RELIABILITY AND REPRODUCIBILITY OF HEMA-
TOLOGICAL VARIABLES, INTER- AND INTRA-
ANALYSER COMPARISON OF COULTER COUNTER
AND HEMOCUE.

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Some degree of measurement error is always associated
stated that reliability can be considered as the minimum ac-
ceptable error for the effective practical use of a testing pro-
cedure or assessment. Quantification of measurement er-
rors and assessment of inter-and intra-analyser differences
are critical in sports science research to assess the min-
imum differences required to infer statistical significance.
Interclass correlation coefficients (ICC) confer information
about reliability, but do not quantify the error magnitude. A
useful tool to assess reliability proposed by Bland and Alt-
man (1983) is the limits of agreement (95%LOA). Unlike
other measures of reliability, usage of LOA requires explo-
ration of systematic bias and assessment of scedasticity
of the error data. This study investigated and quantified
inter- and intra-reliability and reproducibility of haemato-
logical variables assessed using Act Diff Coulter counter
(Coulter Electronics, UK) and Hemocue201 (HemocueAB,
Sweden).

Individual blood samples (n=228) collected by standard
venipuncture technique were assigned to three different
groups. Group 1 (n=132) for intra-analyser comparison of
haemoglobin (Hb) data using Coulter (C) and Hemocue (H)
analysers. Group 2 (n=48) for inter-analyser comparison of
Hb data using H. Group 3 (n=48) for inter-analyser com-
parison of haematological variables (Hb, RBC, WBC, MPV,
MCH and Plt) using C. Measurement errors were quantified
using ICC and 95%LOA, scedasticity was assessed using
Pearson correlation coefficients.

Comparison of Hb data (n=132) between C and H revealed
high reliability (ICC2,1=0.897), a small inter-analyser bias
(C>H; mean bias 0.53 g.dL-1) and 95% LOA of -0.08 to
+1.15 g.dL-1. Repeated Hb data (n=48) using H revealed
high reliability (ICC3,1=0.982), a very small intra-analyser
bias (-0.06 g.dL-1) and 95% LOA of -0.43 to +0.30 g.dL-1.
Repeated Hb data (n=48) using C revealed high reliability
(ICC3,1=0.986), minimal intra-analyser bias (-0.02 g.dL-
1) and 95% LOA of -0.31 to +0.35 g.dL-1. High reliability
(ICC3,1>0.970) were recorded for the additional haemato-
logical variables RBC, WBC, MPV, MCH and Plt assessed
using C. For all assessed variables the error data were
homoscedastic, inferring no relationship between the error
measurement and the magnitude of the measured variable.

In conclusion, data assessed using C or H were highly
reliable and reproducible, however, a small significant
(0.53g.dL-1; P<0.001) inter-analyser bias was detected
between C and H. The assessed 95%LOA for Hb data
have implications for usage in the assessment of plasma
volume (PV) changes; assuming 95%LOA for haematocrit
data of -0.5 to +0.5%, then computed minimal detectable

%PV changes (Dill and Costill, 1974) would be 6.2 and
6.8% for C and H, respectively.


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