TRAINING FOR GENERAL FITNESS

For many fitness enthusiasts the goal of obtaining 'general fitness' dictates that resistance training must be combined with some form of aerobic activity. Athletes too, are often forced to combine anaerobic and aerobic work. Unfortunately for those who seek rapid results, there is considerable evidence suggesting that concurrent endurance training interferes with the gains induced by resistance training (Chromiak and Mulvaney, 1990; Dudley and Djamil, 1985; Dudley and Fleck, 1987, Hickson, 1980; Kraemer et al., 1995).

Fortunately for many novice gym participants the effects of interference are almost insignificant in the low volume training program that are commonly prescribed to them. However, given the need for progressive increases in training volumes, especially in aerobic conditioning, the possibility of interference increases as time goes by. Nevertheless, by recognising the limitations with concurrent programs some common-sense guidelines can be developed for maximising their effectiveness.

Possible Causes of Interference

1. For muscle hypertrophy to occur individuals must consume more calories than they expend. However, when concurrently performing endurance training it is very hard to eat enough to supply these 'surplus' calories and protein synthesis is retarded.

2. Existing protein stores from muscle may be broken down and used as a fuel source during prolonged endurance training. Under certain circumstances, protein degradation may contribute as much as 5-15% of total ATP production during aerobic activities.

3. Recent evidence suggests that in response to endurance training, fast twitch muscle fibres start to produce slow myosins and that type IIb fibres may disappear and be replaced by type IIa fibres. The implication of this information to the speed and power athlete is that endurance training is not only non-specific (and therefore a waste of time) but also potentially detrimental.

Strength Training May Interfere With Endurance

Muscle hypertrophy induced by strength training causes a decrease in both mitochondrial and capillary density. Consequently, the aerobic capacity per unit of muscle mass declines as a muscle increases in size. For athletes competing in weight-bearing activities such as long distance running, the extra body weight would obviously have detrimental effects on performance. However, for endurance athletes competing in weight supported activities, such as rowing, relatively slight increases in body mass are not always detrimental.

Another potentially detrimental effect of heavy resistance training is the stiffness and soreness that may occur in the days after each workout. This discomfort will obviously tend to interfere with the performance of endurance training sessions.

Exercise Prescription Guidelines

Athletes avoid, or at least minimise the problems of interference by periodising the training process. Periodisation, which is a necessity in many sports, involves emphasising one aspect of fitness whilst merely maintaining the others.

In the context of training for general fitness, periodisation may involve two phases. In the first phase, which might last four to 12 weeks, one might concentrate on strength improvements whilst the interference effects are minimised by the employment of minimal endurance activity. Then, for the next four to 12 weeks, strength levels are maintained with a minimal amount of resistance training whilst more emphasis is placed on aerobic conditioning.

Example program

Phase 1 (4-12 weeks):

Resistance training: 4 X 60 minute sessions each week. Following a double split (Chest/shoulders/triceps on Monday and Thursday, and Back/legs and biceps on Tuesday and Friday).
1-2 exercises per body part.

Endurance training: 3 X 30 minute sessions per week.

Phase 2 (4-12 weeks):

Endurance training: 5 X 45-60 minute sessions per week.

Resistance training: 3 X 40 minute sessions each week. Full body workouts (Monday and Friday - intense sessions, Wednesday - recovery session).
1 exercise per body part.

Whilst the periodised approach is undoubtedly the most effective way to avoid excessive interference effects it is fairly complicated and may not be appropriate for many fitness centre participants. Fortunately there are other exercise prescription and dietary guidelines that can be followed.

Training for each component of fitness separately results in significantly better results than mixed training methods such as conventional circuits (Gettman and Pollock, 1981; Tesch, 1991). Aerobic and resistance training sessions are perhaps ideally performed on alternate days, or in morning-evening splits. Unfortunately, many gym participants do not have time to train so often and the two sessions will have to be combined into one, as indicated below.

Example Program

Warm-up: 3-5 minutes cycling.

Weights: 2-3 sets of 6-12 repetitions for each of the following;
Each pair of exercises is super-setted to save time.

Bench press
Seated row
Leg press
Leg curl
Upright row
Reverse crunch

Aerobic circuit: 3-5 minutes per station, 20-30 minutes total.

Cycle → Row → Step machine → Skipping → Treadmill →Repeat?

Cool-down: 3-5 minutes of relaxed cycling or rowing + stretches.

Total time: 45-65 minutes.

Guidelines for Minimising Interference

The utilisation of protein as a fuel occurs to a significant extent only when muscle and liver glycogen levels are very low. To prevent the depletion of glycogen stores, regularly active individuals should eat small meals, rich in complex carbohydrates, five or six times each day. It is especially important not to go without sustenance in the three hours before extended aerobic exercise.

Limiting the duration of each aerobic workout is another way of preventing glycogen depletion. If aerobic exercise sessions last no longer than 45 minutes minimal protein degradation would be expected as muscle and liver glycogen levels typically last for this duration even in relatively untrained individuals. If greater calorie expenditure is required two 45 minute sessions, one in the morning and the other in the evening, would be preferable to one 90 minute session.

The consumption of carbohydrates immediately after exercise is also recommended because this results in elevated intramuscular glycogen.

Several studies have suggested the existence of an intensity threshold above which protein degradation begins to occur. Apparently this threshold occurs at approximately 55% of the maximum heart rate in untrained individuals which suggests that in order to minimise protein breakdown athletes and gym participants should train at lower intensities than normally recommended for cardiovascular benefits (60-90% of maximum heart rate).

Guidelines to minimise protein breakdown during aerobic activity.

1. Consume complex carbohydrates five or six times a day.
2. Do not go without food for many hours prior to aerobic exercise.
3. Limit the duration of any single aerobic workout to 45 minutes.
4. Exercise at an intensity slightly below that of the anaerobic threshold.

Circuit Training

Circuit training is thought by many to provide simultaneous improvements in cardiovascular fitness and muscular strength, however research reveals that circuits have limited benefits when compared with alternative training modes (Gettman and Pollock, 1981; Tesch, 1991).

Because of the largely anaerobic nature of most circuits, oxygen consumptions typically average 30-50% of maximum and rarely reach the appropriate training range of 50-80%. Consequently the improvements in MVO_2 are approximately half of those of brought about by conventional endurance training. The calorie expenditure in circuit training is approximately the same as for brisk walking, indicating that it has potential benefits in weight loss programs but is less effective than jogging and higher intensity aerobic dance classes.

Given the relatively light resistances (40-60% of 1RM) used, the long rests between consecutive sets of the one exercise and the frequently inappropriate exercise order, the strengthening benefits of circuits could not be expected to match those of conventional resistance training (Collins et al., 1989). Studies confirm this view, although biased researchers frequently hide this limitation with imaginative subject selection and by failing to present comparative results from conventional resistance training studies.

Circuit training can bring about 20-50% improvements in weightlifting ability in 10-12 weeks. However, the subjects chosen in many circuit training studies are cardiac rehabilitation patients who would be expected to make strength gains simply as a result of returning to a near normal lifestyle. Conventional strength training studies of similar duration (using healthy subjects) have brought about 100-200% improvements in novice subject's lifting ability, however coordination improvements, rather than real strength gains may account for up to 75% of the gains. In this light circuits seem particularly ineffective.

Particularly damning evidence comes from one study in which subjects who cycled made greater gains in hamstring strength than those who employed leg curls as a part of their circuit work!

Muscular endurance may benefit from the high repetitions commonly employed during circuits and sports specific circuits (which target the muscles employed in each athletes events) may be more beneficial for athletes than conventional circuits are for the development of general fitness.

REVISION QUESTIONS

1. Is interference of equal concern to novices following low volume programs and the highly trained who more often employ high volume conditioning?
2. What are the two major reasons for endurance training's interference with strength increases?
3. Why might strength training interfere with the performance of a cross-country runner but not a still water rower?
4. What training and dietary guidelines would you follow to minimise the interference effects for rugby league players who must combine strength and endurance training?

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