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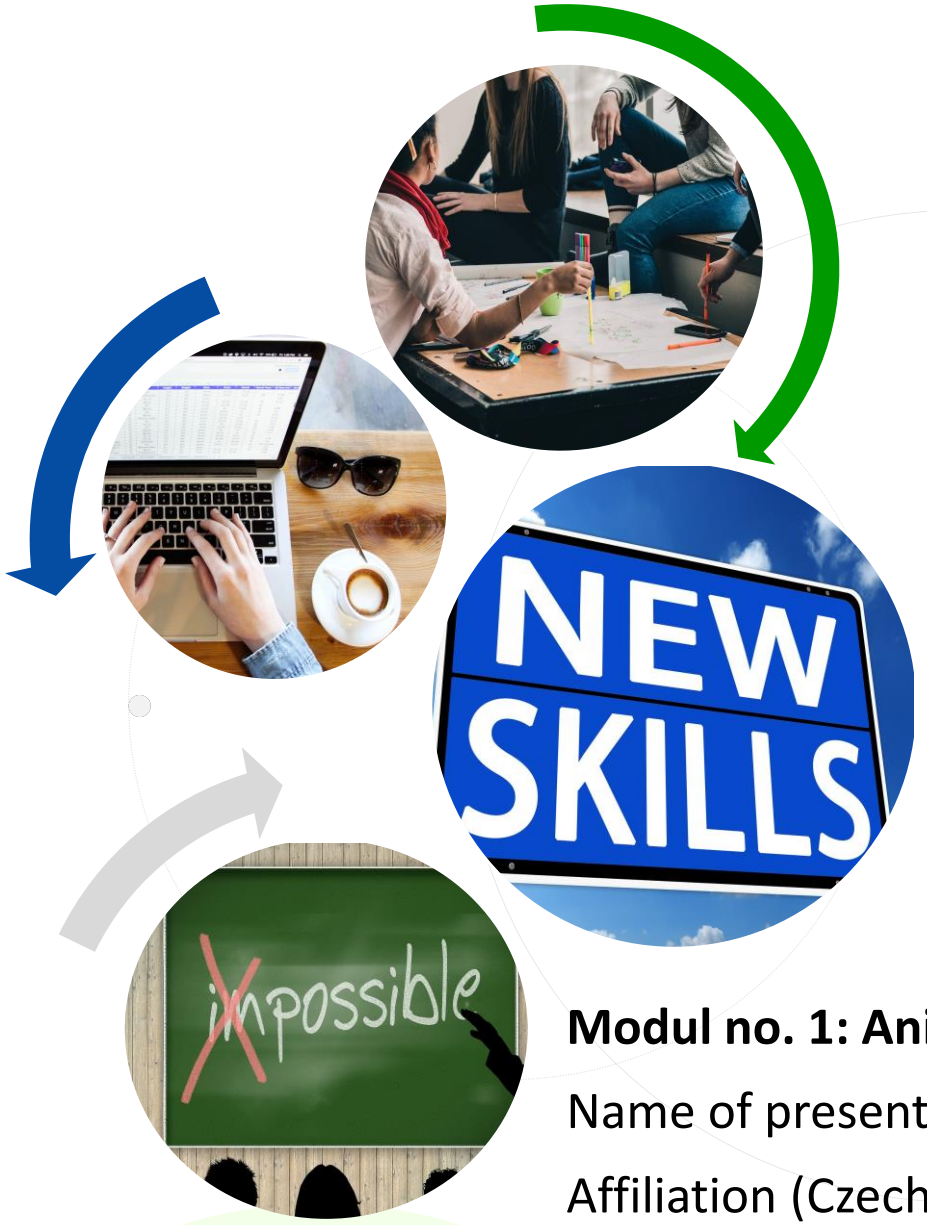

Breeding value - estimate of an animal's genetic merit

Modul no. 1: Animal Breeding

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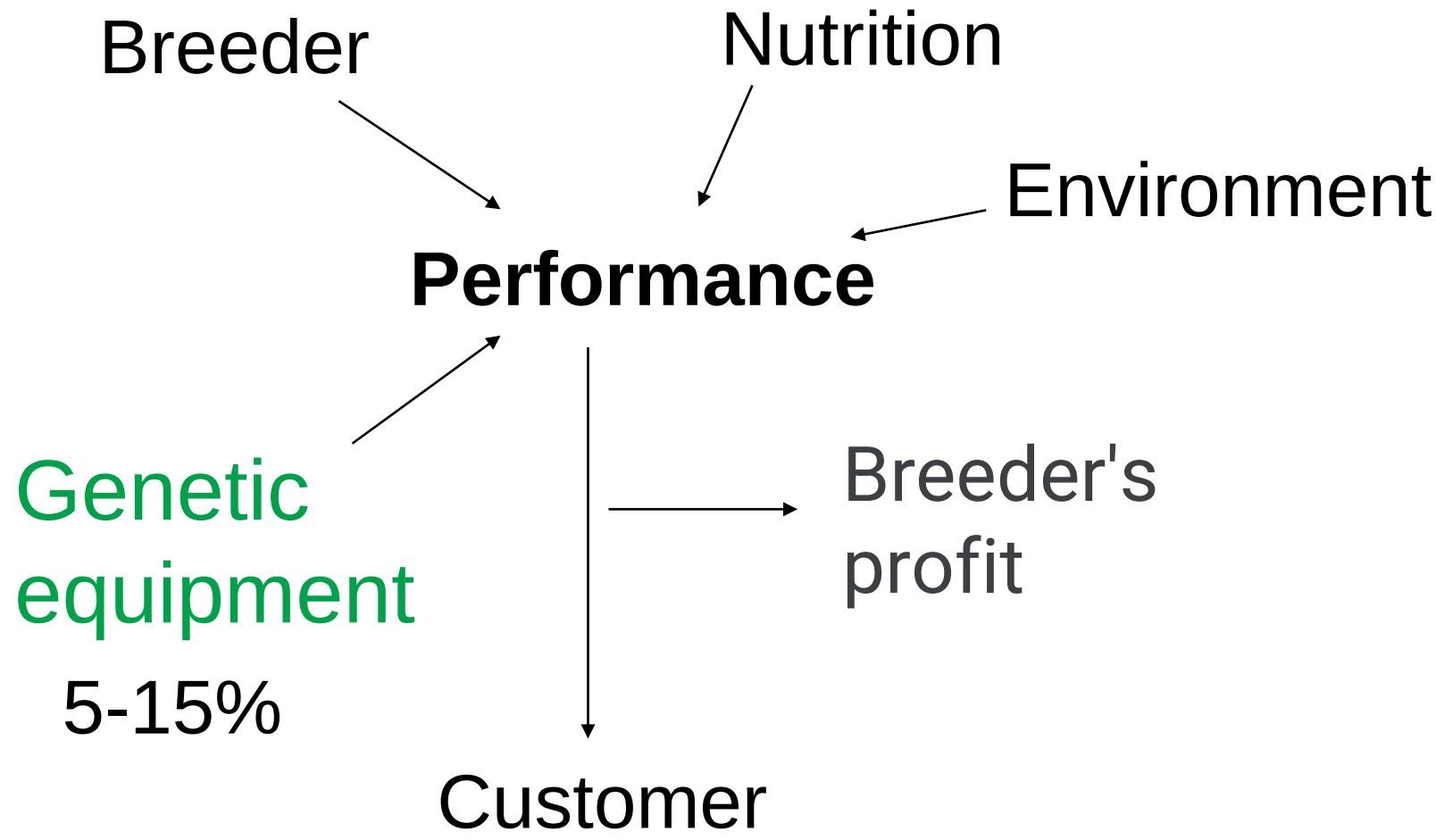
Factors affecting performance



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Performance 100 %

Breeder 60 %

Random environment 30 %

Genetic equipment 10 %

significant genetic progress is being made

Better economics for breeders

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Concept of breeding value

- A breeding value is an estimate of an animal's genetic merit for a particular trait.
- *Twice* the expected *deviation* of an individual‘s progeny performance from the population mean by random meating.
- The sum of the average additive effect of alleles.
- *Deviation* of an individual from the population mean.

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The essence of breeding value

Based on classical theory:

$$P_i = \mu + g_i + e_i$$

P_i – phenotipic value, μ - overal mean, g_i - *genetic value*, e_i – residual error

Genetic value of individual

$$g_i = a_i + d_i + i_i$$

g - *genetic value*, a - additive gentic effect, d - *effect of dominanc*, i – effect of interaction of genes (epistatic effect)

Due to expectation of low effect of dominance and interactions:

$$g_i = a_i = u_i$$

$$\downarrow$$

$$P_i = \mu + u_i + e_i$$

u_i = breeding value

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Whay: *Twice* the expected *deviation* of an individual's offspring from the term population mean by random meating

♂ AA ♀ AA, Aa, aa

gametes: A A, a

offsprings: AA, Aa, AA, Aa, ...

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The average additive effect of genes is most important for breeding value estimation

- Average effect of parents → average genetic merit of their offsprings
- Genetic merit of parents ← average value of offsprings
  - Offsprings 50% genes from evaluated andimas
    50% random genes from populations

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Average effect of parents affeceted average value of **their** offsprings

$$U_{progeny} = \overline{U_{populations}} + \frac{BV_{sire} + BV_{dam}}{2}$$

Note: Large number of offspring

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One offspring

$$U_{progeny} = \overline{U_{populations}} + \frac{BV_{sire} + BV_{dam}}{2} + MV$$

MV – Mendelian sampling

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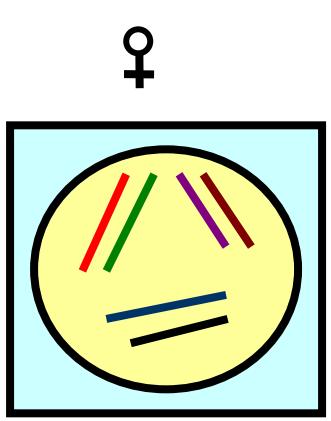
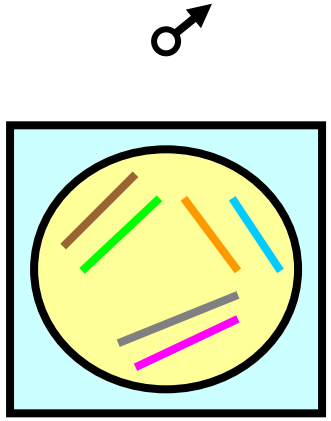
Mendelian sampling





Individuals

Gamets

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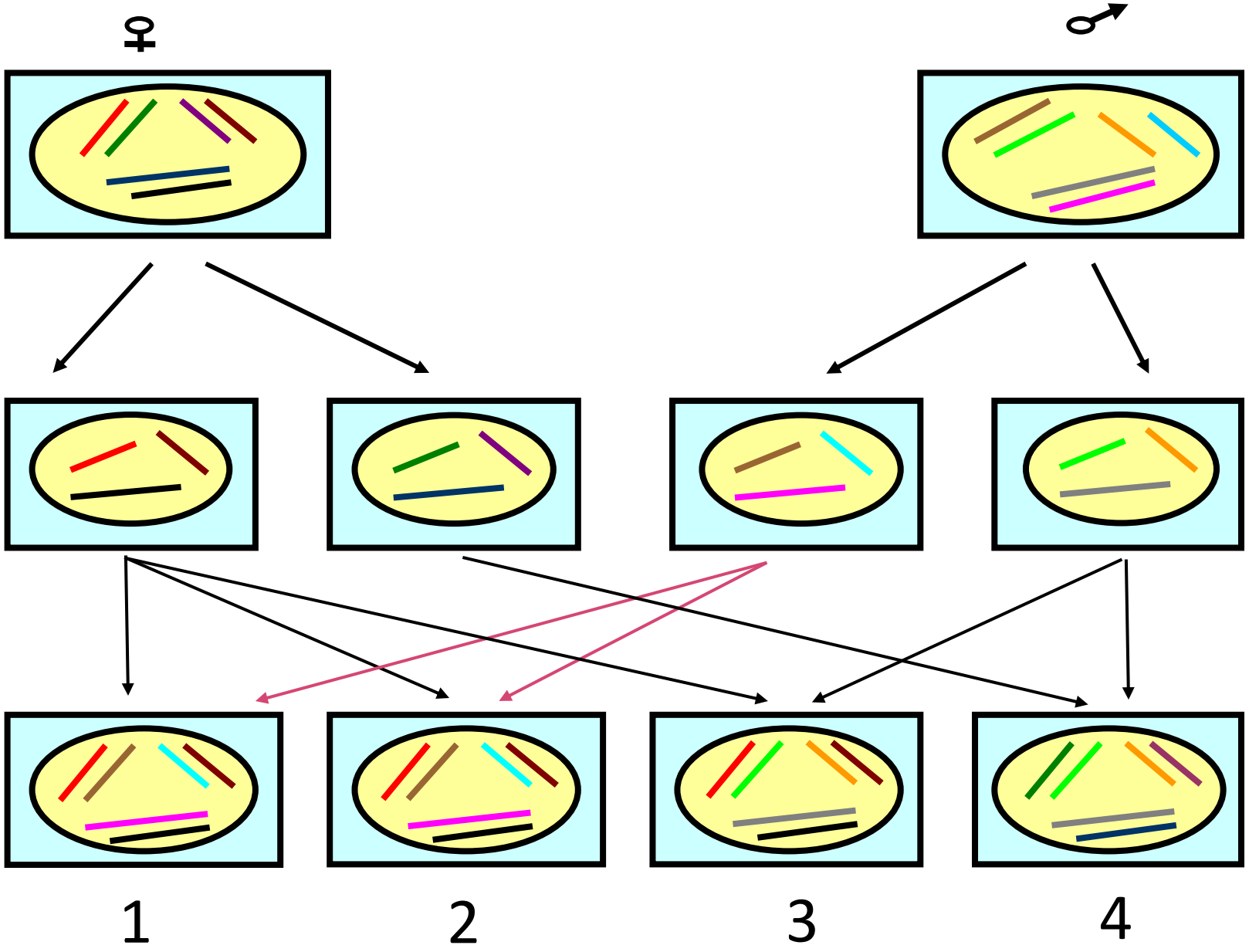

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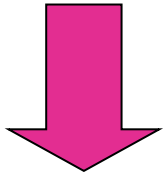
Large number of offspring

$$U_{progeny} = \overline{U_{populations}} + \frac{BV_{sire} + BV_{dam}}{2} + \mathbf{MV}$$



$$U_{progeny} = \overline{U_{populations}} + \frac{BV_{sire} + BV_{dam}}{2}$$

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Breeding value is always estimation/predictin

ESTIMATION of breeding value (EBV) is twice deviation average offsprings performance of evaluated individual from population mean.

Top accurate only : $h^2 = 1$; ∞ offsprings

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Sources of information for breeding value prediction

Estimation of breeding value is possible based on the following sources of information and their mutual combination:

- ✓Parents performance (parents, grandparents, atd.),
- ✓Own performance,
- ✓Full-sibs, Half-sibs performance,
- ✓Progeny performance.

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Estimaton of breeding value

$$PH_i = b_i\,(P_i - \mu)$$

PH_i – breeding value, b_i – regression coefficient,
P_i - phenotypic value, μ - population mean

Informations	v	b	$r_{A\hat{A}}$
Own performance	1	$b=h^2$	$r_{A\hat{A}} = \sqrt{h^2}$
Performance of parents	1/2	$b=v\ h^2$	$r_{A\hat{A}} = v\sqrt{h^2}$
Performance of grant parents	1/4		
Performance of Full-sibs Progeny performance	1/2	$b = \frac{2n}{n+k}$	$r_{A\hat{A}} = \sqrt{\frac{1}{2}b}$
Performance of Half-sibs	1/4	$b = \frac{n}{n+k}$	$r_{A\hat{A}} = \sqrt{\frac{1}{4}b}$

$$k = \frac{4-h^2}{h^2}$$

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Accurycy *(r)* / reliability *(r^2)* of breeding value

- The accurycy (r) is correlaton between true genetic merid and estimated breeding value of individual.

- Reliability (r^2) is presented as coefficient of determination, je vyjádřena determinačním koeficientem, reliability expresses the percentage of which the true genetic merid of an individual is explained by the estimated breeding value.

$$r^2 = (r)^2$$

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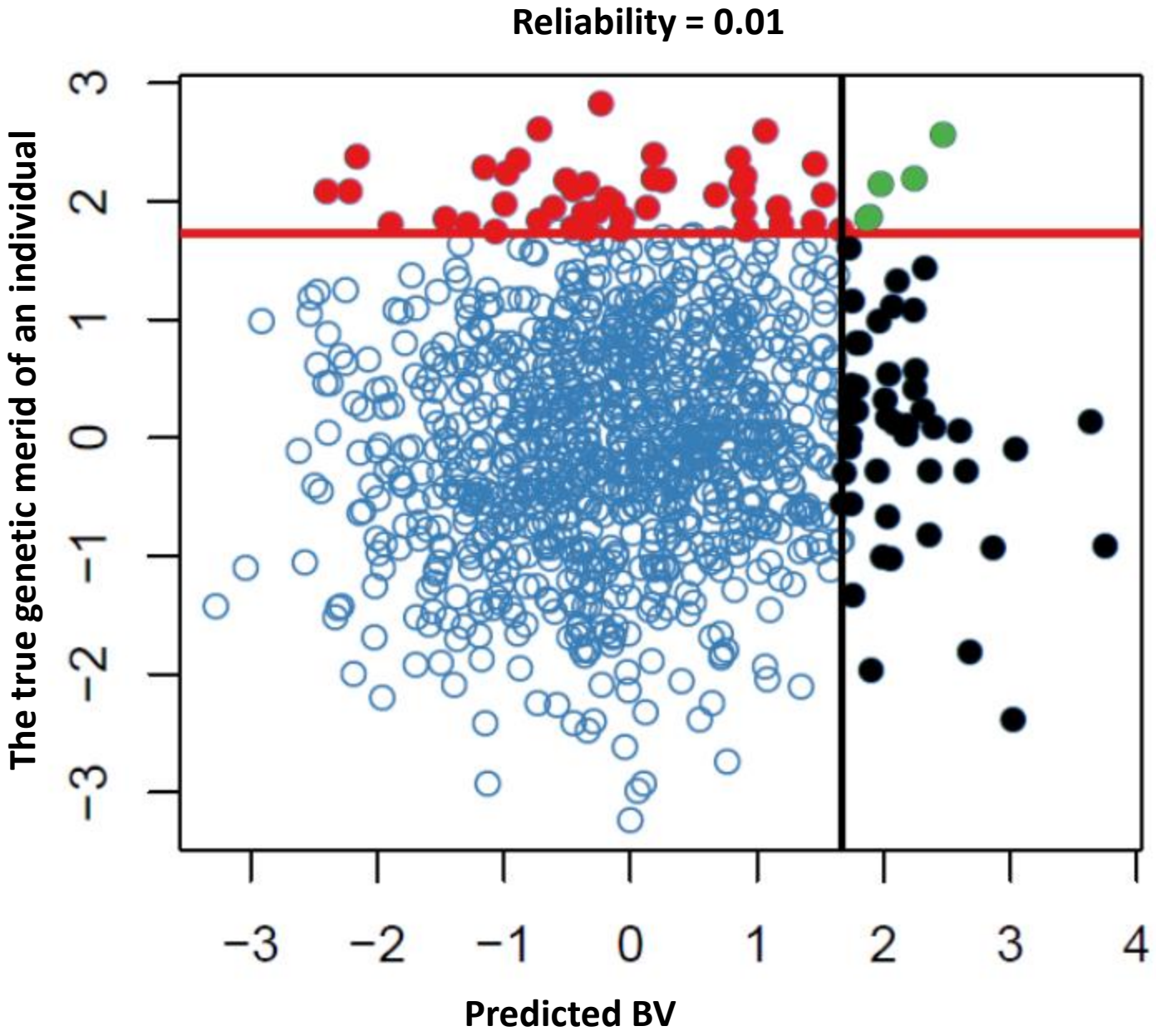

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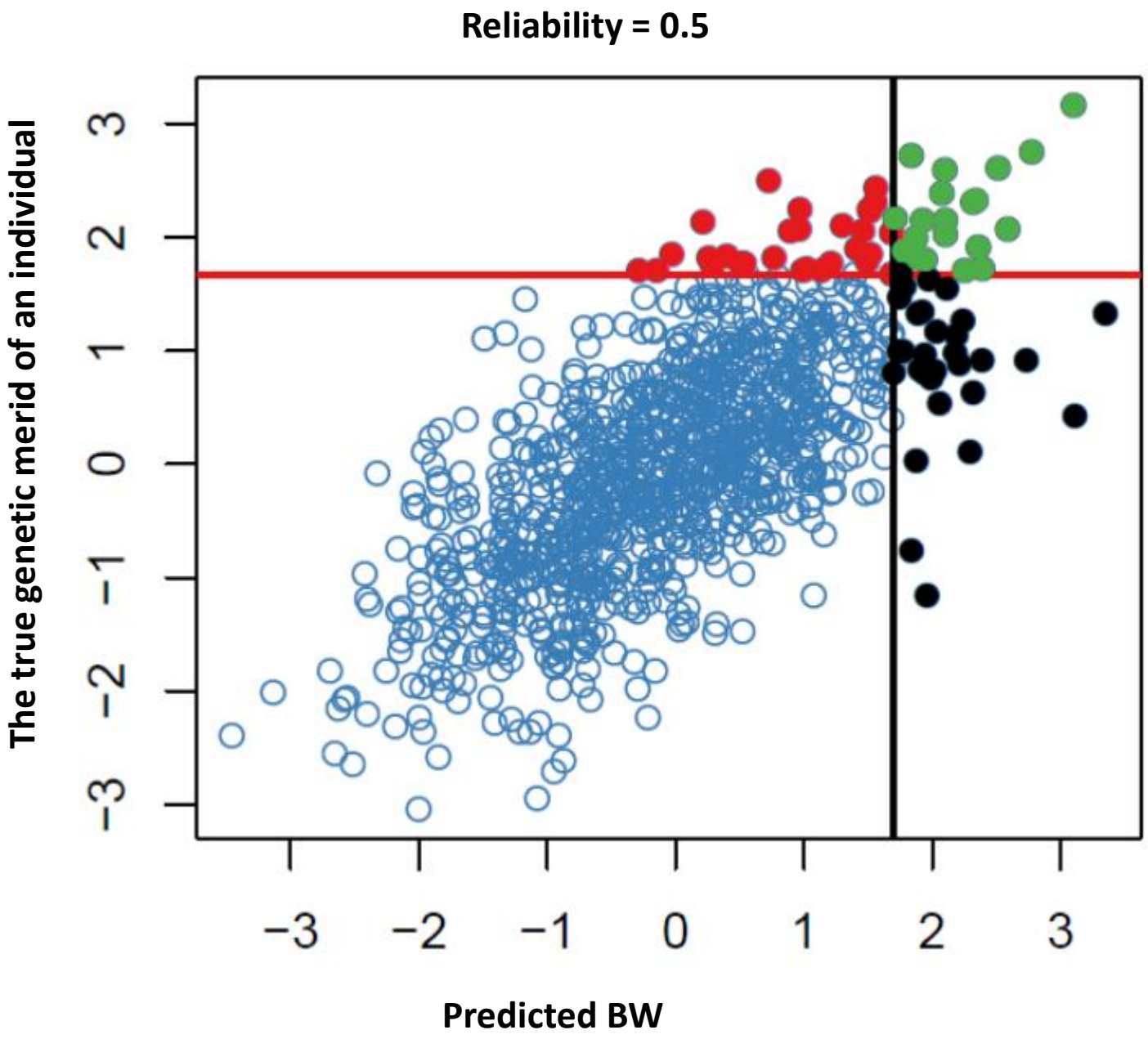

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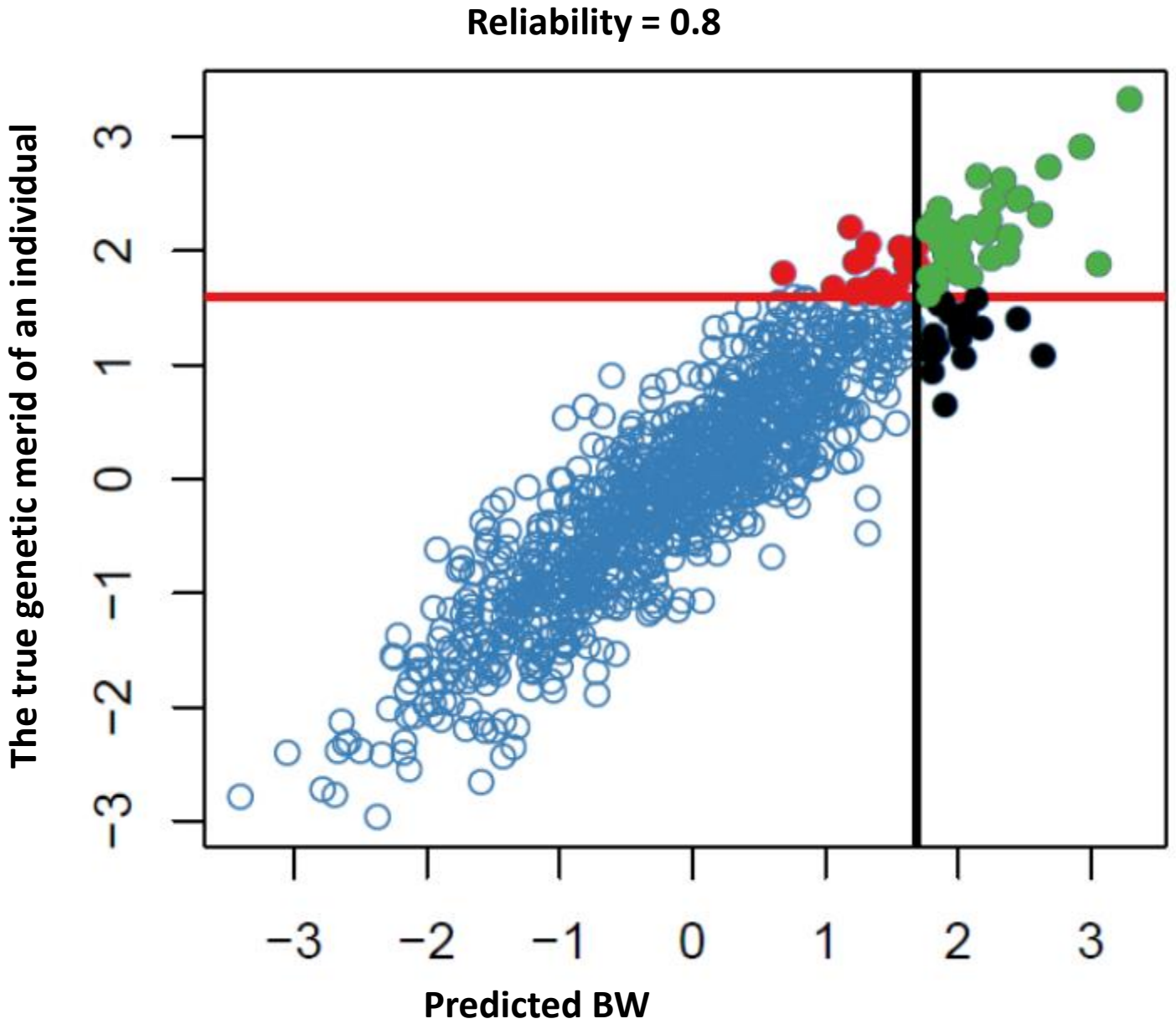

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Partners:

Thank you for your attention!

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