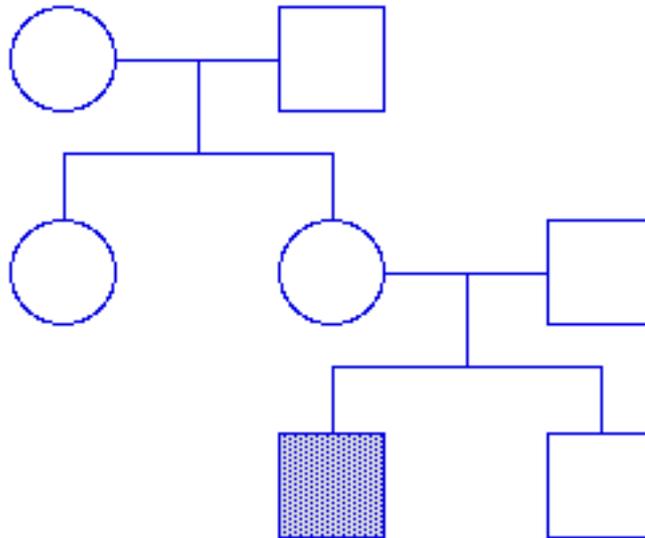


Teacher's guide to the SexLink program

The exercise

Students are presented with a pedigree, and asked to fill in the genotypes of all individuals. One example is shown below:



All pedigrees in the SexLink program are of the same basic form, with two matings over three generations. The program allows for variation in the sexes of the two offspring in both matings.

Once students have grasped the basic principles, the exercise is a reasonably simple one. Nevertheless there is considerable value in repeating the exercise a number of times. Although the program can generate numerous different pedigrees (see below), these fall into a small number of classes. After a number of tries, the student will come to recognise these classes and therefore to appreciate the rules of sex-linked inheritance. The program includes a timing function to encourage repetition.

Rare traits

Most known X-linked human recessive traits are deleterious and therefore rare. Unless unknown past inbreeding is involved, most affected individuals in a pedigree can be traced to a single original occurrence of the gene.

In running the SexLink program, a decision has to be made as to whether to take the likely rarity of sex-linked traits into account. While the resultant pedigrees may be more realistic, the assumption of a single original occurrence of the gene restricts the type of possible pedigree. For example, females will never show the trait in such pedigrees.

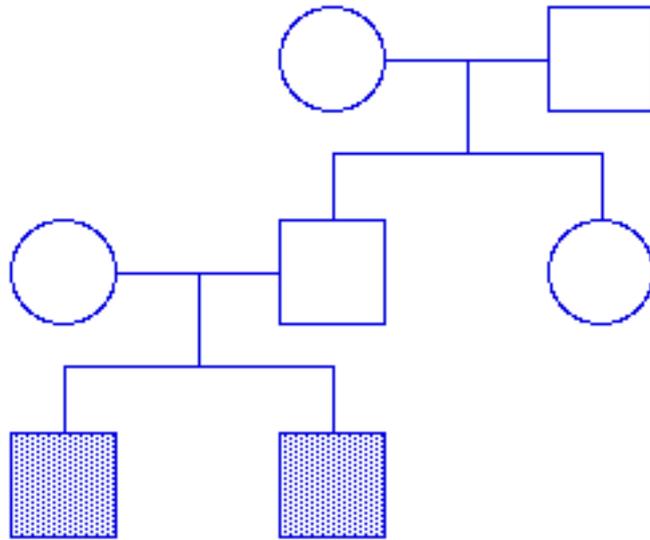
The default version of the program assumes a single occurrence of the recessive gene. In order to show the full variety of possible sex-linked pedigrees, it is necessary to change the default setting (see below).

Order of sexes in a mating and genes in a genotype

The male genotype at a sex-linked locus is conventionally written with the X chromosome followed by the Y chromosome, ie. X^aY rather than YX^a . The SexLink program follows this

convention. It applies the rule also to female genotypes, where the gene symbol coming from the female parent is placed on the left and the one from the male on the right.

The rule for genotype placement appears more natural if the symbol coming from the female parent always comes from the left. The default version of the program ensures that this will always be the case, ie. **the female in a mating is placed to the left and the male to the right**. This is done by moving the first mating either to the left or to the right depending on whether the offspring involved in the second mating is female or male. An example of a pedigree of the latter type is shown below:



If the birth order in a mating is written from left to right, it is not easy to write all matings with the female on the left. The program copes artificially by pretending that in all cases where the sibs in the first mating are of opposite sex, the male is older. This restriction can be removed if desired (see below).

Modifying the program

The first screen which appears when the program starts up is a Welcome screen, which contains the SexLink program icon.

Sexlink



Clicking on this icon **while holding down the Command key (Macintosh) or the Alt key (Windows)** will bring up a new screen, which offers the choice of changing the program:

PROGRAM CHOICES

I. Pedigrees can be restricted to a single occurrence or can contain multiple independent occurrences of the deleterious gene - see instructions for further details:

Single occurrence only **Multiple occurrences allowed**

II. Female in mating is always on the left:

True **False**

If either of the settings is changed, followed by **OK**, the new setting will be saved to the disk. The setting can be changed back by running the program again at any stage.

Technical note: The form of program can also be changed using the ResEdit program (Macintosh) or by editing (or deleting) the Sexlink.ini file (Windows).

In the Macintosh, STR# Resource 300,1 contains the symbol '1' for the single occurrence form and any other symbol, eg. '2', for multiple occurrences. STR# Resource 300,3 contains the symbol '1' for the case where the female is always placed to the left, and any other symbol to remove this restriction.

Note that in Windows, the Sexlink.ini file must be present either in the same directory as the program or in the C:\WINDOWS folder in order to be operative.