

## Velocity Based Training

### Introduction

'Velocity based training' is a relatively new term that describes the use of the measurement of repetition speed to inform us on the potential outcome of a training session. I.e, whether a session is primarily aimed at strength training, hypertrophy training or if indeed it is aimed at explosive power training.

Velocity can be measured via:

- Force plates
- Linear position transducers (GymAware etc)
- Accelerometers
- 3D filming

To a degree, you can also 'see' or 'feel' repetition velocity.

There are different measures of velocity that include:

- Average velocity across the concentric range of motion
- Peak velocity – the highest velocity at any point in the range of motion
- Mean propulsive velocity (MPV) – the average velocity until the point of deceleration in a range of motion
- 1RM velocity – the average velocity at which a 1RM lift is performed

Repetition velocity is always measured in metres per second (m/s). All measures of repetition velocity have their place.

When measuring repetition velocity, it is often worth noting the difference between first rep velocities and second rep velocities, as the latter includes an eccentric phase prior to the concentric phase.

### Normative figures

#### Squat

For strong athletes average squat 1RM velocity is usually 0.2-0.23 m/s

For weaker athletes average squat 1RM velocity is usually around 0.32 m/s

#### Counter Movement Jump (CMJ)

Peak velocity measures

- Rugby players 3.9 m/s
- MMA 3.77 m/s
- Untrained 3.09 m/s

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Any real power athletes are likely to perform the CMJ at 3.5-4+ m/s

## Power cleans

General athlete peak velocity 1.43 m/s

General athlete average velocity 1.05 m/s


Of course, we are all different, therefore normative velocities should be established for each individual. Data should be tracked over time and at each session in order to build a profile of repetition velocities that can be used to inform future training sessions and physical progress.

## How velocity measurement can help explain potential exercise training effect

The table below clearly shows how the number of repetitions performed in a set affects the repetition velocity achieved (or the percentage of decrease in velocity by the end of the set) as well as the lactate and ammonia response (both indicators of the likelihood of the exercises causing hypertrophy).

| Sets/<br>Repetitions | Squat<br>velocity<br>decline % | Squat<br>lactate | Squat<br>ammonia | Bench<br>press<br>velocity<br>decline % | Bench<br>press<br>lactate | Bench<br>press<br>ammonia |
|----------------------|--------------------------------|------------------|------------------|---|---------------------------|---------------------------|
| 3x12RM               | 46.5                           | 12.5             | 125              | 63.3                                    | 8.9                       | 111                       |
| 3x10RM               | 45.7                           | 11.7             | 97               | 58.4                                    | 7.8                       | 89                        |
| 3x8RM                | 39.8                           | 10.4             | 78               | 56.9                                    | 7.5                       | 79                        |
| 3x6RM                | 41.9                           | 10               | 65               | 56.8                                    | 6.9                       | 68                        |
| 3x4RM                | 32                             | 6.9              | 61               | 49.8                                    | 4.9                       | 53                        |
| 3x8 (10RM)           | 32.3                           | 8.6              | 62               | 56.1                                    | 6                         | 64                        |
| 3x6 (10RM)           | 22                             | 6.3              | 48               | 29.8                                    | 4.6                       | 47                        |
| 3x3 (6RM)            | 19.6                           | 3.5              | 47               | 23.7                                    | 3.1                       | 51                        |
| 3x2 (4RM)            | 16.6                           | 3                | 41               | 18.9                                    | 2.6                       | 48                        |

 Higher

 Lower

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You can see from the table that in general, less reps and reps not performed to failure, equals more velocity (less repetition velocity loss) and less fatigue.

With less velocity comes the knock on effect of more muscle hypertrophy. If either higher rep ranges, or if more than 80% of the possible repetitions are performed, then large decreases in velocity occur within a set, lowering power 'gains', but increasing hypertrophy 'gains'.

## Using velocity training to inform planning and periodisation

Studies show that:

3 x 8RM sets 48 hours later are still affecting performance with subsequent training velocities of approximately 95% of maximum.

3 x 4 (8RM) higher velocity sets 48 hours later often have a positive effect to subsequent training session velocity, with 101.9% of previous maximum velocities achieved.

Therefore, by keeping a careful eye on repetition velocity, we can more accurately plan training loads and frequency. This is especially relevant if we are training for power.

## Takeaways

Training at higher repetition velocities gives:

- No overall loss in strength gains
- Greater peak velocity gains
- Greater velocity gains in sub max loads
- Less hypertrophy
- Potential for quicker recovery or more frequent training

Training at lower repetition velocities gives:

- More hypertrophy
- Less velocity gains
- A decrease in explosive fibres
- Decreased training frequency

If repetition velocity loss is limited to 20% for squats or 30% for bench press, then there will be less muscle 'damage' and a shorter recovery time between sessions.

Programme in cluster sets to achieve higher velocities and less muscle damage.

In conclusion, to train for velocity or power, then do not train to fatigue – train fast!