

EFFECT OF VERBAL AND VISUAL FEEDBACK ON PEAK TORQUE DURING A KNEE JOINT ISOKINETIC TEST

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The purpose of this study was to assess the effect of verbal and visual feedback on peak torque in male subjects. Thirty male subjects were tested on four separate occasions by executing a knee flexion/extension isokinetic set of four maximal repetitions, at velocities of 60, 120, 180, 240 and 300 deg/sec with a 60 second rest between each velocity set. The velocity order was randomized and visual and verbal feedback to subjects was randomly assigned. A 2 X 5 repeated measures ANOVA was used to analyze the data with $\alpha < 0.05$. There were no significant differences in peak torque regardless of the presence or absence of feedback. The conclusion of this study was that feedback does not increase peak torque during concentric isokinetic testing.

KEYWORDS: isokinetic, peak torque

INTRODUCTION: During isokinetic testing there is also a disparity in whether or not to provide feedback. There have been studies that do not report whether there was feedback (Cramer et al., 2000; Kovalski et al., 1992; Kovealeski & Heitman, 1993; Parcell et al., 2002; Wilhite et al., 1992), some report verbal encouragement (Tourney-Chollet et al., 2000; Gioftsidou et al., 2006; Ozcaldiran, 2008) and one that reported both verbal and visual feedback (Dauty et al., 2007). This leads to the question of whether feedback is important in isokinetic testing and whether it seems to affect outcome measures, such as peak torque. The importance of knowing the effect of feedback would be important to clinicians who are using this form of evaluation to keep or release patients in rehabilitation. Moreover, other users of isokinetic devices such as athletic trainers or strength and conditioning coaches could be influenced to continue or reduce training protocols based on the peak torque the athletes are exhibiting. In both examples the client may not be working as hard as they could due to lack of motivation which might be exposed by the use of feedback.

Furthermore, much of isokinetic research is conducted using an ascending order of velocity sets (Gioftsidou et al., 2006; Ozcaldiran, 2008; Parcell et al., 2002). However others have used random order of velocities to assess peak torque (Cramer et al., 2000; Dauty et al, 2007; Greig, 2008; Timm & Fyke, 1993; Tourny-Chollet et al., 2000; Wilhite et al., 1992). Kovalski et al., (1992) and Kovalski and Heitman (1993) investigated changing the order of velocities during training and found that it might be advisable in certain situations to train at a faster speed prior to progressing to slower speeds. Regardless of this research, it seems that much of the published literature regarding isokinetic testing protocols reports the use of ascending order without there necessarily being a scientific foundation to do so.

The purpose of this study was to assess the effect of verbal and visual feedback on peak torque. Secondly, to investigate the effect of velocity order (ascending or descending) on peak torque.

METHOD: Thirty apparently healthy, college-aged male subjects were recruited for this study. Twenty-one participants had been members of a Division III collegiate athletic team during the last two academic years [CA]. Nine participants had not been members

of a Division III athletic team during the last two years) [RA]. Subjects were excluded if they had a previous knee injury. The study was approved by the University IRB and all subjects signed informed consent. The mean age, height, and mass of the CA group were 20.76 ± 1.14 yrs, 181.31 ± 9.92 cm, and 85.43 ± 13.01 kg., and for the RA group $20.67 \pm .71$ yrs, 180.90 ± 10.06 cm, and 90.76 ± 17.54 kg.

A Cybex NORM isokinetic machine was used for all testing. For the present study gravity correction was integrated in all tests and the Cybex NORM was calibrated prior to collection of any data.

Subjects reported to the lab on six separate occasions. The first two were familiarization sessions and four were experimental testing sessions, all of which included a required five minute warm up on a bicycle ergometer at a self selected pace. The warmup on the isokinetic machine included four concentric submaximal knee extensions at 60, 120, 180, 240 and 300 deg/sec with a 60 second rest period between each velocity. All isokinetic tests used a 90° range of motion and included four maximal repetitions.

At the first familiarization session, subjects were fitted on the isokinetic system and settings were recorded to ensure the same positioning for all subsequent familiarization and experimental tests. After the warmup protocol, the subjects performed four maximal contractions at isokinetic velocities of 60, 180, and 300 deg/sec with a 60 second rest between sets. When experimental testing began, subjects were requested to abstain from maximal exercise bouts 24 hours prior to each session and there was a minimum of 24 hours between testing sessions. During the four experimental testing sessions the ascending or descending order of velocities was randomly assigned with each subject performing the ascending and descending order twice at 60, 120, 180, 240, 300 deg/sec with knee flexion held constant at 300 deg/sec. Rest periods between velocity sets were standardized at 60 seconds. Subjects were instructed to contract maximally during knee extension, while flexion velocity was set at 300 deg/sec.

Subjects were given both visual and verbal feedback (VV) during one descending test and one ascending test, while during the corresponding ascending or descending test they received no feedback (NO). When subjects were given feedback, each repetition during the isokinetic set the participant was allowed to view the computer screen which was illustrating effort via line graphs, while verbal feedback consisted of the tester encouraging the participant to "push and pull" though each repetition. The order of feedback was randomized. Each velocity tested was considered a set and the peak torque for each velocity set was used for comparison.

A 2 X 5 repeated measures ANOVA was used to analyze the data with $\alpha < .05$. The independent variables were feedback and velocity sets, as well as, velocity order and velocity sets, while the dependent variable was peak torque.

RESULTS: Analysis of the data revealed no significant differences in peak torque in any of the tests, regardless of feedback (Figure 1 and 2). Additionally, there were no significant differences in peak torque between the corresponding ascending or descending tests regardless of feedback.

DISCUSSION: The primary focus of this study was to evaluate the effect on peak torque when subjects were provided visual and verbal feedback. A second purpose was to assess the differences in peak torque when varying velocity set order (ascending versus descending) during isokinetic testing. Although there were no significant differences in peak torque based on feedback, the mean peak torques of the CA group increased at all velocities with the presence of feedback, which was not true for the RA group. Some studies indicate they have used feedback when the subjects were executing the velocity sets (Dauty et al., 2007; Gioftsidou et al., 2006; Ozcaldiran, 2008;

Tourney-Chollet et al., 2000) but few have compared the results to velocity sets when no feedback has been provided. Considering the manner in which results of velocity sets are reported and how that information is used by clinicians to indicate increases in

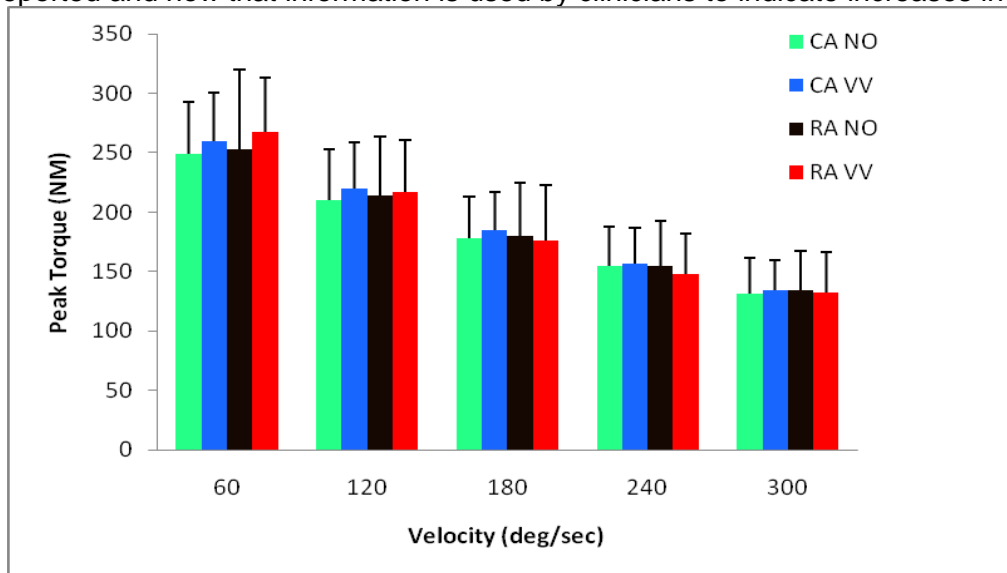


Figure 1. Peak Torques of CA and RA Groups Executing Ascending Velocity Sets With and Without Feedback.

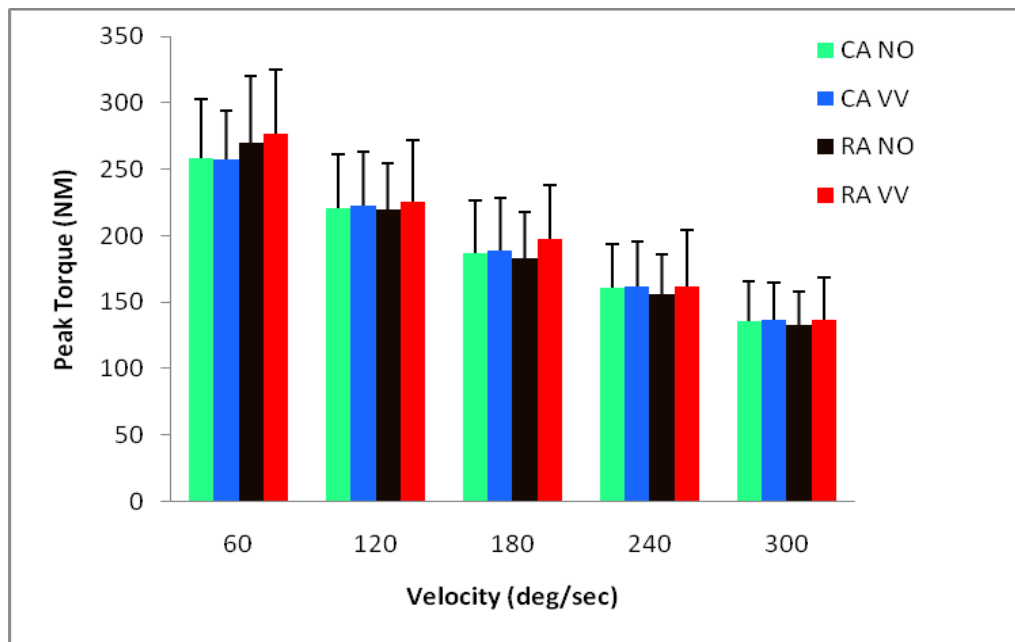


Figure 2. Peak Torques of CA and RA Groups Executing Descending Velocity Sets With and Without Feedback.

strength, rehabilitation progress, etc., it would seem that feedback could be a determinant in a person's effort. Although in this study there were no significant differences in peak torque with the presence or absence of feedback, it would still seem plausible to use feedback to encourage the client during execution.

Although most isokinetic studies seem to use an ascending velocity protocol for assessing peak torque, in the present study the descending protocol produced greater peak torque at all velocities. However, these differences were not significant. Wilhite et al., (1992) suggested that an ascending order of testing should be used when assessing peak torque. Kovelski et al., (1992) and Kovaleski and Heitman (1993) indicated it may be advisable at times to progress from faster velocities to slower velocities. Timm and Fyke (1993) found that order of isokinetic speed did not affect concentric peak torque measurements. In the present study the results seem to point out that a descending protocol would certainly be acceptable for assessing peak torque. From discussions with many of the subjects in this study, it was noted that some favored the descending pattern, while others preferred the ascending order. Therefore, it should be recognized that personal preference of velocity order may play a part in the results of isokinetic testing. If it is the intent of the clinician or researcher to assess the maximum effort of the client/subject, then evaluating which velocity order is most comfortable for the client seems reasonable.

CONCLUSIONS: The conclusions of this study are that peak torque executed during isokinetic sets is not significantly altered by the presence of visual and verbal feedback. Secondly, order of velocity sets maybe a preference of each subject that should be considered when conducting isokinetic tests.

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