rest and recovery should be included each week. The bulk of training will be conducted during the middle of the microcycle. In this example, a medium to high training demand is used. After the bulk of training is completed, unloading should then be planned for the 2 days prior to the next competition.

This basic competitive microcycle can be modified when the opponent is weaker or the competition is of little importance. Such a competition will not present a high physiological challenge, and the subsequent competition-induced fatigue will be markedly less than usual. It may be warranted in these situations to replace the recovery day that is planned for Monday in this example with an additional technical or tactical training session. Additionally, it is likely that only one unloading day would be needed before a minor competition. This schedule results in a net gain of 4 training days, with at least one of those days being of a high demand.

When teams have multiple competitions or games in one microcycle (see figure 8.22), Monday is as a short regeneration session that contains a very low to low training demand. The second session of the microcycle (Tuesday) is a tactical day that is used to elevate performance during the Wednesday competition. On Thursday a regeneration day is planned, and Friday is the only high-demand training session of the microcycle. To elevate performance for the Sunday game, an unloading day is planned for Saturday.

If the competitive schedule is organized over 2 days of a weekend (e.g., team sports tournament or several races in track and swimming) the microcycle can be organized as depicted in figure 8.23. Two unloading training sessions are used on the 2 days (Thursday and Friday) prior to the weekend competition so that fatigue is dissipated and supercompensation of preparedness occurs at the competition. The highest training demand occurs at the beginning of the microcycle (Tuesday), thus progressively decreasing the training demand across the microcycle.

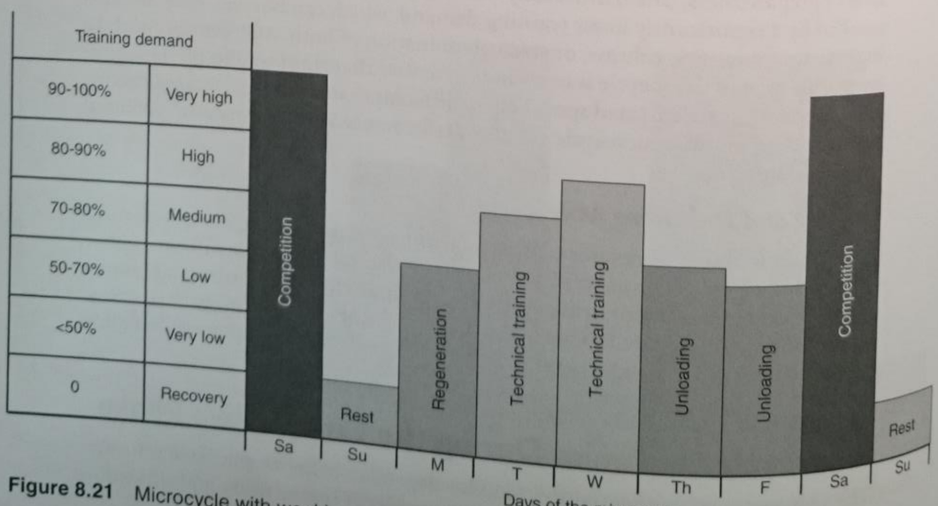


Figure 8.21 Microcycle with weekly competitions.

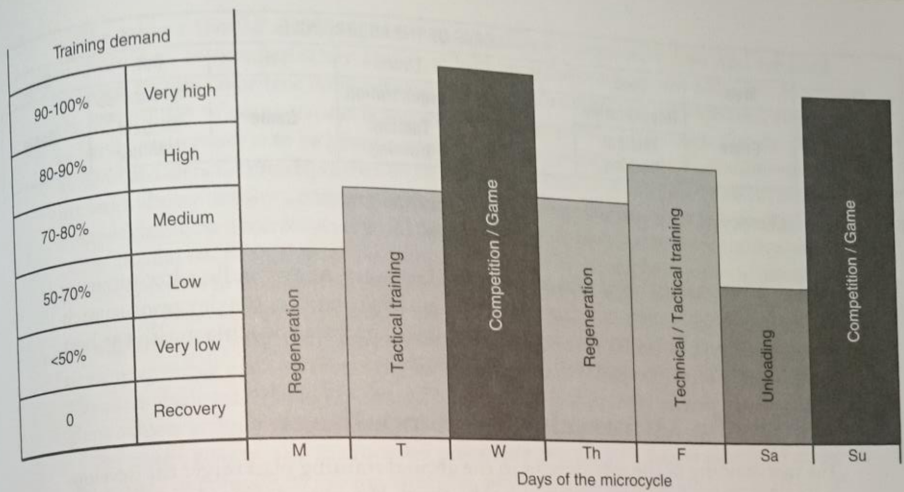


Figure 8.22 Competitive microcycle for a team sport with two games in 1 week.

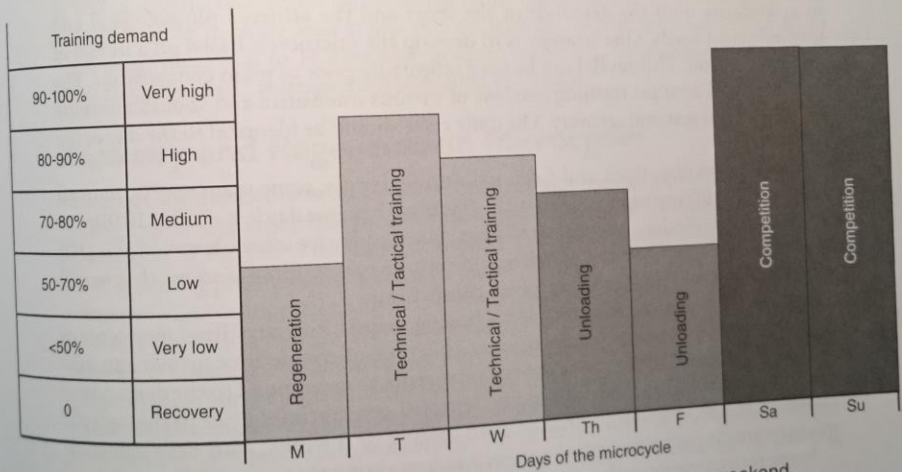


Figure 8.23 Competitive microcycle for a team sport with two games in one weekend.

If the microcycle contains a multiple-day tournament, the coach should plan regeneration activities that may include active recovery (see chapter 5 for information on rest and recovery). Active recovery performed at very low intensities can facilitate lactate removal (10, 13, 17), dampen central nervous system activity (18), and reduce muscle soreness (18). Active recovery should include very low intensities of exercise that do not significantly affect muscle glycogen stores. Tournament play can significantly affect glycogen (9), so glycogen stores must be replenished before the next competitive match. The best method for accomplishing this is to follow a postexercise supplementation regime and ensure adequate dietary intake of carbohydrate between matches (4, 8). A microcycle for a week-long tournament is presented in figure 8.24. Note that the morning after every game includes a very low-intensity

Time	DAYS OF THE MICROCYCLE						
	Mon.	Tues.	Weds.	Thurs.	Fri.	Sat.	Sun.
a.m.	Game	Regeneration	Game	Regeneration	Game	Regeneration	Game
p.m.		Tactical training		Tactical training		Tactical training	

Figure 8.24 Microcycle for a week-long team sport tournament.

regeneration session that is designed to speed recovery. Additionally, a low-intensity tactical training session is planned for the late afternoon on the day prior to each game. A microcycle formatted in this fashion will provide the athlete with the best potential to recover and maximize performance.

Model of a Microcycle for Competition

The vast majority of the microcycles in the annual training plan target the development of skills and abilities required by the sport. However, during the competitive phase, the focus of the training plan shifts to maximizing performance capacity during competition. This is accomplished by modifying the microcycle structure in accordance with the demands of the sport and the athlete's physiological and psychological needs. One strategy is to develop the microcycle based on a model of the competition. This model can be used repeatedly prior to main competition. The model should contain training sessions of various intensities and should alternate between active rest and recovery. The daily cycle should be identical to the day of the competition.

Many sports (e.g., track and field, swimming, tennis, some team sports, martial arts) have qualifying rounds followed by finals in the same day (e.g., Friday 10:00 a.m. and 6:00 p.m.). Models designed to address this competitive schedule would place the main training day on Friday, which would contain two training sessions that would occur at the same times as the targeted competition.

Other sports (e.g., some team sports, boxing, tennis, and wrestling) may contain 3 or 4 days of consecutive competitions. This type of competitive format can also be modeled by modifying the microcycle structure to correspond to the demands of the competition. This model should be repeated several times prior to the contest. However, the model should only be used every 2 or 3 weeks, with developmental microcycles placed between each microcycle containing this competitive model.

Some tournaments such as the Olympic Games, World Championships, or international competitions are organized over 4 to 9 days. It is not feasible to model this competitive format because such a model will create a large amount of physiological stress and significantly affect the time that can be dedicated to training. To prepare for larger tournaments, the athlete should participate in smaller tournaments that last 2 or 3 days and contain four or five competitive efforts. To prepare for these tournaments, the athlete should follow developmental microcycles and daily training structures that contain characteristics of the targeted tournament. It may also be warranted to familiarize the athlete with the competitive schedule by using the competitive model, altering between competition and recovery typically seen in a tournament. It may be recommended that training days that fall on the same day of a tournament involve higher demands, whereas the day after this session should be of lower intensity or contain a recovery session.

The athlete should alternate between simulated competitive days and rest and recovery days to maximize her ability to adapt to the competition schedule. Many athletes do not favor free days between competitions because performance during the second day of competition is sometimes not as good as expected. The decrease in performance seems to be based on postcompetition psychological reactions (such as overconfidence, conceit) rather than an accumulation of fatigue. To facilitate the athlete's ability to tolerate the rest days between competitions, the coach can include competition-based microcycles in all macrocycles contained in the competitive phase of the annual training plan. If the competitive phase is short, the coach can introduce the competitive model during the last part of the preparatory phase.

Although the competitive model can be used to prepare for a major competition, the athlete likely will participate in several additional competitions. Such competitions may occur on a different day of the microcycle than the major competition. The microcycle model usually should not be modified in these situations, especially if the athlete is likely to qualify for the major competition.

The main goal of the microcycles preceding the major competition is to allow the athlete to completely recover from the physiological and psychological stress of training so that peak performance occurs (for more information on peaking, see chapter 7). The athlete can peak by reducing the training load by approximately 40% to 60% across the microcycle (2) before the major competition. Another strategy is to manipulate the training load across two microcycles. In this situation peaking can be accomplished in 8 to 14 days with gradual reductions in training load. Several examples of peaking strategies are presented in chapter 7.

Recovery and Regeneration Microcycles

Elevations in preparedness and performance occur when fatigue is dissipated (19, 20, 24). One might argue that fatigue management is central to the actual training process (20). If fatigue is managed appropriately, a supercompensation effect will occur, elevating preparedness and performance.

Recovery and regeneration can be integrated into a microcycle in several fashions. For example, including rest days, variations in training intensity, and alternative methods of training can facilitate recovery between or within training sessions (20). A regeneration microcycle should be incorporated at the end of a macrocycle. Figure 8.25 presents a classic 4:1 (loading and unloading) step paradigm in which week 4 is an unloading or regeneration microcycle. These microcycles can be structured the same as a training microcycle, but the intensity, density, or frequency of training can be reduced.

Another restoration microcycle structure contains actual training sessions that are designed to stimulate recovery. These sessions can contain a slightly longer warm-up and a relatively short training session consisting of either light work applicable to the sport or complementary activities followed by a series of activities designed to facilitate recovery (see chapter 5 for more details). Table 8.2 gives an example regeneration session and several different regeneration techniques.

Regeneration microcycles are integral parts of the annual plan and are particularly important during the competition phase. During the competition phase of training for many sports, 2 or 3 microcycles can be included that contain a series of competitions. The use of many competitions will increase the amount of fatigue experienced by the athlete. To enable the athlete to tolerate this high amount of physiological and psychological stress, regeneration and recovery microcycle structures should be used.

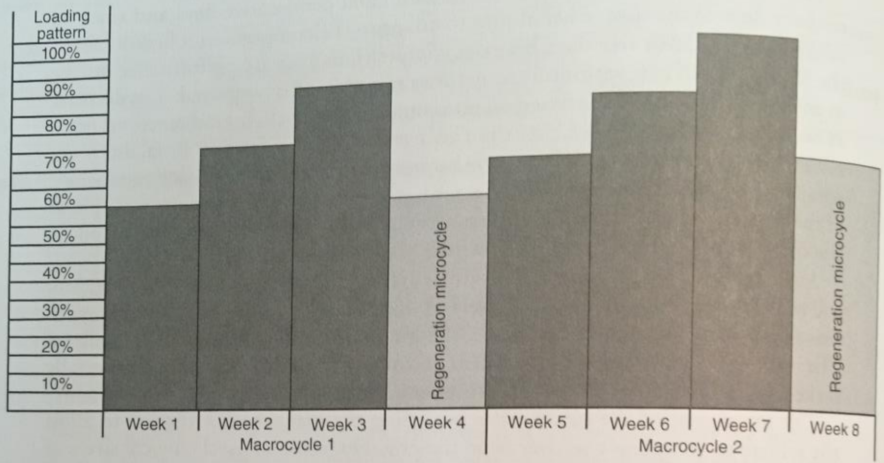


Figure 8.25 Placement of a recovery and regeneration microcycle.

Table 8.2 Regeneration Session

	Description	Duration (min)
Warm-up	General warm-up	10
	Specific warm-up	20
Training session	Low-intensity work from either the sport being trained for or a complementary activity	30
Cool-down	Static stretching	10
Regeneration	Warm water immersion • 37-39 °C for the whole body • 37-40 °C for the legs • 37-45 °C for the arms or hands	10-20
Alternative regeneration techniques	Total body massage	10-20
	Sauna • 60-140 °C; 5-15% humidity	30
	Contrast therapy • Thermotherapy: 37-44 °C • Cryotherapy: 7-20 °C	20 4 1
	Cold water immersion • 12-18 °C	20

An example of a regeneration microcycle is presented in figure 8.26. This microcycle is designed to remove physiological and psychological fatigue, aid in the replenishment of energy substrates, and supercompensate the athlete at the end of the cycle.

Quantifying Training

The coach and athlete should use objective methods to plan training intensities or loads. Too often training programs are based on subjective indicators. In the best-

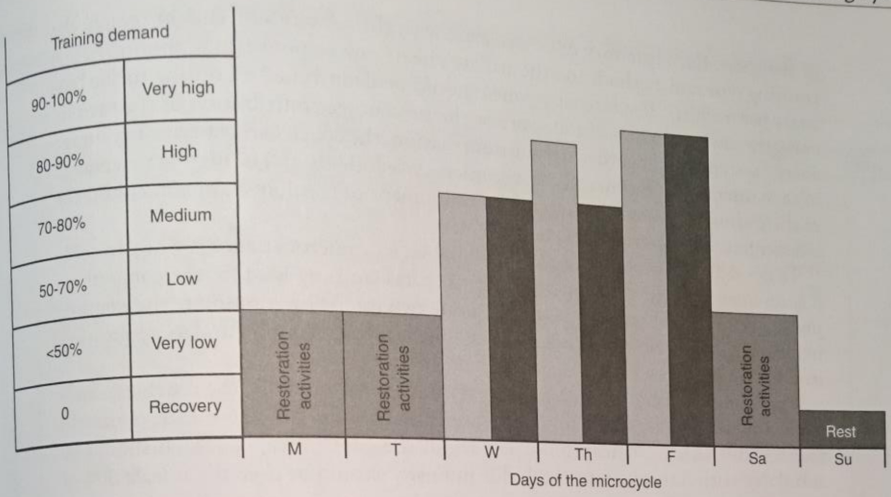


Figure 8.26 Regeneration microcycle.

case scenario the plan alternates heavy training days with easy days throughout the year. In the worst-case scenario, the plan uses a "no pain, no gain" philosophy and the loading or intensity of training is constantly very high, which ultimately leads to overtraining and high levels of fatigue.

Although few coaches quantify the loading parameters contained in their training programs, quantifying training is one of the most important parts of developing a training plan. In individual sports, such as track and field, swimming, and rowing, volume is often quantified using mileage (kilometers or miles per microcycle, macrocycle, or year of training). In the throwing events, volume may be quantified as the number of throws completed in the individual cycles. Intensity may be quantified as distance jumped or thrown, the percentage of maximum speed, or maximal power output or heart rate. In strength training, the volume of training is quantified as the **volume load** or tonnage lifted, whereas intensity is determined by the athlete's maximal strength or **1RM** (see chapter 10 for more information). **Training intensity** and **volume** are rarely quantified in team sports, which makes it difficult for coaches to monitor the athletes' training.

The quantification of training is often a difficult undertaking, which is easier to accomplish when the training program is designed for an athlete with whom the coach is very familiar. The coach should know the athlete's training background, abilities to tolerate physiological and psychological stress, strengths and weakness, and training environment. Because these characteristics are different for each athlete, training programs should not be shared by athletes. Understanding the athlete's needs and abilities is an essential component of designing a training plan. The intensity of training should be planned using established equations, and the volume of training should be quantified.

In all programs, the training intensity throughout the microcycle must be varied to enhance the athlete's physiological adaptation to the training load and stimulate regeneration after a training session. To quantify the training intensity, the coach may identify three to five training intensities based on the physiological demands of the sport. Each intensity must correlate with the activity's rhythm or tempo, the training type and method, and the athlete's heart rate response (plus or minus a few beats per minute). The intensity zones should be determined according to the bioenergetic characteristics of the sport or the percentage contribution of the various energy systems. After gathering this information, the coach can plan the percentage of each intensity level contained in the microcycle (table 8.3). The highest percentage of the training load should target the development of the dominant ability and the bioenergetic characteristics of the sport.

Tables 8.3 and 8.4 show this concept applied in a microcycle for rowing. In table 8.3, intensities 3 and 4 comprise 70% of the total training load for the competitive phase of the annual training plan. The same two intensities dominate the example in table 8.4, which shows the link between the theoretical concept and its application in the training of rowers.

If an objective means of quantifying training does not exist, the coach can subjectively divide skills and training into more difficult (pace of game, race, or match) and less difficult stratifications. The pace of the game, race, or match should be simulated with intensity number 2; this intensity should be used for at least 50% of the training time per week.

Table 8.3 Example of Intensity Zones for Rowing

	INTENSITY ZONES				
	1	2	3	4	5
Characteristics	Speed endurance	Power endurance	Specific racing endurance	Aerobic endurance of medium distance	Aerobic endurance of long distance
Rhythm of activity	Maximum	Very high, greater than the racing rate and rhythm	Rapid, the optimal rhythm and ratios	Moderate, lower than the racing rhythm	Low
Stroke rate	>40	37-40	32-36	24-32	<24
Type of training	Starts and sprints up to 15 s; rest 1.5 min	Repetitions of 250-1,000 m; rest 3-10 min	Races and controlled racing. Interval training of 3-4 min; rest 4-5 min	Long repetitions; variable rate and power. Long-distance rowing with sprints of 30-60 s	Long-distance (steady-state) technique
Heart rate (beats/min)	>180	170-180	150-170	120-150	<120
Bioenergetics (%)					
Anaerobic	80	65	25	1%	5
Aerobic	20	35	75	85	95
Total training volume (%)	10		70		20

Table 8.4 Example of Using Numeric-Based Intensity Zones to Construct a Microcycle for Rowing

Time		MICROCYCLE Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
9:30-11:30 a.m.	Intensity	4	3	5	4	3	4	
	Distribution (km)	24	20	24	24	20	24	
	Training	Long repetitions: 8 × 2 km	Interval training: 10 × 3 min, work/rest ratio 1:1	Aerobic endurance, long distance	Variable rate, variable power	Interval training: 6 × 3 min, work/rest ratio 1:1.5	Aerobic endurance: 3 × 1 min	
16:00-18:00	Intensity	2	4		1	4	2	
	Distribution (km)	20	24		20	24	20	
	Training	Model training: 1 × 250 m, 2 × 500 m, 2 × 1,000 m, 2 × 500 m, 2 × 250 m	Variable rate, variable power		Sprints: 500 total strokes, rest 1.5 min	Long reps: 3 × 6 km, rest 5 min	Model training: 1 × 250 m, 6 × 1,000 m, 2 × 500 m, 2 × 250 m	
	Weight training	Maximum strength	Muscular endurance		Maximum strength	Muscular endurance		

A better quantification system contains five intensities, in which 5 is a low intensity to use for compensation between other intensities or to facilitate supercompensation. An example of a five-category stratification follows:

1. Maximum intensity
2. Higher than the pace of the game, race, or match
3. Pace of the game, race, or match
4. Lower than the pace of the game, race, or match
5. Compensation

In either case, the intensity higher than the pace of the game, race, or match is dominated by anaerobic energy supply, whereas aerobic energy supply dominates intensities that are below game, race, or match pace.

Whether using objective or subjective methods to quantify training, the coach should follow the correct sequence when planning the microcycle. The first step is to plan the intensity zones for each day of the week and indicate this on the training plan (table 8.4). Intensity zones should be chosen for each day of the week to provide variations in intensities, type of work, or energy system targeted. After this step of the planning process is completed, the training plan should be developed (step 2). For the best results, the coach should include several variables of work for each intensity, irrespective of whether this refers to technical, tactical, or physical training. Each plan should include one to three intensity symbols, which means it is possible to train at least two types of work that tax the same energy system. This suggestion is mostly valid for sports of high technical and tactical complexity. An example for a team sport illustrates this sequence. Table 8.5 is an example of a method for quantifying training; whereas table 8.6 is an example of how to plan intensity zones.

Table 8.5 Quantification of Training for Team Sports

	INTENSITY ZONES				
	1	2	3	4	5
Characteristics of training	T: complex; TA: lactic acid tolerance training	T/TA: suicide drills	TA: $\dot{V}O_2max$	T/TA: phosphagen	T: skills: accuracy in shooting, serving, passing
Duration	30-60 s	20-30 s	3-5 min	5-15 s	10 min (several bouts)
Rest interval (min)	3-5	3	2-3	1-2	1
Heart rate (beats/min)	>180	>180	>170	>170	120-150
Bioenergetics (%)					
Anaerobic	80	90	40	90	10
Aerobic	20	10	60	10	90
Total training volume (5)	40		20	20	20

Note: T = technical; TA = tactical. During the rest interval, athletes can practice technical skills of low intensity (e.g., shooting the basketball).

Table 8.6 Example of Alternating Intensities During a Microcycle for a Team Sport

DAY						
Mon.	**Tues.**	**Wed.**	**Thurs.**	**Fri.**	**Sat.**	**Sun.**
3	2	4	3	4	5	
1	5	5	5	1		
5			2	5		

Note: Several intensities are planned for a given day.

Alternating Intensity and Energy System Focus During a Microcycle

Alternating training intensities during a microcycle is one of the most effective methods to prevent exhaustion, staleness, and **overtraining**. The higher the **intensity** or **power** output of the activity, the greater the reliance on anaerobic energy supply (phosphagen, **fast glycolytic**, and **slow glycolytic**). Thus, a plan that modulates the intensity of training will target a specific energy system, thus facilitating recovery and regeneration or stimulating adaptation. The structure of this variation will be dictated by the phase of training (preparatory vs. competitive) and the need to supercompensate a specific energy system prior to competition. This is best accomplished through creating microcycle variations based on the interaction of science and training methodology. A plan that is appropriately varied will greatly increase the athlete's probability of reaching peak performance at the appropriate time.

For most sports, the energy demand of the activity preferentially targets at least two energy systems (12, 20). Although the primary energy system targeted can be isolated, all of the energy systems are active at the same time and the intensity of the activity (i.e., power output) will dictate which energy systems are preferentially targeted (3). Therefore, a high intensity will increase the influence of the phosphagen and fast glycolytic systems, whereas a lower intensity will increase the emphasis on the slow glycolytic and oxidative systems (20). If the competition depletes the athlete's energy reserves, training intensity during the postcompetitive training days should be reduced. Reducing the intensity of training will dissipate cumulative **fatigue**, thus creating a microcycle that induces recovery and regeneration and thus prepares the athlete for subsequent training.

Although it is important to alternate work and regeneration, it is not always necessary for the athlete to be completely recovered for the next bout of training. For example, during the preparatory phase of training, when the major focus is to develop a strong physiological foundation, the athlete will not fully recover and performance will not supercompensate. When the training demand is lowered in later unloading microcycles, the athlete's level of preparedness will be elevated and performance will increase. Therefore, during the preparatory phase of training, the plan can include developmental and shock microcycles without allowing the athlete enough time to remove all of the accumulated fatigue. This process will challenge the athlete's physiological systems and result in greater performance improvements after future unloading microcycles. As a competition approaches, the fatigue generated in the preparatory phase can be reduced by alternating training intensities, thus stimulating physiological adaptations, removing fatigue, and allowing physical parameters to supercompensate.

Alternating the focus on intensity and energy systems can be very difficult with complex sports (such as team sports) in which multiple energy systems play a large role in performance and the technical and tactical skills are very intricate. Such activities can require the athlete to maximize strength, speed, and high-intensity endurance to be successful. Thus, planning involves a conundrum in which many tasks must be trained to meet the demands of the sport without inducing overtraining. The best approach is to vary intensities of training, thus changing the bioenergetic targets of training, to develop multiple facets of the athlete's physiology. A two-step process can be used to vary training intensities in an attempt to target specific energy systems.

The first step is to classify all the skills and types of training according to the energy systems that are taxed. Table 8.7 gives an example of how one might classify skills. Although table 8.7 can be used as a guideline for classifying skills, it may be warranted to systematically classify the skills and biomotor abilities that are germane to the sport. One method for planning the daily training session is to target a specific energy system with all skills and physical training activities. Conversely, the daily session can target one training option and leave the balance of the other activities for other days.

The second step is to plan a microcycle that alternates the training options from table 8.7 to target specific energy systems. The alterations in training loads coupled with appropriate nutrition will allow the athlete to restore energy sources, facilitating physiological adaptations that will eventually increase performance.

In terms of microcycles that alternate energy systems, these types of training cycles are not planned throughout the annual plan. During some phases of training fatigue must be dissipated to stimulate supercompensation, whereas in other phases high levels of fatigue are generated to challenge the athlete's physiology to adapt. Even though the training options are alternated in these microcycles, it is likely that the training demand will create a large amount of fatigue, which will decreases preparedness and ultimately suppress the supercompensation effect.

Several examples of how to manipulate the training demand are presented in this chapter (see the figures in the following sections). Alternating the training demand will challenge the athlete on some training days, which will produce a high level of fatigue, whereas on other days fatigue will be removed in response to a less-challenging training bout. Each sample microcycle contains a diagram of the dynamics of fatigue or supercompensation in response to various training sessions.

Team sports are very complex, and a single training session for these sports will stress multiple energy systems as well as the neuromuscular system (technique, maximum speed, strength and power). Figure 8.27 gives an example of how the microcycle can be varied. Monday's session taxes the neuromuscular, phosphagen, and glycolytic

Table 8.7 Classification of Skills and Physical Training for Alternating Energy Systems

ENERGY SYSTEM					
Phosphagen		**Glycolytic**		**Oxidative**	
Technical skills	1-10 s	Technical skills	10-60 s	Technical skills	Long duration
Tactical skills	5-10 s	Tactical skills	10-60 s	Tactical skills	Medium to long duration
Maximum speed		Speed training	10-60 s	Aerobic endurance	
Power training	Short duration	Power endurance		Muscle endurance	Medium to long duration
Maximum strength	1-2 sets with long rest intervals	Muscle endurance			

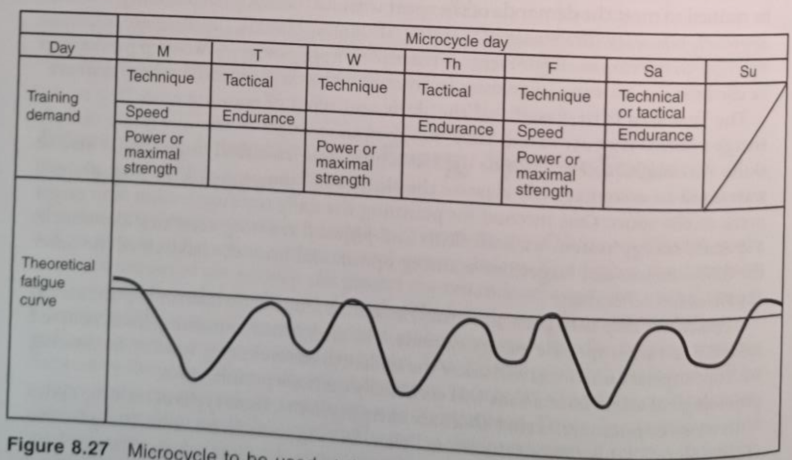


Figure 8.27 Microcycle to be used at the end of the preparatory phase of training for a team sport.

energy systems. Activities involving speed, power, and maximum strength training performed for short durations rely on ATP-PCr as fuel. However, a large volume of these activities can cause significant glycolytic stress and can deplete glycogen stores. Depending on the volume and intensity of training, the rate of recovery from Monday's workout should be relatively quick, allowing the athlete to perform Tuesday's training session without much fatigue.

In a traditional plan in which the athlete experiences high levels of physiological stress almost every day, the demanding session occurring on Monday in figure 8.27 could nearly deplete the glycogen stores and produce a high level of accumulated fatigue. Alternating training intensities may help the athlete better manage this fatigue. For example, in figure 8.27 Monday is a training day with a high amount of physiological stress, whereas Tuesday's training session contains tactical and endurance training performed at a much lower intensity. The remainder of the microcycle alternates training stressors that modulate fatigue (or preparedness).

Another example of how one might alternate training stressors during a microcycle is presented in figure 8.28. This figure presents a hypothetical model for a sport in which speed and power are dominant. Speed and power training occurs on the same day as power endurance training, which is marked by repeating power exercises 10 to 25 times per set. Two high-intensity training days in which the phosphagen and glycolytic systems are taxed precede a training day that focuses on tempo training and the development of endurance.

Figure 8.29 is a microcycle for a sport that is dominated by aerobic endurance capacity and thus relies predominantly on **oxidative metabolism**. The training options in this plan tax the same energy system in the same day. The plan simultaneously includes types of strength training specific to endurance sports that tax the energy system on the particular day. Consequently, muscular endurance or high-volume (many repetitions) strength training is performed after the endurance training bout. Higher-intensity activities (maximal strength or power endurance training) occur on days that specifically tax the phosphagen and glycolytic systems. This type of targeted training is sometimes termed ergogenesis or ergogenic training.

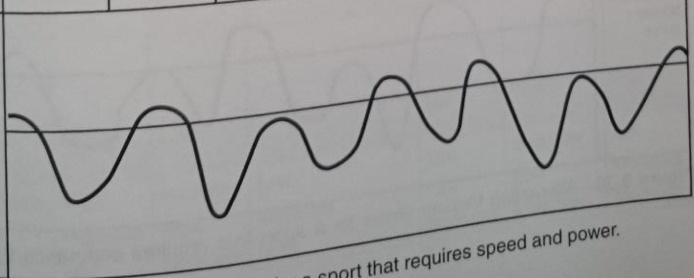
	Microcycle day						
Day	M	T	W	Th	F	Sa	Su
Training demand	Technical	Speed	Tempo	Technical	Speed	Tempo	
	Maximum strength	Power or power endurance	Tactical	Maximum strength	Power	Tactical	
						Power endurance	
Theoretical fatigue curve							

Figure 8.28 Alternating training stress for a sport that requires speed and power.

Figure 8.30 shows a microcycle structure for an endurance sport in which competition lasts between 4 and 6 min. In this example, high-intensity endurance that stresses both the phosphagen and glycolytic systems is important for a successful performance. Days that target the development of high-intensity endurance (i.e., produce significant glycolytic stress) are followed by low-intensity aerobic work that is used as a compensation activity. The goal is to develop the ability to produce high levels of lactic acid formation and then buffer this lactic acid and remove it quickly, inducing a faster recovery rate. In this example, days that follow high-intensity inter-

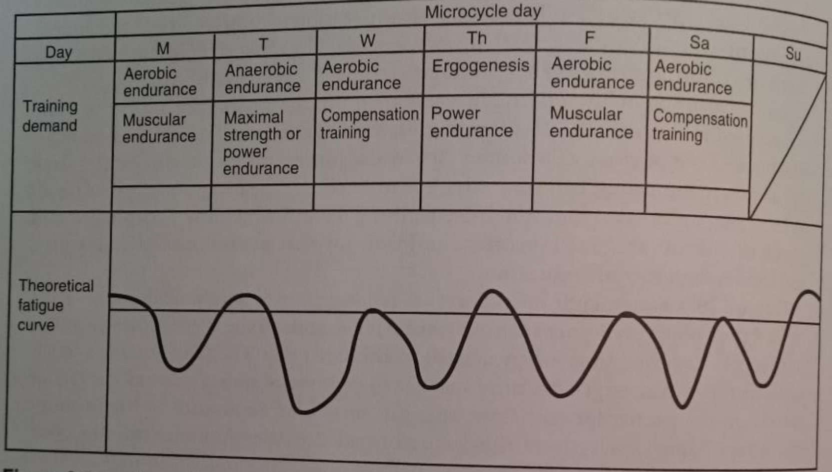


Figure 8.29 Alternating training stress for a sport that requires endurance.

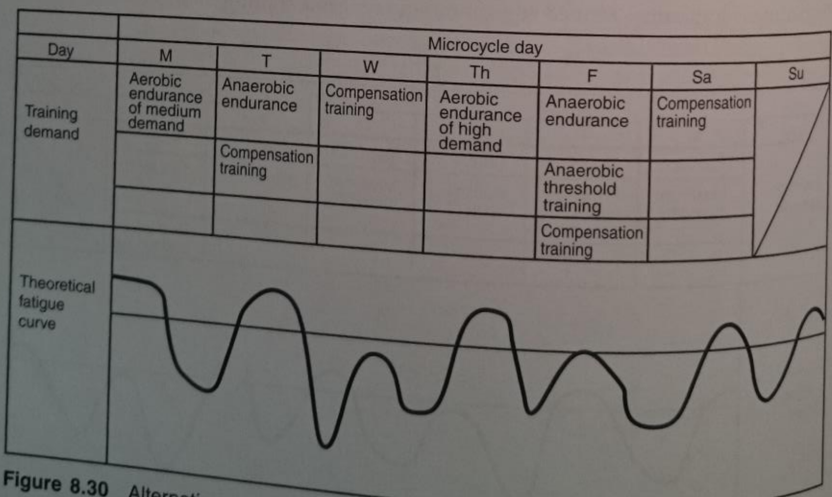


Figure 8.30 Alternating training stress for a sport that requires endurance for 4 to 6 min.

Dates	Months	October				November				December					January				February				March				
	Weekends	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31
Calendar of competitions	Domestic														■												
	International																■		■		■			■			
	Location																Oregon		NY		LA			Worlds			
Periodization	Phase	Preparation phase 1															Competition phase 1								Transition 1		
	Subphase	General preparation						Specific preparation								Precompetition.			Main competition						Transition		
	Strength	Anatomical adaptation					Maximal strength									Power						Maintenance			Anatomical adaptation		
	Endurance	Tempo						Speed endurance development								Maintenance of speed endurance									Tempo		
	Speed	Technique work						Foundation speed development								Maximum speed development									Technique work		

Dates	Months	April				May				June				July					August				September				
	Weekends	7	14	21	28	6	12	19	26	2	9	16	23	30	7	14	21	29	4	11	18	24	1	9	17	24	
Calendar of competitions	Domestic						■																				
	International								■		■		■		■		■		■				■				
	Location										Seville		Moscow		Berlin		Oslo		Zurich				Tokyo				
Periodization	Training phase	Preparation phase 2							Competition phase 2															Transition 2 Other activities			
		General preparation			Specific preparation				Precompetition			Main competition															
	Strength	Anatomical adaptation		Maximal strength						Power									Maintenance								
	Endurance	Tempo		Speed endurance development									Maintenance of speed endurance														
	Speed	Technique work		Foundation speed development									Maximum speed development														

Figure 12.5 Periodization model for a sprinter.
Adapted from W.H. Freeman 2001 (33).

Dates	Months	May			June				July					August				September				October				
	Week starting	12	19	24	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	29	6	13	20	27
	Competitions																									
Periodization	Training phase	Preparation phase 1															Competition phase 1									
	Subphase	General preparation				Specific preparation								Precompetition			Competitive									
	Macrocycles	1				2								3			4			5		6				7
	Microcycles	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Strength training	Primary focus	Strength endurance				Maximal strength				Power					Technique		Maintenance									Peaking
	Sessions	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	2	2	2	2	2
	Strength endurance	M	H	H	M	M	M	L	-	H	L	L	L	-	-	-	L	L	L	H	H	L	L	L	-	-
	Strength	M	M	M	M	H	H	H	M	M	M	M	M	L	L	L	L	M	L	M	M	L	L	L	L	L
	Power	L	L	L	L	L	M	M	L	-	H	H	H	M	L	M	M	M	L	L	L	M	M	M	M	M
	Speed	-	-	-	L	L	L	L	M	-	L	M	M	H	H	H	M	M	H	M	M	M	M	M	M	H
Endurance, speed and agility, technical, and tactical training	Primary focus	SA and SA endurance				SA endurance				Endurance					Tactics		Tactics, maintenance, and recovery									
	Endurance	L	L	L	L	M	M	M	M	H	H	H	H	M	M	M	L	L	L	M	M	L	L	L	L	L
	Speed and agility Endurance	M	M	M	M	H	H	H	M	M	M	M	M	M	L	L	L	L	L	M	M	L	L	L	L	L
	Speed and agility	M	M	M	M	L	L	L	M	L	L	L	L	L	M	M	L	L	L	L	L	L	L	L	L	L
	Technical	M	M	M	M	M	M	M	M	L	M	M	M	M	L	L	L	L	L	L	L	L	L	L	L	L
	Tactical	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	M	M	M
	Recovery	L	L	L	M	L	L	L	M	L	L	L	L	M	L	L	M	M	M	L	M	M	H	M	H	M

Figure 12.6 Annual training plan for an American university soccer team.

Dates	*Months*	*November*				*December*				*January*					*February*				*March*					*April*			
	Week starting	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27
	Competitions	■	■																■		■	■	■	■	■	■	■
Periodization	Training phase	Competition phase 1		Transition phase 1		Preparation phase 2													Competition phase 2								
	Subphase	Comp.		Transition		General preparation								Specific preparation				Precompetitive			Competitive						
	Macrocycles	7		8		9						10				11				12	13				14		
	Microcycles	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Strength training	Primary focus	Peaking		Recovery		Technique		Strength endurance				Maximal strength								Recovery	Power				Speed		
	Sessions	2	1	0	0	2	2	3	3	3	3	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3
	Strength endurance	-	-	-	-	M	M	H	H	H	M	M	M	M	L	M	L	M	H	-	M	L	L	-	-	-	-
	Strength	L	-	-	-	L	M	M	M	M	L	H	H	H	M	H	H	H	M	-	M	M	M	L	L	L	L
	Power	L	L	-	-	-	-	-	L	L	-	L	M	M	L	M	M	M	L	-	H	H	H	M	M	M	M
	Speed	H	M	-	-	-	-	-	-	-	L	-	-	L	M	L	L	M	M	-	M	M	L	H	H	M	H
Endurance, speed and agility, technical, and tactical training	Primary focus	Maintenance		Recovery		Endurance development						Speed and agility			Speed and agility endurance				Recovery and tactical		Speed and agility						
	Endurance	M	L	-	-	H	H	H	M	M	L	-	-	-	L	L	-	-	-	-	-	-	-	-	-	-	-
	Speed and agility endurance	M	L	-	-	L	L	M	M	L	M	M	L	L	M	H	H	H	L	-	L	M	L	L	L	-	-
	Speed/agility	L	L	-	-	-	-	-	L	L	L	M	H	H	M	M	L	L	-	-	-	M	H	H	M	H	H
	Technical	L	L	-	-	M	M	M	M	M	L	H	H	H	L	M	M	L	L	-	L	M	M	M	H	H	H
	Tactical	H	M	-	-	L	L	L	L	L	L	L	L	L	M	M	H	H	H	-	H	M	M	M	L	L	L
	Recovery	H	H	H	H	L	M	M	M	H	H	M	M	M	H	M	L	L	H	-	H	M	M	M	H	M	H

Figure 12.6 *(continued)* Annual training plan for an American university soccer team.
Note: H = high emphasis; m = moderate emphasis; L = low emphasis, - = not trained; SA = speed and agility
Adapted from Gray and Stone 2008 (38).

Month	Macrocycle	Weeks	Emphasis	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
May	1	1-3	Strength training	ST	ST		ST	ST		
			Speed and agility		SA			SA		
			Speed endurance	SE			SE			
			Special endurance							
June	2	4-7	Strength training	ST		ST		ST		
			Speed and agility		SA		SA		SA	
			Speed endurance	SE		SE		SE		
			Special endurance							
July	3	8-10	Strength training	ST	ST		ST	ST		
			Speed and agility		SA			SA		
			Speed endurance							
			Special endurance	SPE		SPE		SPE		
	4	11-14	Strength training	ST		ST		ST		
August			Speed and agility		SA		SA		SA	
			Speed endurance							
			Special endurance	SPE		SPE		SPE		

Figure 12.8 Microcycle structure for a 14-week sequenced preparation phase of training plan for university or professional American football.

ST = strength training; SA= speed agility, SE= speed endurance, and SPE= special endurance. On days when multiple activities are scheduled, the activities must be separated so that one factor is addressed in a morning session and the other at least 4 hr later. If time constraints dictate that both factors must be trained in the same session, the priority item should be addressed first. On days when SA and ST occur, the ST generally for this session focuses on upper-body activities.
Adapted from Plisk 2008 (91) and Haff et al. 2004 (39).

SUMMARY OF MAJOR CONCEPTS

The development of speed, agility, and speed endurance is important for the majority of sports, so these important sport performance characteristics must be integrated into the periodized training plan. Long-distance training methods will impede the development of both speed and agility and should be avoided when attempting to maximize these performance abilities. Both maximal strength and power are important characteristics, which emphasizes the need for an integrated strength training program for athletes who are attempting to maximize speed performance.

Some very specific movement mechanics are essential to maximizing an athlete's speed of movement (see Plisk 91) and facilitate change-of-direction activities. Although speed plays a role in change-of-direction performance, change-of-direction or agility activities must be included in the periodized training plan. Simply practicing straight-line running will not significantly improve agility. Many athletes spend large amounts of time performing straight-line training tasks, but it may be warranted to use more change-of-direction tasks that emphasize acceleration, deceleration, changes in direction, and reacceleration activities. It also may be warranted to include the implements used in competition (e.g., soccer ball, basketball).

Chart of the Annual Plan

Type: Year: Coach:

Athlete's name	Training objectives					
	Performance	Tests/Standards	Physical prep	Technical prep	Tactical prep	Psychological prep

Dates	Months																																																				
	Weeks																																																				
Competitions	Domestic																																																				
	International																																																				
	Location																																																				
Periodization	Training phase																																																				
	Strength																																																				
	Endurance																																																				
	Speed																																																				
	Psychological																																																				
	Nutrition																																																				
	Macrocycles																																																				
	Microcycles	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Peaking index																																																					
Testing dates																																																					
Medical control dates																																																					
Camp/Semicamp																																																					

Training factors	%	Peaking
Volume	100	1
Intensity	90	2
Peaking	80	3
Phys prep	70	4
Tech prep	60	5
Tact prep	50	
Psych prep	40	
	30	
	20	
	10	

From T.O. Bompa and G.G. Haff, 2009, *Periodization: Theory and methodology of training* 5th ed. (Champaign, IL: Human Kinetics).

Chart of the Annual Plan

Type: Year: Coach:

Dates	Months	
	Weeks	
Competitions	Domestic	
	International	
	Location	
Periodization	Training phase	
	Strength	
	Endurance	
	Speed	
	Psychological	
	Nutrition	
	Macrocycles	
	Microcycles	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Peaking index		
Testing dates		
Medical control dates		
Camp/Semicamp		

Training factors	%	Peaking
Volume	%100	1
Intensity	90	2
Peaking	80	3
Phys prep	70	4
Tech prep	60	5
Tact prep	50	
Psych prep	40	
	30	
	20	
	10	

From T.O. Bompa and G.G. Haff, 2009, *Periodization: Theory and methodology of training* 5th ed. (Champaign, IL: Human Kinetics).

Chart of the Annual Plan

Type: Year: Coach:

Athlete's name	Training objectives					
	Performance	Tests/Standards	Physical prep	Technical prep	Tactical prep	Psychological prep

Dates	Months	
	Weeks	
Competitions	Domestic	
	International	
	Location	
Periodization	Training phase	
	Strength	
	Endurance	
	Speed	
	Psychological	
	Nutrition	
	Macrocycles	
	Microcycles	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Optional exercises		
Skill acquisition		
Routines		
Peaking index		
Testing dates		
Medical control dates		
Camp/Semicamp		

Training factors	%	Peaking
Volume	%100	1
Intensity	90	2
Peaking	80	3
Phys prep	70	4
Tech prep	60	5
Tact prep	50	
Psych prep	40	
	30	
	20	
	10	

From T.O. Bompa and G.G. Haff, 2009, *Periodization: Theory and methodology of training* 5th ed. (Champaign, IL: Human Kinetics).

Chart of the Annual Plan

Year: Coach:

Dates	Months																																																				
	Weeks																																																				
Competitions	Domestic																																																				
	International																																																					
	Location																																																				
Periodization	Training phase																																																				
	Strength																																																				
	Endurance																																																				
	Speed																																																				
	Psychological																																																				
	Nutrition																																																				
	Macrocycles																																																				
	Microcycles	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Peaking index																																																					
Testing dates																																																						
Medical control dates																																																						
Camp/Semicamp																																																						
Training factors: ···· Peaking; — Volume (km/wk); **** Speed (% of mx.)	Peaking 1																																																					
	Peaking 2																																																				
	Peaking 3																																																				
	Peaking 4																																																				
	Peaking 5																																																				

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Chart of the Annual Plan

Year: Coach:

Dates	Months																																																				
	Weeks																																																				
Competitions	Domestic																																																				
	International																																																				
	Location																																																				
Periodization	Training phase																																																				
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Peaking index																																																					
Testing dates																																																					
Medical control dates																																																					
Camp/Semicamp																																																					

Training factors		Peaking
	Peaking (dotted line)	1
	Volume (solid line)	2
	Intensity (grey dashed line)	3
		4
		5

Training factors		Peaking
	Peaking (dotted line)	1
	Volume (solid line)	2
	Intensity (grey dashed line)	3
		4
		5

Training factors		Peaking
	Peaking (dotted line)	1
	Volume (solid line)	2
	Intensity (grey dashed line)	3
		4
		5

From T.O. Bompa and G.G. Haff, 2009, *Periodization: Theory and methodology of training* 5th ed. (Champaign, IL: Human Kinetics).

	Objectives			
Year	20	20	20	20
Performance				
Physical preparation				
Technical preparation				
Tactical preparation				
Psychological preparation				
Tests and standards				
Training factors: Volume; Intensity; Peaking; Phys prep; Tech prep; Tact prep; Psych prep — %100, 90, 80, 70, 60, 50, 40, 30, 20, 10				

From T.O. Bompa and G.G. Haff, 2009, *Periodization: Theory and methodology of training* 5th ed. (Champaign, IL: Human Kinetics).