ACUTE EFFECTS OF VERBAL FEEDBACK ON EXPLOSIVE UPPER-BODY PERFORMANCE IN ELITE ATHLETES

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The purpose of this study was to determine the effects of verbal feedback on the explosive upper-body performance of well-trained rugby union athletes in a resistance training session. Athletes (n = 9) completed two sessions of bench-throws with peak velocity feedback after each repetition, and two identical sessions without feedback. Within each session, three sets of four repetitions of bench-throw were completed. When feedback was received there was a small increase of 1.8% (90% confidence limits, ±2.7%) and 1.3% (±0.7%) in average peak power and velocity when averaged over the three sets. When individual sets were compared, there was a tendency towards greater increases in average peak power in the second and third sets. Benefits of feedback may be greatest in the latter sets of training and could improve training quality and adaptation.

KEYWORDS: Power, velocity, bench-throw, rugby union.

INTRODUCTION:

To be successful in a chosen sport, athletes need to develop a variety of specific skills and physical attributes. However in many sports, such as rugby union, athletes have limited time to train and develop each physical attribute before optimal recovery is compromised or injury risk is increased. It is possible the athletes sometimes train with insufficient motivation or intensity to maximise their training time. Therefore, improving the quality of each training session (without extending the duration or increasing the volume) is a common goal for many athletes, coaches and support staff.

Training quality can be affected by a number of factors, particularly motivation and intensity. Motivational strategies can be classified as either intrinsic (e.g. self talk or 'psyching up') or extrinsic (e.g. external feedback or encouragement) (Jung & Hallbeck, 2004; Tod et al., 2005). 'Psyching up' has been shown to increase isokinetic bench press strength by 11.8% when compared to a mental distraction control (Tod et al., 2005). Additionally, Jung and Hallbeck (2004) reported an increase in peak handgrip strength of approximately 5% when visual feedback or verbal encouragement were given. It should be noted that performance improvements in the aforementioned investigations were assessed in testing sessions consisting of a single repetition or set, an approach that is atypical in resistance training where multiple sets of multiple repetitions are performed consecutively (excluding one repetition maximum lifting). This is important as since regular resistance training sessions consist of multiple sets and repetitions, the fatigue which accumulates throughout the session will likely reduce the intensity of the work completed in the final sets, resulting in reduced training quality (Legaz-Arrese et al., 2007),. Therefore, the effect of motivational strategies on performance across a resistance training session still requires investigation.

While strength is important and often assessed in practice, research indicates that power may be a better predictor of athletic performance (Newton and Kraemer, 1994). Numerous authors have reported increases in lower body power when motivational strategies were implemented (Tod et al., 2009). To date, only one study has investigated the acute effects of motivation on upper body power (Antonis et al., 2004). These authors reported that intrinsic motivation (self talk) increased distance of an over head throw in water polo (7.2%) in untrained swim class students (Antonis et al., 2004). Thus, it is unknown whether verbal feedback can improve performance in upper body explosive exercises in well trained athletes. Therefore, the purpose of this investigation was to determine the effects of verbal feedback on upper body power in a resistance training session consisting of multiple sets and repetitions in well trained rugby athletes.

METHOD:

Nine elite rugby union athletes from a Super 14 professional rugby team volunteered to take part in this study during the competitive phase of their season (mean ± SD; age, 22.1 ± 2.1 years; height, 184.2 ± 7.7 cm; mass, 107.3 ± 13.2 kg; maximal bench press strength 135.9 ± 22.6 kg). Athletes were assessed using the bench-throw exercise on four separate occasions each separated by seven days. Each athlete completed two sessions consisting of three sets of four repetitions of the bench-throw with peak velocity feedback provided following each repetition; and two identical sessions where no-feedback was provided after each repetition. Each set was separated by two minutes rest. Athletes were randomly split into two groups which differed only in the order they received feedback or no-feedback over the four testing occasions (Figure 1).

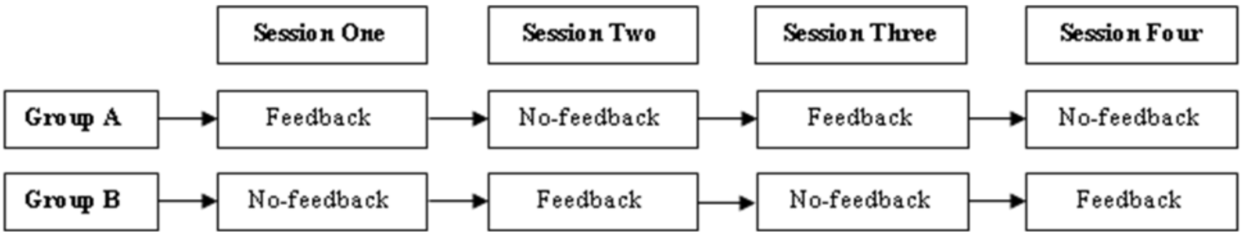

Figure 1. Outline of testing order. Group A, n=4; Group B, n=5.

A standardised warm up consisting of two sets of ten body-weight press ups followed by one set of five explosive press ups with a clap was completed. Athletes then completed three sets of four repetitions of bench-throws at a load of 40kg within a smith machine. Athletes used a self selected hand position and lowered the bar to a self selected depth (Argus et al., 2009). Athletes then threw the bar vertically and explosively as possible, trying to propel the bar for maximal velocity. In both conditions a one second pause occurred following the completion of each repetition (at the end of the concentric phase) so that peak velocity feedback or no-feedback could be provided (obtained via GymAware®; 50 Hz sample period with no data smoothing or filtering; Kinetic Performance Technology, Canberra, Australia). Athletes rested for two minutes between all warm up and training sets. Athletes were ask to rate their effort after each set; with all reporting maximal effort across all sets.

The first repetition from each set was excluded from analysis, as feedback could not be provided until after the completion of the first repetition. The repetitions for each set from the two feedback sessions were combined and averaged prior to analysis, as were the no-feedback repetitions. Average peak power and peak velocity data of all nine repetitions, as well as the average for each set of three repetitions (set one, two or three) were used for analysis.

All data were log-transformed to reduce non-uniformity of error, and the effects were derived by back transformation as percent changes (Hopkins et al., 2009). Standardised changes in the mean of each measure were used to assess magnitudes of effects by dividing the changes by the appropriate between-subject standard deviation. Standardised changes of <0.2, <0.6, <1.2, <2.0 and >2.0 were interpreted as trivial, small, moderate, large, and very large effects. To make inferences about the true (large-sample) value of an effect, the uncertainty in the effect was expressed as 90% confidence limits (Hopkins et al., 2009).

RESULTS:

A small increase of 1.8% (90% confidence limits; ±2.7%) in average peak power of all repetitions was observed when feedback was received. When each set was compared individually there was no difference in average peak power between the first set in either condition. The average peak power in the second set was 2.4% (±4.7%) greater when feedback was received compared to the second set of the no-feedback condition, representing a small effect. There was also a small increase of 3.1% (±3.3%) in average peak power of the third set in the feedback condition compared with no-feedback (Figure 2). Average peak velocity of all repetitions was 1.3% (±0.7%) greater when feedback was provided and this represented a small effect. When each set was compared, a small improvement in average peak velocity was observed in all three sets in the feedback compared to no-feedback condition. Increases in average peak velocity were 1.3% (±1.1%), 1.1% (±1.1%) and 1.6% (±1.0%) for set one, two and three, respectively (Figure 2).

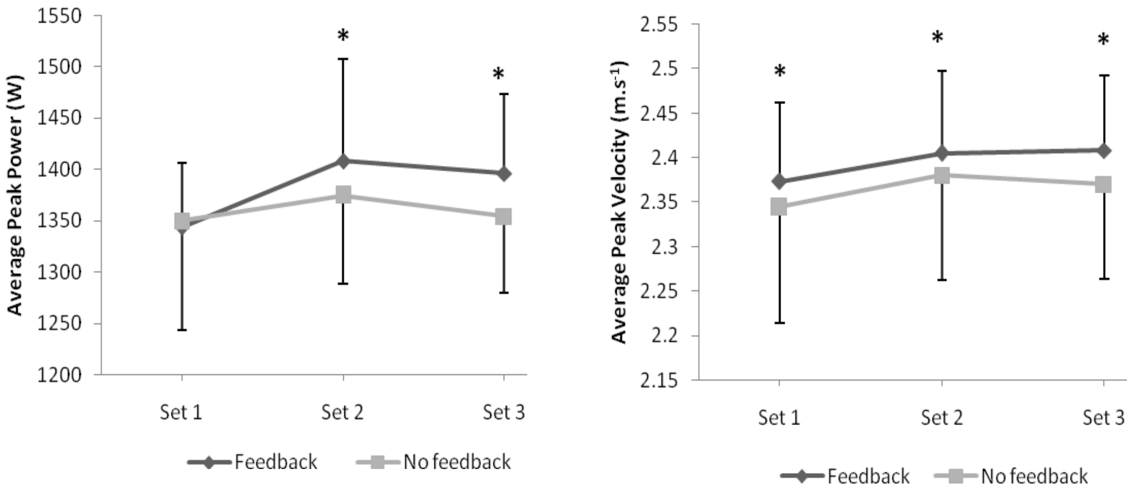

Figure 2. Average peak power and velocity with standard deviations (error bars) obtained during three sets of three repetitions of 40-kg bench throw. Peak velocity feedback was provided in a verbal manner at the completion of each repetition for the feedback condition. * denotes a small difference between conditions.

DISCUSSION:

Small improvements in bench-throw average peak power and average peak velocity were observed when specific feedback of performance was received immediately after each repetition. These results add to the current literature in several ways. Firstly, to our knowledge, only one other investigation has examined the effects of feedback on upper body power (Antonis et al., 2004). However, the previous investigation examined the effects of feedback on a complex technique based task (overhead throw), whereas the current investigation examined the effects of simple task (bench-throw). Secondly, this was the first investigation to examine the effects of feedback using assessment procedures typical of a traditional resistance training session i.e. consisting of multiple sets and repetitions. As such, the current investigation addresses a gap in the literature.

Receiving verbal feedback improved average peak power and velocity of the training session by 1.8% and 1.3%, respectively. The greatest benefit when receiving feedback appears to be in the latter sets of training. Indeed, when each set was analysed separately, improvements were greatest in the final set (3.1% peak power; 1.6% peak velocity). These findings suggest that receiving feedback improved the quality of training; which may be observed as an increase in, or maintenance of intensity or motivation in the latter sets of training. Additionally, if these improvements seen during one training session can be maintained over multiple training sessions, the long-term effects of repeating these “higher quality” sessions may result in enhanced training adaptations and therefore better performance (Kaneko *et al.*, 1983; Newton and Kraemer, 1994). Although the benefits gained may appear small, it should be noted that previous literature has reported 5% improvements in upper-body power in elite rugby league athletes over a four year period (Baker and Newton, 2006). As such acute improvements of ~3.1% in a single session are a positive and worthwhile finding.

Performance improvements were smaller than previously reported in studies investigating strategies that may alter motivation (Jung and Hallbeck, 2004; Tod *et al.*, 2005; Tod *et al.*, 2009). Differences may be due to the level of subjects and musculature recruited. It is commonly accepted that well trained individuals routinely evoke a greater percent of muscular activation than their untrained counterparts (Van Cutsem *et al.*, 1998). Therefore in untrained individuals, there may be greater potential for feedback to enhance muscular activation which may lead to greater performance improvements. Smaller improvements may

also be due to the muscle group involved (i.e. upper vs. lower body). The different response between the two extremities may be due to the disparity in the total muscle mass recruited, i.e. the larger muscle mass of the lower body may have greater scope for improvement.
The mechanisms for improvements as a result of feedback were not assessed in the current investigation. However, it can be speculated that improvements may be due to enhanced neuromuscular activation or increased intent. All athletes reported that maximal effort was given in each repetition on all testing occasions; nonetheless athletes still improved on their self reported maximal effort when feedback was received. As such, if athletes were indeed using maximal effort, it would suggets that feedback improved performance due to other mechanisms than motovation or increased intent. Further research should attempt to identify the mechanisms that lead to performance improvements with specific feedback.

CONCLUSION:

The use of verbal feedback resulted in acute increases in upper body average peak power and velocity. However it is unknown whether providing feedback to athletes will provide continuous acute adaptations in performance over a longer training phase, or if adaptation will diminish with repeated use. Providing verbal feedback increases the quality of training and produces acute improvements in power output of well trained athletes, in which small improvements are often difficult to achieve. Providing feedback may be particularly useful in periods where training volume is higher as the results of this investigation indicate that the benefit of feedback was greatest in the latter sets of training.

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