

19 March 1950

Dear Henningsen:

After a great deal of delay, I have at last got out the estimates of the proportion of parents heterozygous, based on the proportion of families (of various sizes) containing one or more recessives. I find:

| | Pp | S.D. | Het. | Hom. | Total |
|------------|---------|-------|-------|-------|-------|
| P (strong) | 33.67% | 7.68% | 31.3 | 61.7 | 93 |
| P (medium) | 70.17% | 5.60% | 146.0 | 62.0 | 208 |
| P (weak) | 100.00% | | 42.0 | - | 42 |
| pp | | | | | 99 |
| | | | 219.3 | 123.7 | 442 |

Quite independently, from the proportion of parents found to be recessive, we may estimate the number of homozygous dominants:

$$\sqrt{\frac{442}{99}} = 21.024 \quad (11.074)^2 \quad \begin{array}{l} 122.6 \text{ homo exp. from pp parents} \\ 123.7 \text{ homo estimated from} \\ \text{families of P parents.} \end{array}$$

These values agree well.

It clearly appears (i) that homozygosity is an important factor in observed P strength, (ii) that both homozygotes and heterozygotes show such variability, and (iii) that this greatest among the heterozygotes.

Children classify themselves differently:

| | S | M | W |
|------------------|-----|-----|-----|
| 219.3 Pp Parents | 14% | 67% | 19% |
| 141 Pp Children | - | 77% | 23% |

Also 58 children of whom 2/3 are Pp and 1/3 PP give only 8 strong, i.e. no more than 1/3 the expected PP, and probably all homozygous.

The interval consisting of the analysis of parents was good.

In the families producing recessives the number of recessives produced is on the low side, but not significantly: -

| Matings | Exp. | Ob |
|---------|---------|----|
| P x P | 38.587 | 33 |
| P x pp | 62.953 | 60 |
| Total | 101.540 | 93 |

Papers

"On the Heritability of Clinical Form P" filed with diff. notes

Modifying factors (or allelic potency) show in the classification of Pp children:

| Type of P parent | Children (all Pp) | | | Total | % w |
|------------------|-------------------|----|---|------------|-----|
| | W | M | S | | |
| W | 6 | 5 | - | 11 | 55% |
| M | 21 | 63 | - | 84 | 25% |
| S | 5 | 41 | - | 46 | 11% |
| | | | | <u>141</u> | |

If the strength differences were due ^{to} inclusive^{ly} to P allelic^{ity}, then children of the same families would be genotypically equivalent, while the phenotypes W, M, S would have to be heterogeneous. Non allelic modification should also be considered.

I will preserve my working sheets, which will need checking, so that, if you want them, copies can be sent you later from Cambridge, were I hope to be within a month.

Yours sincerely,

R. A. Fisher

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