Progeny Intra-Class

pvr

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Generic Relation for Single Observation

- Data: parent i with k offspring performances
- Variance according to genetic model

$$var(y) = var(u) + var(e) = \sigma_y^2 = \sigma_u^2 + \sigma_e^2$$

* Genetic model of observation for offspring k

$$y_k = \mu + u_k + e_k = \mu + \frac{1}{2}(u_i + u_d) + m_k + e_k$$

where i and d are parents of offspring k

Variance for Single Observation

The phenotypic variance σ_y^2 is computed by $var(y_k)$

$$\sigma_y^2 = var(y_k) = var(\mu + \frac{1}{2}(u_i + u_d) + m_k + e_k)$$

$$= var(\mu) + var(\frac{1}{2}u_i) + var(\frac{1}{2}u_d) + var(m_k) + var(e_k)$$

$$= \frac{1}{4}var(u_i) + \frac{1}{4}var(u_d) + var(m_k) + var(e_k)$$

Permanent and Non-Permanent Variance Components

- Permanent refers to what is constant across all offsprings $(1 \ldots k)$ of parent i which is only $\frac{1}{4} var(u_i)$
- Define t as the ratio between the parmanent and the total variance, hence

$$t = \frac{\frac{1}{4} var(u_i)}{var(y_k)} = \frac{h^2}{4}$$

- Consequently

$$\frac{1}{4} var(u_i) = t * \sigma_y^2$$

$$(1 - t)\sigma_y^2 = \frac{1}{4} var(u_d) + var(m_k) + var(e_k)$$

Parent i

- Observations of n offspring of parent i

$$\bar{y}_i = \frac{1}{n}\sum_{k=1}^{n} y_k$$

- Assume n offspring are half-sibs

$$\bar{y}_i = \frac{1}{n}\sum_{k=1}^{n} y_k = \frac{1}{n}\sum_{k=1}^{n}\left[\mu + \frac{1}{2}(u_i + u_{d,k}) + m_k + e_k\right]$$