

College of Saint Benedict and Saint John's University

DigitalCommons@CSB/SJU

Celebrating Scholarship & Creativity Day

Experiential Learning & Community
Engagement

4-24-2014

Identifying anaerobic lactate threshold by visual inspection: A study of validity and reliability

Laura Bailly

College of Saint Benedict/Saint John's University

Follow this and additional works at: https://digitalcommons.csbsju.edu/elce_cscday



Part of the [Sports Sciences Commons](#)

Recommended Citation

Bailly, Laura, "Identifying anaerobic lactate threshold by visual inspection: A study of validity and reliability" (2014). *Celebrating Scholarship & Creativity Day*. 9.

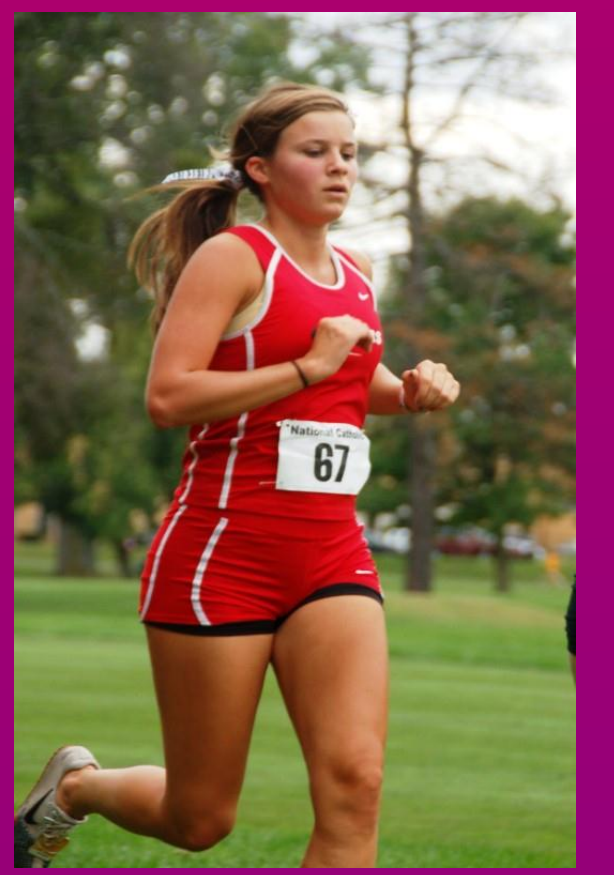
https://digitalcommons.csbsju.edu/elce_cscday/9

This Poster is brought to you for free and open access by DigitalCommons@CSB/SJU. It has been accepted for inclusion in Celebrating Scholarship & Creativity Day by an authorized administrator of DigitalCommons@CSB/SJU. For more information, please contact digitalcommons@csbsju.edu.

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

Laura Bailly, Donald V Fischer

College of Saint Benedict/ Saint John's University Department of Exercise Science and Sport Studies



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.³
- LT2 is believed to be the result of an increasing reliance on anaerobic metabolism.⁵
- LT2 has important implications in predicting performance in endurance sports and in designing training programs for endurance athletes.⁵
- There is no 'gold standard' for estimated LT2; however, visual inspection is commonly used in clinical and practical settings.¹
- 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.¹

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).²

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.

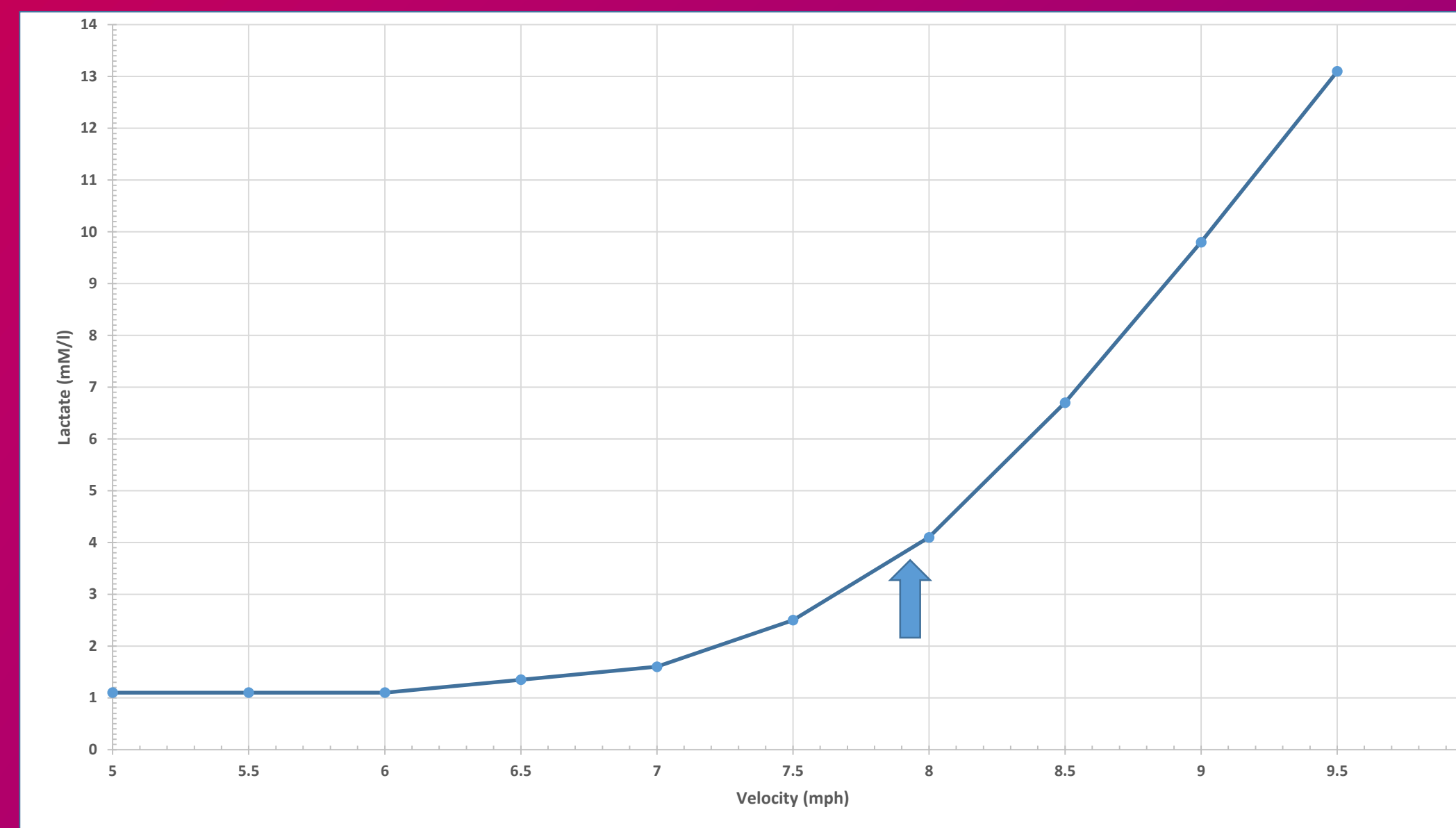
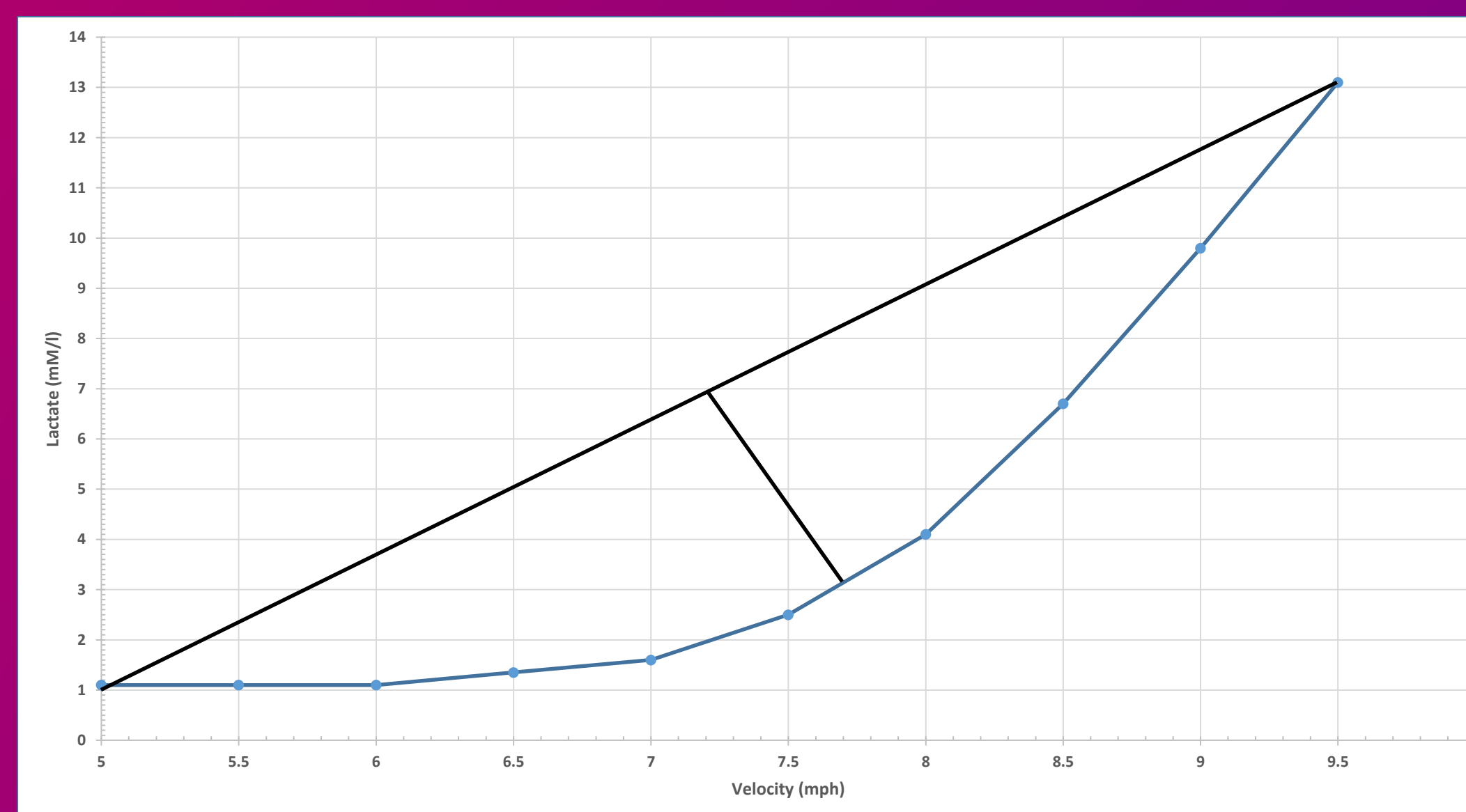


Figure 2: Blood lactate curve with LT2 identified by Dmax method.



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.^{2,4}
- 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:

- 1.) Fraude, O., Kindermann, W. & Meyer, T. (2009). Lactate threshold concepts: How valid are they? *Sports Medicine*, 39(6), 469.
- 2.) Cheng, B., Kuipers, H., Snyder, A. C., Keizer, H. A., Jeukendrup, A., & Hesselink, M. (1992). A new approach for the determination of ventilatory and lactate thresholds. *International Journal of Sports Medicine*, 13(7), 518-522.
- 3.) Coen, B., Urhausen, A., Kindermann, K. (2000). Individual anaerobic threshold: Methodological aspects of its assessments in running. *International Journal of Sports Medicine*, 22, 8-16.
- 4.) McGehee, J. C., Tanner, C. J., Houmard, J. A. (2005). A comparison of methods for estimating the Lactate Threshold. *Journal of Strength and Conditioning Research*, 19(3), 553-558.
- 5.) Power, S. K., Howley, E. T. (2009). *Exercise physiology: Theory and application to fitness and performance* (7th ed.). Retrieved from highered.mcgraw-hill.com.

Acknowledgements:

- Special thanks to Dr. Mary Stenson and Emily Willaert, MS, for their assistance with this research study.