



UNIVERSITÀ DEGLI STUDI DI
VERONA



CONGRESSO
NAZIONALE
AcEMC
19 | 20 MAGGIO 2016
PARMA



Presidente del Congresso **Gianfranco Cervellin**

Ore 10.30 - 11.00

La valorizzazione dei parametri di laboratorio trascurati
G. Lippi, G. Cervellin





I parametri di laboratorio trascurati

- Red Blood Cell Distribution Width (RDW)
- Mean Platelet Volume (MPV)



I parametri di laboratorio trascurati

- Red Blood Cell Distribution Width (RDW)





Red blood cell distribution width: A simple parameter with multiple clinical applications

RDW

Gian Luca Salvagno¹, Fabian Sanchis-Gomar², Alessandra Picánza², and Giuseppe Lippi³

- **Anisocytosis**: degree of heterogeneity of RBC volume
- **RDW-SD**: standard deviation (SD) of RBC volumes
- **RDW**: standard deviation (SD) of RBC volumes divided by the mean corpuscular volume (MCV)
- **RDW-CV**: RDW multiplied for 100, to express data as percentage

$$\underline{\text{RDW}\%} = [\text{SD of RBC volumes}]/[\text{MCV}] \times 100.$$

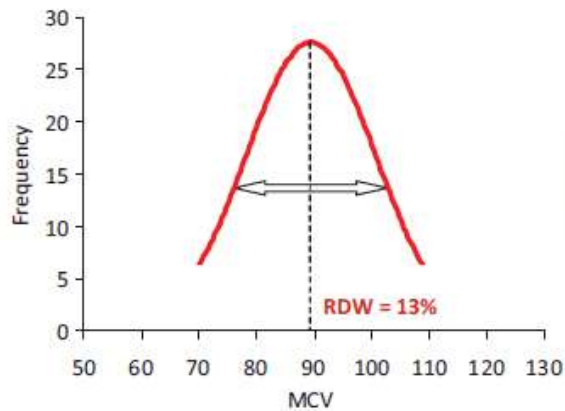
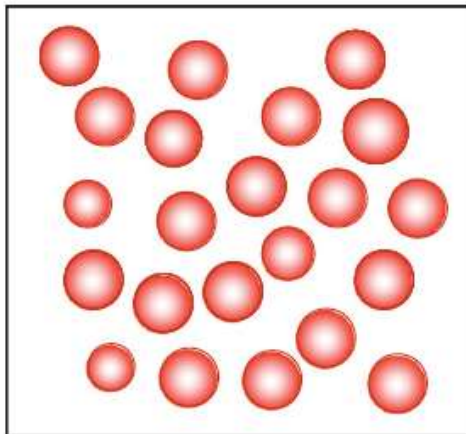
- **Reference range**: Instrumentation-dependent (usually between **11%** and **15%**)

Red blood cell distribution width: A simple parameter with multiple clinical applications

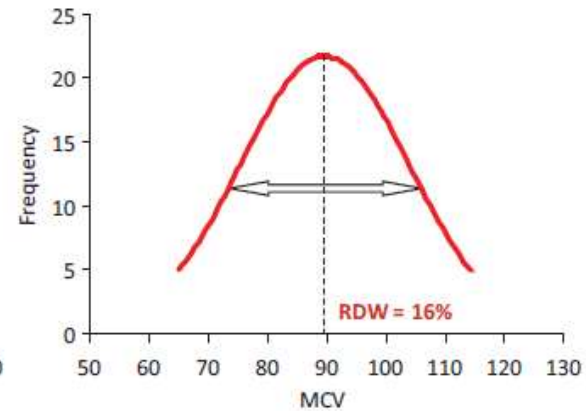
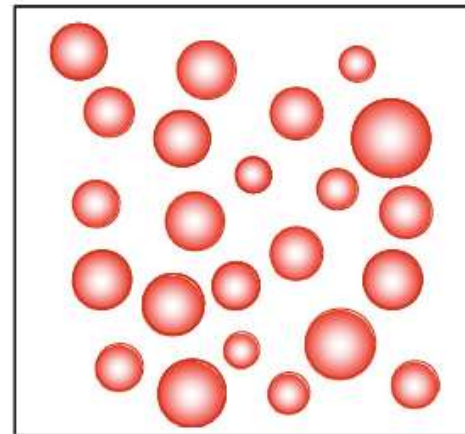
Gian Luca Salvagno¹, Fabian Sanchez-Gomez², Alessandra Picanza³, and Giuseppe Lippi³

RDW

Low Anisocytosis



High Anisocytosis



Red blood cell distribution width: A simple parameter with multiple clinical applications

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RDW

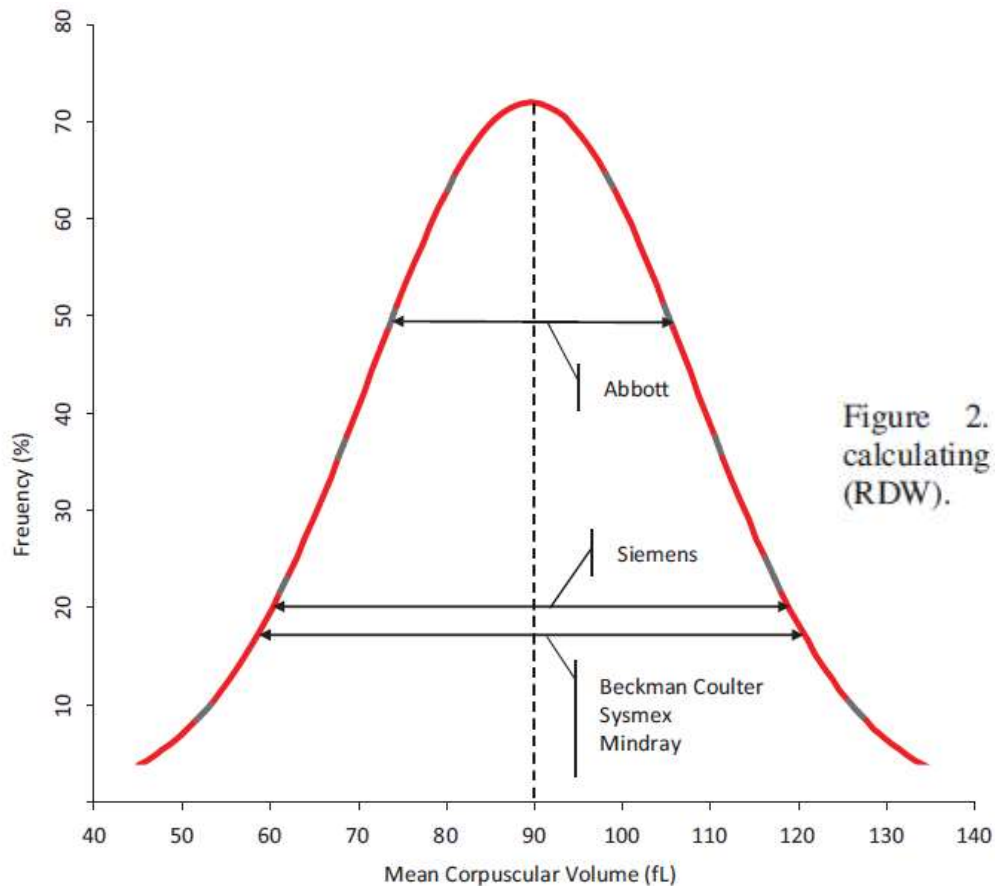


Figure 2. Instrument heterogeneity for calculating red blood cell distribution width (RDW).



Lack of harmonization of red blood cell distribution width (RDW). Evaluation of four hematological analyzers

Giuseppe Lippi*, Fernanda Pavesi, Mirco Bardi, Silvia Pipitone

RDW

Results of hemoglobin (Hb), mean corpuscular volume (MCV) and red blood cell distribution width (RDW) measured in 132 inpatient samples referred for routine hematological testing.

| | Abbott Sapphire | Mindray BC6800 | Siemens Advia 2120 | Sysmex XE5000 |
|-----------------|------------------|------------------|--------------------|------------------|
| n | 132 | 132 | 132 | 132 |
| <i>Hb (g/L)</i> | | | | |
| Median (IQR) | 112 (102–127) | 111 (99–125) | 112 (103–127) | 111 (100–126) |
| <i>MCV (fL)</i> | | | | |
| Median (IQR) | 92 (86–98) | 92 (86–98) | 91 (85–98) | 93 (85–98) |
| <i>RDW (%)</i> | | | | |
| Median (IQR) | 15.0 (13.3–17.0) | 15.9 (14.1–17.6) | 15.7 (14.0–17.2) | 16.1 (14.6–17.9) |
| >14.6% | 75/132 (57%) | 87/132 (66%) | 89/132 (67%) | 100/132 (76%) |



Red blood cell distribution width: A simple parameter with multiple clinical applications

Gian Luca Salvagno¹, Fabian Sanchis-Gomar², Alessandra Picánza², and Giuseppe Lippi³

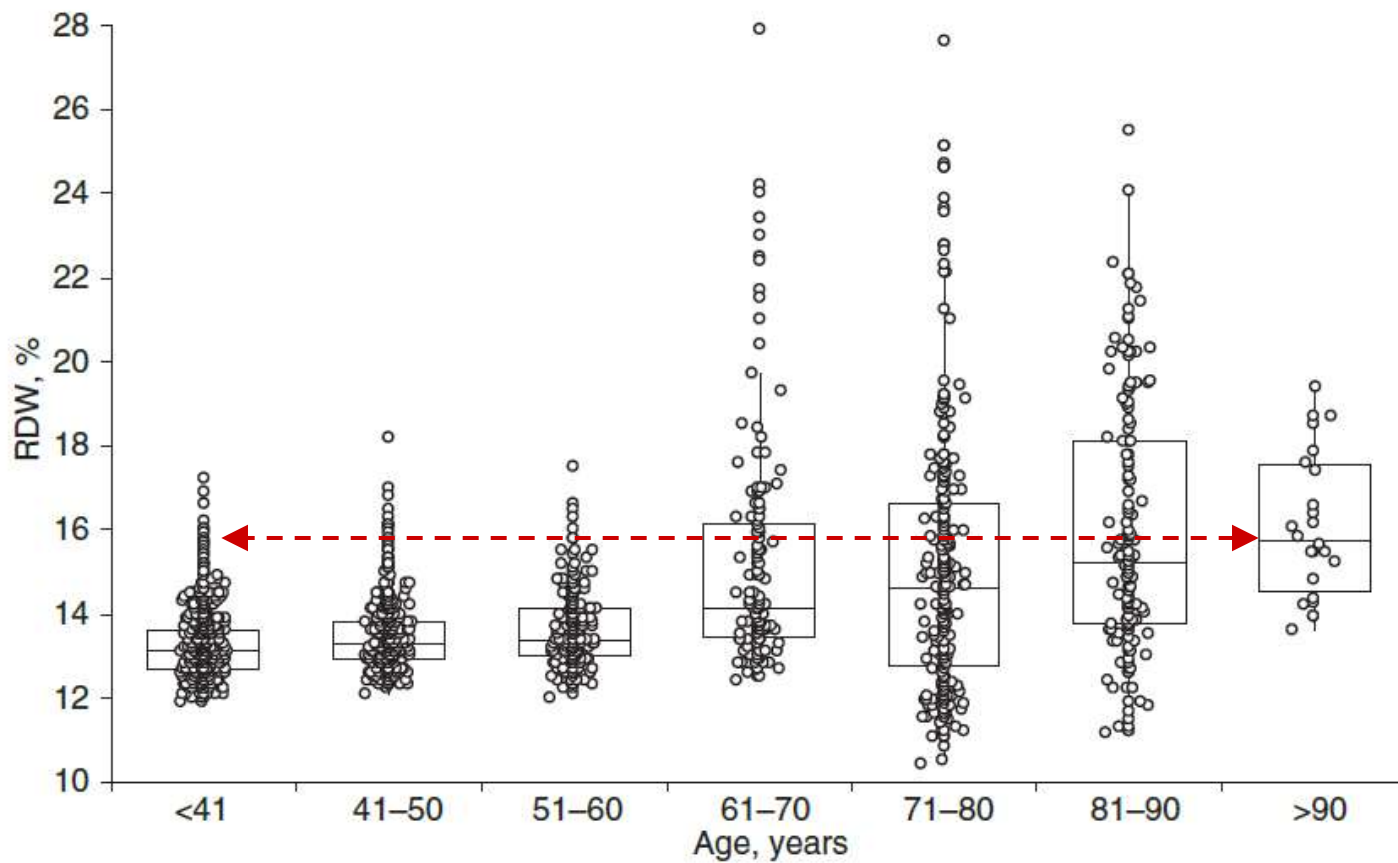
RDW

Table 1. Physiological determinants of increased RDW.

-
- Erythropoietin deficiency and hyporesponsiveness
 - Ageing
 - Black ethnicity
 - Physical exercise
 - Pregnancy
-

Red blood cell distribution width is significantly associated with aging and gender

RDW





Variation of Red Blood Cell Distribution Width and Mean Platelet Volume after Moderate Endurance Exercise

Giuseppe Lippi,¹ Gian Luca Salvagno,² Elisa Danese,² Cantor Tarperi,³
Gian Cesare Guidi,² and Federico Schena¹

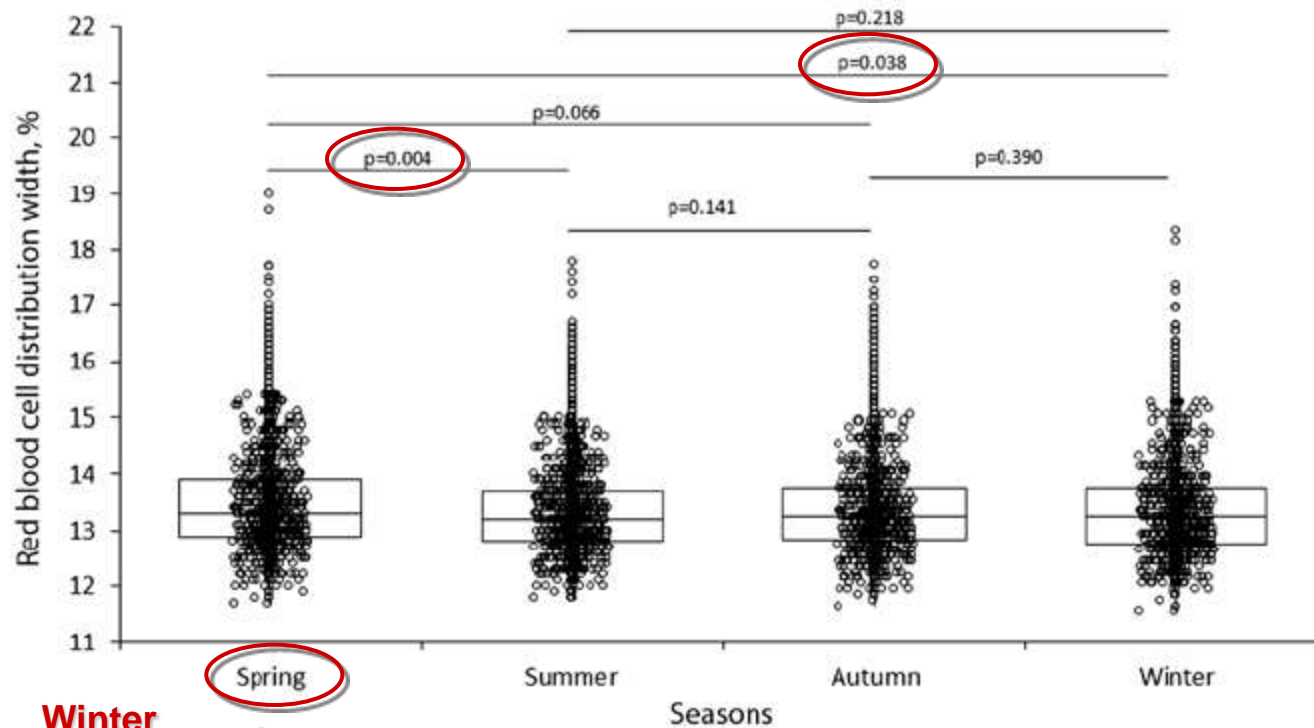
TABLE 1: Haematological changes in middle-trained athletes undergoing a half-marathon run.

| | Baseline | Post run | After 3 h | After 20 h |
|----------------------------|------------------|-------------------------------|-------------------------------|-------------------------------|
| RBC ($10^{12}/L$) | 4.9 (4.6–5.1) | 4.8 [†] (4.5–5.1) | 4.6 [‡] (4.3–4.9) | 4.7 [‡] (4.4–4.9) |
| Hemoglobin (g/L) | 149 (145–155) | 148 [†] (140–155) | 142 [‡] (136–148) | 144 [‡] (139–150) |
| MCV (fL) | 94.9 (91.9–96.3) | 95.3 [†] (93.5–97.3) | 94.1 (92.3–95.8) | 94.9 (91.5–97.1) |
| MCH (pg) | 31.0 (30.0–31.1) | 31.5 (30.0–32.0) | 31.0 (30.3–32.8) | 30.5 (30.0–32.0) |
| RDW (%) | 13.3 (13.1–13.5) | 13.4 [†] (13.1–13.6) | 13.4 [‡] (13.2–13.6) | 13.5 [‡] (13.3–13.8) |
| Reticulocytes ($10^9/L$) | 60.5 (49.5–72.5) | 60.4 (49.6–74.2) | 58.0 [‡] (46.7–69.3) | 59.7 [‡] (46.9–65.9) |
| Ret CHR (pg) | 31.0 (31.0–32.0) | 31.0 (31.0–32.0) | 31.0 (31.0–32.0) | 31.0 (31.0–32.0) |
| Platelets ($10^9/L$) | 255 (216–298) | 311 [‡] (264–361) | 263 (219–290) | 255 (212–290) |
| MPV (fL) | 9.2 (8.6–9.9) | 9.5 [‡] (9.1–10.2) | 9.1 (8.1–9.4) | 9.2 (8.7–9.7) |

Giuseppe Lippi*, Gian Luca Salvagno, Martina Montagnana, Elisa Danese
and Gian Cesare Guidi

RDW

Birth season predicts the values of red blood cell distribution width (RDW) in adulthood



**Winter
gestation**



I parametri di laboratorio trascurati

- Mean Platelet Volume (MPV)





Genetic and nongenetic determinants of mean platelet volume

Giuseppe Lippi UNIVERSITY OF VERONA

- **Platelets**: small subcellular elements produced from bone marrow megakaryocytes
- **Diameter**: between 1.6 and 3.9 μm
- **Volume**: Typically between 7 and 11 fL
- **MPV**: Mean of platelets volumes
- **Reference range**: Instrumentation-dependent (see above)



Genetic and nongenetic determinants of mean platelet volume

Giuseppe Lippi UNIVERSITY OF VERONA

BIOLOGICAL DETERMINANTS:

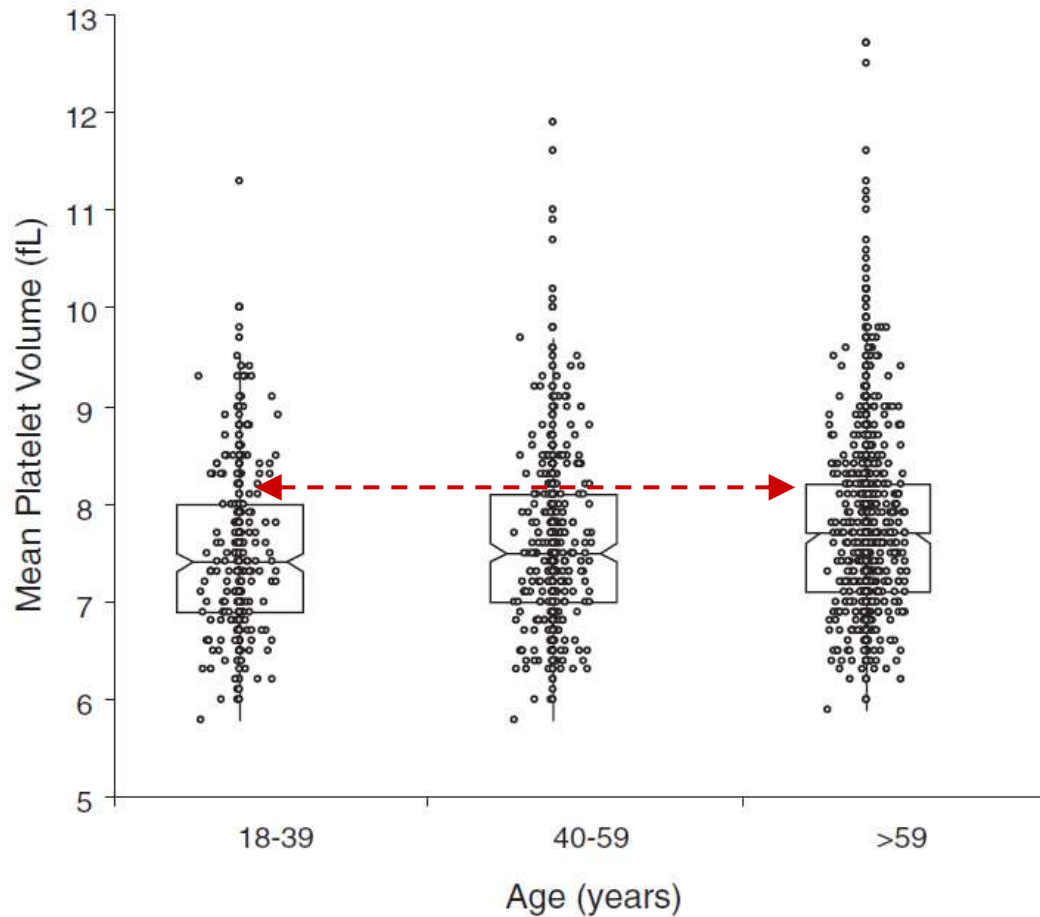
- Advanced age
 - Smoking
 - Hypertension
 - Diabetes
 - Oral contraceptives
-

Thrombosis Research 129 (2012) e159–e160

Mean platelet volume increases with aging in a large population study

Giuseppe Lippi, Tiziana Meschi, Loris Borghi

MPV





Variation of Red Blood Cell Distribution Width and Mean Platelet Volume after Moderate Endurance Exercise

Giuseppe Lippi,¹ Gian Luca Salvagno,² Elisa Danese,² Cantor Tarperi,³
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Evaluation of mean platelet volume with four hematological analyzers: harmonization is still an unresolved issue

Giuseppe Lippi, Fernanda Pavesi and Silvia Pipitone

Table 2 Results of PLT count (optical methods) and MPV measured in 100 inpatient samples referred for routine hematological testing

| | Abbott Sapphire | Mindray BC6800 | Siemens Advia 2120 | Sysmex XE5000 |
|------------------------|--------------------|-------------------|-----------------------|------------------|
| PLT count ($10^9/l$) | 156 ± 17 | 167 ± 22 | 165 ± 18 | 173 ± 24 |
| MPV (fl) | 8.1 ± 1.3 | 9.5 ± 1.0 | 9.9 ± 1.5 | 10.9 ± 1.1 |



Genetic and nongenetic determinants of mean platelet volume

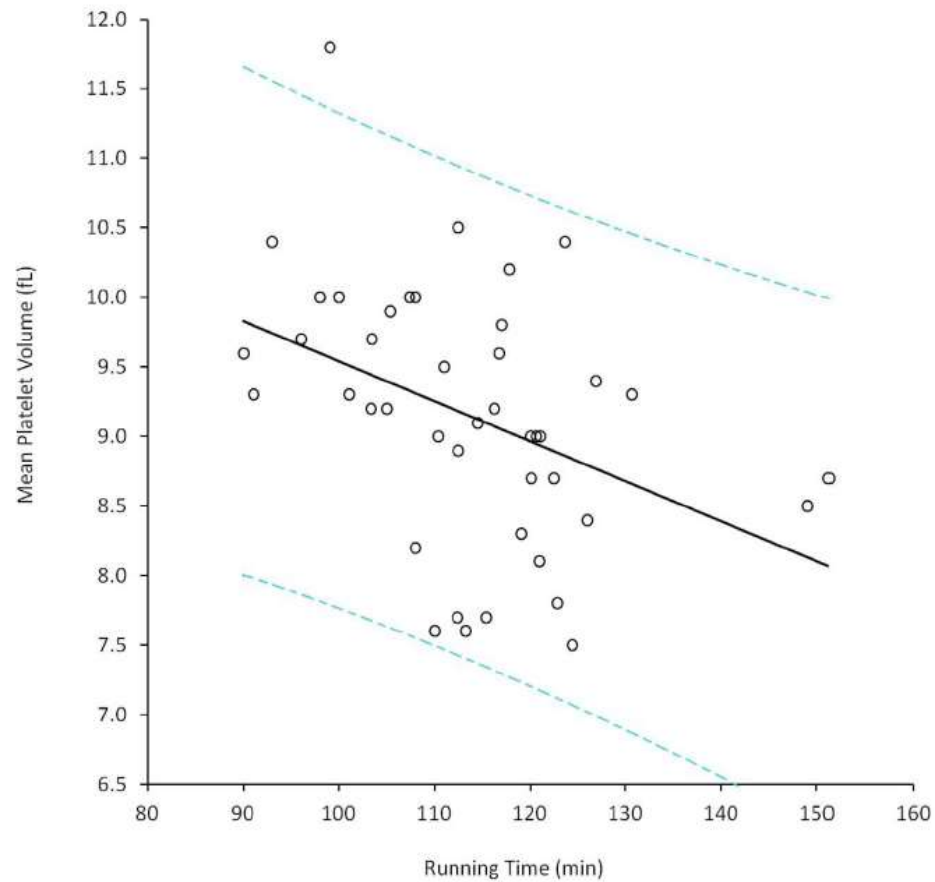
Giuseppe Lippi UNIVERSITY OF VERONA

Larger platelets **overexpress** surface activation markers and seem to be metabolically and enzymatically more active, thus **establishing a prothrombotic milieu** that increases the risk of thrombosis.



Mean Platelet Volume (MPV) Predicts Middle Distance Running Performance

Giuseppe Lippi^{1*}, Gian Luca Salvagno², Elisa Danese², Spyros Skafidas³, Cantor Tarperi⁴,
Gian Cesare Guidi², Federico Skena⁴





Unfortunately, it is not clear **which comes first, the chicken or the egg?**

Are **larger platelets** and **anisocytosis** the causes of human disorders?

Or have human disorders directly contributed to triggering **platelet activation** and **anisocytosis**?





Ai posteri, l'ardua sentenza!

