Reproducibility of creatine kinase: how useful is this measurement tool?

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ABSTRACT

Establishing the reproducibility of a measurement is essential for repeated testing to ensure that any systematic change is a result of an external influence (i.e. intervention), as opposed to normal random variation. Although some degree of error is inherent in any measure, a measurement tool should yield consistent results that do not fluctuate to an unacceptable degree from one test to another. Creatine kinase (CK) is consistently measured in the blood as a marker of exercise induced muscle damage (EIMD). However, its usefulness as a predictive tool to examine the temporal pattern, and magnitude of muscle damage has been questioned.

PURPOSE: The main aim of the present study was to employ a variety of reproducibility statistics in order to examine the typical level of measurement error for CK.

METHODS: Fifty (36 male, 14 female), apparently healthy participants completed three trials on three separate occasions with each trial separated by 48 - 72 h. The initial trial served as a familiarisation. During trials 2 and 3 (48 h), CK measures were obtained using standard fingerprick technique, and analysed in duplicate immediately using a colorimetric assay procedure. Each participant completed their trials at the same time of day, following identical pre-test procedures.

RESULTS: The intra-test coefficient of variation (CV) within our laboratory was 9%. Dependent t-tests indicated there was no systematic bias between trials (p = 0.82). The interdian CV displayed low reproducibility (20%). Furthermore, the 95% limits of agreement (LoA) were -69.7 to 63.5 iµ/L. However, the intraclass correlation coefficient (ICC) was 0.90, which can be classified as displaying ‘high’ reproducibility.

CONCLUSION: The interdian CV demonstrates that under identical resting conditions (48 h apart), CK displays inherent low absolute reproducibility, which may obscure a true experimental effect. However, interpretation of the ICC, suggests that CK has high relative reproducibility. The high range of observed CK values is thought to have increased the size of the correlation. Subsequently, an individual change in CK following EIMD may not be indicative of the magnitude of damage, and may simply be a result of the inherent variation (e.g. biological). Therefore, it is advised that caution should be taken when using CK within experimental research, and as an indication of when an athlete has recovered, and is able to recommence training.