PSY30100-03 -- Assignment 7

Chapter 7:
Power Analysis

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Question 1: 6.106 (p.410)

- Make a recommendation.

Ans: (You may have your own answers) The power of this study is far less than what is generally desired - for example, it is well below the "80% standard" mentioned in the text. 20% power for the specified effect means that, if the effect is present, we will only detect it 20% of the time. With such a small chance of detecting an important difference, the study should probably not be run, unless the sample size is increased to give sufficiently high power.

Question 2: 6.108 (p.410)

□ Power for a different alternative.

Ans: The power for $\mu = -5$ is 0.82, the same as the power for $\mu = 5$ because both alternatives are an equal distance from the null value of $\mu = 0$. The symmetry of two-tailed tests with the normal distribution means that we only need to consider the size of the difference, not the direction.

Question 3: 6.112 (p.411)

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(b) Find the type II error.

	H0 true	Ha true
Reject H0	Type I error (alpha)	Correct decision (Power)
Fail to reject H0	Correct decision	Type II error (beta)

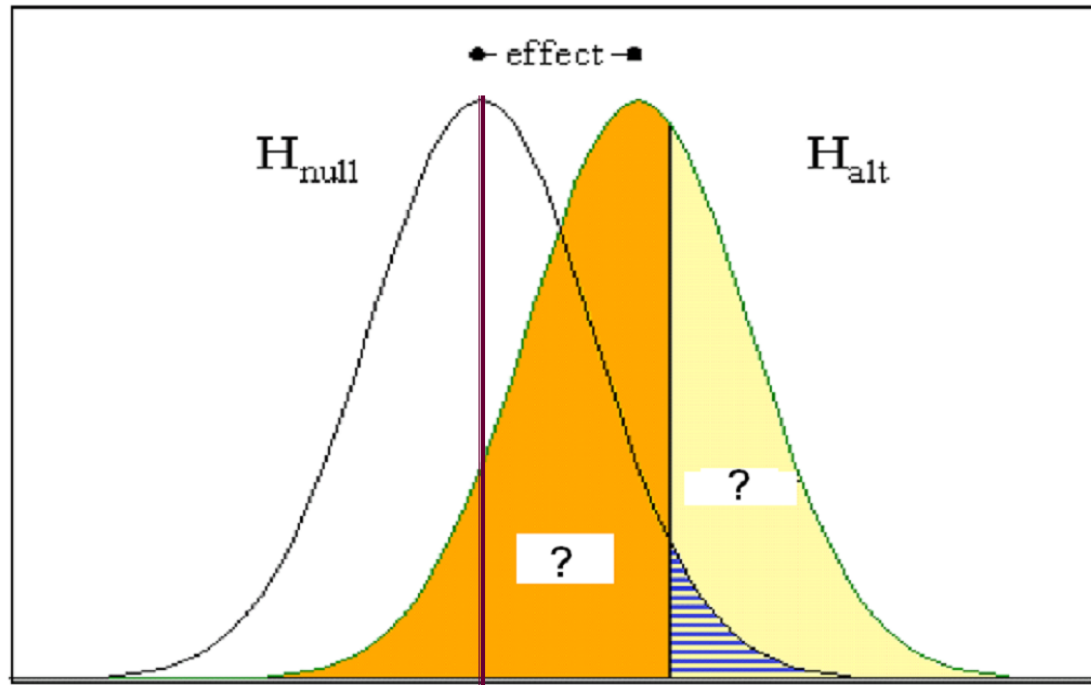A **Type I error** is the probability of incorrectly rejecting a true H_0.

A **Type II error** is the probability of incorrectly keeping a false H_0.

The power of a test is $1 - \beta$.

Yellow (including barred area): Power
Gold: Type II error
Barred: Type I error

Remember:

1. To calculate power or type II error, you need a specific value for μ_{H_a}

2. For different μ_{H_a} value, the power or type II error will be different.

Question 3: 6.112 (p.411)

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(b) Ans:

Step1: Write down the null and alternative hypotheses.

$$H_0 : \mu = 25 \quad vs. \quad H_a : \mu > 25$$

Step2: Sketch the distributions involved and define the type II error area (use μ_{H_a})

Step2: Find the z_{Ha}

$$z_{Ha} = \frac{\bar{x} - \mu_{Ha}}{\sigma_{\bar{X}}} = \frac{26 - 28}{50 / \sqrt{900}} = -1.2$$

Step3: Obtain the type II error

$$p(Type\ II\ error\ when\ \mu = 28) = p(Z_{H_a} < -1.2) = 0.1151$$

Question 3: 6.112 (p.411)

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Additional Q1: what is the power?

Ans: power

$=$1-type II error

$=$1-0.1151

$=$0.8849

Question 3: 6.112 (p.411)

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Additional Q2: Can you find a conceptual error in this question?

Ans: We **never** accept H0!

Question 3: 6.112 (p.411)

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Ans: (d) "(The central limit theorem!) the fourth rule of the sampling distribution of a sample mean."

The sample size, n=900, is so large that the sample mean will be very close to Normal.