

# Identifying Anaerobic Lactate Threshold by Visual Inspection: A Study of Validity and Reliability

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## Introduction:

- Anaerobic lactate threshold (LT2) is identified as the point at which blood lactate (BLa) begins to rise in a rapid, non-linear fashion with increasing exercise intensity.<sup>3</sup>
- LT2 is believed to be the result of an increasing reliance on anaerobic metabolism.<sup>5</sup>
- LT2 has important implications in predicting performance in endurance sports and in designing training programs for endurance athletes.<sup>5</sup>
- There is no 'gold standard' for estimated LT2; however, visual inspection is commonly used in clinical and practical settings.<sup>1</sup>
- While visual inspection is commonly used method to estimate LT2, the method has been criticized for its lack of objectivity - leading to concerns about reliability.<sup>1</sup>

## Purpose:

- To examine the inter-rater reliability and concurrent criterion-related validity of the visual inspection method of identifying LT2.

## Methods:

- Existing BLa data from a previous study were utilized.
  - Previous study was IRB approved.
  - 14 DIII female cross country athletes.
  - Treadmill graded exercise test to volitional exhaustion.
  - BLa concentration tested after every 2 minute stage.
  - BLa concentration vs. velocity graphs plotted in excel.
- Visual inspection method:
  - Two experts.
  - Each expert independently established trend lines for the plotted BLa data.
  - Photocopies of trend lines, prior to the experts' identification of LT2, were made (used with Dmax method).
  - LT2 was visually identified as the point on the BLa curve at which BLa concentrations began to rise in a rapid non-linear fashion (Figure 1).
- Dmax method:
  - Expert produced trend lines were used.
  - Dmax method is defined by the point on the BLa curve where a perpendicular line between the curve and a line between the endpoints of the curve is greatest (Figure 2).<sup>2</sup>

## Results:

- Inter-rater reliability of the visual inspection method of identifying LT2:
  - Intraclass Correlation = .730
  - 95% CI = -.174 – .927
  - Judged to be fair.
- The validity coefficients for identifying LT2 by visual inspection compared to the Dmax method:
  - Rater 1 ( $r = .851$ ;  $P \leq .001$ ) judged to be excellent.
  - Rater 2 ( $r = .742$ ;  $P = .002$ ) judged to very good.

Figure 1: Blood lactate curve with LT2 identified by visual inspection.

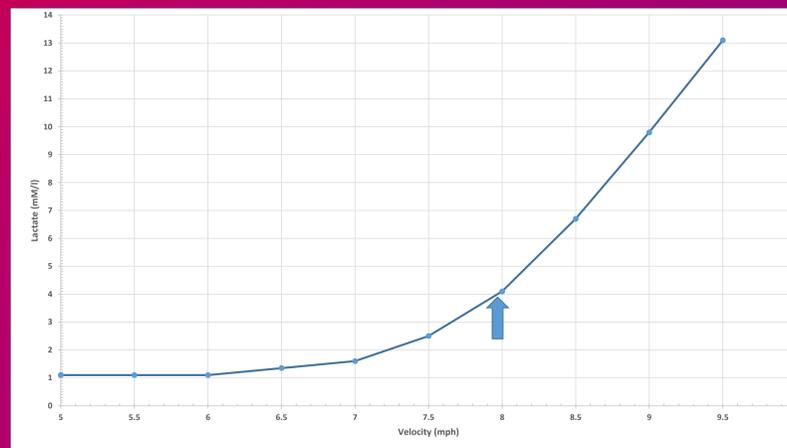
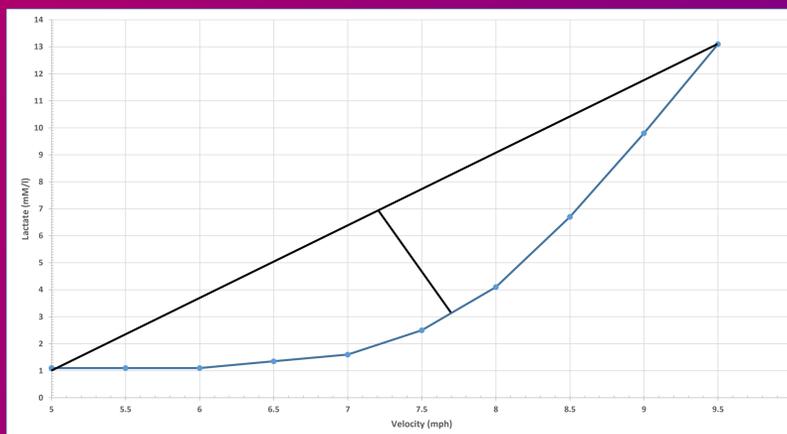


Figure 2: Blood lactate curve with LT2 identified by Dmax method.



## Discussion:

- Visual inspection may be a valid method of identifying of LT2.
- Some evidence that validity may be rater dependent.
- Results are consistent with previous research that found LT2 values identified by the Dmax method to be comparable to the values obtained through visual inspection.<sup>2,4</sup>
- The fair inter-rater reliability and large CI indicate that caution should be used when comparing LT2 values derived through visual inspection by multiple raters.
  - Given the subjective nature of the visual inspection method, a fair inter-rater reliability rating is not surprising.
  - The small sample size may have contributed to the large CI.

## Future Research:

- Establish inter-rater reliability of the visual inspection method of estimated LT2 by duplicating this study with different homogenous populations and with large heterogeneous populations.
- Establish test-retest reliability of the visual inspection method of estimating LT2, which was not addressed in the current study.
- Establish concurrent criterion-related validity of the visual inspection method of estimating LT2 by comparison to other established methods.

## Conclusion:

- The current study provides evidence that visual inspection is a valid method of identifying LT2. However, further research is needed to establish validity relative to other objective methods of identifying LT2 and in evaluating diverse subject populations.
- Given the fair inter-rater reliability and large CI associated with the current study, scientists and practitioners should establish inter-rater reliability within clinics or research groups before comparing LT2 across raters.
- Future research should examine test-retest reliability of the visual inspection method to further establish the reliability of this method of identifying LT2.

## Cited Literature:

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