The Spartan Circuit

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Spartan circuits

Introduction

Typically circuits are described as a series of exercise stations performed one after the other and repeated in a set order (Wilmore & Costill, 1994; Fox, Bowers & Foss, 1993; Howley & Franks, 1992; Egger & Champion, 1990). Most agree on the concept of a circuit, their effectiveness however is still in question.

Designing a Circuit

When designing and implementing the circuit the following steps should be considered.

1. Goals.
2. Facts.
3. Design Variables.

1. Goals

Perhaps the most important factor. **Why are they here? What physiological goals can be met through circuit training ?** If you do not cater to your clients goals.....they will go elsewhere.

- ☺ Hypertrophy.
- ☺ Muscular endurance / lactic acid tolerance.
- ☺ Cardio respiratory fitness and fat loss.
- ☺ Strength.
- ☺ Sports specificity.

2. Use Facts.

For any form of conditioning to be effective we must follow established and recognised principals of training, we utilise them for all other forms of training and programming.....Why do we not apply them for circuit training ? Several facts in particular need consideration.

- ✓ It takes around three minutes for a muscle to become aerobically efficient (Marieb, 1998; Shield & Young, 1995; Wilmore & Costill,1994).
- ✓ Pre-fatigued muscles become the limiting factor in compound exercises (Fleck & Kraemer, 1997; Shield & Young, 1995; Fox, Bowers & Foss, 1993).
- ✓ Lactic acid inhibits the burning of fat (Marieb, 1995; Wilmore & Costill,1994; McArdle, Katch & Katch, 1991)
- ✓ For effective gains in hypertrophy the repetition range should be between 6 to 15 repetitions, with a break of between 30 seconds to 3 minutes between sets. (Fleck & Kraemer, 1997; Shield & Young, 1995; Baechle, 1994)
- ✓ For effective gains in strength, the weight must be heavy enough to incite muscle failure in the 1 – 6 repetition range and, for complete ATP PC_R and neural recovery a rest of at least 3 minutes is required (Fleck & Kraemer, 1997, Shield & Young, 1995; Zatsiorsky, 1995; Baechle, 1994).

In line with the facts, remember that:

I. Better gains are made by the use of specific training programs and that certain training parameters (like those for strength / power) are extremely difficult to provide in a standard gymnasium circuit.

II. Many forms of adaptations contradict each other, eg training for hypertrophy and aerobic endurance (Gibbons, 1995; Shields & Young, 1995; Shields, 1995; Wilson, 1995), circuit training is not the magical key that can break this rule.

III. There are other positive benefits provided by circuit training, including initial resistance training technique, in a non-threatening environment, provided to a group of people, individually and collectively.

IV. For those concerned with peripheral heart action (PHA) or blood 'shunting' remember that correct exercise order can provide smooth blood muscle phasing and alleviate this problem. PHA may also be specific for certain sports like triathlons.

3. Design Variables

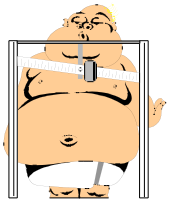
Design variables are what make or break your circuit. There are several variables that need to be considered when designing a circuit, including time at each station, weight lifted and exercises selected, all of which will be discussed further under "Circuits for....". Another variable that is often neglected is the order in which exercises are placed.

Exercise Order Guidelines

- The fixators or synergists at an exercises station should be considered. This is particularly important if they have been utilised in the preceding station as prime movers. Eg. Abdominals before push ups or lower back exercises before squats. By fatiguing the synergist / fixator muscles that stabilise the trunk, core stability is compromised.
- Be weary of the effects of blood pooling. Avoid placing exercises that have the head in a lowered position after exercises that elevate the heart rate substantially, Eg. Shuttle sprint followed by sit ups ups then a stair climber. During sit ups there is a decrease in venous return from the legs, which are still receiving a vast amount of blood induced by the shuttle run. When the client suddenly stands up to move to the next station blood has pooled in the lower limbs and they may faint.
- For *general* circuit training, blood - muscle phasing should be consistent and effective. This means that the 'moving' of blood into different muscles should be 'smooth' as opposed to ***blood shunting*** or ***peripheral heart action***. (Forcing blood to move rapidly to unused muscles).

  Specific circuit programs may purposefully utilise peripheral heart action. Eg. Training the transition phases of triathlons.

- Sports specific circuits should not have exercises that cause excessive fatigue prior to those requiring a higher level of technique. Eg. Military press prior to shooting basketball hoops.



CIRCUITS FOR….

FAT LOSS AND AEROBIC ENDURANCE

The aerobic system is utilised in both fat loss and aerobic endurance training. Both training methods require compound movements that are continuous and rhythmic in nature, at a pace slow enough to facilitate ATP production via the oxidative system (Smith, 1996; Shield & Young, 1995; Pyke, 1991). They are best suited whilst in a 'steady state' or 'steady rate'. At this 'state / rate' lactic acid build up is minimal (Mc Ardle, Katch & Katch, 1991). The importance of this relates primarily to those seeking fat loss as lactic acid inhibits lipolysis (Marieb, 1995; Wilmore & Costill, 1994; McArdle, Katch & Katch, 1991)

A common statement by many claims that circuit training is not an effective form of cardio - respiratory training. Consider this.....How effective is an Aerobic class, primarily utilising smaller muscle groups with complex movements that are hardly ever repeated more than eight times before changing exercise. What about LSD training with recommended heart rates between 60% and 80% ? (Wilmore & Costill,1994; Mc Ardle, Katch & Katch, 1991).

> *L.S.D. training is an excellent approach to general endurance conditioning because it is effective and can be performed at a comfortable rate of work.* (Wilmore & Costill,1994,p.18)

What if you design your circuit to resemble basic interval training. Eg. Squats x 1 min, 1 Lap walk around the circuit, Lunges x 1 min.

Guidelines.

Time at Each Station : **Up to 60 secs**
Time on Each Muscle : **Up to 3 mins**

The basic guideline is that it takes around three minutes for a muscle to become aerobically efficient (Marieb, 1998; Shield & Young, 1995; Wilmore & Costill, 1994). With this in mind, the same muscle group should be worked for at least three minutes. This can be done in a variety of ways. Two examples follow;

1. If you are working only one muscle group before changing to another, the station should last for at least 3 minutes, or alternately
2. By utilising the same muscle group for at least three to four stations in a row. Eg. Squat - Lunge - Step Up - Shuttle run. Your time on each station need only last a minute.

Weight Lifted: **Light**

The weight used needs to provide a training effect without causing excessive fatigue and lactic acid build up. A point to remember is that you are training at a sub maximal pace. Training harder would shift the training emphasis to lactic acid tolerance.

> A common fault is to start off too fast and fatigue with Lactic Build up. The aim should be to start off at a steady pace and maintain that cadence all the way through the work out.

Exercise Selection: **Compound** (No minor muscle groups or isolation exercises)

To ensure the aerobic system remains active 'blood - muscle phasing' must be effective. This should decrease the need for an anaerobic energy supply when shifting the training emphasis to a different muscle.

CIRCUITS FOR….
MUSCLE ENDURANCE AND LACTIC ACID TOLERANCE

Lactic acid tolerance and muscular endurance are related in the sense that ' *the development of lactic acid tolerance is an important factor in the development of muscular endurance.'* (Shield & Young, 1995p. 207). Yet Shield &Young (1995, p.207) question the need for your average circuit participant to have a high lactic tolerance. As do most of us. Yet we should all agree that muscular endurance is an important factor in general fitness and the ability to carry out daily tasks. From shoulder and forearm endurance to carry stores and equipment to abdominal endurance to stabilise the pelvis. So with muscular endurance of more importance than lactic tolerance, can one be trained without the other? Yes

According to Shield and Young (1995,p.163) for lactic acid tolerance to be trained effectively..... '*Providing that the anaerobic threshold is breached so that lactic acid accumulates and is maintained at high level for reasonable periods of time.'* With this in mind muscular endurance training need not be lactic acid tolerance training. Although station times may remain the same, muscular endurance can be trained sub maximally with fatigue and lactic acid accumulation coming at the end of a station or muscle group.

Guidelines.

Time at Each Station : **30 secs to 60 secs**

(Lactic Acid)

As Shield & Young (1995,p. 162) *'As the lactic system can only operate at its maximum for approximately 30 seconds to 45 seconds it would be best overloaded with a work interval which lasts 30 seconds to 60 seconds.'*

(Muscular Endurance)

As stated in most resistance training sources, muscular endurance training requires a repetition range of at least 15 plus (Fleck & Kraemer,1997; Shield & Young, 1995; Baechle, 1994; Wilmore & Costill,1994; Sharkey, 1990). These repetitions would take around 40 seconds to 60 seconds to complete.

Weight Lifted : **Moderate**

(Lactic Acid)

The weights used must be heavy enough to bring about a rapid increase in lactic levels but not so heavy as to cause premature muscle failure (or technique failure). Once failure is near the participant can lower the weight. This allows the participant to continue working rather than causing them to cease due to muscular failure.

(Muscular Endurance)

The participant should aim to reach muscular failure around the 20 repetition range. A common fault, especially encountered amongst novices, is starting off too quickly and either reaching lactic thresholds or muscular failure too early. This causes them to slow or cease the work out at that station.

The aim is to keep working at a constant pace through the duration of the station.

Exercise Selection : **Compound** (No minor muscle groups or isolation exercises)

To enable a more effective training benefit compound exercises should be utilised. This will help alleviate isolation specific muscular endurance or lactic acid tolerance. This would also prevent minor muscles becoming the limiting factor (due to pre-fatigue) when conducting compound exercises for the larger muscle groups.

CIRCUITS FOR….

HYPERTROPHY

With hypertrophy in mind we should well apply our goal specific knowledge for hypertrophy training. That includes, reps, sets and rest protocols. To apply these protocols effectively, instructors must ensure that there is a rest between sets. If they do not, then they begin moving into the realm of muscular endurance with high muscular tension and lower neural drive.

Training Experience.

It is noted that beginners make hypertrophy gains no matter what form of resistance training they adopt (Fleck & Kraemer,1997; Shield & Young, 1995; Baechle, 1994; Wilmore & Costill,1994; Sharkey, 1990). Also note that only those who are of at least intermediate resistance training experience have a more accurate value of training to muscle failure.

With this in mind we should note that true hypertrophy trainers have months of experience in the weight room and the guidelines below are for their benefit (when desiring a break from Traditional Weight Training.).

Guidelines.

Time at Each Station : **20 secs to 40 secs.**

Weight Lifted : **Moderate to Heavy**

For hypertrophy gains the weight should be heavy enough to induce muscular failure at around 8 repetitions to 15 repetitions (Fleck & Kraemer,1997; Shield & Young, 1995; Baechle, 1994; Wilmore & Costill,1994; Sharkey, 1990), no more than 20 seconds to 40 seconds should be needed to achieve this.

Exercise selection : **Compound** (No minor muscle groups or isolation exercises)
(No Compound before Isolation unless pre-fatiguing)

CIRCUITS FOR….

STRENGTH

Due to the training requirements for strength gains it is not possible to train for true strength in a circuit. Two primary reasons are ;

1. The required training weight needs to be heavy enough to induce muscle failure between 1 and 6 repetitions (Fleck & Kraemer,1997; Shield & Young, 1995; Baechle, 1994). This training requires more advanced resistance training techniques and a spotter for safety, and
2. The rest time required for complete neural and ATP - PC_R recovery is around 3 minutes (Fleck & Kraemer,1997; Shield & Young, 1995; Baechle, 1994; Wilmore & Costill,1994; Sharkey, 1990).

With these factors in mind, the goal should become one of strength - endurance or relative strength, rather than true strength.

Guidelines.

Time at Each Station : **20 secs to 40 secs.**
Weight Lifted : **As heavy as possible within SAFE limits.**
The weight or intensity must be high enough to ensure muscular failure as soon as possible.

Exercise Selection : **Compound & Functional**
The most effective form of strength - endurance training comes from using functional activities like body weight exercises, rope climbs, stair climbing, etc. If resistance training exercises are used the exercises should be compound or smaller muscle groups will become the limiting factor.

PUTTING THE SESSION GUIDELINES TOGETHER

With the following guidelines how can we put it all together into one circuit session.
Here is a basic simple rotation format :

60 Secs per station :

Hypertrophy	30 - 40 Secs work / 20 - 30 Secs stretch, or	
	30 Secs work whilst partner spots / Swap over.	
Lactic Acid Tolerance	45 Secs work / 15 Secs Stretch Recovery (Beginner)	
	60 Secs work. (Intermediate - Advanced)	
Muscular Endurance	}	
Aerobic Endurance	}	60 Secs work.
Fat Loss	}	

If that gets too monotonous an active recovery could be incorporated. Those doing hypertrophy training or beginning lactic tolerance training, requiring a rest interval, could walk / jog around the circuit, moving onto the next station as they return. Or how about an interval circuit - Work for two stations rest for one.

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