1. Introduction

Training loads are characterized by a specific blend of stimulus and recovery. This operates at every level from the design of a training unit through to multi-year plans. Awareness of the relationship between stimulus and recovery (the training ratio) is bread and butter to endurance coaches in focussing on the specific effect of training units such as interval training. However, it is still fair comment that most coaches are happier with their understanding of stimulus than they are of recovery. To illustrate this, although the overcompensation diagram (1) is generally accepted in terms of explaining the phenomenon of training effect, it is difficult to produce consensus on the timescales over which it operates. Of course the athlete “recovers” and certainly the organism “overcompensates”, but how long does this process take? How variable is such a timescale according to the athlete, stimulus, activity during recovery – and so on? We need, then, to look more closely at “recovery”.

Frank W. Dick

THE “R” IN TRAINING
Recovery and regeneration course
Loughborough Summer School, July 1987
Recovery is related to Rest. The latter, however, normally implies inactivity, whilst the former may or may not. As a consequence expressions such as “active recovery” and “passive recovery” have been coined. I believe that “rest” should not be viewed as general inactivity - but rather, as relief from a particular activity. For example, a big warm-up and mobility session is hardly inactivity, but might be used as a rest from strength training. Rest is universally accepted as something we need in order to remain efficient in meeting the demands of our lifestyle, be those demands routine or emergencies. We know we each need our own waking:sleep ratio. Lack of sleep can be most debilitating, leaving us unable to cope with even minor stressors. This is brought into very bold relief when working with growing children who require energy for growing, participating in sport, studying - and enjoying their young social lives. But what about rest and you? Operating on 6 - 7 hours' sleep per night - grudging taking a break during the day; avoiding taking a day off when it's due - and cutting corners with your vacation time - are hardly strong evidence of ability to produce peak efficiency when dealing with work, coaching and the family's need! Lack of rest - lack of recovery from the cumulative stressors of our lifestyle, not only erodes our efficiency, it also dulls our creative edge. Appreciation that recovery can be active or passive - and that lack of rest or recovery can reduce creativity leads naturally to a derivative of active recovery - Recreation.

The question is often asked why so few Physical Education Teachers coach. The answer might be found in the thought that one man's recreation is another man's job! Without doubt we each have need of activity be it physical, intellectual, emotional or a mixture of these, which affords us opportunity to get into our own space - to feel good about ourselves - and to free us from the many stressors which bombard us in our working life. In the three lanes of the "Time Travellers"

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Diagram 1: Overcompensation curve (from YAKOVLEV)

- Loading
- Fatiguing
- Recovering
- Overcompensating
motorway - Recreation is in your lane. In my opinion it's a need to have part of that lane - not a nice to have part. Wrapped up in this concept is the idea of "supercharging the batteries". To put it another way, when coaches use the words rest and recovery, their meaning leans in a different direction than when doctors use them. The doctor normally has "recovery" in mind - getting the patient back to normal - say after illness or an injury. The coach, on the other hand, wants a heightened state of readiness of the athlete's interest! The coach wants overcompensation. It is a recreative - rather than recuperative direction. I am convinced that such activity can be better thought through by most coaches, and that the means at our disposal can be more fully explored. Once identified, understood and applied, I believe there will be a shift towards an even more positive role for this aspect of training - and the concept of Regeneration will emerge strongly within training regimes from training units through to multi-year plans. Once achieved athletes will gain far more value from their training programmes.

Without endeavouring to lay down a precise definition of Rest, Recovery, Recuperation, Recreation and Regeneration, we consider that the "R" between repetitions, sets, units, microcycles, macrocycles and year plans must fulfil the condition that the athlete will be prepared to gain maximum training effect or result from the rest unit, microcycle, etc.

Against this backcloth, I'd like to review the means and methods available to us to produce the effects we require of our interpretation of Rest/Regeneration - then to consider how they might be applied.

2. Means and methods

2.1 Intra - Unit

(Between repetitions or between sets).

The period of time involved here is measured in seconds or minutes. During this period the athlete must recover to a level which permits the objective of the training unit to be met.

For example, if the unit is interval training, the degree of recovery, monitored by noting heart rate, must slow the athlete's heart rate to fall to around the mid-point of the total range. If resting heart rate is 60 and maximum is 180, then the athlete's heart rate should be around 120-130 before he/she performs the next repetition.

If maximum quality of performance is required over a number of repetitions - say for speed - then recovery must be complete between runs. A unit of 3 × 60m, then, will require at least 10 minutes between repetitions.

If incomplete recovery is required to guarantee cumulative fatigue for development of anaerobic tolerance, time periods are chosen to ensure that the athlete can perform sufficient repetitions to guarantee a training effect. This effect may or may not require that the athlete maintains a minimum quality of performance in each repetition. If it does, then clearly the time periods are longer and the quality of performance is sub maximum.

Recovery Activities include:

- Lying down;
- Walking;
- Jogging;
- Doing a related activity;
- Doing an unrelated activity;
- Massage;
- Changing footwear;
- Warming-up.
Intra-unit recovery is, by definition, part of the training load. However, it may also be considered part of the stimulus in certain types of training. For example, in some special strength work, where the objective is to accelerate strength levels, instead of:

\[ \text{load} = \text{stimulus} + \text{recovery} \]

it becomes

\[ \text{load} = \text{stimulus (1)} + \text{stimulus (2)}. \]

So, in leg work, the training unit might become:

Stimulus 1 - 5 x 85% max 1/2 squat
Stimulus 2 - 5 x rebounds over 8 hurdles at 3”

immediately on completing stimulus 2, the athlete starts again stimulus 1.

The total unit is 3-5 x (stimulus 1 + stimulus 2).

2.2 Inter Unit (Between units on a given day or from day to day).

The period of time involved here is measured in hours or days. Few athletes outside the endurance group, pursue the same training objectives in successive units. Having said this, many endurance athletes follow a pattern of “hard unit” – “easy unit” alternation. Inbuilt into most training programmes, then is a form of recovery from the stressor of specific training loads.

There does, however, exist a problem borne of the cumulative progression of loads in pursuit of a variety of objectives. At this point, it is not the stressors of specific training loads which reduce the value of training, but the stressor of the total training load in the organism! – In short, there is general fatigue. Most coaches should spot this early, in that control targets are not being met. If it is not spotted, the athlete eventually loses his/her excitement for training – his/her mental and physical edge becomes dulled – and there is risk of stress related injury and illness. Coaches must learn to feel comfortable not only at including rest units and days in the microcycle – but also at introducing periods of up to several days recovery when occasion suggests. Flexibility within the programme’s overall structure is the key to controlling the cumulative effect of training.

Recovery activities include:
- Eating/drinking;
- Lying down;
- Sleeping;
- Massage;
- Jacuzzi;
- Sauna;
- Change of venue;
- Work/study;
- Going out to a show;
- Watching TV;
- Listening to music, etc.

Doing another event/sport at recreational level, e.g. swimming, golf, cycling etc.

- Varying:
  - The training objective;
  - The level of athlete involvement in decision making;
  - Routine;
  - Between training and competition.

General activity units
- Warm-up units
- “Feel good” sessions;
- “Finding space” sessions;
- Relaxation units – dynamic/passive;
- Dance, aesthetic expression.

Even if a coach agrees on the need for recovery units and days, it may not
be obvious where or when such need might be anticipated. It may help if the “danger zones” in the training process are highlighted because clearly coaches must afford recovery and higher profile in microcycles and macrocycles.

Danger zones exist when there is:

- few or no general exercise units in the microcycle;
- acceleration of intensity in training units as in precompetition phases/macrocycles (December/January: May/June);
- following illness or injury, when athletes and coaches are tempted to “hurry nature”;
- a high proportion of units of maximum/submaximum intensity, a structure of loading (intensity: extent) which is approaching the limits of the athlete's ability;
- a technical workload which is as mentally demanding as physical work;
- bias of training units/methods;
- a blend of:
  * high frequency competition
  * frequent disturbance of daily routine
  * compromise in training routines;
- a high demand on energy and time from the “non athletics” part of the athlete’s life;
- a problem of general stress, or health;
- a possible injury or risk of viral illness.

Most of these examples are simply common sense – but both athletes and coaches can occasionally abandon common sense when pressurised. For example, it is not unknown for programmes to be made harder rather than easier when performance training does not come up to expectation! For athletes who are “achievers” – lack of commitment or hard work is not an acceptable explanation for performance problems. It is more likely that the athlete has been overcommitting and overworking – or that the work has been inappropriate!

2.3.3 Inter Micro/Macro-Cycle
(Normally a transition phase/etc. or regeneration phase/etc.)

The period of time involved here is measured as numbers of days or weeks. The period of time suggests that consideration of when such cycles/phases are introduced to the programme, normally occurs at the same time as the year plan itself is set out. This is not to say, of course, that given certain circumstances, such a phase may be introduced in pursuit of a specific regenerative objective – at any time in the year.

The “early planned” regeneration phase is normally located in the period between conclusion of the competition period and commencement of the introductory phase of the year plan. It should be planned in such a way that the athlete returns to training highly motivated and fully prepared to commit himself/herself to the rigours and discipline of training. This is best achieved quite simply by taking a vacation. This suggests:

- a different climate;
- different surroundings;
- different routine;
- different social environment;
- different physical activities;
- different diet;
- different emotional and mental demands.

The “introduced” regeneration phase is normally associated with re-
covery from crises. Unexpected and critical defeat; selection for a major championships; serious injury/illness; all represent possible crises which may require a regeneration phase to help bring things back into focus. However, it should be said that the “crisis” situation may not just suddenly happen. The need for “regeneration” actually manifests itself in a number of ways which, if watched for, will help coaches respond before the situation becomes virtually irretrievable. The coach should be aware of the following:

1. PSYCHOLOGICAL SYMPTOMS:
   - Increased irritability;
   - Obstinacy;
   - Increased argumentativeness;
   - “Flying off the handle”;
   - Complaining about trivial things;
   - Defiance;
   - Anxiety;
   - Melancholy;
   - Avoidance of contact with coach and colleagues;
   - Very sensitive to criticism;
   - Blaming everyone else for problems;
   - Increased indolence;
   - Dullness;
   - “Imagining things”;
   - Depression;
   - Insecurity.

2. PERFORMANCE SYMPTOMS:
   a. Techniques
      - Increased incidence of disturbance in the basic technical model, e.g. reappearance of old faults; cramps; inhibitions; loss of confidence; disturbance in the rhythm and flow of the movement; reduced ability to differentiate between right and wrong movement.
   b. Condition
      - Diminished status of endurance, strength, speed.
      - Longer recovery times needed.
      - Loss of “bounce” in training – becoming almost a “slog”.
      - Loss of personal effervescence on and off track.

c. Competitive qualities
   - Reduced readiness for competition “action”.
   - Fear of competition – or rather of losing.
   - Giving up under pressure.
   - Confusion in competition such as departure from competition plan or inability to respond correctly to the strategy of the opposition.
   - Easily demoralised.
   - Loss of belief in self and abilities.
   - Talks about lack of point in continuing the struggle.
   - Wants out!

3. SOMATIC FUNCTIONAL:
   - Sleeping difficulties;
   - Lack of appetite;
   - Loss of weight;
   - Increased weight;
   - Dizzy spells;
   - Night sweating;
   - Increased susceptibility to injury/infection;
   - Disturbance in digestive function;
   - Longer time to have pulse recover to resting;
   - Increased resting heart rate;
   - Loss of vitality.

Should such symptoms arise, especially if there are several symptoms, the coach should:
   a) have the athlete check with his/her doctor;
   b) put the athlete immediately on a regeneration programme.

Over-stressing the athlete due to what might be considered as failure to
tolerate the cumulative stresses of the athlete’s lifestyle—i.e. athletic and non-athletic, manifests itself, according to Israel, in two types of reaction. These should be considered against the backdrop of the symptoms outlined above. More important still, it should be borne in mind that they are the outcome of coaches failing to build into the programme at micro-cycle, macrocycle (phase) and year-level, adequate rest, recovery, regeneration, etc. He saw the two reactions as:

a) Basedovoid—i.e. when stimulatory processes dominate. This is where the athlete is “jumpy”, “irritable”, over reactive to criticism and so on.

b) Addisonoid—i.e. when inhibitory processes dominate. This is where the athlete loses vitality, “can’t be bothered”, and so on.

Selection of components to be included in the regenerative programme vary according to whether the athlete’s reaction is Basedovoid or Addisonoid. Israel identified examples of such variance and these have been added to here under three headings.

BASEDOVOID

Diet

Encourage the athlete to eat more;
Choose basic foods such as milk, vegetables, fruit;
Avoid spicy or greasy sauces/dressings;
Avoid coffee, tea and soft drinks containing caffeine;
Reduce protein consumption—especially red meat;
Take a concentrated course of vitamins—especially B complex, C and A;
Take small quantity of alcohol—e.g. a glass of sherry prior to sleeping;

Take proprietary brand tonics e.g. biostrath and nutritional drinks such as Ovaltine.

Physical Therapy

Swim outdoors;
Bathe in the evening for 15-20 minutes— at water temperature 33-37°C— with additives such as Radox, Badedas, extract of pine needles, hops, valerian, carbonic acid; etc.;
Take Jacuzzis;
In the morning—take cold shower followed by a brisk towelling;
Take soothing massage;
Do soothing slow pace-rhythmic aerobics/exercises to music with emphasis on slow stretching.

Climate

Move to a quiet area—forest or mountains;
Avoid intense ultra violet radiation;
Live in moderate temperatures of 18°C-24°C.

ADDISONOID

Diet

Encourage maintaining a strict 3 meals/day routine;
Increase protein intake—meat, cheese, eggs, cereals;
Take a concentrated course of vitamins—especially B complex and C;
Avoid alcohol;
Take occasional caffeine based drinks with meals.

Physical Therapy

Take alternate hot/cold showers in the morning and in the evening;
Take saunas in the middle of high range of temperatures;
Take vigorous massage using hot rubbing lotions;
Do vigorous fast rhythm aerobics/exercises to music – with emphasis on elasticity.

*Climate*

Move to a bracing climate – windy seaside location is ideal;
Look for moderate ultra-violet radiation;
Seaside in a warm climate allows benefits of hot sun and high temperatures to be alternated with plunges in the sea.

Live in moderate to high temperatures of 22°C-28°C.

3. Conclusion

There can be little doubt that very few coaches pay sufficient attention to the “R’s” in training! The purpose of this paper has been to encourage and help coaches to afford this very important aspect of the training processes sharper focus at the unit, microcycle/macrocycle (phase) and year plan level.