

Two Factor ANOVA

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Factorial Designs

- # Often researchers want to study the effects of two or more independent variables at the same time
 - Does it matter where a list of words is studied, on the beach or under water?
 - Does it matter where a list of words is recalled, on the beach or under water?

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Factorial Designs

- # *Factor* is another name for *independent variable*
 - The preceding example has two factors: where you study and where you recall
- # In a *factorial design*, all possible combinations of the factors are present

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A Factorial Design

		Study	
		On Beach	Underwater
Recall	On Beach	Study on beach; recall on beach	Study underwater; recall on beach
	Underwater	Study on beach; recall underwater	Study underwater; recall underwater

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Naming Factorial Designs

- # Factorial designs are referred to by the number the number of IVs and the number of levels of each IV
- # A design with two IVs is said to be an $n \times m$ (read n by m) design
 - n is replaced with the number of levels, or conditions, of the first IV
 - m is replaced with the number of levels, or conditions, of the second IV

Naming Factorial Designs

- # The preceding example is a 2×2 factorial design because there are two IVs, and each IV has two levels
- # What would you call a design that had 3 IVs in which the first IV had 2 levels, the second IV had 3 levels and the third IV had 4 levels?
- # $2 \times 3 \times 4$

Factorial Designs

The number of conditions in a factorial design is equal to the product given by its name

Design	# Conditions
2×2	4
$2 \times 3 \times 4$	24
3×4	12

Information From A Factorial Design

- # An $n \times m$ factorial designs is very powerful because it allows us to answer three questions:
 - Is there an effect of the first IV?
 - Do you recall more words when you study them on the beach or underwater?
 - Is there an effect of the second IV?
 - Do you recall more words when you recall them on the beach or underwater?

Information From A Factorial Design

- # An $n \times m$ factorial design is very powerful because it allows us to answer three questions:
 - Are the effects of the two IVs independent of each other?
 - When recalling on the beach, does it matter whether you studied underwater or not? When recalling underwater, does it matter whether you studied on the beach or not?

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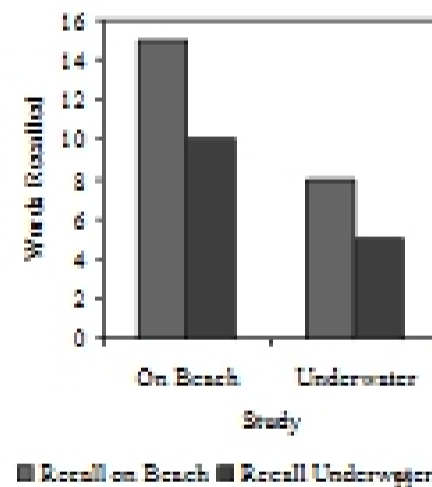
Main Effects

- # Each of the first two questions (Is there an effect of the first / second IV?) is asking whether there is a *main effect* of that IV
 - A main effect occurs when an independent variable has an influence on the dependent variable
 - If people recalled more words when they studied them on the beach than when they studied them underwater, then there would be a main effect of where the words are studied

Main Effects

- # When looking at the main effect of one IV, you should ignore the existence of the other IV

- Compare all conditions that have one level of the IV to all conditions that have the other level of the IV



Main Effects

- # For the main effect of where the words were studied:
 - # Average the values of the left two bars (conditions in which people studied on the beach)
 - $(15 + 10) / 2 = 12.5$
 - # Average the values of the right two bars (conditions in which people studied underwater)
 - $(8 + 5) / 2 = 6.5$

