**Interval Training.**

When I hear people nowadays talking or writing about HIIT, I have to smile wryly. Listening to some of the new gurus , one could get the impression that there is something new or even revolutionary about “High Intensity” interval training.

The reality ,of course, is that interval training has been around for a very long time indeed - and interval training has always been pretty much “high intensity”. Walter George was using versions of interval training back in the late nineteenth century . So was Arthur Newton in the early part of the twentieth century. But it was in the late 1930s that a German coach , Dr. Woldemar Gerschler, who, in association with a cardiologist Dr.Herbert Reindel, developed modern interval type training and based it on solid physiological and psychological principles. This method was designed to develop a training template which would maximise the size , fitness and efficiency of the heart. As a result of a number of experiments carried out on up to 3000 athletes, Gerschler devised a form of repetition training where an athlete would run a relatively short distance , such as 200m., at a fairly fast pace a certain number of times. The name of this system, “Interval training” , arose because they believed that the rest or recovery period between the fast runs was the most important and vital part of the training as it was during this “interval” that the heart grew larger and stronger. Gerschler believed that the athlete should run the fast section at a speed which would elevate the heart rate to approx. 180bpm. The rest interval should be long enough to ensure that the heart returned to a rate of 120bpm. It was a very precise and controlled system of training. He craved precision and, for this reason , Gerschler was not a fan of the “Swedish method” ( Fartlek ) as it was “not exact”.

Rapid improvements were effected using this method and many world record holders and Olympic champions flocked to Gerschler’s training centre in Freiburg to adopt his methodology. But many of them soon found the method mind numbingly boring : a Spanish athlete , Tomás Barris , described it as “ a real Calvary”. Yet the 800m.world record of German Rudolf Harbig ( 1:46.6 ), set in 1939 ,who had utilised Gerschler’s interval method, lasted 16 years until another Gerschler protégé , Roger Moens of Luxembourg, broke it in 1955. In 1952, Josy Barthel , again coached by Gerschler, won the Olympic 1500m. title . So there had to be something very effective about this type of training. While other coaches admitted that it was ,indeed , highly effective in bringing about rapid improvements, many of their athletes could not abide the monotony of it. Both coaches and athletes also discovered that the fitness gained by this type of training was almost as quickly lost **unless it was combined with sufficient aerobic endurance work to stabilise the improved cardiovascular effect. (This is why lots of easy/steady running is so important on the days in between the “sessions”, and this aerobic work must be maintained, although reduced, even during the competition phase ).**

Coaches ,such as Franz Stampfli, also got tremendous results using this type of interval training. He advised Roger Bannister ( although Bannister has emphasised that he never actually coached him ) and coached Chris Chataway, who set a world record of 13:51.6 for the 5000m.in 1954 , and Chris Brasher who won Gold in the Steeplechase in the Melbourne Olympics. The legendary Emil Zatopek developed his own form of interval training, carrying it to extremes perhaps, often running up to 100X 400m. in a single day ! But gradually , coaches such as Percy Cerutty , who coached Herb Elliott ( who ran a world Mile record of 3:54.5 in Santry in 1958 ) and Arthur Lydiard ( who coached so many World record holders and Olympic champions that they are too numerous to mention !) began to question the rigid interval methods of Gerschler and Stampfli. They started putting greater emphasis on conditioning and foundation work , rightly believing that the athlete needed to have a very solid aerobic foundation before embarking on, and assimilating the benefits of, the more demanding interval work. They also began to emphasise the necessity to do longer distances in the fast reps., especially if training for races longer than 800m. In effect ,they developed what has now become known as “Cruise Intervals”. They also encouraged their athletes to get away from the track and start doing more of their training on dirt trails, beaches and undulating ,grassy parkland. This also provided the athletes with a more pleasant and inspiring environment . We ourselves are familiar with the beautiful surrounds of the “Munich” lap in the Phoenix Park or the sylvan beauty of Malahide Castle Park or Santry Demesne . Runners revelled in the sense of freedom which such locations provided, as opposed to the monotony of constant track work . The “Double-double “ Olympic champion , Laase Viren , is on record as saying that he did very little training on the track. The same applied to Herb Elliott.

Yet , a certain amount of training on the track is , in my opinion , absolutely essential . It is necessary first of all in order to learn a good sense of pace. It also , undoubtedly, develops speed and running economy if done at the correct pace. John McDonnell had his Arkansas team members do sessions of 14 X 400 even in the Autumn and Winter . He said it was important to maintain a certain speed element in the training programme all year round. Of course , he also had one eye on the Indoor season which always commenced in December or early January. The famous Jumbo Elliott of Villanova University ( who, of course , coached our own Ronnie Delaney, Eamonn Coghlan , and Clonliffe’s Frank Murphy and Des McCormack) insisted on his protégés consistently -if not exclusively -running 400s on the track in training in order to develop a perfect sense of pace judgement.

So, let’s cut to the chase and leave the history of Interval Training behind us . What most young athletes want to know is how often should they do interval work , what distances they should run , how many repetitions should they do , at what speed should they run the fast sections ( the “work intervals” ) and how long should the recoveries be . These , of course , are the five classic variables in interval training. And each one depends on what event you are training for . Be specific !

First , how often ? Well, that depends on the time of year. ( A future article will discuss the topic of Periodisation ). There is a strong argument , ( backed up by Lydiard’s principles ) that you should not be doing any interval work at all at a certain time of the season . (This all depends too ,of course, on which event you are training for and when do you wish to peak ). But any initial, conditioning phase should comprise just lots of steady, aerobic running before attempting to do any higher quality, faster work. Only when the athlete is strong enough to cope with this faster running should he attempt to introduce interval training into his programme.

Marcus O’Sullivan, writing about his own career, stated that when he was a kid he didn’t think he had much speed ( apparently, when he first joined a club, a coach initially put him in with a group of girls – and they all beat him in the sprints ) but, after Donie Walsh had made him do a thorough winter’s conditioning , he discovered a hitherto unexpected turn of speed . Even after a proper aerobic foundation has been laid, it is very questionable whether any more than one interval workout per week or micro-cycle is advisable . So , I believe that ONE interval session per micro-cycle is sufficient. ( A micro-cycle need not necessarily be a week : it could be 8-10 days )

***( N.B. I am not advocating only one quality session per week : athletes should do at least two*** **quality *workouts per week but the second one should not be an interval session )***

**Next question is : How fast ?**

Before we attempt to answer that question we should be clear about different types of “interval training”. Remember that Dr. Jack Daniels Ph.D. only refers to “interval pace “ as that pace which is approximately equal to your fastest 3000.race pace . So , if you’re an 8 minute 3000m. runner, “interval pace “ for you is 64 seconds per lap .If you’re an 9:00 athlete , your “interval pace” is 72 seconds per lap. Daniels emphasis that while this is quite fast running , it is most definitely not flat out . Some might even think that this is relatively slow ; well , try running 20X 400 at 64 or even 68 sec. pace and you might review your opinion ! Jerry Kiernan will confirm that for 6 weeks or so before he ran an Irish record for 3000m.in 1977 he was doing precisely this : he would run 20-25 X 400 in 65-66 on a Tuesday night ( what Jerry calls “ a rake of 400s”) followed by 6-8 laps of the 1200m. “Munich” course on the following Saturday.( Cruise Intervals ) On this training diet he ran 7:54.7 which was a new Irish record at that time . Furthermore , on an identical training regime , accompanied by a very brave and tough young tyro called Noel Harvey ( who went on to become the National Senior C.C. Champion in 1986 ) he ran 13:32.71 for 5000m.in 1981 . His young training partner , Harvey , ran 13:38.88 in the same race . Both men are still in the top 6 All-Time Clonliffe men over 5000m.with these times .

If using a H/R monitor , the athlete may be aiming for a heart rate of up to 90% of Heart Rate Reserve while doing this type of training .( cf.” Heart Rate Reserve” in the article on Correct Pace ) .

When we talk about faster “interval work” , we are actually talking about what Daniels calls R pace , that is Repetition Pace which is faster than VO2 max.pace. There is not much point in getting mired in semantics – it may not matter much what we call them as long as we all understand what we mean by each type . This is extremely fast running : sometimes coaches refer to this type of training as “Peaking” sessions. It is the race pace ( or faster ) of the event for which the athlete is training. An example would be the type of workouts which Nick Willis did a few times shortly before the London Olympics : 400,800,1200,all at 59 sec.lap pace followed by 2X 200 in 26; 2X300 in 38; 400 in 50.5. ( He later admitted that this may have been too severe ) .Peter Coe said **that the final workout before a major race or championship “should serve more to keep the engine fine tuned than to damage the cylinders.”**

Peter Elliott liked to do long work intervals at race pace e.g. 5 X 600 in 1:26 with 3 mins. recovery or 3-4 X 1000m.in 2:27 with 5 mins. recovery. Again , the word of warning (!): younger athletes should not even think of imitating such sessions : only very mature, extremely fit ,elite runners can handle such intensities.

Nick Symonds likes to do 6 X 200 flat out ( usually slightly under 23 secs. )with 3 minutes recovery as his final peaking workout. This was also the favourite final workout of the great Jim Ryun .

Brenda Martinez , who won Bronze in the World C’ships in 2013 and is coached by the legendary Joe Vigil, used to do 4 X 400 flat out with 7-9 minutes recovery between each. Note that the faster the “work interval” is , the longer the recovery must be . It’s almost like sprint training ( but not quite ! ). Of course if you’re training for a longer distance e.g. the 10000m. then it’s more important to increase the number of “work intervals” and reduce the recovery rather than trying to run the work intervals faster and faster. Running 400s in 68 might not seem very fast ( and it isn’t ) but if you run 25 -30 of them at this pace with only a 50 second recovery ,you will find that it’s not all that easy ! And it will better prepare you for a 10K than running 12 X 400 in 62-63 with a 90 sec. recovery. Many years ago I saw Tom O’Riordan ( who in 1964 was the second fastest man in the world over 3 miles )running 20 X 300 on the grass track in Belfield .He didn’t seem to be running all that fast and, indeed, when I timed him I discovered that he was”only” clocking 49/50 with just a 100m. jog recovery .

These examples are simply given to illustrate the difference between what Daniels calls Interval Pace ( not all that fast ) and Repetition Pace which is very fast indeed . Each has its place in a training programme : if you’re aiming to peak in July ,there is not much point in doing R type training in the previous October .Even Interval type training might not be very appropriate at that time of year.

**Next , how many repetitions should an athlete do ?**

Again, this depends on a number of factors , including the age of the runner , the level of fitness which he’s at, the time of year , the length of the “work interval” , the competitive distance he’s training for etc. In former times , dedicated athletes in their pursuit of excellence simply tried to do more and more intervals. Donore’s great Bertie Messitt ( who ran for Ireland in the Olympic marathon in 1960) revealed in his autobiography that he often ran 40 X 400 in training. Sometimes coaches have asked their protégés to do prodigious workouts in order to test their mental toughness. John Downes (National senior C.C. Champion in 1996 ) tells how David Bedford( who himself ran a world record of 27:30.8 for the 10000 n 1973 ) asked him to run 20 X 400 on the first occasion Bedford supervised Downes’s training. When he had finished , Bedford looked at him and then simply said “Do it again”. Downes was in no doubt that this was a test : Beford wanted to find out just how tough and mentally resilient Downes was . ( He passed the test ! )

\*( ***Please note again , that I am NOT yet discussing “cruise intervals”)\****

When it became public knowledge that Roger Bannister’s favourite session before he broke the 4 minute barrier was 10 X 400 in 60 , a theory developed that the number of work intervals run should be 2.5 times the race distance . At this rate , 10000m. runners would be doing sessions of 62-63 X 400 .( Zatopek type workouts all over again ! ) Jerry Kiernan never tells his protégés how many reps.they will be doing : he just observes them very closely and knows ( from the look on their faces, their body language , their level of distress or fatigue ,etc.) when each athlete has enough done and then tells him or her to stop. Jerry has what Joe Doonan ( Caitríona McKiernan’s coach) used to call “the coaching eye “. Some coaches like to err on the side of caution and tend to advise their charges to do one or two less than the athlete would like to do. ( Better to be undertrained than over-trained , is a good rule of thumb ) . Another good rule is to ask the athlete “If you really had to do one more rep. , would you be able to do it ?” In other words , the athlete should come away feeling that he has not left everything out there on the training ground .The place to leave everything out on the track is in the race situation : As Marcus O’Sullivan used to say “ They’ll be scraping me off the track at the end of the race”. But the coach should not be “scraping” the athlete off the track after a training session . He should feel that ,no matter how hard the workout , there is a little left in the tank . Killian Lonergan has another very good rule of thumb : Am I doing something today which may prevent me from doing what I need to do tomorrow or later in the week ?

**Peter Coe also believed that there should be something left in reserve : “ Every training session** **should end with the athlete still capable of doing more . If there is ever a question of whether to do more - do less”.**

**\*\* If, however, you want a very definitive rule , we must go back to Dr. Daniels who is quite adamant that the total mileage covered in an interval session should never exceed 8% of the total weekly mileage .**

**The next variable is the Recovery - how long should it be ?**

Gerschler strongly believed that the recovery should be long enough to allow the pulse return to 120bpm. This is quite an effective rule, especially if you are wearing a reliable heart rate monitor. Otherwise it requires the rather cumbersome method of either the coach or the athlete himself taking the pulse ( using a stop watch , time the number of beats for 6 seconds and multiply by 10 ).

Heart rate ,however, is a very individual variable; some athletes ( younger athletes in particular ) can have naturally high heart rates ,even after a **sustained** period of distance training, and their H/R may be very slow indeed in returning to 120bpm. Other highly trained ,elite athletes can get their heart rates back down below 120 very quickly indeed . ( Killian Lonergan’s H/R was usually back down to 90 after about 40 -45 seconds even while doing a very tough interval session !) .

There are some rather crazy theories about recovery : one is that the recovery interval should be twice the length of the work interval . This just doesn’t make any sense : it would suggest that if an athlete is running 6 X300 in 38 ,the recovery should be only 76 seconds . I don’t think there are too many athletes capable of doing such a session of 300s with such a short recovery ! Perhaps this theory, that the recovery should be twice the length of the fast run, goes back to the fact that Roger Bannister tended to run 10 X 400 in 60 sec. with a 2 minute recovery .

Another dubious theory is that the athlete should work on a 2 minute cycle . So, if the athlete is running 400s in 62, the recovery would be only 58 ! I don’t think he would be able to do very many at this pace with a recovery so short. If the runner is training for a 5000 , say, and clocking 67s,then a recovery of only 53 might be very well possible and advisable . So a lot depends on what event the athlete is training for and how fast the work intervals are being run.

**\* A good rule of thumb is : the faster the work interval , the longer the recovery should be . The “slower” the work interval , the shorter the recovery should be .So ,if you’re training for a 5000 or 10000 ( or longer ) you should try to increase the number of work intervals and decrease the recovery time . ( More on this when we get to Cruise Intervals )**

Before we leave the subject of recovery , many athletes will also ask “What should I do during therecovery interval ?”. Traditionally, the favoured option was to jog . Those of us of a certaingeneration will remember Laro Byrne and later Paddy Marley regularly reminding us that “ There **is** no recovery in a race “ . So they advocated short ,recovery jogs . They are in good company inrecommending this as there is a body of scientific evidence to prove that jogging helps to dispel the lactic acid. Of course, elite distance runners are increasingly likely to adopt a “float recovery”. This is very difficult and only very seasoned ,highly trained long distance runners can cope with it. ( It is not particularly suitable for 800/1500m.runners ).As we saw in the article on Fartlek , this trains the “Lactate Shuttle” which means that the recovery “float” both clears the lactic and at the same time is using it as a fuel.

Yet, some authorities are in favour of standing or walking during the recovery phase. The formerworld record holder for the Mile and 1500m., Noureddine Morceli , was reported to come to a fullstop after each work interval and remained standing still until it was time to go again. The **purpose** of this was deliberately to let the lactic accumulate in order to get accustomed to running with alarge amount of lactic in his muscles . This developed lactic tolerance but ,again, It’s not somethingthat the young or novice runner should attempt . It takes time to reach this level of training and can only be achieved by small, incremental increases .

Finally, what variations have been introduced into Interval Training in recent times ? There are three worth noting :

**1.Sets. 2. Differentials 3. “Hammer Intervals” 4. Variable Pace Training.**

1.Sets : This is simply where the coach ,instead of asking his or her athletes to run 12 X 400 ( say ) , asks them to do 3 sets of 4X 400. The rationale behind this is to improve the quality of the workout . The coach knows that his charges are not capable of running 12 X 400 in 60 ( say ) but he/she does know that they are able to run 4 X 400 at that pace and , if they get a generous recovery between the sets , they will be able to repeat this three times . This type of workout is more suitable for middle distances ( 800/1500 ) rather than the longer races . If training for 5000,10000 or longer we should ,indeed , remember the words of Paddy Marley : “There are no recoveries in a race” . So, for a 5000m.runner it would be better to do 12( + ) X 400 straight ( continuous ) in a slower time but with much shorter recoveries.

2. Differentials : This is based on the Principle of Negative Splitting . In simple terms , if the athlete is running a 400m. ,the coach will blow a whistle at the 200m. point ( or at some point which the athlete does not know in advance )and this is a signal for the runner to speed up and “kick it in”. This is a very energy sapping form of interval training, probably more suitable for a “peaking” session. It is designed to prepare the athlete for the changes of pace which will inevitably come in a race and/or to prepare the athlete to develop the ability to kick when tired.

3. Hammer intervals : This is a method which has become popular with American middle distance runners in recent years. This involves a “surprise” element being introduced by the coach. The athletes will run their work-intervals at the designated pace but then , without warning, the coach will blow a whistle or shout “Hammer” . This is the signal for the athletes to run the next interval practically flat out . It is ,needless to say , a very tough form of training . Once again it is designed to simulate race conditions where the athlete may have to respond to a sudden ,unexpected change of pace . Great runners such as Brendan Foster used this tactic with devastating effect in his 5000m. races over 40 years ago . In the European Championships in Rome in 1974 , for example , he threw in a 58 second eight lap which destroyed the field. Needless to say , a runner needs to be extremely brave and strong to employ such a tactic ,otherwise he himself will simply “blow up” and end up looking very foolish .

4. Variable Pace Training.

This type of training has become popular in recent times and is ,perhaps, inevitable if doing a pyramid or a ladder . If doing a workout such as 1600,1200,800,600,400,300,200 (a very popular “Ladder” in Arkansas under John McDonnell ) it simply wouldn’t make sense to run each work interval at the same pace . So the athlete might run the 1600 at 10K race pace , the 1200 at 5K race pace , the 800 at 3K race pace , the 600 at 1500 race pace , the 400 at 800 race pace ,the 300 also at 800 race pace and the 200 at 400 race pace .

It is debateable whether such forms of training are particularly advisable unless or until the athlete has reached a very high level of performance indeed. They are certainly advisable for the elite runner – indeed they may be absolutely essential . However, for athletes who have not yet reached international level ,it might be more worthwhile to adhere to basic, fundamental forms of interval work . There is a lot to be said for the KISS method of training : **Keep It Simple Stupid !**

When training for events like the 5000 , 10000 and longer , it is highly advisable to keep the work intervals at an even pace ,if only to learn proper pace judgement . Adopting some of the variations , as outlined above , may only result in the athlete running into oxygen debt, accumulating vast quantities of lactic and ,ultimately, being unable to finish the workout and being left feeling very frustrated.

To finish , I would like to refer to a form of training which the late Jack Sweeney ( the “Father of Irish Coaching” ) utilised in U.C.D. many years ago . It might be called “ Race Simulation”.If you were training for the 1500 ( say ) , Jack would get the athlete to do the following :

400m.at target race pace;200m.jog; 400m.at race pace;200 jog ; 300 at race pace . A week later he would ask the athlete to do 400 at target race pace ; 100 jog; 400 at race pace ;200 jog; 200 at race pace ; 100 jog; 100 flat out . This would continue over a period of weeks , extending the length of the fast sections and reducing the length and number of the recovery jogs until, eventually, the athlete was running close to the entire race distance . This gave the athlete practice at running at the target race pace while, at the same time, building up his confidence in his ability to actually achieve his goal.

Next time ,we will look at Cruise Intervals , Hill Training and Parlauf.