

Christoph Zinner

CONCURRENT TRAINING

Einordnung, Mechanismen und praktische Empfehlungen

Literatur

Berryman, N., Mujika, I., Arvisais, D., Roubeix, M., Binet, C. & Bosquet, L. (2018). Strength training for middle- and long-distance performance: a meta-analysis. *Int. J. Sports Physiol. Perform.*, 13 (1), 57-63.

Bonacci, J., Chapman, A., Blanch, P. & Vicenzino, B. (2009). Neuromuscular adaptations to training, injury and passive interventions: implications for running economy. *Sports Med.*, 39 (11), 903-921.

Coffey, V. G. & Hawley, J. A. (2007). The molecular bases of training adaptation. *Sports Med.*, 37 (9), 737-763.

Coffey, V. G. & Hawley, J. A. (2017). Concurrent exercise training: do opposites distract? *J. Physiol.*, 595 (9), 2883-2896.

de Souza, E. O., Tricoli, V., Roschel, H., Brum, P. C., Bacurau, A. V. et al. (2013). Molecular adaptations to concurrent training. *Int. J. Sports Med.*, 34 (3), 207-213.

Dolezal, B. A. & Potteiger, J. A. (1998; 1985). Concurrent resistance and endurance training influence basal metabolic rate in nondieting individuals. *J. Appl. Physiol.*, 85 (2), 695-700.

Eddens, L., van Someren, K. & Howatson, G. (2018). The role of intra-session exercise sequence in the interference effect: A systematic review with meta-analysis. *Sports Med.*, 48 (1), 177-188.

Eklund, D., Pulverenti, T., Bankers, S., Avela, J., Newton, R., Schumann, M. & Hakkinen, K. (2015). Neuromuscular adaptations to different modes of combined strength and endurance training. *Int. J. Sports Med.*, 36 (2), 120-129.

Hakkinen, K., Alen, M., Kraemer, W. J., Gorostiaga, E., Izquierdo, M. et al. (2003). Neuromuscular adaptations during concurrent strength and endurance training versus strength training. *Eur. J. Appl. Physiol.*, 89 (1), 42-52.

Hauswirth, C., Argentin, S., Bieuzen, F., Le Meur, Y., Couturier, A., & Brisswalter, J. (2010). Endurance and strength training effects on physiological and muscular parameters during prolonged cycling. *J. Electromyogr. Kinesiol.*, 20 (2), 330-339.

Hennessy, L. & Watson, A. (1994). The interference effects of training for strength and endurance simultaneously. *J. Strength Cond. Res.*, 12, 9-12.

Hickson, R. C. (1980). Interference of strength development by simultaneously training for strength and endurance. *Eur. J. Appl. Physiol. Occup. Physiol.*, 45 (2-3), 255-263.

Hickson, R. C., Dvorak, B. A., Gorostiaga, E. M., Kurowski, T. T. & Foster, C. (1988; 1985). Potential for strength and endurance training to amplify endurance performance. *J. Appl. Physiol.*, 65 (5), 2285-2290.

Hughes, D. C., Ellefsen, S. & Baar, K. (2018). Adaptations to endurance and strength training. *Cold Spring Harb. Perspect. Med.*, 8 (6): a029769 (doi: 10.1101/cshperspect.a029769).

Hunter, G., Demment, R. & Miller, D. (1987). Development of strength and maximum oxygen uptake during simultaneous training for strength and endurance. *J. Sports Med. Phys. Fitness*, 27 (3), 269-275.

Jones, T. W., Howatson, G., Russell, M. & French, D. N. (2013). Performance and neuromuscular adaptations following differing ratios of concurrent

strength and endurance training. *J. Strength Cond. Res.*, 27 (12), 3342-3351.

Kraemer, W. J., Patton, J. F., Gordon, S. E., Harman, E. A., Deschenes, M. R. et al. (1995; 1985). Compatibility of high-intensity strength and endurance training on hormonal and skeletal muscle adaptations. *J. Appl. Physiol.*, 78 (3), 976-989.

Leveritt, M., & Abernethy, P. (1999). Acute effects of high-intensity endurance exercise on subsequent resistance activity. *J. Strength Cond. Res.*, 13, 47-51.

Lundberg, T. R., Fernandez-Gonzalo, R., Gustafsson, T. & Tesch, P. A. (2013; 1985). Aerobic exercise does not compromise muscle hypertrophy response to short-term resistance training. *J. Appl. Physiol.*, 114 (1), 81-89.

Lundberg, T. R., Fernandez-Gonzalo, R. & Tesch, P. A. (2014; 1985). Exercise-induced AMPK activation does not interfere with muscle hypertrophy in response to resistance training in men. *J. Appl. Physiol.*, 116 (6), 611-620.

McCarthy, J. P., Pozniak, M. A. & Agre, J. C. (2002). Neuromuscular adaptations to concurrent strength and endurance training. *Med. Sci. Sports Exerc.*, 34 (3), 511-519.

Mikkola, J., Rusko, H., Izquierdo, M., Gorostiaga, E. M. & Hakkinen, K. (2012). Neuromuscular and cardiovascular adaptations during concurrent strength and endurance training in untrained men. *Int. J. Sports Med.*, 33 (9), 702-710.

Mikkola, J., Rusko, H., Nummela, A., Pollari, T. & Hakkinen, K. (2007). Concurrent endurance and explosive type strength training improves neuromuscular and anaerobic characteristics in young distance runners. *Int. J. Sports Med.*, 28 (7), 602-611.

Murach, K. A. & Bagley, J. R. (2016). Skeletal muscle hypertrophy with concurrent exercise training: Contrary evidence for an interference effect. *Sports Med.*, 46 (8), 1029-1039.

Paavolainen, L., Hakkinen, K. & Rusko, H. (1991). Effects of explosive type strength training on physical performance characteristics in cross-country skiers. *Eur. J. Appl. Physiol. Occup. Physiol.*, 62 (4), 251-255.

Rønnestad, B. R. & Mujika, I. (2014). Optimizing strength training for running and cycling endurance performance: A review. *Scand. J. Med. Sci. Sports*, 24 (4), 603-612.

Sale, D. G., MacDougall, J. D., Jacobs, I. & Garner, S. (1990; 1985). Interaction between concurrent strength and endurance training. *J. Appl. Physiol.*, 68 (1), 260-270.

Saunders, P. U., Telford, R. D., Pyne, D. B., Peltola, E. M., Cunningham, R. B. et al. (2006). Short-term plyometric training improves running economy in highly trained middle and long distance runners. *J. Strength Cond. Res.*, 20 (4), 947-954.

Sperlich, B., Engel, F. & Zinner, C. (2015). Interventions to modify running economy in middle and long distance runners. *Dt. Zeitschr. Sportmed.*, 66 (9), 229.

Sunde, A., Storen, O., Bjerkaas, M., Larsen, M. H., Hoff, J. & Helgerud, J. (2010). Maximal strength training improves cycling economy in competitive cyclists. *J. Strength Cond. Res.*, 24 (8), 2157-2165.

Taipale, R. S., Mikkola, J., Nummela, A., Vesterinen, V., Capostagno, B. et al. (2010). Strength training in

endurance runners. *Int. J. Sports Med.*, 31 (7), 468-476.

Tanaka, H., Costill, D. L., Thomas, R., Fink, W. J. & Widrick, J. J. (1993). Dry-land resistance training for competitive swimming. *Med. Sci. Sports Exerc.*, 25 (8), 952-959.

van der Zwaard, S., van der Laarse, W. J., Weide, G., Bloemers, F. W., Hofmijster, M. J. et al. (2018). Critical determinants of combined sprint and endurance performance: an integrative analysis from muscle fiber to the human body. *FASEB J.*, 32 (4), 2110-2123.

Wilson, J. M., Marin, P. J., Rhea, M. R., Wilson, S. M., Loenneke, J. P. & Anderson, J. C. (2012). Concurrent training: a meta-analysis examining interference of aerobic and resistance exercises. *J. Strength Cond. Res.*, 26 (8), 2293-2307.

Korrespondenzadresse

Dr. Christoph Zinner, Hessische Hochschule für Polizei und Verwaltung, Schönbergstraße 100, 65199 Wiesbaden
E-Mail: christoph.zinner@hfpv-hessen.de