# Interaction between strength and endurance training

A human’s body becomes accustomed precisely to the strains enforced upon it. Endurance and strength training overlap between themselves to produce various distinct adaptations. Strength training generally increases mass muscle and strength while endurance training revolves on a different concept. Unlike strength training, it prompts increase in maximum uptake of oxygen and metabolic alterations that further induces exercise capacity. Combined strength and endurances training is a familiar concept in many sports and is aimed to improve the performance of the athletes. However, in some instances where endurance training and strength are applied concurrently, a possible interference in the development of the muscles occurs, thus making such a concept seem incompatible. This research will explore the problem of merging the two concepts and review other studies that have been done to explain this inhibition. The discussion will outline various researches explaining whether when applied simultaneously, these two regimes leads to improved or diminished performance as opposed to them being applied separately

Different types of training done by athletes highly dictate the exercise adaptations. (Burgoman et al, 2008). Endurance training means severe physical action averagely comprising of duration exercises ranging from few minutes to hours at various intensities; For instance, long distance running. This recurring exercise improves the ability to endure repetitive low-opposition and high-intensity workout. Maximal uptake of oxygen greatly contributes to increased performance ability. In addition, research shows that increased performance is improved through increased skeletal muscle ability (Hakkinen et al, 2003). Conversely, strength training means another extreme physical action. It involves short-interval exercise with high intensities, high resistance activity in single or average repetitions such as is in weightlifting.

Izquierdo et al (2005) argues that increased performance involving strength training is achieved via muscle cell hypertrophy and perhaps hyperplasia (Izquierdo et al 2005). These improvements are generally without alterations on maximal oxygen intake. Hawley, (2009) further contributes that the improvements are also not altered by the ability to produce energy through oxidation breakdown. In reference to these distinct styles of exercises, most sports prefer to combine them but in doing so are likely to face some rational challenges and perhaps some biotic restrictions in the course of performance improvement (Hawley, 2009). Hickson (1980) published a study explaining this regime integration. When developing this thesis, several considerations were deliberated: the first was that both types of exercises were in reference to similar muscle groups and the second is that the reaction to strength and endurance programs do not intersect, meaning that endurance training would not increase the strength and that strength training would not increase maximal oxygen uptake. The third consideration was that the magnitude of alteration in maximal oxygen intake and strength would be sufficient to identify any distinct reaction in both regimes.

The study involved three training groups: the strength team (Q) which trained half an hour a day, 5 days weekly for ten weeks, an endurance team(W) that trained forty minutes daily, six days weekly for ten weeks and finally a last group (AW) which trained in similar training regimes as in both groups when combined. For group Q, all training was conducted using maximum weight. Thus as the strength increased, the body adapted to retain maximum resistance for the repetitions required. On the other hand, in-group W, as individual’s power production intensified in the course of training, the activity work rate also intensified as required to reach maximal oxygen intake. Their training involved constant running as fast as possible for thirty minutes a day in the beginning week, 35 minutes a day in the next week and 40 minutes afterwards. Nader (2006) observes that when measured, maximal oxygen uptake during team E’s training period, increased to the same level as that of group QP (20-25%). On the other hand, maximal oxygen intake increased to some extent (4%) in the group Q during training (Nader, 2006). Therefore, strength training did not conclude any other substantial alterations in maximal oxygen intake assuming absolute and relative standards. Alternatively, endurance training recorded no substantial strength increase. Group W training resulted to increase in strength in a manner that substantial increase in the parallel activities was noticeable on a weekly basis throughout the duration. On the other hand, group QW recorded a substantial increase in strength during their first six to seven weeks, then a flattening-off period and finally a decrease in strength in the last two weeks of the duration.

The results offers evidence showing that at the high limits of both regimes combined, prevents or alters additional strength increase. Hoff and Helgerud (2004) in their study restates this by suggesting that a relationship exists between the procurement of strength and the aerobic power increase rate (Hoff & Helgerud, 2004). In addition, the conclusion of the research noted combined high concentration of isokinetic strength and training interval cycling endurance training. (Dudley and Djamil, 1985). Cycling maximal oxygen intake increased to the same level as in group W and QW when recorded several times during a seven week duration. However, strength improvement was distinct between W and QW. The Q group recorded an increase in highest rotation at 0.00-4.19 rounds per second while group QW recorded a substantial increase only at 0.00, 0.24 and 1.68 rotations per second. This shows that in this scenario, the alteration in strength improvement occurred at high velocity rates of force output. Similarly, in another study by Hawley, (2009) interference was demonstrated in the development of strength in synchronized training. It discovered that synchronizing endurance and strength training had an effect strength training and prompted fiber cross sectional parts increase. These findings dictate that alteration of strength progress can arise at a cellular state. In addition, these commentators identified that synchronized training affected development of strength only in instances where both regimes engaged in similar muscle groups.

However, there are studies that have recorded no limitation of strength development through synchronized training. For instance, a study conducted by Burgomaster, (2008) involved two groups who member had to undertake different exercises for different legs. In first group one leg was subjected to strength (Q) exercise while the other leg a synchronized training (QW). In the second group, one leg was subjected to synchronized training (QW) while the other endurance training (W). W training involved 5 three-minute sessions of pedaling to work needing 90-100% maximal oxygen uptake while Q training involved 6 circles of 16-23 recurrences on the leg press at full resistance for a 21 week duration. All forms of exercises gave out identical responses comprising increased strength, maximal oxygen intake and muscle citrate creation activity (Burgomaster, 2008). Nader (2006) suggests that in reference to the similar reactions to these regimes, it is logical that no restriction of strength was recorded with synchronizing regime training since they appear to have more synergistic instead of antagonistic.

In conclusion, subsequent to these studies, other studies have either agreed or disagreed with this concept of strength interference during synchronized training. The different views of synchronized training rely on various logistical concerns. In reference to the studies shown, the effect of interference appears to be true in certain scenarios. Some of the distinct outcomes were assumed to be associated and reliant on variable selection, modality of exercises, subject’s characteristics and the period of study. In addition, these differences create challenges in cross assessment distinctions which confuses the understanding of the body variations to synchronizing training. Ultimately, various mechanisms such as neural components, low glycogen content and fiber-type transformation among others have been articulated as responsible for strength development inhibition.

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