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The Functional Continuum: Are we weight training for success?

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PLOTTING

The more motion involved in the action the greater the number of joints required to perform the action. With this in mind, and other factors withstanding, the generic plotting of the functional continuum would be as shown in Figure 1.

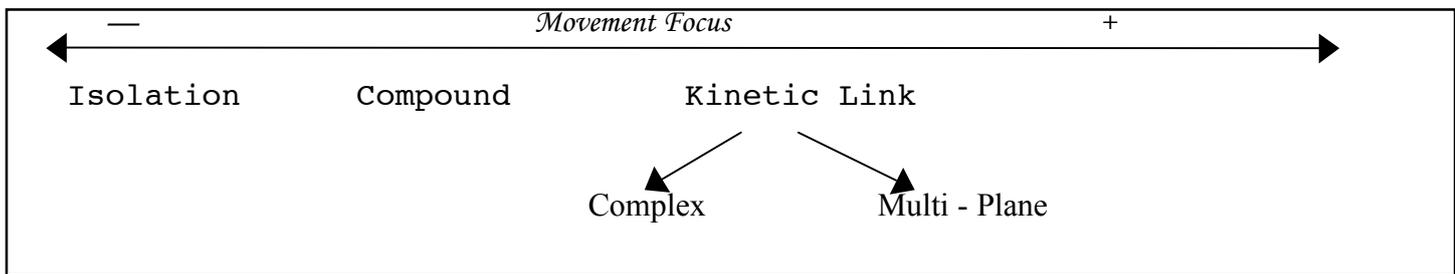


Figure 1. The generic plotting of the functional continuum.

INCREASING THE MOVEMENT VALUE

Stabilisation

Activities that require the body to stabilise other body parts through increased synergy, increase the functional value of an exercises, two qualities vital to sports performance and everyday function.

- *Dumbbell Exercises* — Dumbbells due their independent nature have a higher synergy requirement than bar or fixed machine work. They also allow greater versatility in movement and mimicking of specific actions.
- *Fitball Exercises* — Fitballs decreases the stability of the body by amplifying weaknesses in balance. Therefore exercising on a fitball increases the need for effective stabilisation, hence increasing synergy between muscles and core stabilisers. (Eg. Try performing a push up with each hand and foot on separate basketballs. You are so busy utilising energy to balance, your push up strength / endurance is usually poor.).

Potential For Movement

The greatest potential for movement is one that allows full range of motion (ROM) across all planes of movement in unilateral independence. Dumbbells for example, allow greater movement (hence require greater stabilisation) than a barbell. Medicine balls, with their droppable - throwable nature, can provide even greater potential for movement than a dumbbell.

RE-PLOTTING

So as can be understood, plotting on the functional continuum is not quite so black and white. For example; a Squat performed on a Universal machine (a fixed - machine) would have a lower synergy and stabilisation requirement than a squat performed on a smith machine, which would in turn have a lower synergy and stabilisation requirement than a barbell free squat. Although all these are compound exercises, they have a different plotting on the continuum. As shown in Figure 2, the continuum is more complex than it first appears.

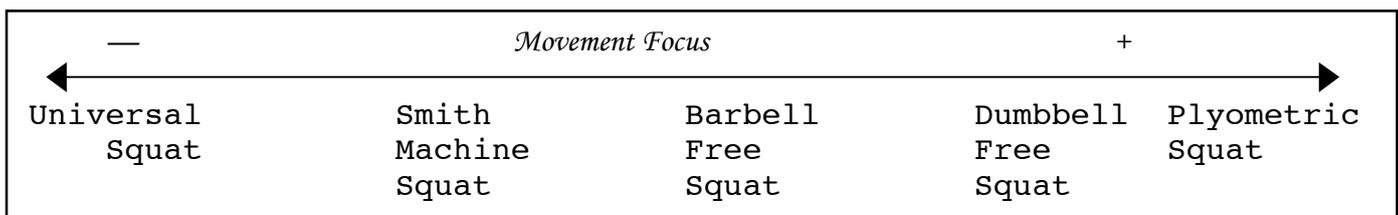


Figure 2. Plotting a compound movement classification accounting for the increased stabilisation requirements and potential for movement.

COMPARING THE FUNCTIONAL VALUES

Isolation vs Compound

The technology of the fitness boom with its muscle isolating machines and focus on parts of the body produces the body as an object of increasingly isolated and fragmented parts. (Costa 1995).

One must ask how functional isolated exercises are. Not only is the cross over to function of single joint exercise poor (Chek 1998a) but when in life are isolated movements performed ? Name any sport that utilises a purely isolated action? When in life does the knee perform extension alone, as in the Leg Extension, whilst the back and upper thighs are supported?

There are few benefits of an isolated action for the general fitness trainer or even advanced athletes. Some of the common reasons (or excuses) given by resistance training (RT) instructors for the implementation of isolated exercises include:

◆ *Rehabilitation :*

Even though an isolated exercise MAY be prescribed by a physiotherapist, (Eg. The Leg Extension, prescribed to strengthen the Vastus Medialis Obliques), it is done so in conjunction with functional movement and mobility work. You will find that for most physiotherapists, it is the return to function that is of primary concern and the restrengthening exercises are so directed.

◆ *Muscle Balance :*

Would not a compound exercise provide the same muscle strengthening benefits whilst providing a greater functional movement and co-ordination aspect. For unilateral actions like Javelin throwing or bowling, where one side is trained more than the other, the same gross action can be performed on the weaker side utilising weighted balls like medicine balls.

◆ *Pre-fatiguing :*

The means of isolating a muscle to ensure it is the limiting factor in an exercise, is utilised by body builders to target a specific muscle requiring growth. However this value is almost purely aesthetic and of little use for athletes. For example, if an Olympic lifter always fatigues in the glutes when dead lifting, what good would pre - fatiguing the quadriceps be (to ensure the quads are the limiting factor in his / her dead lift) to performance.

Machine vs Free Weights

80% of injuries in the US are from machines like a Pec Deck. (Chek 1998a).

◆ *Safety :*

For many years it has been commonly advised that beginners utilise machine weights rather than free weights. The predominant reason being safety, as less synergy and balance is required. However what happens in real life when the client is required to utilise the muscles in a functional capacity, a capacity which requires synergy and balance.

For example: Many novices Squat utilising machine weights, what happens then when they get home in the afternoon and attempt to lift a box. The muscles may be further developed but how has the synergy, proprioception and balance improved to aid in the movement. The same applies to the body builder when they attempt to lift heavier weights in order to stimulate greater neural drive, the prime movers may have increased strength capabilities during isolated exercises, but what about the synergists and fixators?

McEvoy, Rawson & Ridley (1993) state that '*Since pin weight machines consist of preset lines, it is often argued that the stabilisers are neglected. It is often these stabilisers that are prone to injury.*'

By fixing lines and planes of movement the chance of injury may actually increase as opposed to decreasing. Poliquin (1997 as cited by Ostrowski 1998), in regards to the smith - machine bench press, states that....

Because of the mechanics of the human shoulder joint, the body will alter the natural pathway during a free - weight bench press to accommodate efficient movement at the shoulder. A fixed - bar pathway does not allow variation for efficient movement at the joint, thereby predisposing the shoulder to harmful overload from the lack of accommodation.

The question must then be asked why then are fixed - machine weights still so commonly prescribed. I have determined three major reasons after consulting resistance trainers and gymnasium instructors.

1. The gym owners are safe, the injuries occur outside of their facility or instruction,
2. The RT instructors are either lazy or under time constraints and short cuts are taken with technique coaching which becomes easier and quicker on a machine, and
3. Overload is introduced to soon. Why are free squats performed in aerobic classes and pump classes without an uproar? The most common answer is....*because the weights are lighter in an aerobic class.*

PUTTING FUNCTION TO WORK

◆ *Stabilisation*

The transferability of gains made on machines are questionable. Chek (1997) explains that motor patterns are centrally generated and if the body is not satisfied that the core is stable it will decrease the activation of the larger muscle groups.

If the stabilising muscles of the shoulder joint are weak then innervation of the prime movers will decrease during the performance of a movement. (Ostrowski 1998, on developing the stabilisers for the Bench Press.)

You can only pull what you can stabilise. (Chek 1998b, on Bent Over Rowing.)

TRY THIS.....Perform a single leg Leg - Extension on a Leg Extension machine with a weight that will allow only ten to fifteen repetitions. Now stand on one leg and perform a single leg extension with the same weight for the same amount of repetitions, can you do it? Probably not. Even though your legs can still produce the same amount of force, it is not able to as the rest of the body is unstable. The body is also accustomed to producing this force with your core supported, the way you trained it in the gym on the leg extension machine. Yet which position are you in on the sports field when kicking a ball, are you standing on one leg whilst moving and rotating, or sitting down with a back support? As Ellison (1995) states it is '*Important to develop active, internal stabilisation as opposed to passive external stabilisation.*'

The more you stabilise a movement the stronger the movement becomes, transferability from functional to stable exercises is therefore high, yet these gains are low in the reverse situation. Ostrowski (1998) uses the example of the Lat Pulldown and the Chin Up. Increases in the Chin Up are transferable to the more stable Lat Pulldown, yet not the other way around.

◆ *Synergy*

One of the most notable factors in strength gains for beginners comes from an increase in muscle synergy (Sharkey 1990; Shields 1994; Wilmore & Costill 1994; Fleck & Kraemer 1997). This is because the motor pathways develop to make the action more efficient by not sending neural impulses to the antagonists and non-essential muscles. Synergy develops to allow a coordinated activation of the agonists, synergists and fixators in their correct roles, without interference from the antagonists. (See Figure 3.)

The body adapts to the level of performance required. If the level required is below the current level developed, then detraining will take place (Eg. When you take time off, your body detrains to your current sedentary levels). For the sedentary person who takes up resistance training, there is a positive adaptation to the new level of synergy and stabilisation required, (the inter muscular adaptations that bring strength gains.). However for the general resistance trained individual, who performs the generic isolated, machine or supported exercises, the stabilisation / synergy requirement is still below that required for functional activity and sport. With this in mind, strength for function needs to be developed in a functional setting, (remembering that strength is transferable from an unstable environment to a

stable environment but not the other way around.

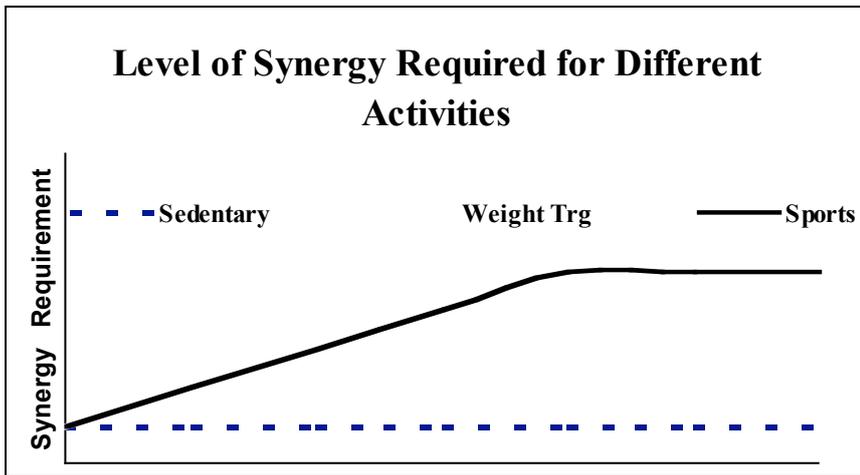


Figure 3. The level of synergy required for different activities

The means in which stabilisation is increased is also important. In the upright position humans use their abdominals as stabilisers as opposed to just movers. How many functional activities and sports require their strength in the upright position, almost all of them. As Ellison (1995) states '*A muscle's function in the upright position is a priority in training.*'

PROGRAMMING FOR FUNCTION

The first and most simple thing to do to each exercise is add more movement, rather than moving only one joint, move more. The more you move the more functional your exercise. Compare the amount of joint movement in a leg extension as opposed to a Deadlift or even a run.

Progression is the most important aspect of programming. It is hard, due to ego, but vital that we start at the beginning. The method of progression should be from techniques and stabilisation to strength then if required power. '*We should never break the stability - strength - power rule of progression or we break the client/athlete*' (Chek 1998a). I know You want the muscles of your legs to look good, so you want to do Leg Extensions and Leg Pressing.....Ever seen a sprinters legs ? Pec Decs and Flyes for the Upper Body? - Seen a gymnast? Yes they do perform weight training exercises, but their dominant training is kinetic link and they do their weight training after functional training.

The next thing to do is to decrease your support and increase the requirement to balance. This can be done by moving off the machines and onto free weight. Once barbells have been mastered move onto dumbbells. From there the choices are endless. Use medicine balls, body weight, ropes, throw away the bench and use a fitball.

Easy is it not ? However there is a catch. By decreasing your stability and increasing your balance requirement, the weights you can normally lift need to be decreased. Once you can control your ego, here are a few variations you can try. The exercises are shown in order of functional / stabilisation regression, as training protocols dictate, the athlete / client should move from an unstable environment to a stable one.

****Safety****Safety****Safety****Safety****Safety****

1. Follow the guide of developing technique and core stabilisation *FIRST* then Strength then Power.
2. Move from exercises with the higher stabilisation requirement to those more stable during a training session.
3. Progression - DO NOT increase weight too rapidly -----Remember first rule.



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