

The effect of a 10-week complex training programme, utilising optimal PAP recovery duration, on the sprint, power and agility capabilities of elite academy footballers

Harsley, P., Bishop, D.C., and Gee, T.I.

Scunthorpe United Football Club Academy

School of Sport and Exercise Science, University of Lincoln

Purpose: Complex training alternates a high-load strength exercise (85% $>$ of 1RM) with an explosive or plyometric exercise, set-to-set, in the same session. This method is supported by the assumption of a post-activation-potential (PAP) of the neuromuscular system. Acute PAP has been shown to occur at 8-min following the performance of high-load exercise (Kilduff et al., 2008). However, the effect of the implementation of this practice (*8-min PAP recovery period*) within a prolonged training programme is unknown. The study aimed to investigate the effects of a 10-week complex training program, utilising optimal PAP recovery period, on the sprint, power and agility capabilities of elite academy footballers.

Methods: Seventeen male apprentice academy football players were randomly assigned to two training groups, which both completed two training sessions per week for 10-weeks. A complex training group (CT) ($n = 9$) undertook a training program consisting of four different complex-exercise pairs; Four high-load resistance exercises (3 sets \times 3 repetitions at 85% 1RM) (HRE) with two plyometric exercises (PLYO), and two Olympic-lifting style exercises (OLSE) for a total of four complex pairs. An 8-min recovery period following each HRE exercise was provided to allow for optimal PAP of the PLYO/OLSE. A normal training group (NT) ($n = 8$) performed the same exercises and total session volume as the CT group, however all of the PLYO/OLSE were executed prior to performance of the HRE exercises. Participants completed both pre and post-training intervention physical assessments; a countermovement jump test (CMJ), a seated medicine-ball throw test (Throw), a 40-m run sprint test (40-m), which incorporated a 0-10-m assessed phase (10-m) and the arrowhead agility test (Agility).

Results: Findings from repeated-measures ANOVA tests indicated that CMJ performance significantly improved within the CT group (3.4% increase; $P = 0.003$) after the training intervention, while no improvement occurred for the NT group. Both groups significantly improved 10-m, 40-m and Throw post intervention, with no distinct differences in magnitude of improvement between groups. Agility performance was unchanged from pre to post intervention for both groups.

Conclusion: A complex training programme, utilising an optimal PAP recovery period, resulted in significant improvements in jump performance in elite academy footballers. However these improvements in jump performance did not occur for footballers undertaking the same program without utilisation of PAP. This suggests that frequent longitudinal potentiation of plyometric and power training via high-load strength training resulted in specific adaptation and enhancement of jumping ability.

References

Kilduff, LP, Owen, N, Bevan, H, Bennett, M, Kingsley, M and Cunningham, D (2008) Influence of recovery time on post-activation potentiation in professional rugby players. *Journal of Sport Sciences*. 26 (8) p 795-802