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Power

We therefore need to plan our experiment in advance to check whether it would probably give a useful result—a mean result that is significant and important. Assuming that we know the standard deviation of the results, we can calculate the power of the test for a particular number of observations and a given important difference (see Box 2).

> *The power of a test is the probability of rejecting the null hypothesis when it is false*

Some examples of power calculations are shown in Figure 1. Suppose we took the standard deviation of the results as 0.2 % (mass fraction) and, as before, regarded a difference of 0.1 as important. Then we would need 33 repeated results for a power of 0.8, *i.e.*, to see a significant difference in four experiments out of five. If the precision were better (0.1), we could get the same level of power with 8 results. Of course, in an example such as that given, we may have little or no control over the precision. It might be necessary to reconsider our ideas about the magnitude of an error regarded as important.

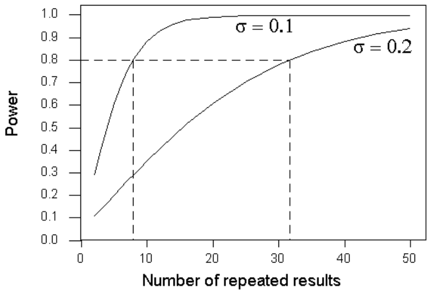

Figure 1. Power of a one-sample two-tailed *t*-test for a difference of 0.1. (See Box 2 for the explanation of how power is calculated.)

This Technical Brief was prepared for the Analytical Methods Committee by the Statistical Subcommittee under the chairmanship of M. Thompson.

I certify that I have studied this document as a contribution to Continuing Professional Development.

Name…………………..

Signature…………………………..…….Date………….

Name of supervisor…………………………………..

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Box 2. Power calculations

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