WHEEL INTO FITNESS

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1990

CHAPTER OUTLINE

LEARNING OBJECTIVES

1. To provide perspective on the value of a fitness approach in rehabilitation

2. To explain the concept of fitness training

3. To inform and encourage health care professionals to utilize a fitness approach in rehabilitation

4. To describe different approaches to fitness for the everyday user and for the elite athlete, a more progressive approach.

DISABLED, WHY KEEP FIT?

Physically disabled people are no exception to the general population when it comes down to Physical Activity, neither should they be treated differently in their daily life. There are more similarities than differences.

Everyone, including physically disabled people, can benefit from regular participation in challenging physical activity. Regular exercise helps to reduce obesity and the risks of heart disease associated with an inactive lifestyle.

When exercise programs for disabled persons incorporate daily activities, such as transferring, going up and down curbs, and performing "wheelies", participants are able to improve wheelchair skills/techniques, in addition to general personal fitness levels. This combination of fitness and skill training works to improve the overall INDEPENDENCE of each participant.

When this type of exercise training is incorporated within the inpatient's rehabilitation program it serves to complement the total rehabilitation process. Continued fitness/exercise training on an outpatient or community basis, enables physically disabled persons to maximize their levels of independence.

Why is Exercise Training Important for Disabled Persons?

A majority of the spinal cord injury population, in North America, are physically inactive. Frequent and regular exercise increases the workload of the cardiovascular and muscular endurance. As the cardiovascular circulation improves. People feel better, tire less easily and have more reserve energy.

- The most common cause of death for spinal cord injured persons is cardiovascular disease (Lee and Price, 1982), which is now the same as for the general population.

- Modern health care has greatly reduced previously fatal complications and persons with Spinal cord Injuries are living longer lives.

- Regular daily activities do not provide a training effect for the wheelchair user.

In the early years of sport for the disabled, both athletes and coaches tended to be interested volunteers who had limited knowledge and expertise in the field. Today, built on their enthusiastic foundation, the field has developed to the point where specialized fitness instructors and/or coaches are required to help disabled persons reach their potentials. These professionals must be educated in areas of fitness and physical activities specific to physically disabled persons.

Benefits are not only mobility related. Eating right and keeping fit enhances both physical and mental health. Higher energy levels, working off stress and gaining more confidence enable people, again including those with disabilities, to enter more freely into new situations and activities, and therefore the mainstream of life.

Attitude is the real key to independence and fitness is one way to get it. As cited in Kelley and Frieden (1989), the motto of the National Handicapped Sports and Recreation Association. explains much of the appeal of fitness activities for people with disabilities " If I can do this, I can do anything".

Despite the fact that most mobility impaired individuals expend more energy than their able-bodied counterparts going about their daily lives, these activities tend to increase frustration levels and have an accumulative tiring effect. Think of the effort just to wheel several blocks downtown, negotiating curbs, and other people, for example.

Non-paralyzed muscles must work harder to compensate for limitations. (To demonstrate this principle, just ask a veteran quadriplegic person to demonstrate arm strength some time !). The natural process of aging also takes its toll, and more aggressively than for the able-bodied population.

- Kelly and Frieden (1989) explain that: " For these reasons, disabled people often become more sedentary and avoid strenuous activity, gradually become less fit and less involved in community life. Because until recently few schools or community centers offered programs of vigorous exercise for people with disabilities, many disabled people have never experienced the pleasure of being physically fit.

The loss of fitness resulting from inactivity - and the reduction of associated social interaction - can in itself be disabling. Inactive disabled persons tend to have less cardiovascular endurance, higher body weight and higher percentages of body fat than either their more active counterparts or disabled athletes (Fersterman-Normansell, 1986).

A "Fit" paraplegic is in average 25 lbs lighter in body weight then an "Unfit" paraplegic (Eriksson-Lofstrom- Ekblom, 1988).

For health care professionals not directly involved in fitness and sport programs, it is important to fully understand the value of such activity and participate in supporting such programs. Over and over again, it is evident that participation in and enjoyment of such activities will, among other values, open the doors and increase a person's readiness to learn. The desired outcomes of formal rehabilitation are enhanced. In fact, post-discharge wheelchair athletes are more successful at avoiding medical complications than non-athletic persons with spinal cord injuries so involvement is important.

There are essentially two basic levels of participation in physical activity which lead to improved performance and independence.

- Exercise training for fitness benefits in a non-competitive environment (examples, aerobics, aquacize, free wheeling).

- Specialized training over several years for development of recreational or elite athletes.

Each person must decide the level at which they wish to participate, since degree of commitment varies dramatically takes considerable more time to be an elite athlete.

DEVELOPING A FITNESS PROGRAM

Pre-Planning Considerations

Before the actual planning of an exercise or fitness program can begin, several factors must be considered by a participant and the instructor/coach. These factors include:

- Medical/health status. The individual must receive a doctor's permission to exercise prior to participating in a physical activity program. This determines if a prescribed exercise program would be contraindicated to the participant's level of health/ fitness. This serves as a protection for the Spinal Cord Injured person as one should not start their training with a previous injury that has not propel healed. These injuries may then be exacerbated by vigorous exercise, thereby impacting daily living.

- Equipment and facilities. Identify equipment needed and available to participate in the training program (i.e., resistance training equipment, special gloves). Wherever possible, wheelchair accessible facilities and equipment should be chosen since less assistance a participant requires for getting in and out of the facility, and on and off of equipment, the greater the level of independence and convenience.

- Instructor/coach. In the ideal situation, the participant will have access to a qualified individual who can assess, prescribe, implement, and monitor physical activity programs to meet participant's needs, interests, capabilities, and limitations.

- Time. Amount of time participant is able to commit to exercise training must be determined. A minimum of three, thirty minute workouts per week are required for positive training effects. Athletes must be prepared to devote at least ninety minutes of quality training per day in order to experience improved performance.

Note: Even if a participant has a lot of time to train, a progressive program to avoid overtraining must be followed; that is appropriate amount of rest between training workouts must be included.

- Type and level of disability. The participant's type and level of disability has a significant effect upon expected levels of performance. Potential is maximized if participants are familiar with physiological abilities and limitations of disability. This can be accomplished by consulting with the interdisciplinary rehabilitation team members and coach, and by reading available literature.

- Short and long term goals. Goals must be identified to ensure that instructor/coach and participant are striving for the same outcomes. When realistic goals are agreed upon, commitment to activity is usually much greater and therefore, success is more likely to occur. Short-term goals might be to lose weight, able to wheel a mile without a break or be able to do transfers to the floor from the wheelchair or vice versa. Whereas a long-term goal might be to become a recreational athlete, or to wheel a longer distance without rest for example 10 miles constant wheeling.

These factors may be affected by....

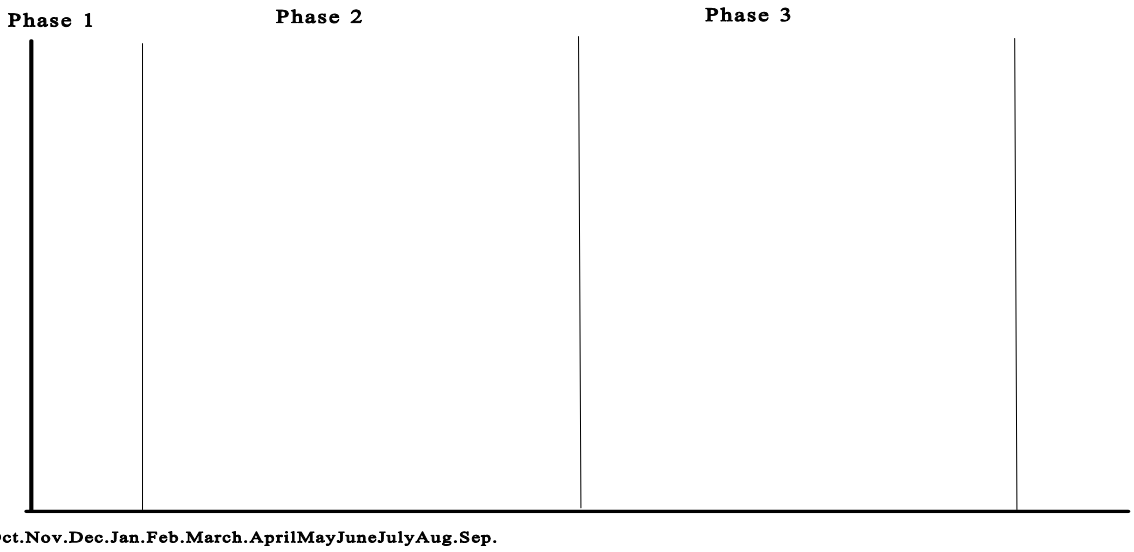
- support given to participant by family and friends;
- sport and exercise history of participant before injury;
- availability of a training partner; and
- participant's financial situation.

The Training Year

Three primary/macro phases exist within the training year (Fig. 1).

These phases are further divided into secondary/micro periods. Thus, it is this system of sub programs which prepares the participant for a greater level of fitness and/or peak athletic performances. By utilizing micro periods, the participant is also able to make workouts more exciting.

Phase I - Weeks 1 - 6



For a track athlete, this period would normally occur from October to mid-November. For the beginning fitness enthusiast, this is time to become familiar with different training methods and to learn different weight training techniques. Essentially, it is an introductory period. The athlete or person who has been active for more than a year, often takes this time to participate in different activities which develop strength and maintain their basic aerobic fitness levels, that is, take an active rest.

Phase II - Weeks 7 - 26

This phase may occur from about mid-November to the end of April for the participant. During Phase II, aerobic training predominates early in the period and is then followed by anaerobic activities. Development of a good recovery system also occurs at this time.

Phase III - Weeks 27 - end of competitive season.

For the track athlete, this would normally continue from the beginning of May to the end of September. Phase III period includes a time of reaching peak performances and competition for the athlete.

For the non-athlete, this is a good time to measure progress/success by conducting fitness

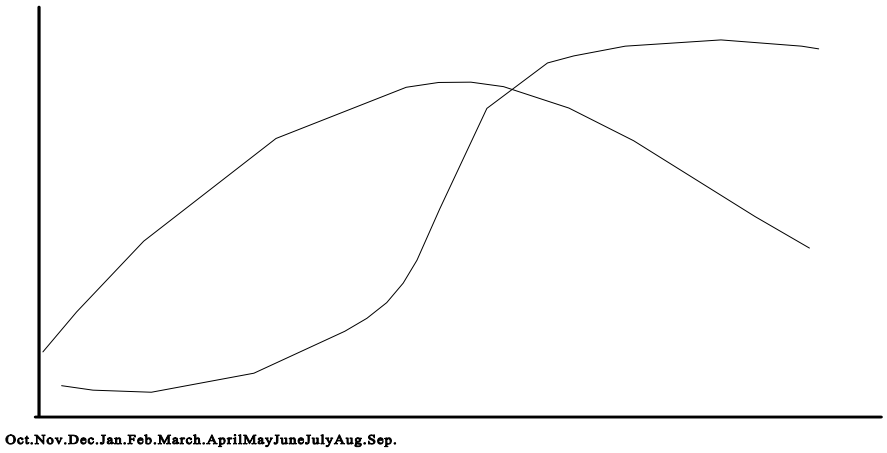
and performance tests. This is also the time to experience more intense workouts and introduce new activities for training variations.

It is important to maintain training gains (overload) throughout the year.

During Phases I and II, workouts are geared to quantity of training volume increases while intensity remains low. The participant increases the duration of workouts progressively (i.e., distance or time) while maintaining a relatively slow speed.

Phase III is spent performing quality training whereby speed and intensity are increased and volume is decreased. Since shorter distances comprise quality workouts, a natural increase in speed occurs.

Quality



Quantity

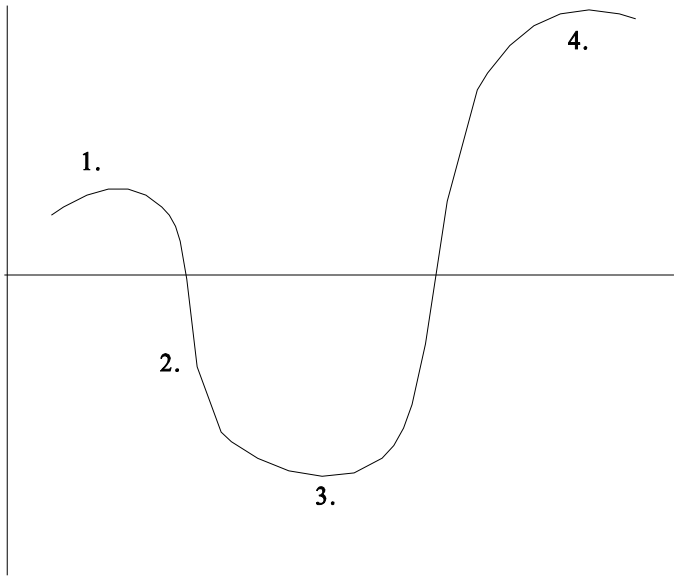
Figure 2
Changes in Training Intensity (quality) and

Volume (quantity) from September to August.

THE PRINCIPLE OF SUPERCOMPENSATION.

Supercompensation is an underlying principle of training program design for today's participant. This method of exercising avoids overtraining and yet maximizes workout benefits. The key to Supercompensation is to allow adequate rest between subsequent workouts. This rest period is important for the body to be able to replenish the working cells.

Four elements of the Supercompensation principle includes:



(1) The participant performing an initial workout.
(2) During the workout the participant becomes exhausted.
(3) Participant rests and recovers.
(4) Performance improves.

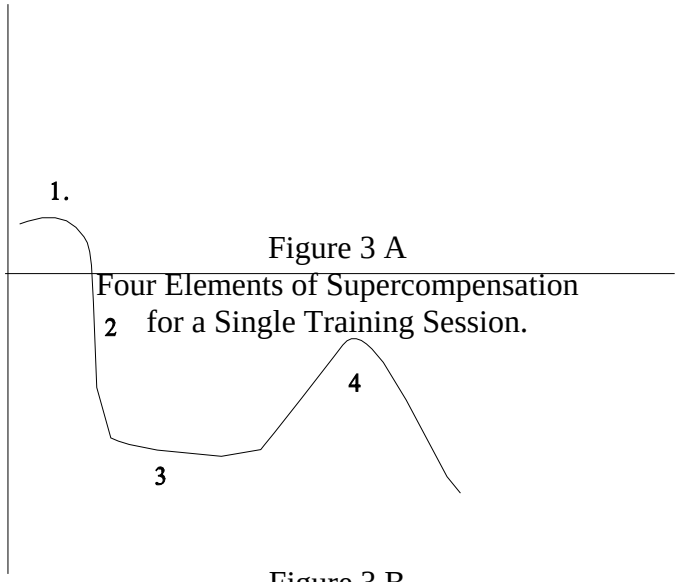


Figure 3 A
Four Elements of Supercompensation
for a Single Training Session.

Figure 3 B
Reduced Effect of Supercompensation
With An Extended Rest Period.

The following occur when Supercompensation is performed with an extended rest period.

(1) The participant performs an initial workout.

(2) During workout, participant becomes exhausted.

(3) Participants have too long rest and recovery.

(4) Performance deteriorates.

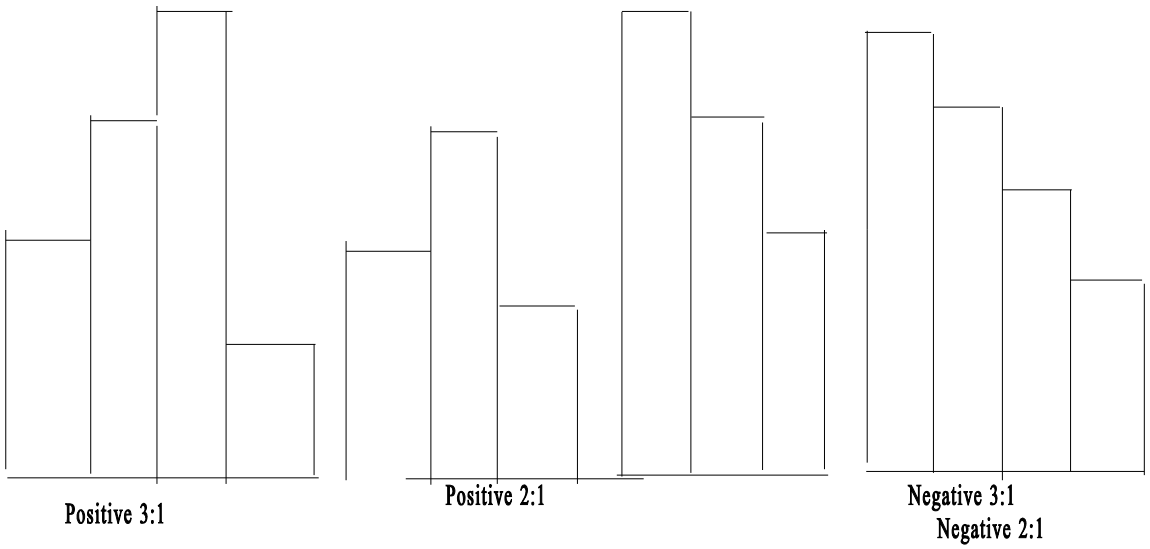
It is essential that balance between workload and rest be optimized to promote improved performance levels. If rest periods are too long, there will not be an increase in performance levels. (e.g., If Resistance training is utilized only once a week there would be too long of a rest period between each training session and consequently no training effect from this type of training.)

Figure 4
Four Different Approaches of Supercompensation.

Figure 5 depicts several approaches to super- compensation. Each block may represent a single workout, a week of exercising or a month of training.

- Positive approaches indicate a progressive increase in training quality, followed by a recovery period.

- Negative approach refers to a decrease in intensity followed by the recovery period. Recovery periods are not complete rests but instead are for quality training - a reduced intensity, extended over a longer duration, and for quantity training - reduced duration for a more intense workout.



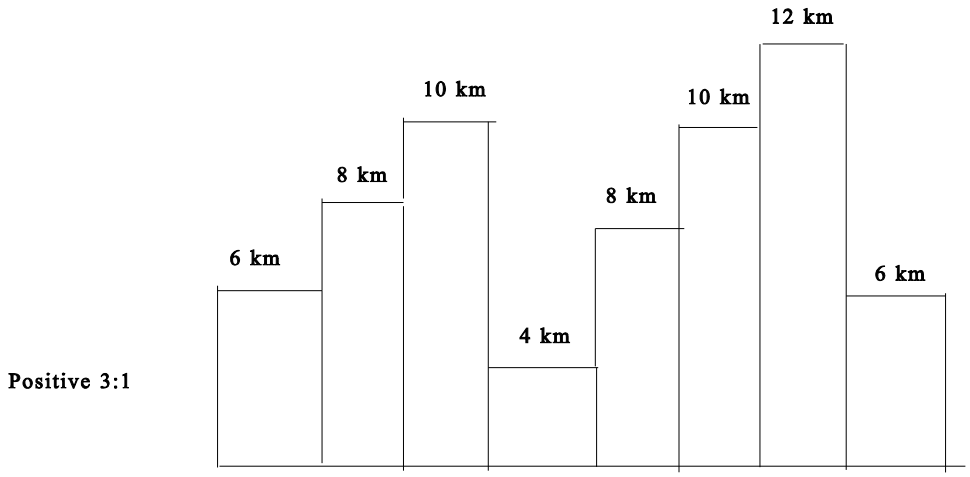


Figure 5
Example of Positive 3:1 Supercompensation
for Shorter Distance Training.

To increase quantity or volume of training during the build-up period (phase I), a positive/rest (pos) 3:1 may be implemented.

Figure 6 depicts a 2 km increase in distance, which results in an increase in the length of the workout time except during rest weeks 4, 8 and 12. In this type of training (i.e., quantity oriented), there is minimal increase in speed.

The type of Supercompensation program usually varies from person to person thus making it very individually tailored.
Unfortunately, a trial and error system must be used to determine which approach is best for each participant.

Overtraining

It is very easy for a participant to overtrain. Overtraining occurs when a person trains too frequently or, at an intensity beyond his/her ability/ fitness level without required rest between workouts. Thus, you may have heard an experienced athlete exclaim, "I've been training three times per day for the last three years - I just don't know why I do not improve!"

Instructors/coaches and participants must realize that during actual training workouts, the body becomes fatigued. Without the recovery phase, improvement CANNOT occur. Unfortunately, there is no exact rest schedule which will ensure that overtraining will not occur. Therefore, remember to rest!

Training Methods

This second part, initially defines elements of a training workout that the instructor and/or participant controls (i.e., intensity, frequency). As well, various training methods are described and their benefits outlined. Suggestions are made as to when each method should be utilized (periodization). Note that some training methods described are more appropriate for the elite athlete than for the non-competitive participant.

Use of different types and intensities of training depends on several factors, such as the person's level of fitness, scheduled competitive events, time of year, and purpose for training. The coach must keep these points in mind when identifying finer details of the workout.

Training intensity is monitored by observing the working heart rate and/or wheeling speed as indicated on a cyclocomputer.

To determine target working heart rate zone, use the following example. Assume a person's maximum heart rate is 220 beats/minute and resting heart rate is 50 beats/minute. Participant is instructed to carry out distance workout at 70% of their maximum heart rate.

Therefore, the person performs the following calculations: (Karvonen, 1987)

Maximum heart rate:	220	beats/minute
Resting heart rate	- 50	beats/minute
	170	beats/minute
70% of max. heart rate	x 0.7	
	119	beats/minute
Resting heart rate	+ 50	beats/minute
	169	beats/minute

This monitoring can be used as a precaution to minimize the risk of overtraining and can be carried out independently by the wheeler.

Results of an unpublished study (Eriksson 1985) revealed that determining workout intensity by monitoring the heart rate is effective for highly trained paraplegic athletes, but not accurate for those with quadriplegia. Therefore, persons with quadriplegia benefit most from monitoring wheeling speed on the cyclocomputer. Consequently, each participant must match training intensity with chosen monitoring method by a trial and error system.

Before we begin to talk about different types of training methods and their effects, it is important to become familiar with the terminology or language of fitness training (See table 00-1).

Table 00-1

Terminology

Intensity Degree of exertion (i.e., speed of wheeling, resistance of weights).

Duration	Length of time athlete works without rest.
Volume per Set	Time athlete works for a series of reps or a single set.
Total Volume	Total time of work. If workout is one continuous effort, duration and volume are identical; if workout has periods of work and rest, volume is sum of the work times.
Rest Period	Length of time athlete is given to recover between work periods. These rest periods must often be determined on an individual basis.
Repetition	Number of times a specific exercise, routine, or event is repeated during a fixed part of the workout.
Frequency	Number of workouts per day, week, etc.
Tempo	Variations in intensity and/or variations within components of a program.

Training Methods and Effects

Distance Training

Distance training involves continuous work (without rest periods) of long duration. Therefore, total volume of work is high.

Short distance training involves wheeling between 5 and 15 km and long distance from 15 to 30 km. A single workout remains constant throughout. For example, a new fitness enthusiast trains at low intensity and performs short distance workouts. Phase I training is usually geared to distance training.

Distance training promotes greater tolerance for endurance work at moderate intensity (sub-maximal work). For daily life this would make a participant able to wheel for their own shopping, and able to go for long walks without being dependent on another person's help.

Slow and long distance training has local effects on muscle groups (i.e., capillaries, mitochondria). Fast and short distance training increases central capacity in the cardiorespiratory system.

Fartlek Training

Fartlek training also includes workouts of short and long duration.

Short Fartlek training involves wheeling between 5 and 15 km, and long Fartlek from 15 to 30 km.

During Fartlek training tempo changes frequently which is distinction between Fartlek and distance training workouts. (Recall that during distance training the same intensity is maintained throughout).

Intensity for Fartlek training ranges between 40 and 95% of maximum. Shifts in intensity may be planned or may occur spontaneously, based on how the athlete feels or on type and nature of terrain.

Fartlek training combines the benefits of both distance and interval workouts.

The following is an example of how you can set up your Fartlek workout.

The distance of this Fartlek example is 10 km. The average speed in a regular distance training session is 5 min per km. Total time for this Fartlek program would be 50 min. The program is outlined for close examination and understanding.

TIME	EXERCISE	% OF MAX. SPEED	TOTAL TIME
5min.	Jog	50%	5 min.
5 x 1 min	Interval	80%	5 min.
Rest (4 x 1 min)		60%	4 min.
5 min.	Jog	50%	5 min.
2 x 5 min.	15 sec. work (90%)-15 sec. rest (60%)		10 min.
3 min.	Rest between set	50%	3 min.
5 min.	Jog	60%	5 min.
3 x 2 min.	Interval	75%	6 min.
2 min.	Rest (2 x 2 min)	60%	4 min.
3 min.	Jog	50%	3 min.

Total Time = 50 min.

INTERVAL TRAINING

Interval training involves exercising for brief periods of time followed by active rest (easy wheeling).

Three groups of intervals exist - long, short, and shorter intervals.

Long intervals consist of five to ten reps of two and eight minutes of work (5 reps of 2 minute work outs with 2 minutes of rest between reps).

Short intervals require working for 60 - 90 seconds for five to twenty reps (i.e., 5 reps of work for 70 sec. followed by 20 sec. of easy wheeling; allow 3 minutes of rest between sets!; repeat sequence).

Shorter intervals are 15 seconds in length and are repeated eight to forty times (i.e., 15 seconds of work followed by 15 seconds of easy wheeling for a total of 5 minutes; allow a 3 minute rest; repeat sequence).

Interval training has a positive effect on the body's central capacity. It increases the participant's level of tolerance for short, fast work bouts. In daily life this can be related to pushing the wheelchair easier up a hill or having more power when pushing against a strong wind.

Resistance Training

Resistance training can be oriented to: (1) muscular strength, (2) muscular power, (3) muscular endurance.

Power resistance training is most important for wheelchair participants since they receive endurance training by carrying out daily tasks from a wheelchair and/or performing the wheeling workouts. Participating in an additional endurance weight training program increases one's risk of overtraining and over use injuries.

Ideally, resistance training is an integral part of the participant's rehabilitation program. When muscular strength is adequate, an individual is better able to transfer and propel up and down curbs, stairs and hills.

Benefits the athlete receives from regular participation in a power oriented strength training program are many - faster starts, a kick during the home stretch, breaking away from the pack, and more efficient up hill propulsion.

There is a large variety of resistance training equipment available on the market. The participant should utilize apparatus which allows him/her to carry out the program as independently as possible.

Resistance training activates more motor units in the exercising muscles and therefore, a greater muscle contraction occurs. As well, the muscle learns to contract faster.

The instructor/coach must be familiar with different types of training methods and how they can be appropriately incorporated into exercise/fitness program. Participants with different levels of cord injury respond differently to various training regimes. Therefore, the coach must often experiment to determine an optimal exercise program.

To reach optimal improvement in the fitness training program by adhering to the following principles:

- ❑ Training has to be specific for each participant's needs.
- ❑ Training has to be consistent to give the expected result.
- ❑ Each quality in the training program has to have properly adjusted workloads organized in a progressive manner.
- ❑ Each quality of training has to have the optimal resting time, before it repeats itself, to achieve on optimal effect.

Fitness is for everyone. If the participant wants to become more involved in elite sport, this requires greater structure and more time commitment for specific training.

The next section describes the structure of an effective training workout for athletes. This is followed by specialized training methods for recreational and elite athletes, and finally, programs for sprint/middle distance, and long distance/road racing athletes.

Information presented in the second half is directed towards the elite athlete; however, participants may also adapt and incorporate this material into their own training plans.

FIVE STEPS FOR ALL WORKOUTS

First, lets look at a basic structure for all physical activity workouts. All too often, both able-bodied and disabled athletes avoid performing warm-up and stretching routines before carrying out their actual training programs.

Historically warm-up has also been excluded from the training regime! These components should never be avoided since they are critical for both a quality workout and the prevention of athletic injuries.

Following are five components of a workout.

Warm-up

- Wheel for 10 - 20 minutes (slow speed)

Stretching

- While sitting in the regular or racing wheelchair, stretch all functional upper body muscles. Stretching routine lasts for 10-15 minutes and includes both dynamic (movement through full range of motion, i.e., arm circles) and static (stretch and hold) exercises.

- A partner is especially helpful to persons in racing chairs since the sitting position makes it difficult to perform some stretches. Warm-up and stretching components of the workout prepare participant for actual training session by:...

A. increasing the body temperature by 1° C., which in turn provides a 10% increase in work efficiency,

B. increasing the blood flow to the working muscle groups, and

C. stretching working muscles and ligaments.

Actual Training Session

Work performed during this component is what has been referred to in Section II as training methods, for example Fartlek, long or short distance, or interval. Each training method has a specific purpose and therefore, should be carefully selected.

Cool-down

- Wheeling 10 - 20 minutes at a slow pace allows the metabolic waste products to be transported away, thereby reducing the likelihood of muscle soreness and stiffness. The cool-down is as important as the warm-up procedure.

Stretching

- This may be performed while still sitting in the racing wheelchair, but is better carried out while in the regular wheelchair, since a greater range of motion is often attainable. Post workout stretching should last from 10 - 15 minutes.

Specialized Training Methods

LONG AND SHORT TEMPO TRAINING

Long and Short Tempo Training utilizes the lactic acid component of training and is used during different periods of Phases II and III (i.e., competition and pre-competition).

Lactic acid is used by the body as the main energy resource when the intensity is high and the circulatory system cannot provide the working muscle cells with oxygen. This method of training requires adding distance to the events in which the athlete competes in and varying the speed intensity.

Long tempo training includes distances from 300m to 1000m (for marathon wheelers even up to 2000 meters).

Changes in speed may alternate between intense and less intense, progressing from low to high, or vice versa.

Example:5 x 600 m = first 200m in 75% of maximum speed, second 200 m in 85%, third 200 m in 95%.
This example is appropriate during competitive period of Phase III training.

Short tempo workouts incorporate distances from 100 m to 300 m, and the variation in speed is similar to long tempo training.

Example: 10 x 150 m = accelerate the speed up to 95% of maximum, with a long active rest.

This example can be used during the competitive periods of phase III as well.

Sprint Training is designed to improve neuro-muscular functioning and reaction time. This training is divided into two components:

- Lactic acid training (up to 120 m distance). In this type, lactic acid is produced and the body must efficiently eliminate it. Few reps and sets are performed at high intensity, and active rest periods are long. This type of training is used primarily in Phase III (competitive period)

Example: 5 x 100 m in 95% of maximum speed with long active rest. This example can be used during competitive period of phase III as well. Specific examples as above should be used.

- Alactic acid training (up to 60 m distances). In this type of training lactic acid is not produced in working muscles because working time for each repetition is very short and few sets are performed. This training is of very high intensity with long active rest periods.

Example: 3 x 30 m with flying start in maximum speed,
2 x 80 m with flying start in high intensity, with long active rest (100% work active slow rest).

Both of these methods benefit the wheeler's speed, and sprint endurance (i.e., speed beyond point of maximum acceleration). It is directed towards the improvement of anaerobic capacity.

ENDURANCE TRAINING

Training during Phase I for sprint and middle distance athletes requires wheeling at low intensities for long durations. During this time, the majority of resistance training time is volume oriented (i.e., high reps and sets).

Phase II workouts continue to be quantity oriented. Training methods utilized, include; long and short distance, Fartlek, long interval, long tempo and strength training.

In the second half of the Phase II schedule, the athlete begins to prepare for specific training and the competitive period. Therefore, volume of training begins to decrease while quality increases. Short tempo and sprint training are added to train lactic acid system, while the Fartlek workouts are dropped.

Sprinters and middle distance racers must find the optimal combination of muscular strength, power (speed), and endurance. All of these components are important, and the training model should ensure maximum development of each.

- Research indicates that 6-8 weeks of strength training without a change in the program will not result in significant improvement (Weineck 1983).

Thus it is important to change resistance training program frequently and follow a periodization schedule. Muscular endurance improves as the athlete continues to wheel. Therefore, resistance training is directed to strength and power components.

The training program must be adjusted to ensure an increase in wheeling speed. If a participant cannot maintain the desired speed due to exhaustion, the workout must be stopped. Training on asphalt provides optimal speed, which in turn produces positive effects. Continuous training on a rubberized track is slow due to high resistance, and the participant does not experience an increase in maximum speed.

Every training session throughout the year includes some type of sprint training (i.e., 3-5 standing starts; 30-80 m accelerations to 90%).

Tempo training plays an important role in middle distance training. Coach and athlete must ensure that speed/tempo are progressively adjusted to different periods of the year.

Today's middle distance racers change speeds frequently in races, and therefore athletes

must be prepared to respond.

For example, during Phase I, the 800 m distance can be performed as 400 m at 70% followed by 400 m at 85%.

During Phase II, 800 m distance can be reduced to 600 m and further divided to 200 m at 70%, 200 m at 80%, and 200 m at 90%. This variation in speed is referred to as ins and outs or split work.

Endurance training is method used most frequently in wheelchair sport. If endurance is not adequately developed, negative effects can be experienced in other components of training, including recovery time.

Coach and athlete must be well versed in energy systems, specifically anaerobic versus aerobic to be able to prescribe an ideal training schedule.

Aerobic training incorporates distance, Fartlek, and interval workouts; anaerobic training involves working close to actual racing speed by performing long and short tempo exercises.

Goals for endurance training for long distance athletes and road racers are four-fold:

1. To Increase speed.

2. To Increase length of time speed can be maintained.

3. To Maintain or increase aerobic capacity (depending on the level of physical fitness), and

4. To Maximize hill speed.

The coach must always keep the athlete's disability type and level in mind (including complete vs. incomplete).

Through personal experiences the following have been discovered:

- ❑ Highly trained quadriplegic athletes can perform aerobic workouts at a higher intensity than paraplegic athletes and they also require a shorter recovery time between the same intensity of workouts, and between their last hard workout and their peak performance.

This appears to be the result of reduced functional muscle mass placing a lower demand on the maximum circulatory capacity, as compared to persons with paraplegic. In this case, the faster return of the venous blood flow from the working muscle groups results in the lactic acid transport system being more efficient.

- ❑ T1 quadriplegic athletes do not have the expected positive effects of long

distance training utilizing short tempo method. Successful results have been noted by performing short distance training or Fartlek routines at high speeds.

T1 quadriplegic athletes respond best to the super compensation method of 1:2 negative/2:1 positive.

T1, according to ISMGF Classification System include quadriplegics with Severe reduction of power in the arms affecting grip and elbow extension, severe shoulder problems and functionally reduced triceps power.

Hill Training

Road racers incorporate hill training into their workout schedules, as well as longer total distance sessions.

Lactic training is practiced during Phase III, once every 2 to 3 weeks, to enhance quality of training. Work time is 40 sec. to 90 sec, performed 5 to 8 times. Rest periods between sets are long enough to ensure recovery.

Uphill training sessions start on a flat surface to attain high speed. The hill cannot be too steep, because the athlete must be able to maintain high speed for the entire duration.

The athlete also prepares for hills by performing Fartlek, distance, and interval routines. The coach and athlete must be aware though, that many tactical/strategical movements occur during competition on the hills, therefore, it is important to master them.

Overspeed Training

Research from Finland pertaining runners, indicated that overspeed training enhanced maximal running speed.

A positive effect has also been noted when wheelchair athletes utilize this technique during long or short tempo and short distance training. In this type of training, the athlete works at high intensity (close to maximal power output) at speed that slightly exceeds maximum speed.

For example, athletes perform 200 - 400m short tempo distances at 90 - 95% of maximum power output with wind at their back, or wheels on a slight downhill grade. The athlete ensures maintenance of high frequency pushes throughout this training.

This type of training is only used during Phase III, especially during peak performance preparation. It also has a positive psychological effect on the athlete.

Personal Thoughts

Wheelchair track and road racing athletes must specialize more in the future. Thus, each racer should train for and compete in, only sprints and middle distances or only long distances and road racing.

To be successful in racing, the athlete develops and maintains balance among muscular strength, power (speed) and endurance. To do this each individual must approach training in a very well planned manner.

Two methods of maximizing training for all groups of athletes are to emphasize speed changes in the training program (in and outs/splits), and to develop speed with overspeed training on asphalt. Of course an increase in the athlete's aerobic capacity, and in length of time that speed can be maintained are also important.

With more education/information in the area of work physiology, the athlete/coach can acquire greater understanding of how the body responds to training. This results in improved performances with an avoidance of overtraining.

Conclusion

As the general population moves more toward exercising for health and fitness, so too does the disabled community. Wheeling into fitness generally reduces the related risks of obesity and cardiovascular disease while adding benefits of independence and quality of life.

Certainly, in both areas of fitness for recreation and for elite competition, expertise is required. For optimal benefits, fitness enthusiasts should have a knowledgeable instructor/coach to prescribe and to help implement a program designed to meet each individual's needs.

The startling fact that so many disabled people are inactive in the world of fitness in general, raises the concern that health care professionals must explore ways in which to encourage and provide opportunities for more participation and enjoyment. Early introduction to an exercise program during the rehabilitation process, is the best means of ensuring that the physically disabled person pursues an active lifestyle.

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