COMPLEX EXPERIMENTAL DESIGNS

PSYC214

Chapter 10

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Increasing the Number of Levels of an Independent Variable

Can provide more information about the relationship than a two level design

Necessary to detect curvilinear relationships

- Three levels is minimum requirement
- Inverted-U
- Positive monotonic relationships

Helps to compare two or more groups

Figure 10.1 — Linear vs. Positive Monotonic Functions

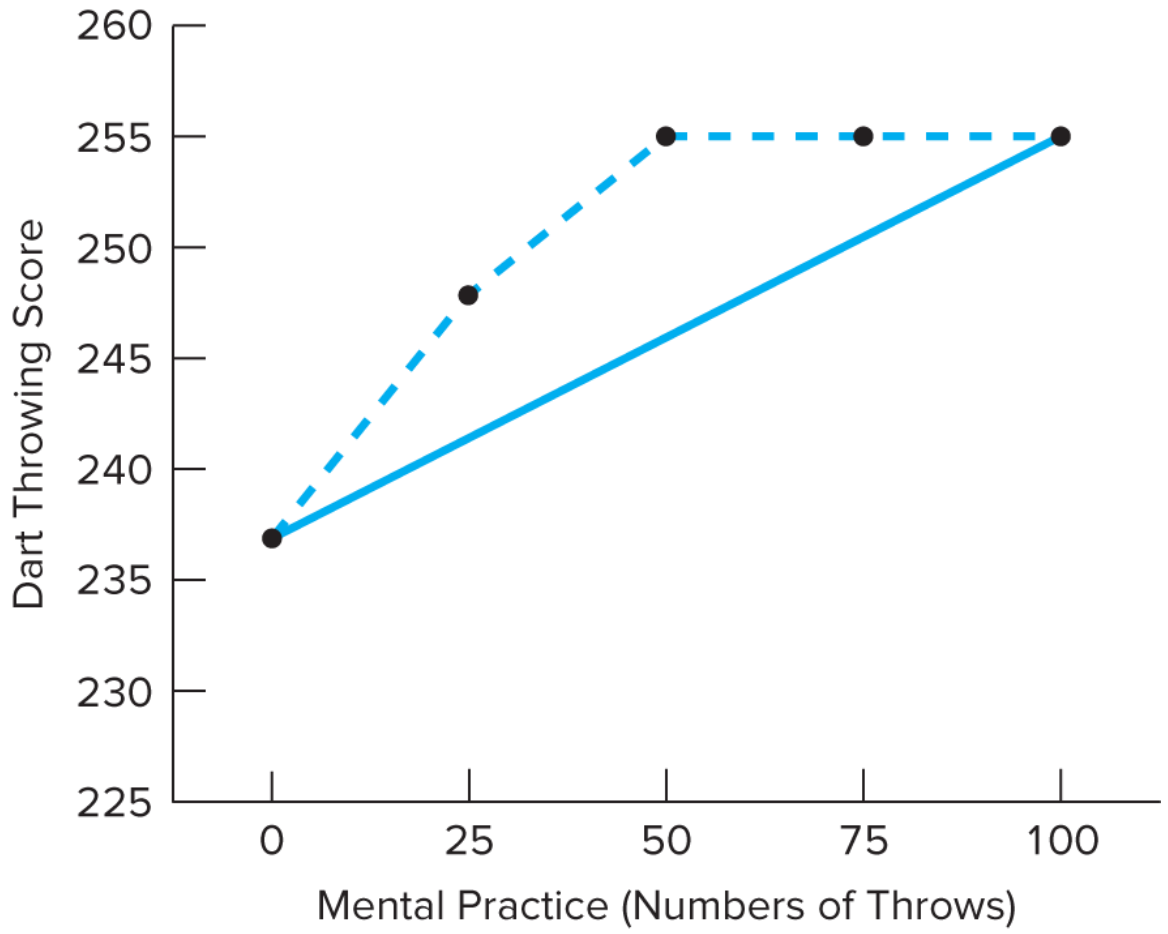
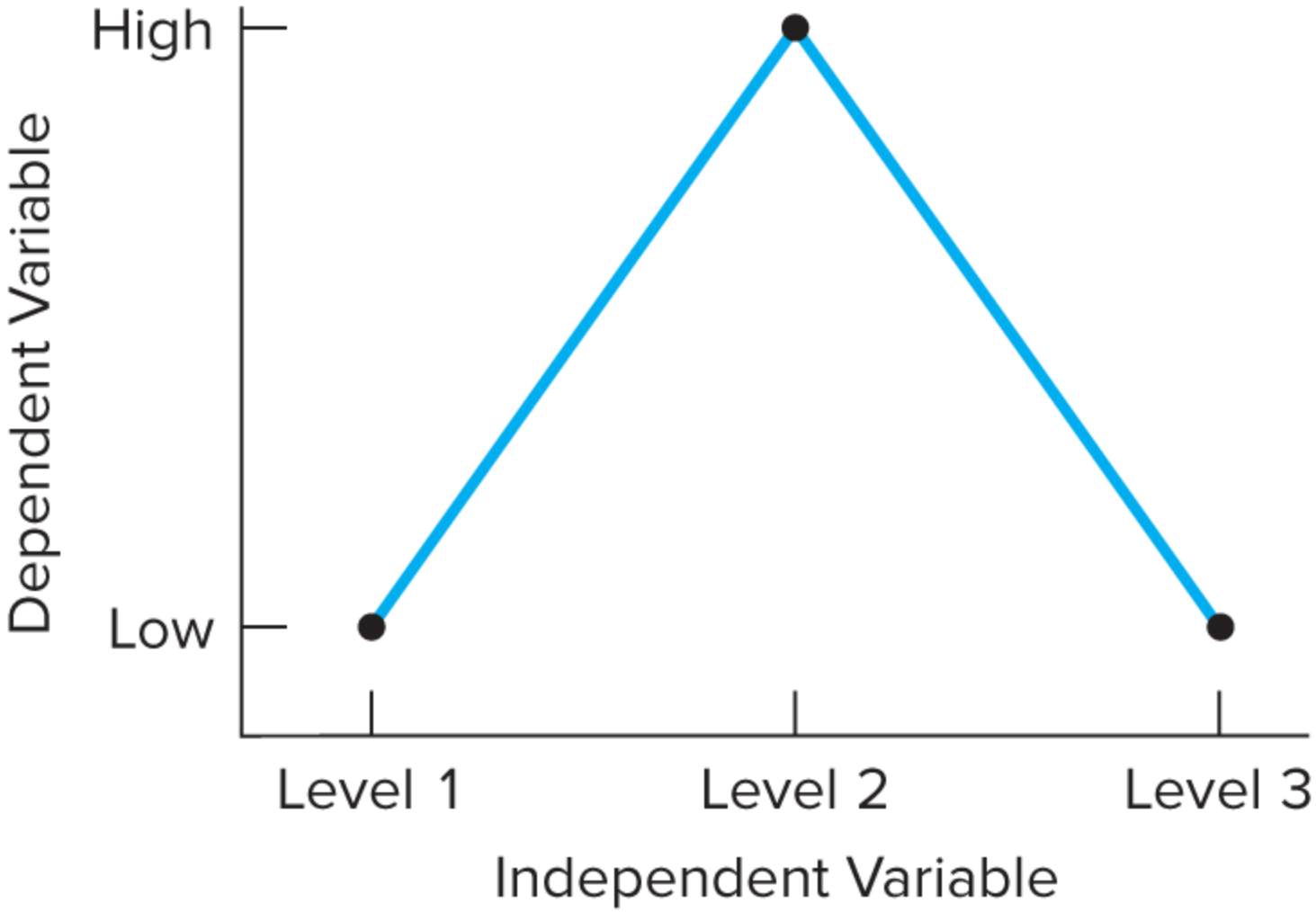


Figure 10.2 — Curvilinear Relationship



Factorial Designs

Experimental designs with more than one independent variable (or factor)

2 x 2 factorial design

- Simplest factorial design
- Has two independent variables
- Two levels of each variable

Figure 10.3 — 2 x 2 Factorial Design: Setup of Food Intake Modeling

	Independent variable A: Confederate sociability	
Independent variable B: Confederate food intake	Sociable	Unsociable
Low	Sociable/ low food intake	Unsociable/ low food intake
High	Sociable/ high food intake	Unsociable/ high food intake

Factorial Designs

No. of levels of IV1 x No. of levels of IV2 x No. of levels of IV3

- A design with two independent variables one having 2 levels, the other with 3 levels is a 2x3 factorial design, with 6 conditions.
- A design with two independent variables one having 3 levels, the other with three levels:
- A design with three independent variables each having 2 levels:

Factorial Designs

Interpretation of factorial designs

Main effect: The effect of an independent variable on its own

- **Main Effect A:** Is there a relationship between sociability and food intake?
- **Main Effect B:** Is there a relationship between confederate food intake and food intake?

Confederate food intake (independent variable B)	Confederate sociability (independent variable A)		Overall means (main effect of B)
	Sociable	Unsociable	
Low	6.58	2.14	4.36
High	5.68	10.63	8.16
Overall means (main effect of A)	6.13	6.39	

Factorial Designs

Interpretation of factorial designs

- **Interaction:** The effect of one independent variable that depends on the level of another independent variable
- Interactions not measurable in simple experimental designs

Confederate food intake (independent variable B)	Confederate sociability (independent variable A)		Overall means (main effect of B)
	Sociable	Unsociable	
Low	6.58	2.14	4.36
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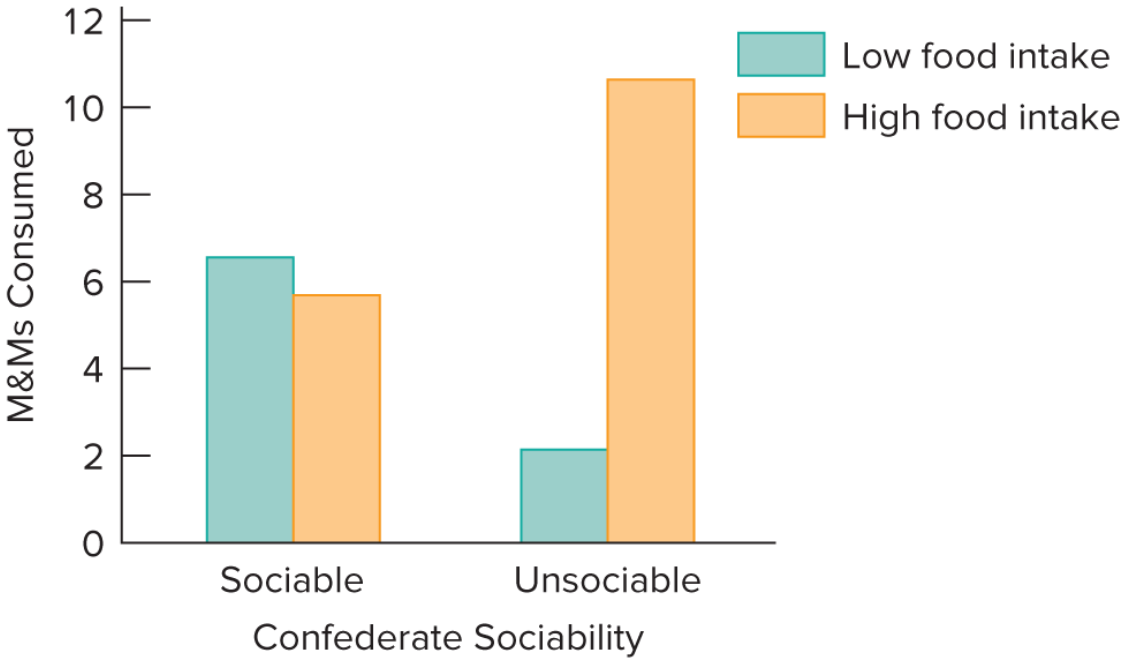
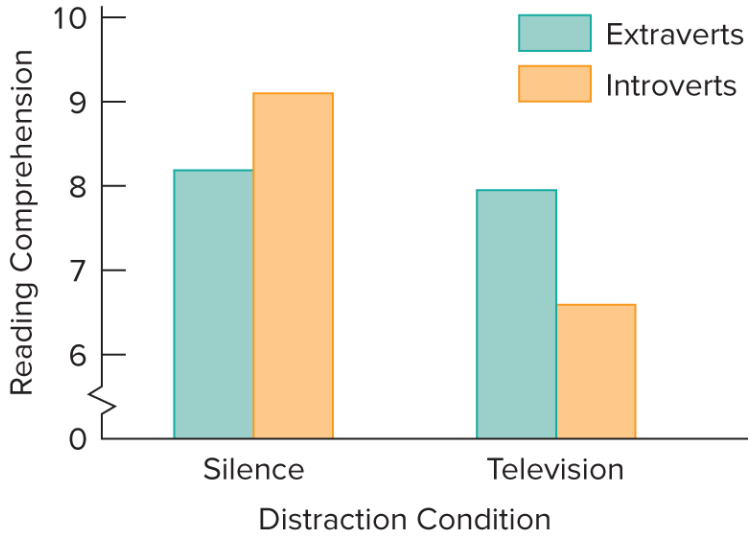
Interactions can be seen easily when the means for all conditions are presented in a graph.



IV x PV designs: Independent Variable by Participant Variable

- Factorial designs with manipulated and non-manipulated variables
- Show effects of participant variables (such as age)



Outcomes of a 2 x 2 Factorial Design 1

There may or may not be a significant

- Main effect for independent variable A
- Main effect for independent variable B
- Interaction between the independent variables

Figure 10.6 — Outcomes of a Factorial Design with Two Independen Variables: No Interaction between A and B

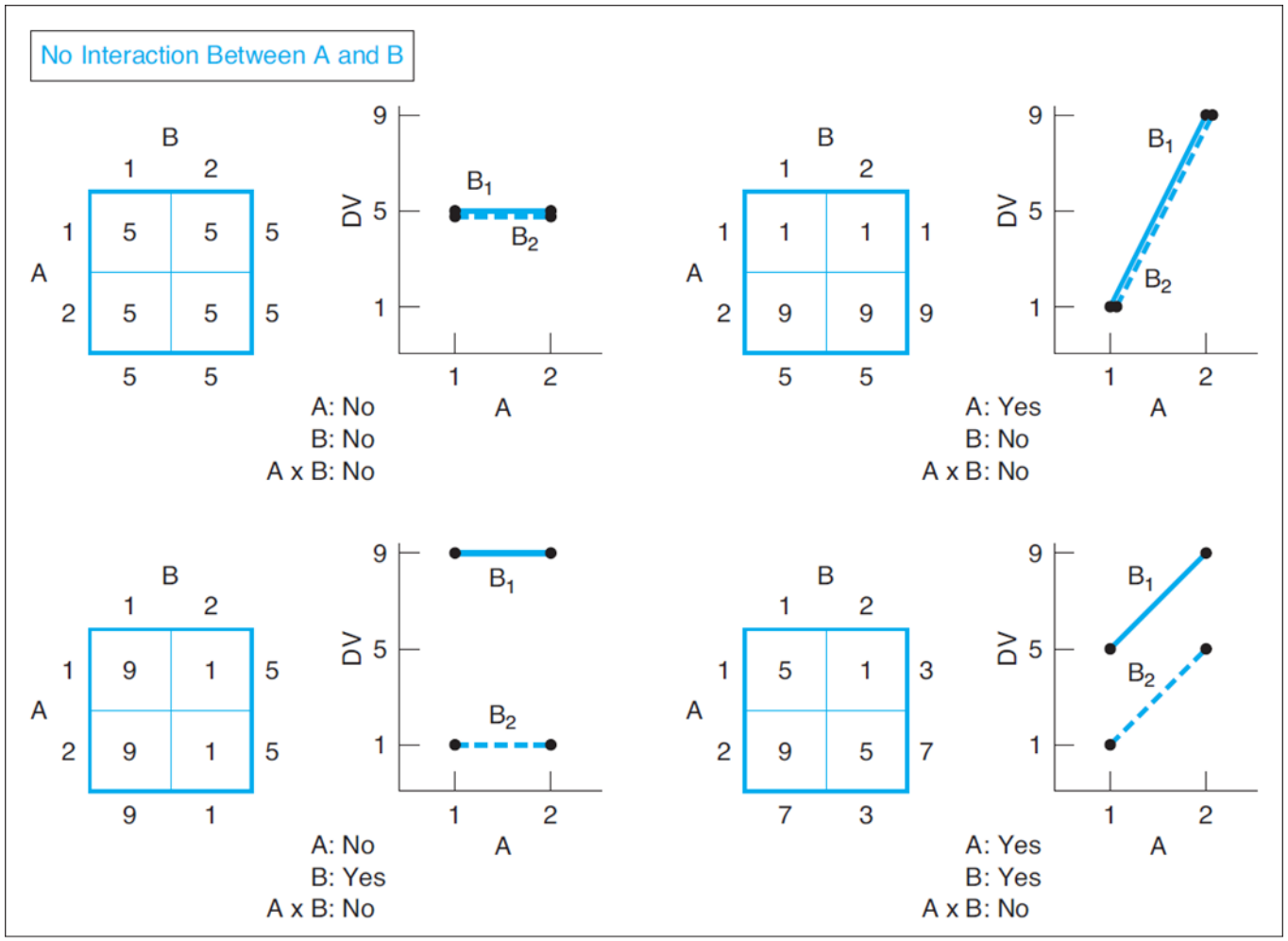
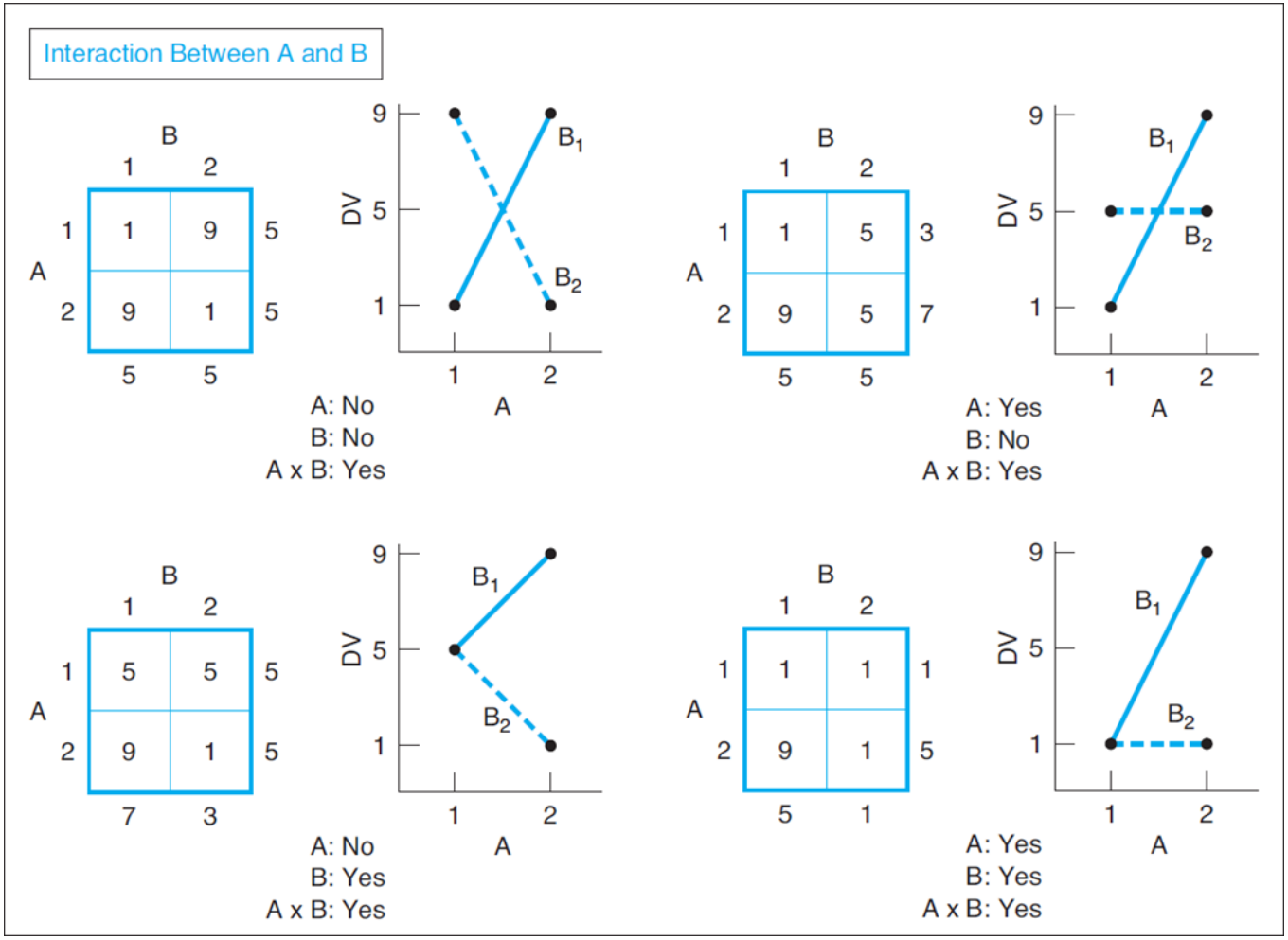


Figure 10.6 — Outcomes of a Factorial Design with Two Independent Variables: Interaction between A and B



Outcomes of a 2 x 2 Factorial Design 2

Interactions and simple main effects

- Analysis of variance is used to assess the statistical significance of main effects and the interaction in a factorial design.
- **Simple main effect** analysis examines mean differences at each level of the independent variable.

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	Sociable	Unsociable	
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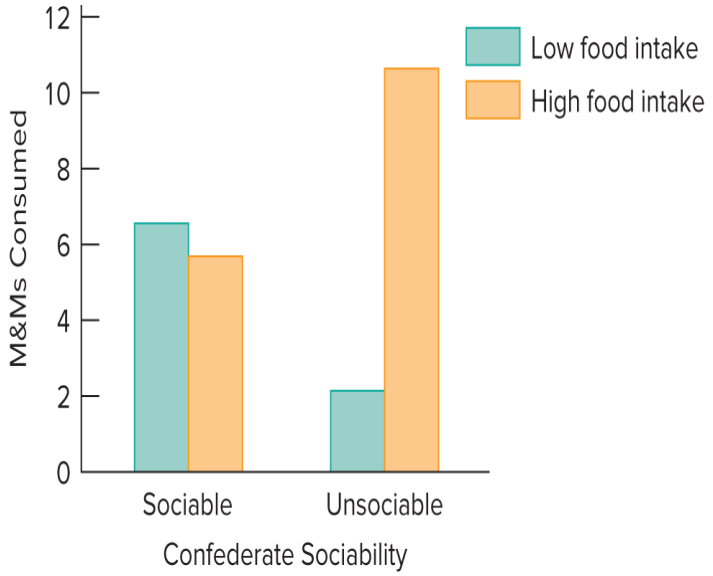
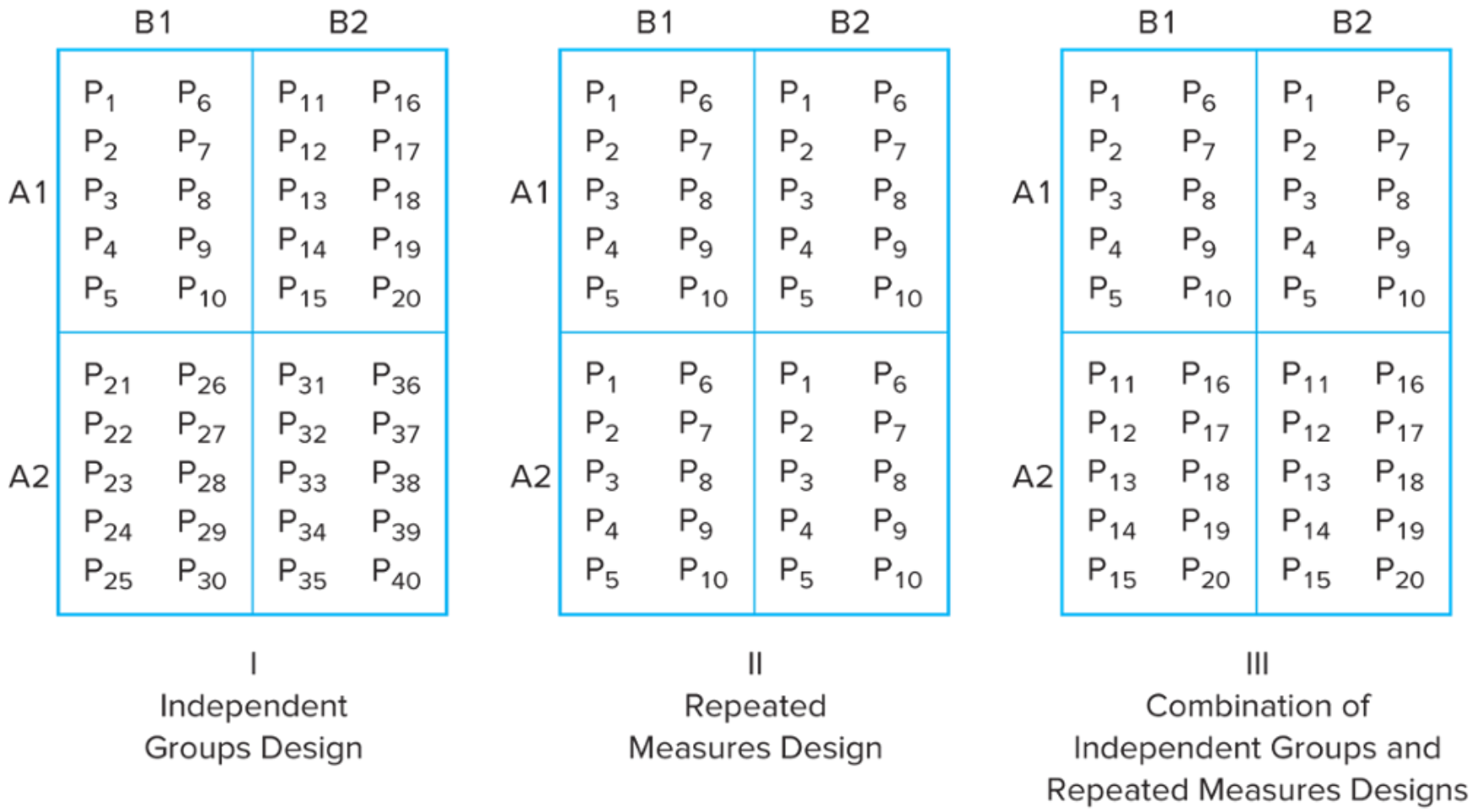


Assignment Procedures and Factorial Designs

The three methods for assigning participants to conditions affect how many participants are necessary for an experiment.

- The **independent groups** (**between-subjects**) **design** requires the largest number of participants as a different set of individuals is assigned to each condition.
- The **repeated measures** (**within-subjects**) **design** requires the fewest participants as the same individuals take part in all conditions.
- The **mixed factorial design** establishes a unique set of individuals for one variable but not the other and then tests these groups repeatedly, requiring a number of participants that lies between those used by the other two approaches.

Figure 10.7 — Number of Participants (P) Required to Have 10 Observations in Each Condition



Jump to long description.

Designs with More Levels of Variables and Designs with Three or More Variables

Increasing the number of levels of an independent variable

- For example, a 2 x 3 factorial design has one independent variable with 2 levels and a second independent variable with 3 levels.

Increasing the number of independent variables in a factorial design

- For example, a 2 x 2 x 2 factorial design has three variables, each with two levels.
- Designs with large numbers of variables can become very complex, require enormous numbers of participants, and yield results that are difficult to interpret.