

INTRODUCTION TO BEHAVIORAL GENETICS

PSYCH 3102 Dr Hewitt

HOMEWORK #4 ANSWER KEY

<u>1. Type of relative</u>	Expected correlation in terms of h^2	Numerical value if $h^2 = 0.6$
MZ twins	h^2	0.6
DZ twins	$\frac{1}{2} h^2$	0.3
Parent w. adopted child	0	0
Parent w. biological child	$\frac{1}{2} h^2$	0.30
Adoptive siblings	0	0
Biological full sibs	$\frac{1}{2} h^2$	0.3
Biological half sibs	$\frac{1}{4} h^2$	0.15
Cousins	$\frac{1}{8} h^2$	0.075

2.

TRAIT

	HT	IQ	N	EXT
--	-----------	-----------	----------	------------

i. Is the trait influenced by genes? *yes to all*

Reasons:- *in each case, MZ correlation > DZ correlation*

ii. Is there evidence of shared family environmental effects? *no yes no no*

Reasons:- *only for IQ does DZ correlation exceed 1/2 MZ correlation*

iii. Is there any evidence for

non-additive genetic effects? *no no no yes*

Reasons:- *only for EXT is the DZ correlation less than 1/2 the MZ correlation*

iv. Does the non-shared environment

account for more than 10% of variance? *no yes yes yes*

Reasons:- *only for HT does the MZ correlation exceed 0.9*

3. Heritability for this trait is *0*

Because *no variation in the phenotype is due to genes in this population*

4. a, False – *heritability is NOT the proportion of a phenotype that is passed on – phenotype is never passed on, only genes are. Whilst roughly 50% of alleles are passed on to each offspring by each parent, we never know exactly which alleles. The actual 50% is unique to each offspring.*

b. False – *high heritability does NOT mean genetic determinism. Whilst a high heritability implies most variation for the trait comes from genes not environment and also that the phenotype of the person is a good reflection of their genotype, the environment can (and does) change or can be manipulated so that phenotype is changed*
examples of this : the change in IQ, height over time – mean levels of both have been rising over time, heritability for both remains high

c. False – *heritability estimated from one group can NOT be used to imply anything about a second group – each heritability that is calculated refers to the group from which the data was drawn. Heritabilities may vary across groups, as might mean level of trait – but we cannot say anything about the causes of those group differences. The environment might differ between the groups, for example, and this may be the cause of the differences.*

d. False – *a large heritability does NOT imply genes of large effect. We can say that genetic variation is important in determining level of trait but this could come about through the action of a small number of genes of large effect each, or from a large number of genes each with very small effect.*

5. you can work the chi-square on the allele frequencies or the genotype frequencies but you have to take into account the facts that genotype (allele) frequencies and sample sizes are all different . You would use a null hypothesis of NO Association and calculate the expected on the basis that each class will have a frequency that reflects sample size and genotype frequency ONLY ie there is NO effect of genotype on case versus control.
full analysis will be shown in class