CANADIAN SPORT INSTITUTE'S SPORT RESOURCE PUBLICATION
PERFORMANCE POINT

A PERFECT COMBINATION: BANDS, CHAINS, AND POWERLIFTING

INCORPORATING ASSISTANCE AND RESISTANCE INTO POWERLIFTING

BY: TRAVIS MCMASTER, STRENGTH & CONDITIONING, CANADIAN SPORT INSTITUTE

While powerlifting, (i.e. bench, squat and deadlift) force-generating capabilities are optimized as the involved joints approach full extension; a mechanical advantage is gained during joint extension. Due to this mechanical advantage, powerlifts are collectively known as an ascending strength curve movement. Rubber bands are viscoelastic and supply a curvilinear increase in resistance to the lifter-bar when stretched (Figure 2). In contrast, chain resistance increases linearly as the links are lifted vertically (Figure 1). These three powerlifts as well as the options in the following list are nearly a perfect mechanical match for the resistance variations provided by rubber bands and steel chains:

- Back squat
- Box squat
- Front squat
- Hack squat
- Bulgarian split squat
- Sumo squat
- Overhead squat
- Leg press
- Romanian deadlift
- Snatch grip deadlift
- Trap bar deadlift
- Bench press
- Shoulder press/Military press
- Push press
- Incline/decline press
- Bent-legged deadlift

A proper set up is vital, as it determines how, where, and when the resistance is applied to the athlete bar.

1. **RESISTED SET UP:** CHAINS ATTACHED TO BARBELL

2. **RESISTED SET UP:** BANDS ATTACHED TO BARBELL AND BASE RACK

Both of these set ups alter the proportion of free-weight and chain/band load in respect to the total load lifted. During a lift with the resisted set up, chain/bands deliver the greatest resistance at the top, and lowest at the bottom. During a lift with the assisted set up, bands apply the least amount of assistance at the top, and greatest amount of assistance at the bottom. Both methods are designed to match the ascending strength curves of the powerlifts by providing the greatest amount of total resistance at the top and least amount of resistance and the bottom.

3. ASSISTED SET UP: BANDS ATTACHED TO BARBELL AND TOP RACK FOR BENCH PRESS

What is the optimal load ratio of band/chain to free-weight resistance to improve maximum strength? Surprisingly, there is minimal scientific evidence to support the use of specific load combinations. However, some resistance studies suggest prescribing one-repetition maximum (1RM) loads of 72 - 98%, utilizing free weight loads of 65 - 85% of the total load and band/chain loads of 15 - 35% of the total load; the band supplemented training programs improved 1RM by 7 - 18%. (5, 8, 9).

Additional band and chain free weight loading recommendations:

1. Maximum strength can be increased lifting loads of 90 - 100% 1RM comprised of 65 - 90% free-weights and 10 - 35% bands/chains.
2. Strength-speed improvements are maximized using 1RM loads between 90 - 100% 1RM comprised of 50 - 65% band/chain resistance and the remaining 35 - 50% from free weights.
3. It has also been suggested that loads of greater than 100% 1RM (102 - 110% 1RM) be used to further improve maximum strength (70 - 90% free weight and 10 - 40% band or chain load).

The maximum dynamic strength benefits of rubber bands and chains will most likely lead to a stronger, more explosive athlete, as many of these methods are currently being applied in elite sport specific training environments.

MAXIMUM STRENGTH: RUBBER BAND AND STEEL CHAIN PROPORTIONAL LOADING GUIDELINES

Training Goal	Intensity			Volume	
	Total Load (%1RM)	Free Weight (%TL)	Band/Chain (%TL)	Sets	Reps
Maximum Strength	90 - 110	65 – 90	10 - 35	5 - 10	1 - 4
Speed-Strength	90 - 100	35 - 50	50 - 65	5 - 10	1 - 4

%1RM = percentage of one-repetition maximum; %TL = percentage proportion of the total load utilized out of 100%.

REFERENCES

1. Fry, A. The role of resistance exercise intensity on muscle fibre adaptations. Sports Medicine 34 (10), 663-679, 2004.
2. McMaster, D., Cronin, J., and McGuigan, M. Forms of variable resistance training. Strength and Conditioning Journal, 31 (1): 50-64, 2009.
3. Zatsiorsky V and Kraemer W. Science and Practice of Strength Training. 2nd ed. Champaign: Human Kinetics; 1995.
4. Myslinki, T. Development of the russian conjugate sequence system (Thesis). May 30, 2012 Retrieved from <elitefts.com> August 15, 2012.
5. Anderson, C., Sforzo, G, and Sigg, J. The effects of combining elastic tension and free weight resistance on strength and power in athletes. Journal of Strength and Conditioning Research 22 (2). 567-574, 2008.
6. Bain, J. Force-velocity curve. EliteFTS. March 26, 2012. Retrieved from < www.elitefts.com > August 15, 2012.
7. Bellar, D., Muller, M., Barkley, J., Kim, C., Ida, K., Ryan, E., Bliss, M., and Glickman, E. The effects of combined elastic and free-weight tension on one-repetition maximum strength in the bench press. Journal of Strength and Conditioning Research 2011 25 (2): 459-463.
8. Wallace B., Winchester, J., and McGuigan, M. Effects of elastic bands of force and power characteristics during the back squat exercise. Journal of Strength and Conditioning Research 20: 268-272, 2006.
9. Baker, D., and Newton, R. Effect of kinetically altering a repetition via the use of chain resistance on velocity. Journal of Strength and Conditioning Research 23 (7): 1941-1946, 2009.
10. Simmons, L. Bands and Chains. Powerlifting USA 22:26-27, 1999.