Challenges of Developing a Muscular Fitness Program: The Goldilocks Combination

Determining the best "Goldilocks" combinations of the acute training variables (e.g. intensity, frequency, duration, repetitions, sets, load etc.) in a muscular fitness (strength training) program to produce the best outcome for a client is extremely challenging (Peterson, Rhea, & Alvar, 2004). Besides what research has determined regarding acute training variables, consideration must also be given to the type of client (trained/untrained/professional athletes/special populations) and the client's state of being (state of health, nutrition, lifestyle, stress level, physical capacity, etc.) at the current moment in time. Optimally, the goal is to require the minimum "dose" for the greatest "response" (minimize the "cost" for the greatest "gain"; "biggest bang for the buck") (Rhea, 2014).

Research particularly regarding the manipulation of exercise intensity, frequency, and volume of training has yielded some clues for strength programs in the untrained (generally healthy) population. Maximal strength gains may be attained by untrained individuals working at 60% of 1RM exercise intensity, 4 sets per muscle group, 3 days per week (Peterson et al., 2004; Peterson, Rhea, & Alvar, 2005). Trained (healthy) individuals seem to benefit most by working at 80% of 1RM exercise intensity, 4 sets per muscle group, 2 days per week (Peterson et al., 2004; Peterson et al., 2005). Athletes vary more due to the specific training needed for their sport. Some research has shown that athletes may experience the best outcome working at 85% of 1RM, averaging 8 sets per muscle group, 2 days per week (Peterson et al., 2005).

Generally, individuals with less training and less experience (e.g. novice/beginners) may see the greatest outward improvements—the results will be most obvious (e.g. the most over-fat person will exhibit the most dramatic body-shape change as compared to a person who is already lean) (Rhea, 2014). The more experienced and more trained individual will require more effort and specificity to produce similar gains.

While the amount of work and effort are typically discussed, one often overlooked acute training variable is rest (the rest interval) which is related to the training goal, intensity of exercise, amount of muscle mass involved in the activity (large versus small muscle groups), and duration (Farlnatti, & Castinheiras Neto, 2011; Rodrigues, Rodrigues, Sandy, Filho, & Dantas, 2012). Shorter rest periods tended to result in fewer repetitions per set (fatigue; not enough time for energy systems to recover, ATP-PC), and such a decrease in total volume may negatively impact goals of maximal strength gains (De Souza et al., 2010; Rodrigues et al., 2012). Many studies have shown that longer rest periods (2-5 minutes) produced greater strength increases as opposed to short rest periods (30-40 seconds) (De Souza et al., 2010). However, shorter rest periods promoted increased positive metabolic and hormonal (e.g. growth hormone, IGF-1) adaptations to strength training which are important for hypertrophy (De Souza et al., 2010). Farlnatti and Castinheiras Neto's (2011) study of rest interval impacting oxygen uptake and large- versus small-muscle mass suggested that rest intervals were more important when working with large muscle groups. Rest intervals were less of a factor when working with smaller muscle groups in resistance training (Farlnatti & Castinheiras Neto, 2011). Other studies have implied that exercise order may require variable rest intervals—sets towards the end of the training period may need longer rest intervals as opposed to sets performed at the beginning of the training period for maximal strength gains (Miranda et al., 2010). Exercise pairings may also

affect the amount of rest needed. Maia, Willardson, Paz and Miranda (2014) found that when training antagonist-paired sets (APS) such as the knee extension and knee flexion, a significantly shorter rest interval (or no rest) was required. APS may be useful when training time is a concern.

The challenges in designing an effective strength training program lie in modulating imposed physiological stress. Eustress ("good stress", mind and body) allows for positive adaptations, whereas "bad stress" becomes distress (body cannot cope or positively adapt to the imposed level of stress) (Sanchis-Gomar et al., 2012). Clearly there is no "cookie-cutter" solution, and the best strength program is one that is individualized, taking into account the whole-person.

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