



CIRCUIT TRAINING

DEVELOPMENT OF STRENGTH AND CONDITIONING



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*"Great athletes are not born,
they are made."
- Seb Coe*

Strength and conditioning training is central to successful athletic performance. It involves the development of aspects of fitness such as cardiovascular endurance, muscular endurance and power.

Athletes need good levels of strength and conditioning to help them attain their sporting goals.

Circuit training is one such training method used in a strength and conditioning programme, and in this fact sheet we provide information related to the correct design and implementation of a circuit training programme. Effective programme design and implementation can result in improved athletic performance.

WHAT IS CIRCUIT TRAINING?

*"Circuit training is a method of fitness training that is designed to develop general, all-round physical and cardiovascular fitness."
- Scholich (1990:40)*

The athlete and his or her background, the sport, the time of year and the facilities available will dictate the type of circuit that is designed and implemented. Circuit training can be designed to develop a number of fitness components, including cardiovascular endurance (CVE), muscular endurance (ME), power, and anaerobic endurance. All of these components of fitness are extremely applicable to team sports.

In addition, sport-specific circuits can be designed to address the specific skill and fitness requirements of a sport. Information related to the design of the various types of circuit is contained in this fact sheet. The instruction and delivery of circuit sessions is a key

element in the effectiveness of this training method, and important relevant information is also provided at the end of the fact sheet.

EXPLANATION OF TERMINOLOGY

Cardiovascular endurance: Ability to utilise oxygen during exercise. It is the ability of the heart, blood vessels, blood and respiratory system to effectively supply fuel and oxygen to the working muscles, and then the ability of the muscles to utilise this oxygen and fuel to allow sustained exercise.

Muscular endurance: Ability to repeatedly exert a force at a sub-maximal level.

Anaerobic endurance: Ability to sustain repeated short bouts of high intensity exercise. It is the ability of the muscle groups to work without oxygen.

Strength: Maximum force a muscle or group of muscles can produce.

Power: The rate at which work can be done. It is the speed at which strength can be applied or the rate at which force can be developed. These guidelines are for the selection and sequencing of exercises for an ME, CVE, power, anaerobic and sport-specific circuit. For all types of circuit, adaptations and progressions should be provided to the athletes for each exercise, to cater for any mixed ability that may exist within the group.

1. MUSCULAR ENDURANCE CIRCUIT

This type of circuit is typically used during the pre-season. Balancing muscle groups is the central focus when selecting exercises.

- Include exercises that cover the upper, middle and lower sections of the body.
- Include exercises that work the front and back of the body, i.e. opposing muscle groups, such as quadriceps and hamstrings.
- Lower-body ME activities need to include:
 - Forwards and backwards movement, e.g. lunge
 - Up and down movement, e.g. step-up
 - Right and left movement, e.g. side-lunge.

The sequencing of the exercises is important. Vary the muscle group area that is worked from one exercise to the next. A common sequence to use is an upper-body exercise followed by a middle-body exercise and then a lower-body one. This selection and order of an ME circuit will avoid excessive fatigue in the muscle group and help to maintain good technique, resulting in a reduced risk of injury and a better training effect.

These guidelines are for the selection and sequencing of exercises for an ME, CVE, power, anaerobic and sport-specific circuit. For all types of circuit, adaptations and progressions should be provided to the athletes for each exercise, to cater for any mixed ability that may exist within the group.

Exercises	Time on(s)	Time off(s)	No. of circuits
1 Press-up/modified press-up	30	15	2
2 Sit-up	30	15	2
3 Dumbbell squat & shoulder press	30	15	2
4 Bent-over row	30	15	2
5 Back extension	30	15	2
6 Multi-lunge	30	15	2

2. CARDIOVASCULAR ENDURANCE CIRCUIT

Like the ME circuit, a CVE circuit would tend to be used during the pre-season. It uses many of the movements that are typical of an aerobics session. The movements include dynamic actions using large muscle groups.

- Include on-the-spot and off-the-spot exercises; an example of an on-the-spot exercise is knee-lifts and an off-the-spot exercise would be running shuttles.
- Include high and low impact exercises
- The exercises selected should be balanced as follows:
 - Side to side movement
 - Up and down movement
 - Forwards and backwards movement.
 - Alternate between the different directions of movement.
- Alternate between the high and low impact exercises.
- Keep the athletes active during the time off (e.g. walking or stepping side to side).

An example of a CVE circuit suitable for beginners is as follows (90 seconds recovery between circuits):

Exercises	Time on(s)	Time off(s)	No. of circuits
1 Jumping jacks	30	10	2
2 Shuttles	30	10	2
3 Knee lifts	30	10	2
4 Zig-zag running	30	10	2
5 Skipping	30	10	2
6 Grapevine	30	10	2
7 Step-up	30	10	2
8 V-step	30	10	2

3. COMBINED CVE AND ME CIRCUIT

In many cases, the goal of the circuit is to improve CVE and ME simultaneously. This aspect of fitness is generally targeted and developed during the pre-season, and can be achieved by designing and conducting a combined CVE circuit and ME.

- Include both ME and CVE exercises in the circuit; for equal emphasis, include the same number of CVE and ME exercises, to focus more on ME, have a greater percentage of ME exercises and vice versa.
- Alternate between the CVE and ME exercises.
- When selecting the CVE and ME exercises, adhere to the guidelines outlined previously.
- For ME, use compound exercises as opposed to isolation exercises to target as many muscle groups as possible. Compound exercises involve many joints moving and numerous muscle groups working simultaneously, e.g. back squat or step-ups
- If CVE is the more important aspect of this circuit, consider avoiding floor-based ME exercises, such as sit-ups and back extensions during the circuit because the heart rate would decrease too much. Instead, do these exercises at the end of the session.

An example of a combined CVE and ME circuit is as follows (90 seconds recovery between circuits):

Exercises	Time on(s)	Time off(s)	No. of circuits
1 Squat and shoulder press	30	10	2
2 V-step	30	10	2
3 Bent-over row	30	10	2
4. Jumping jacks	30	10	2
5 Lunge	30	10	2
6 Shuttles	30	10	2
7 Step-up and front raise	30	10	2
8 Knee lifts	30	10	2

4. MEDICINE BALL POWER CIRCUIT

Medicine balls are weighted balls that can be used to develop power. They range in size from 1 kg to 10 kg. With beginners it is recommended to use a lighter weight, such as a 3 kg medicine ball.

Medicine ball exercises can be included in a circuit by themselves or incorporated into a sport-specific or anaerobic circuit. They are very useful for mimicking the skills and patterns of movement of a sport, such as the hand-pass in gaelic football or the rugby pass. When designing a medicine ball circuit, adhere to the guidelines for the selection and sequencing of an ME circuit. An example of a medicine ball (MB) power circuit is as follows (three minutes recovery between circuits):

Exercises	Repetitions	Time off(s)	No. of circuits
1 MB single-arm pass	6 each arm	30	2
2 MB twister	6 each side	30	2
3 MB kick	10	30	2
4 MB slam down	10	30	2
5 MB V sit-up	15	30	2
6 MB drive and push	6 each leg	30	2
7 MB overhead throw	10	30	2
8 MB knee lifts	6 each leg	30	2

MB chest pass, MB sit-up, MB squat jump and MB hamstring flick are additional exercises that can be incorporated into a medicine ball circuit.

5. ANAEROBIC CIRCUIT

The most appropriate time to use an anaerobic circuit is just before and during the competitive season. An anaerobic circuit should only be used with athletes who have a good overall level of fitness and who participate in a sport with a high anaerobic demand.

The aim of such a circuit is to develop power, speed and anaerobic endurance. It stimulates the body to develop the anaerobic energy systems through bouts of maximum-intensity, short-duration exercises.

- Exercises tend to be more plyometric and explosive in nature, e.g. squat jumps, and should involve the major muscle groups in the legs; a plyometric exercise is a jumping type exercise designed to develop explosiveness and speed, e.g. hopping, squat jumping.
- The intensity level is high and the heart rate should be somewhere between 80% and 95% of the maximum heart rate.
- The technical proficiency of the exercises and the speed of movement are vital; while the exercises should be performed in an explosive, quick manner, it is important not to sacrifice technique for speed.
- Due to the high level of technical proficiency demanded during an anaerobic circuit, the time on is low and the time off is high.
- The ratio of time off to time on is 2:1 or 3:1 depending on the anaerobic demands of the sport; keep active during the time off by doing low impact on-the-spot aerobic exercises, e.g. sidestepping with hands on hips.
- Include exercises that work opposing muscles groups and alternate between upper, middle and lower parts of the body.
- Include exercises that are relevant to the muscles used in the sport and the manner in which they are used in the sporting context.
- Monitor athletes throughout the circuit through observation and measurement of heart rate; if the quality of the exercise is too low encourage the

athlete to do the exercise at a higher level, if this does not change the quality reduce the time on.

An example of an anaerobic circuit is as follows (four minutes recovery between circuits):

Exercises	Time on(s)	Time off(s)	No. of circuits
1 Pyramid sprints	15	30	2
2 Tuck jumps	15	30	2
3 Treadmills	15	30	2
4 Line ankle jumps	15	30	2
5 Burpees	15	30	2
6 Fast knees	15	30	2
7 Ankle jump pattern	15	30	2
8 Scissors jumps	15	30	2

Squat jump, tuck jump pattern, line tuck jump and split jump are additional exercises that can be incorporated into an anaerobic circuit.

6. SPORT-SPECIFIC CIRCUIT (GAELIC FOOTBALLERS)

To meet the specific requirements of a sport, it is advisable to design a circuit that is sport-specific. In addition to being specific to the sport that the athlete is involved in, a circuit should be related to the age (chronological and training), fitness levels (in particular the fitness weaknesses) and desires / aims of the athletes.

Certain factors need to be considered, as follows, when designing a sport-specific circuit:

- Skills involved in the sport.
- Fitness requirements of the sport; which of these requirements is most important? Will this change depending on the time of year?
- Actions or movements involved in the sport, for example, jumping movements in gaelic football, getting up off the ground quickly in rugby.
- Major muscle groups used in the patterns of movement involved in the sport.
- Time of year, i.e. pre-season or competitive season.

The term 'sport-specific training' implies that exercises should mimic as much as possible the actions of the body during participation in a given sport. Specificity should not, however, be overemphasised when selecting resistance exercises because it could lead to imbalances. Consequently, finding a balance between general and specific exercises would be appropriate in a circuit.

An example of a sport-specific circuit for gaelic footballers is as follows (two minutes recovery between circuits):

Exercises	Time on(s)	Time off(s)	No. of circuits
1 Squat jump to catch	30	15	2
2 Zig-zag running with soloing	30	15	2
3 Press-up	30	15	2
4 Shuttle running with soloing	30	15	2
5 Lunging with ball in front	30	15	2
6 Bent-over row	30	15	2
7 Split jumps	30	15	2
8 Sit-up	30	15	2