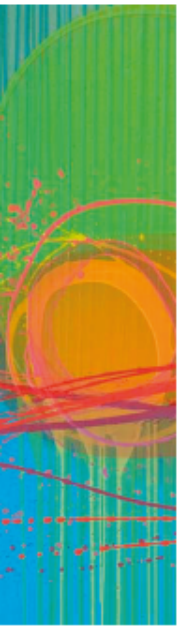
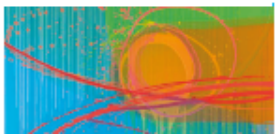
DISCOVERING STATISTICS USING SPSS THIRD EDITION

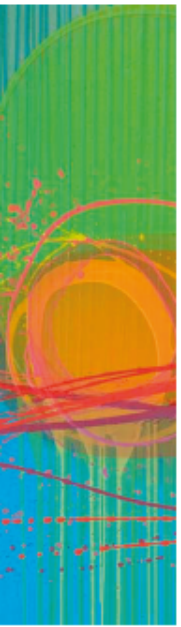


Exploring Data with Graphs

Lecture 03

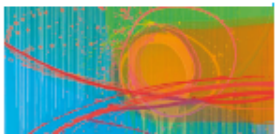
ANDY FIELD





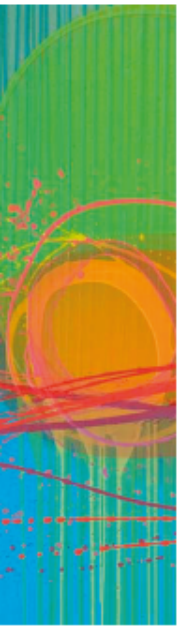
Aims

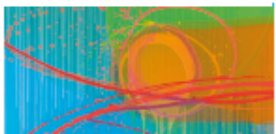
- How to present data clearly
- The Chart Builder
- Graphs
  - Histograms
  - Boxplots
  - Error bar charts
  - Scatterplots



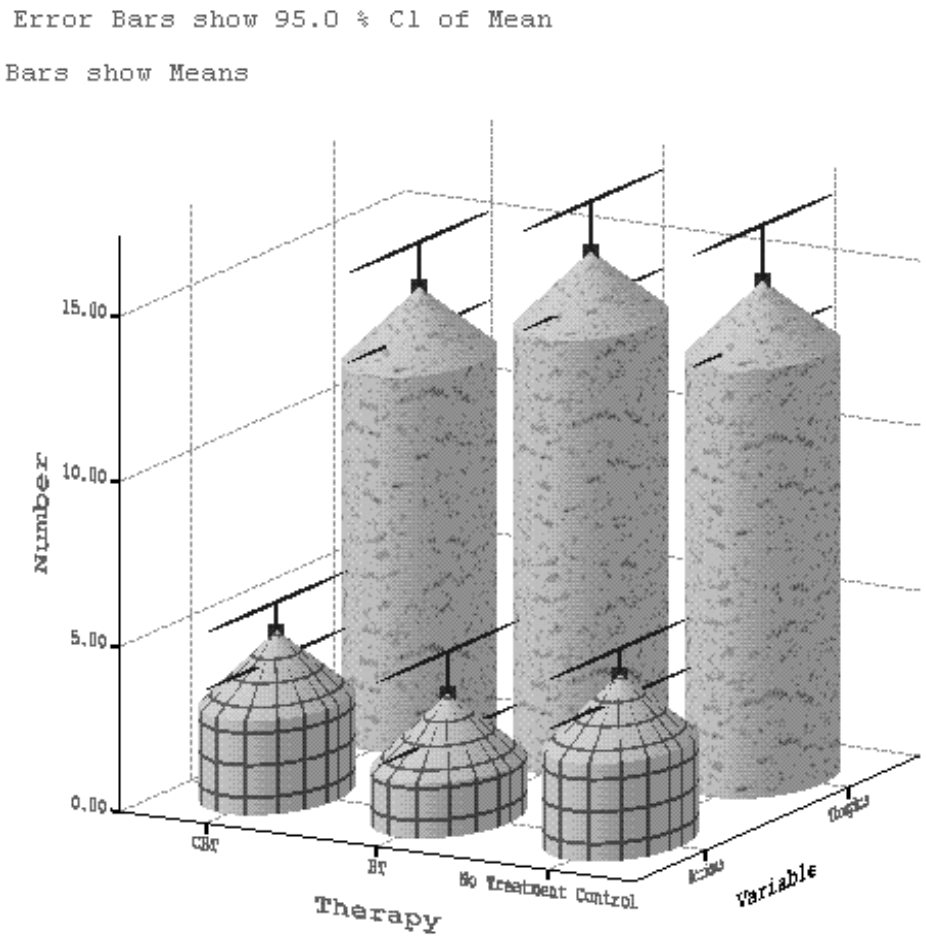
The Art of Presenting Data

- Graphs should (Tufte, 2001):
  - Show the data.
  - Induce the reader to think about the data being presented (rather than some other aspect of the graph).
  - Avoid distorting the data.
  - Present many numbers with minimum ink.
  - Make large data sets (assuming you have one) coherent.
  - Encourage the reader to compare different pieces of data.
  - Reveal data.

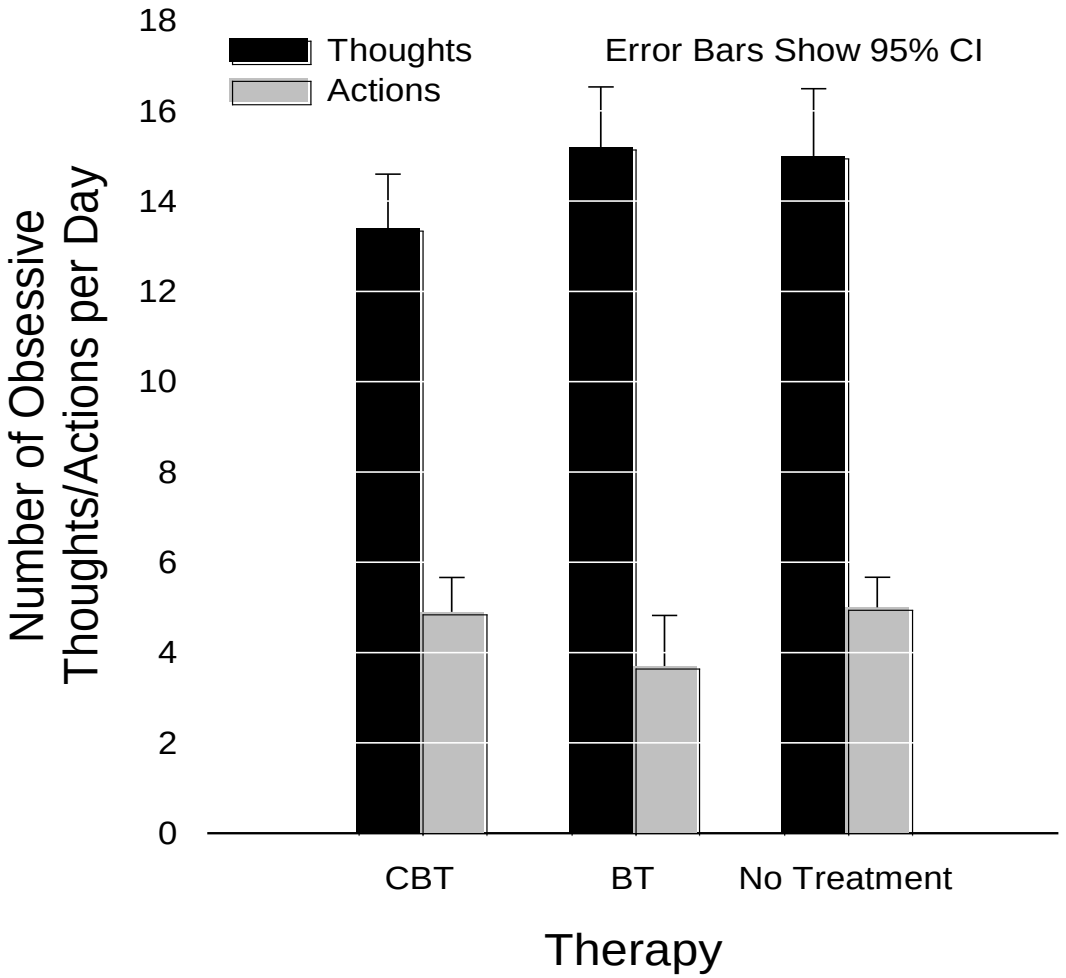




Why is this Graph Bad?

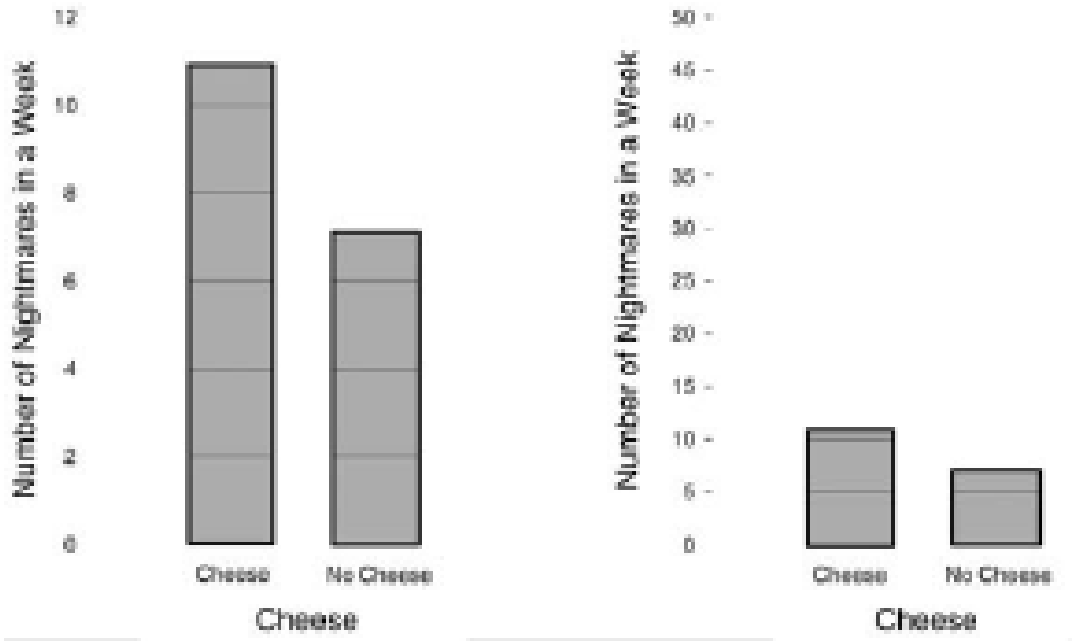


Why is this Graph Better?

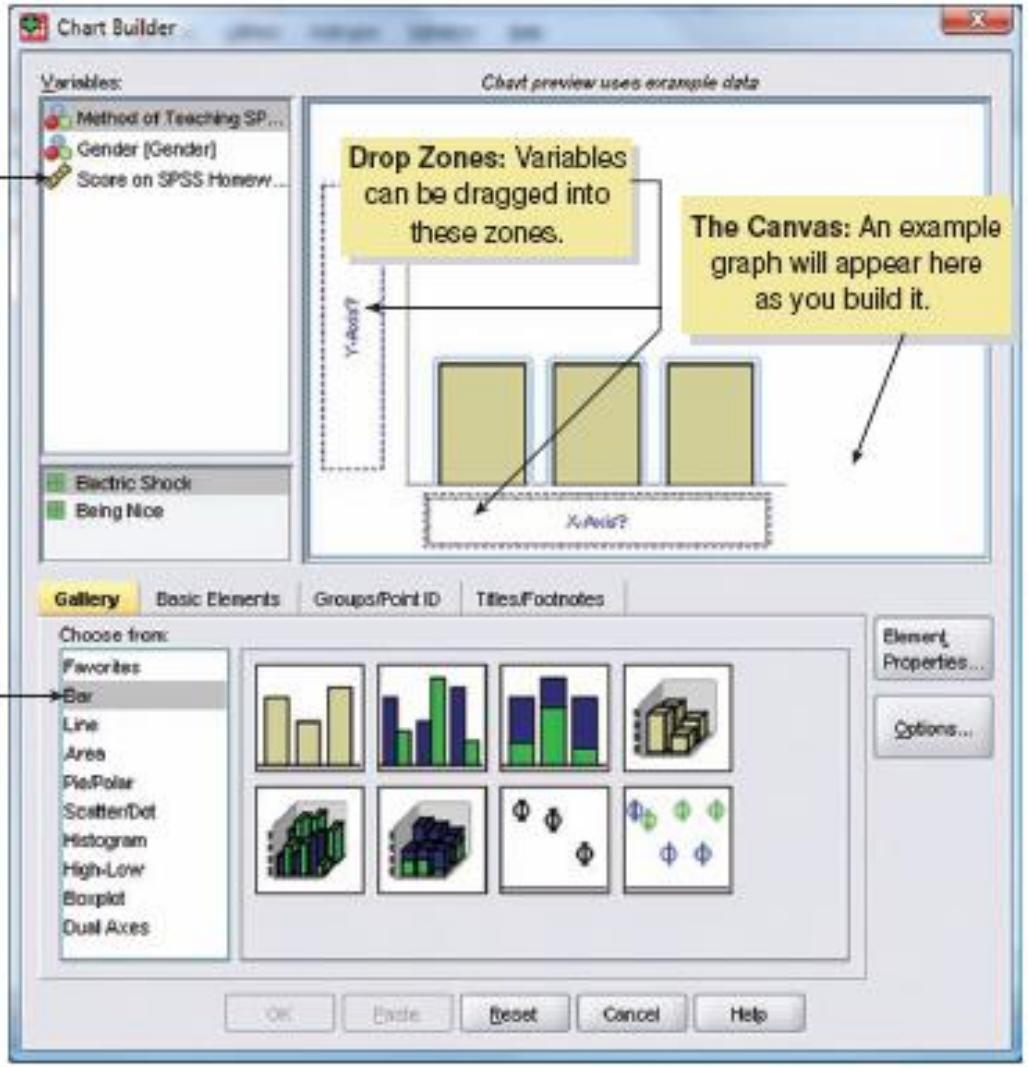


Deceiving the Reader

FIGURE 4.4
Two graphs about cheese



The Chart Builder



Variables list: Variables in the data editor are displayed here.

Gallery: Select a style of graph by clicking on an item on this list.

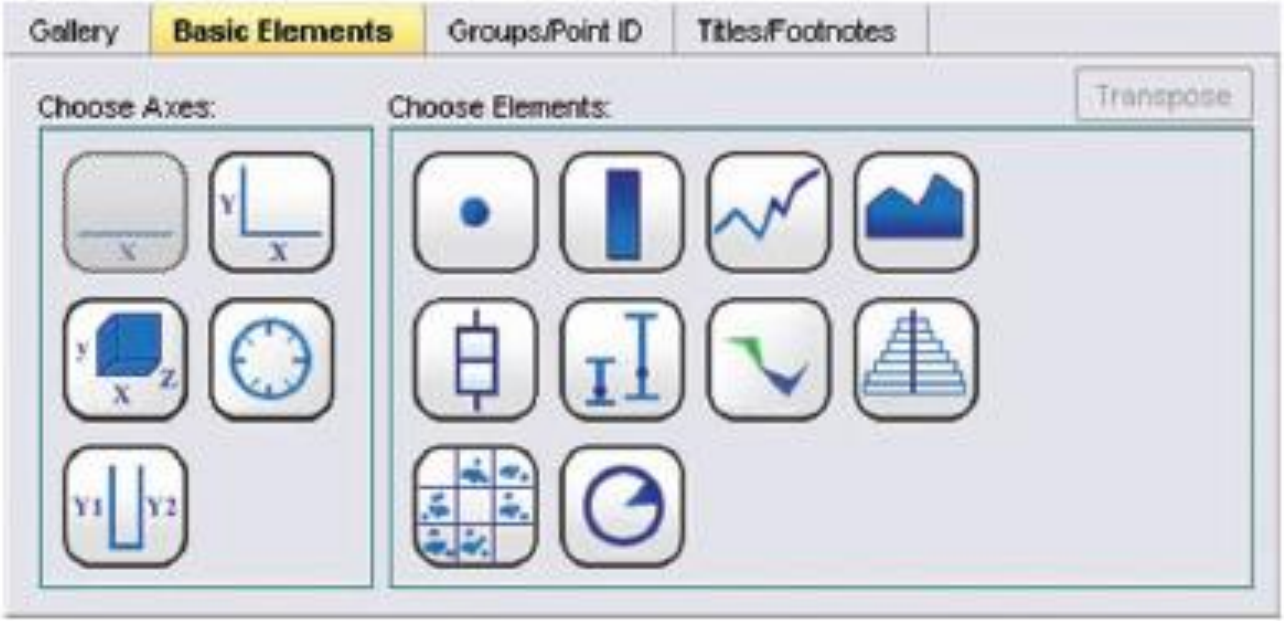
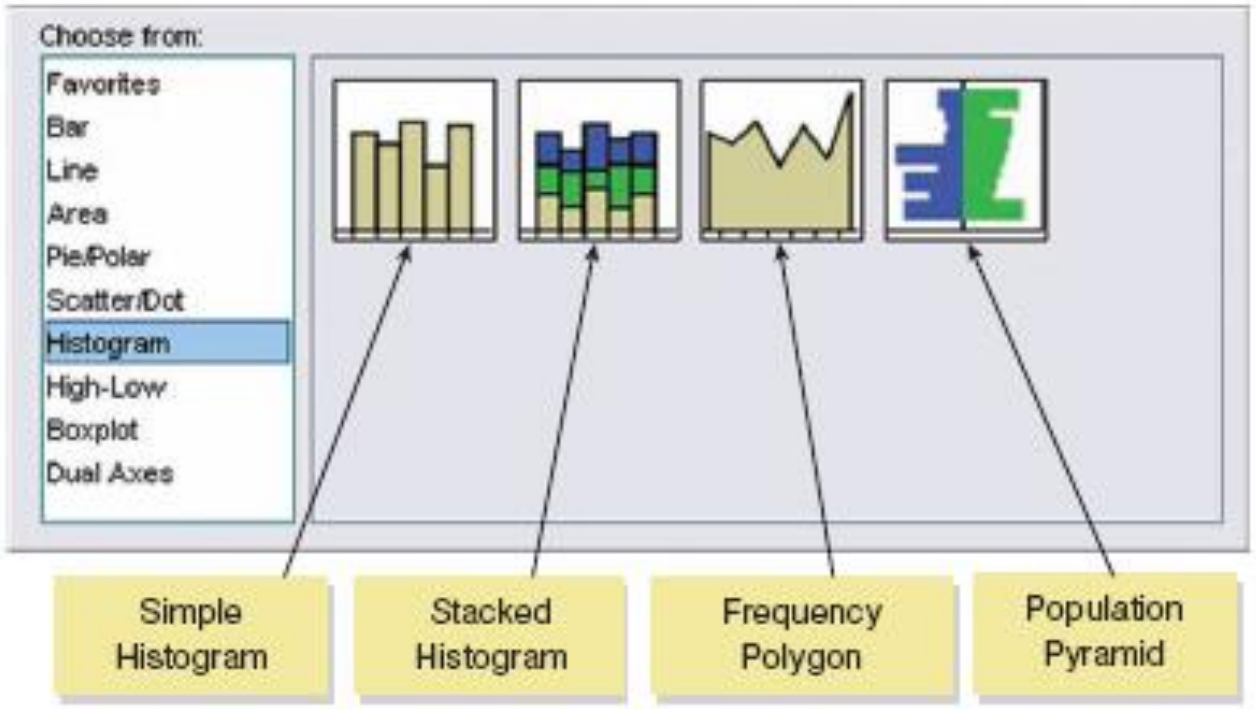


FIGURE 4.6
Building a graph from basic elements

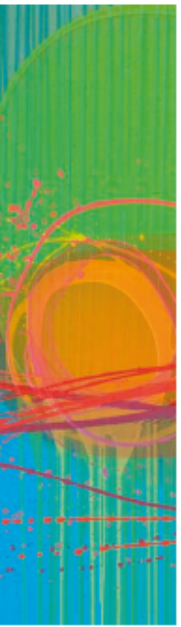
Histograms: Spotting Obvious Mistakes

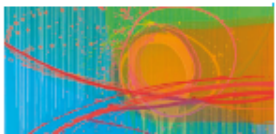
FIGURE 4.7
The histogram gallery



Histograms

- Histograms plot:
  - The score (*x*-axis)
  - The frequency (*y*-axis)
- Histograms help us to identify:
  - The shape of the distribution
    - Skew
    - Kurtosis
    - Spread or variation in scores
  - Unusual scores





Histograms: Example

- A biologist was worried about the potential health effects of music festivals.
- Download Music Festival
- Measured the hygiene of 810 concert-goers over the three days of the festival.
- Hygiene was measured using a standardised technique :
  - Score ranged from 0 to 4
    - 0 = you smell like a corpse rotting up a skunk's arse
    - 4 = you smell of sweet roses on a fresh spring day

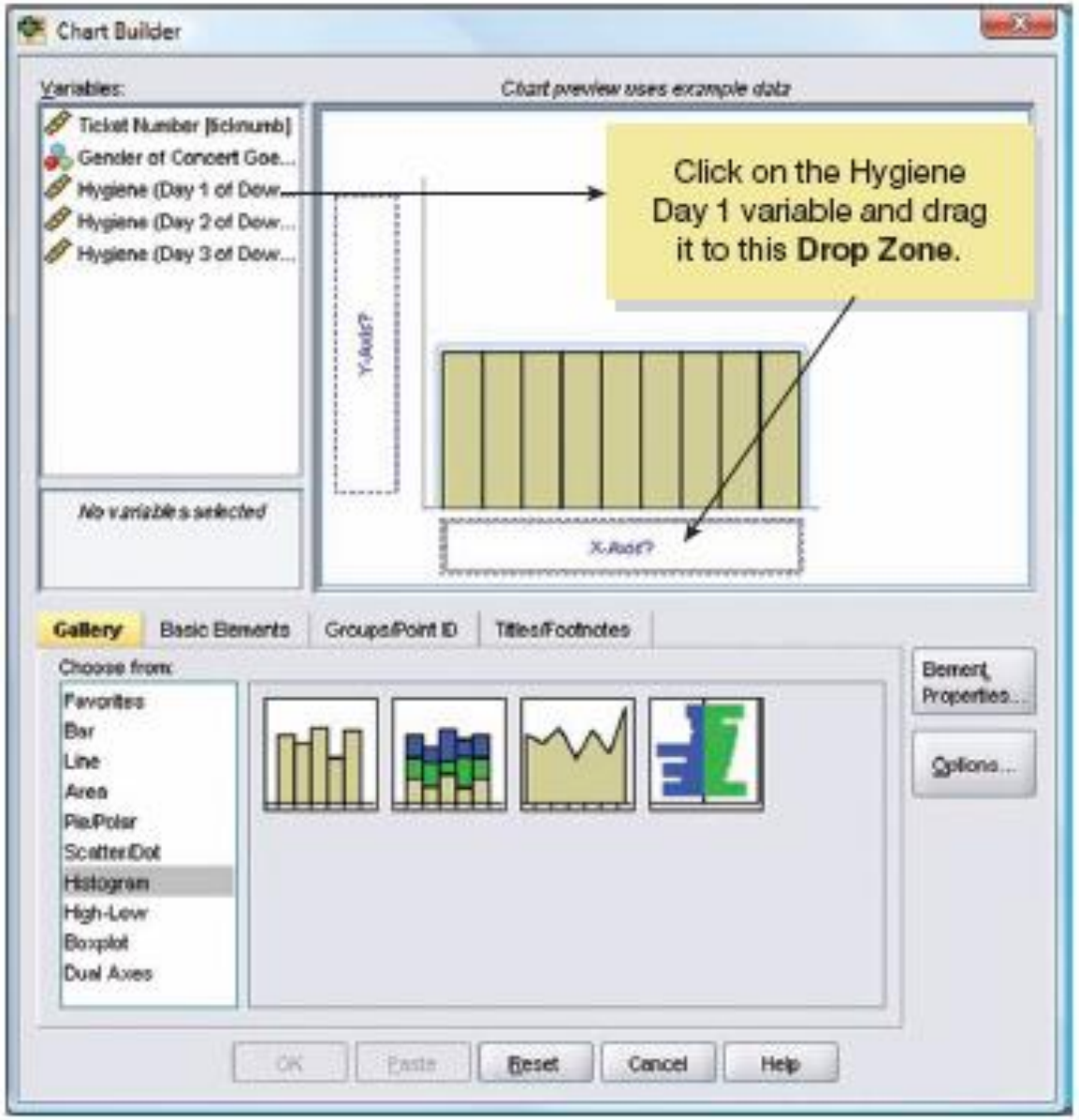
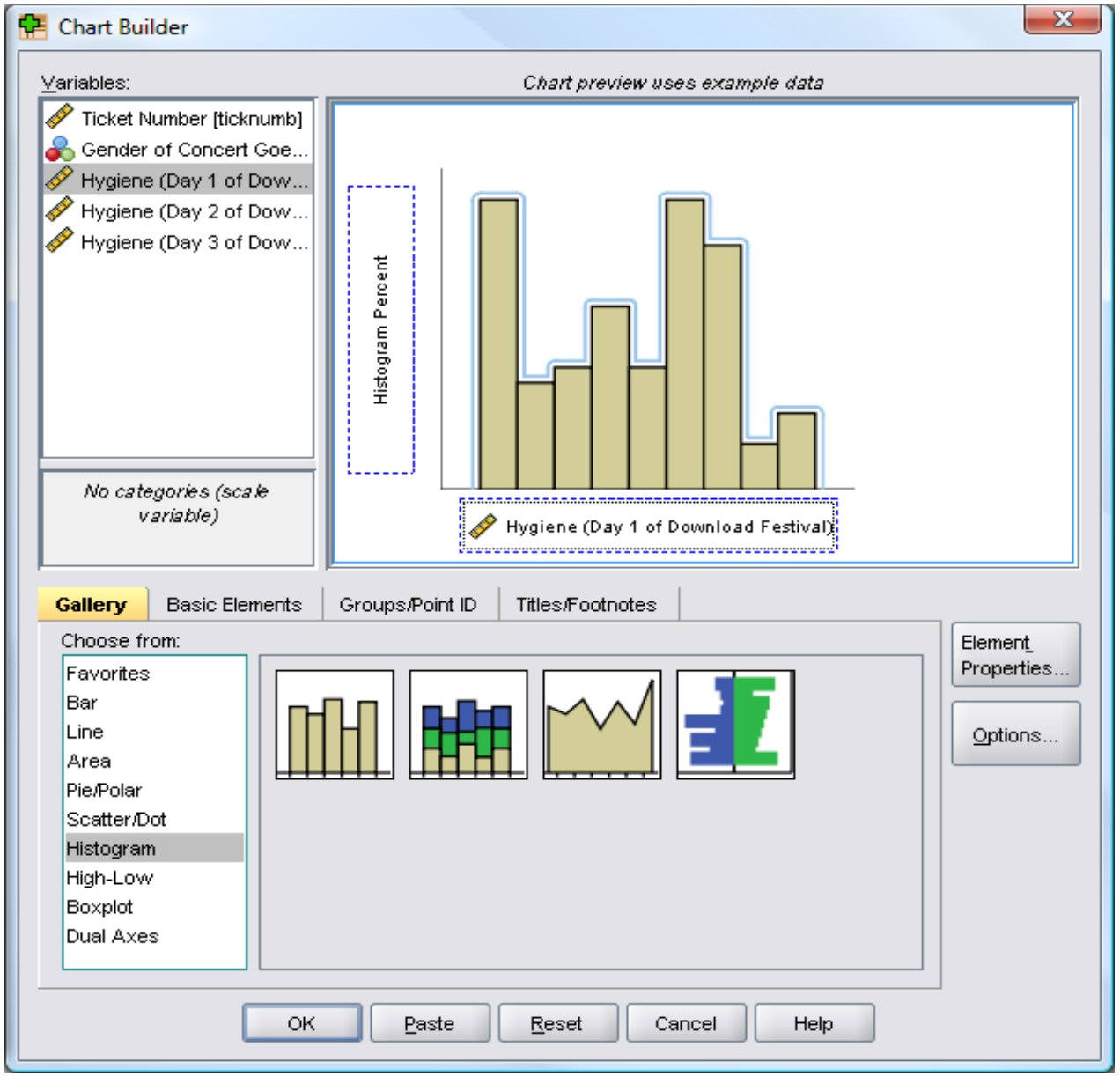
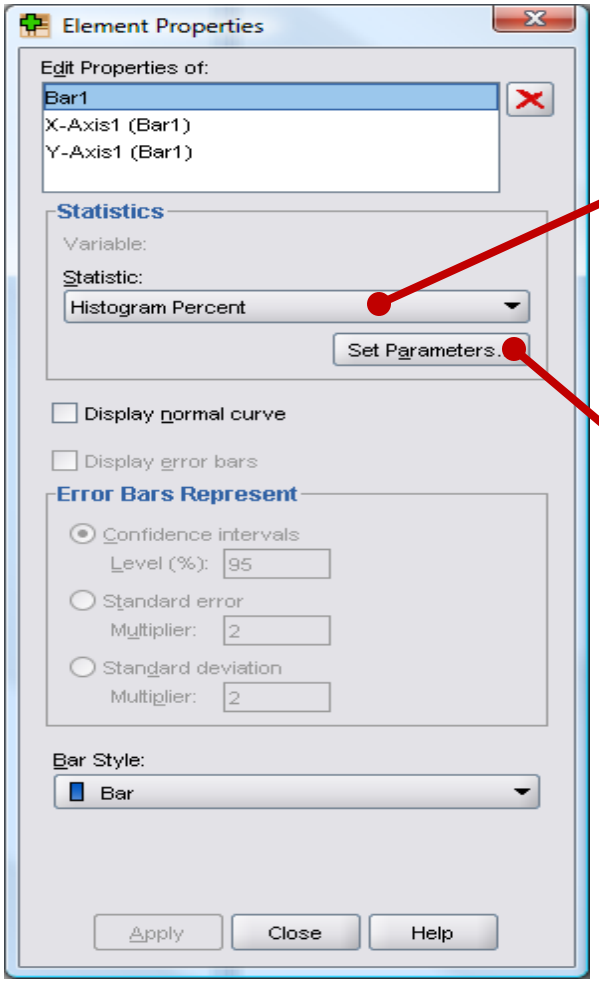


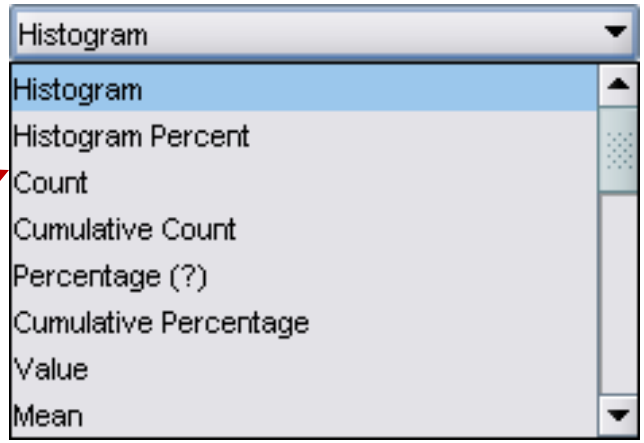
FIGURE 4.8
Defining a histogram in the Chart Builder

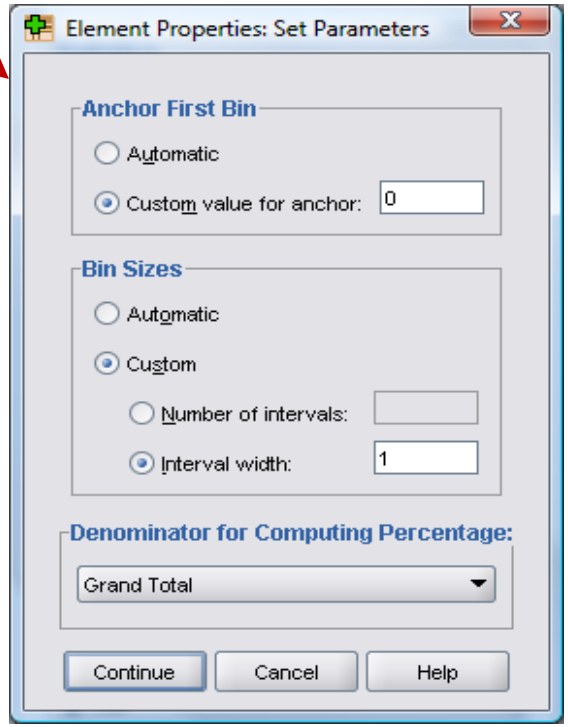
DISCOVERING STATISTICS USING SPSS THIRD EDITION



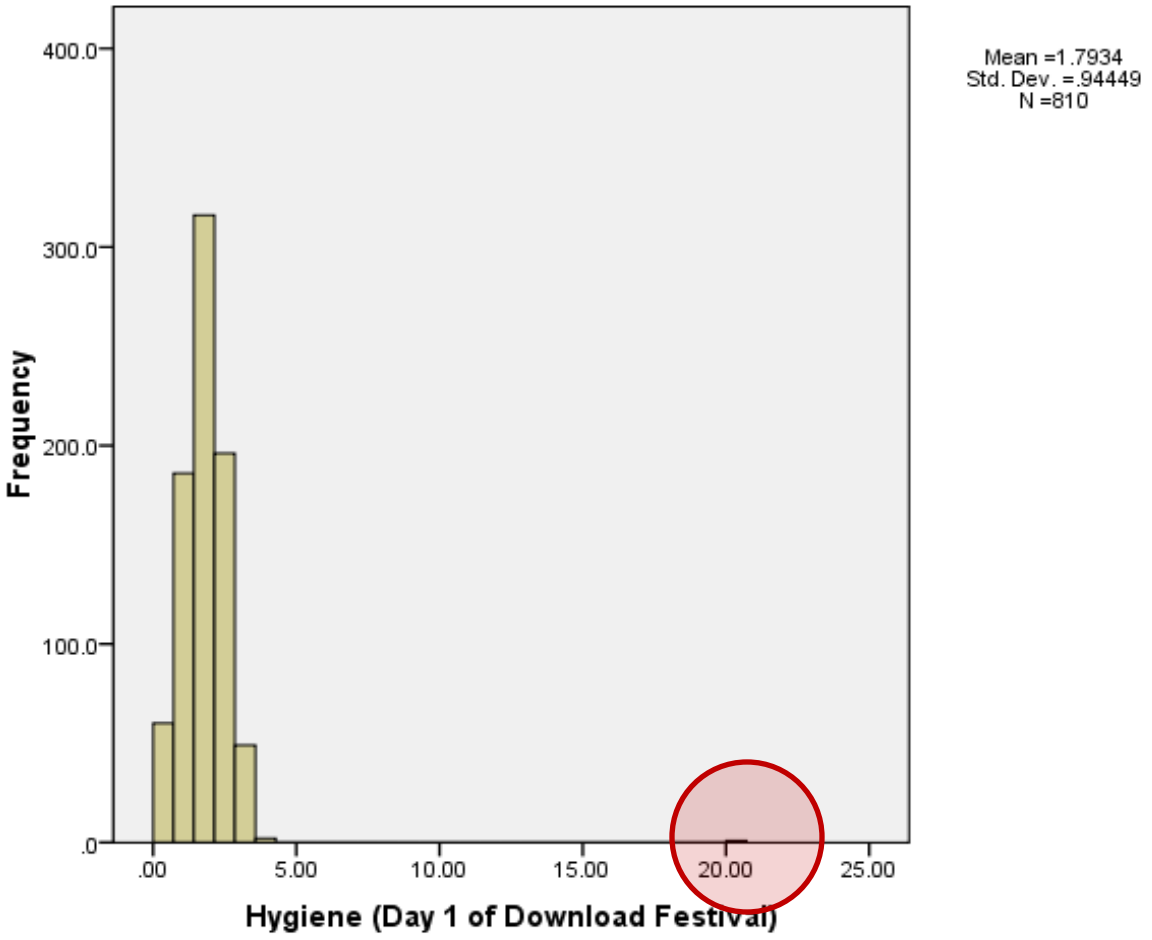
ANDY FIELD


Element Properties
Edit Properties of:
Bar1
X-Axis1 (Bar1)
Y-Axis1 (Bar1)
Statistics
Variable:
Statistic:
Histogram Percent
Set Parameters...
Display normal curve
Display error bars
Error Bars Represent
Confidence intervals
Level (%): 95
Standard error
Multiplier: 2
Standard deviation
Multiplier: 2
Bar Style:
Bar
Apply
Close
Help

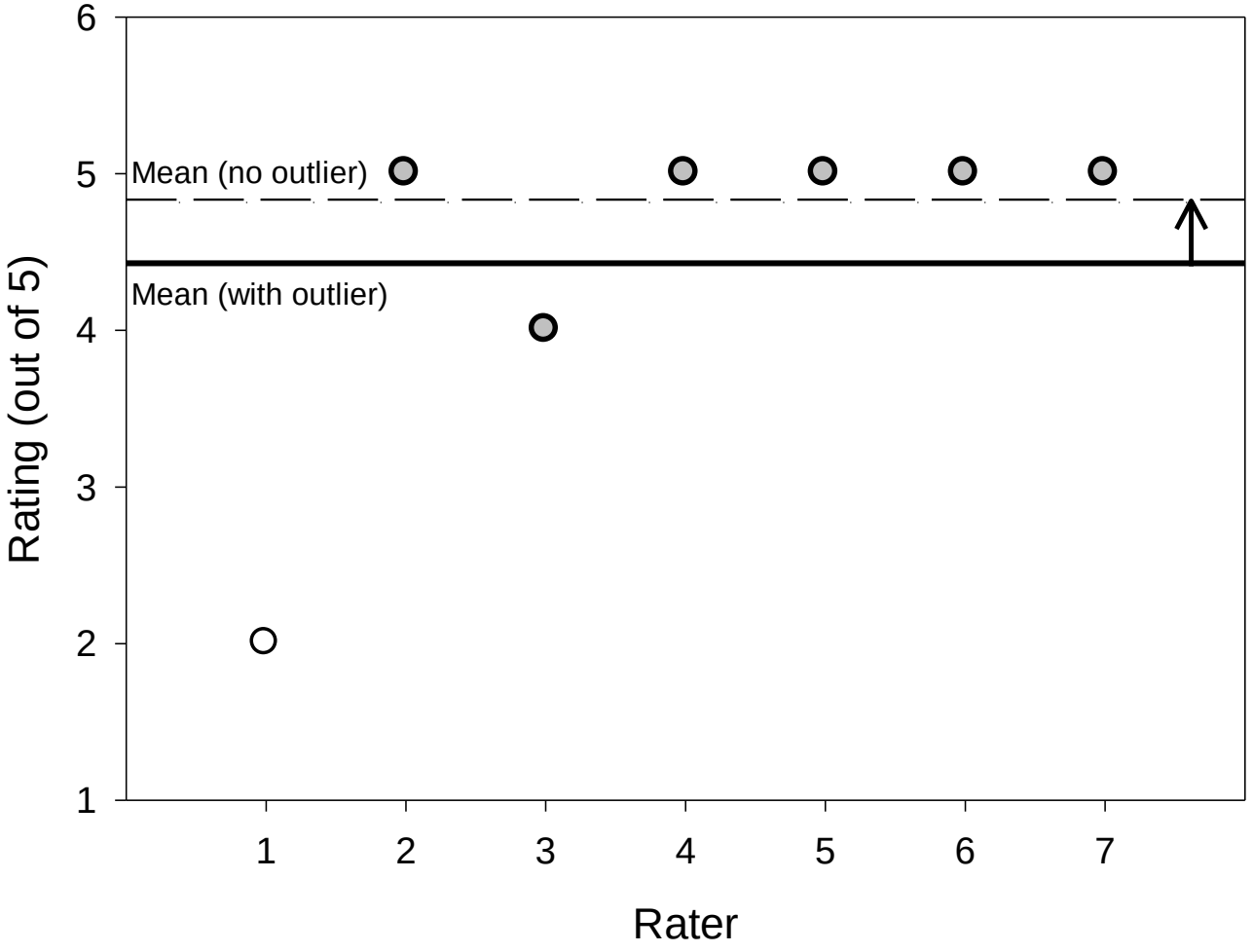

Histogram
Histogram
Histogram Percent
Count
Cumulative Count
Percentage (?)
Cumulative Percentage
Value
Mean


Element Properties: Set Parameters
Anchor First Bin
Automatic
Custom value for anchor: 0
Bin Sizes
Automatic
Custom
Number of intervals:
Interval width: 1
Denominator for Computing Percentage:
Grand Total
Continue
Cancel
Help

The Resulting Histogram



Outliers


Mean (no outlier)
Mean (with outlier)
Rating (out of 5)
Rater
1
2
3
4
5
6
7

Boxplots (Box-Whisker Diagrams)

- Boxplots are made up of a box and two whiskers.
- The box shows:
  - The median
  - The upper and lower quartile
  - The limits within which the middle 50% of scores lie.
- The whiskers show
  - The range of scores
  - The limits within which the top and bottom 25% of scores lie

Boxplots (Box-Whisker Diagrams)

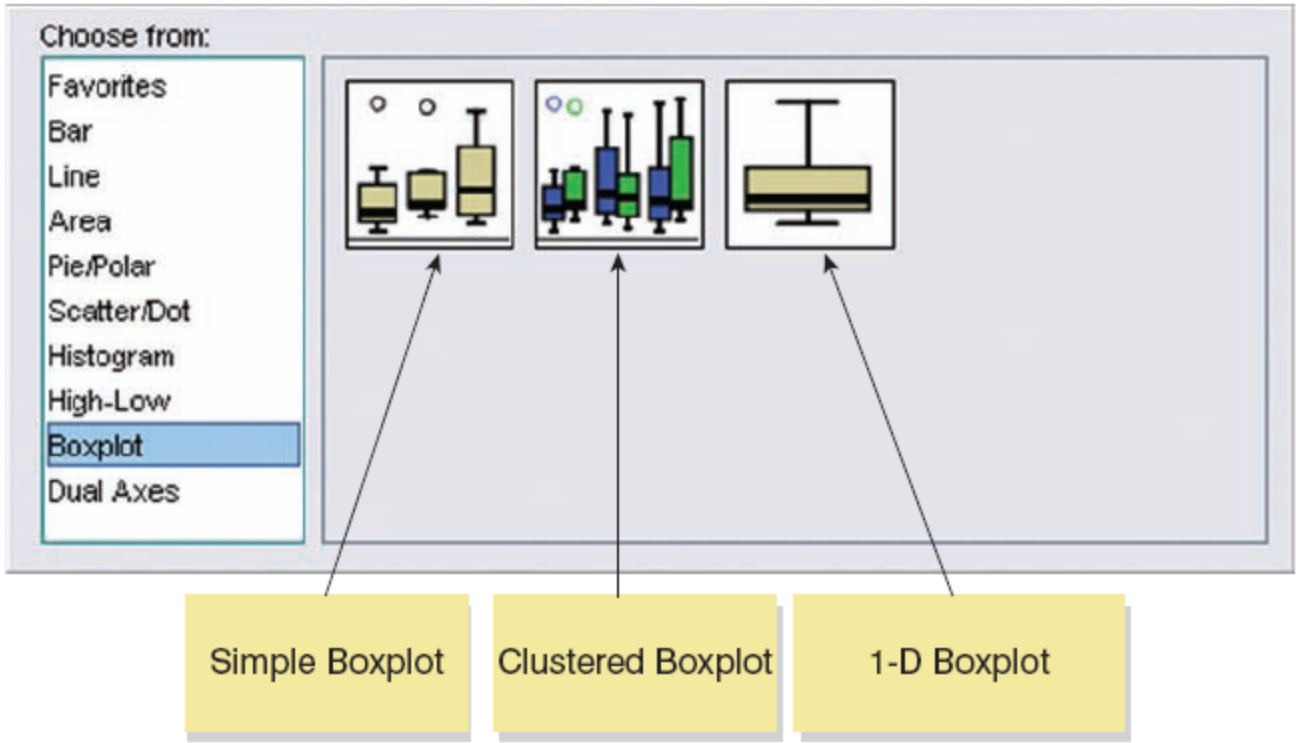
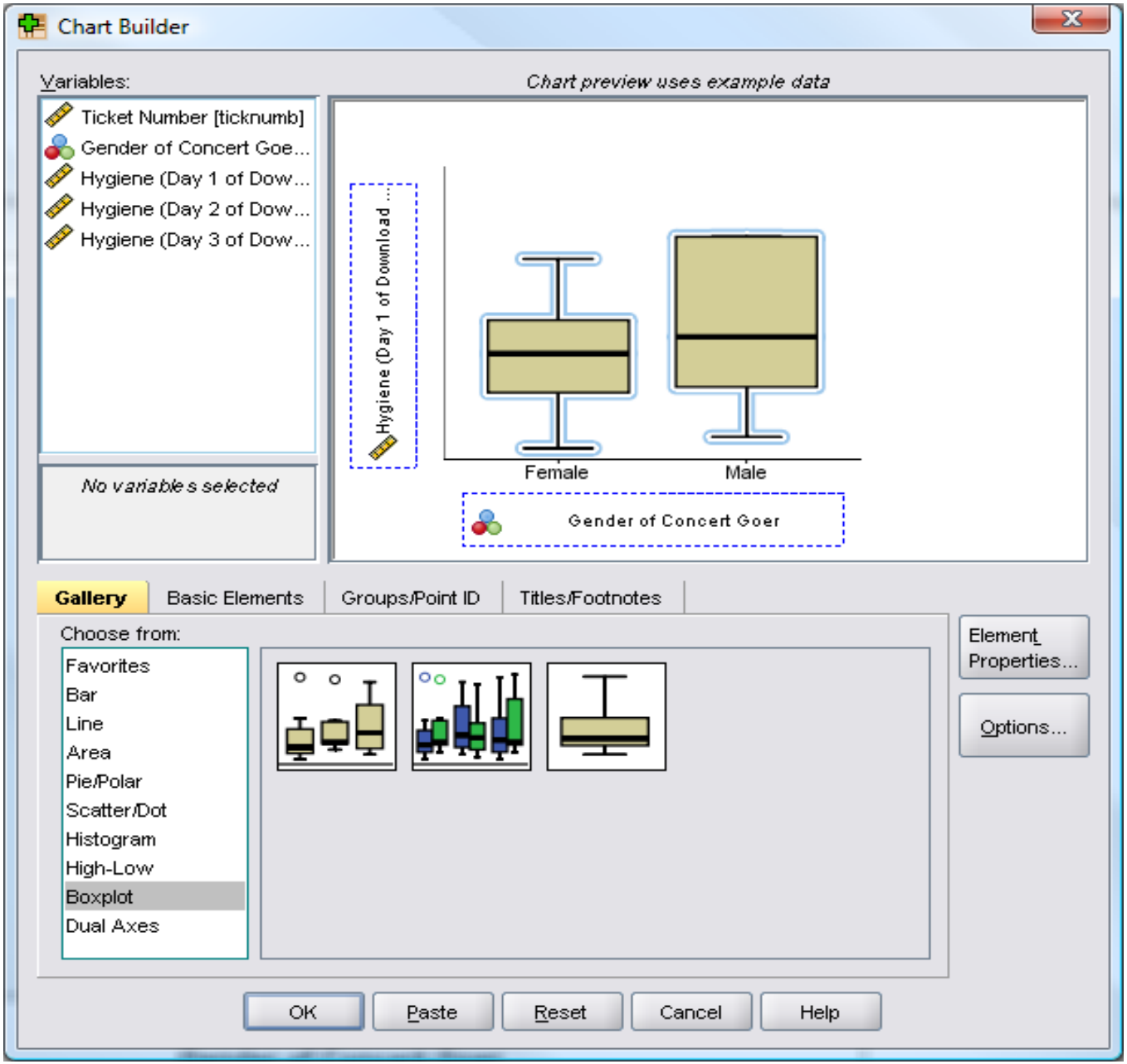


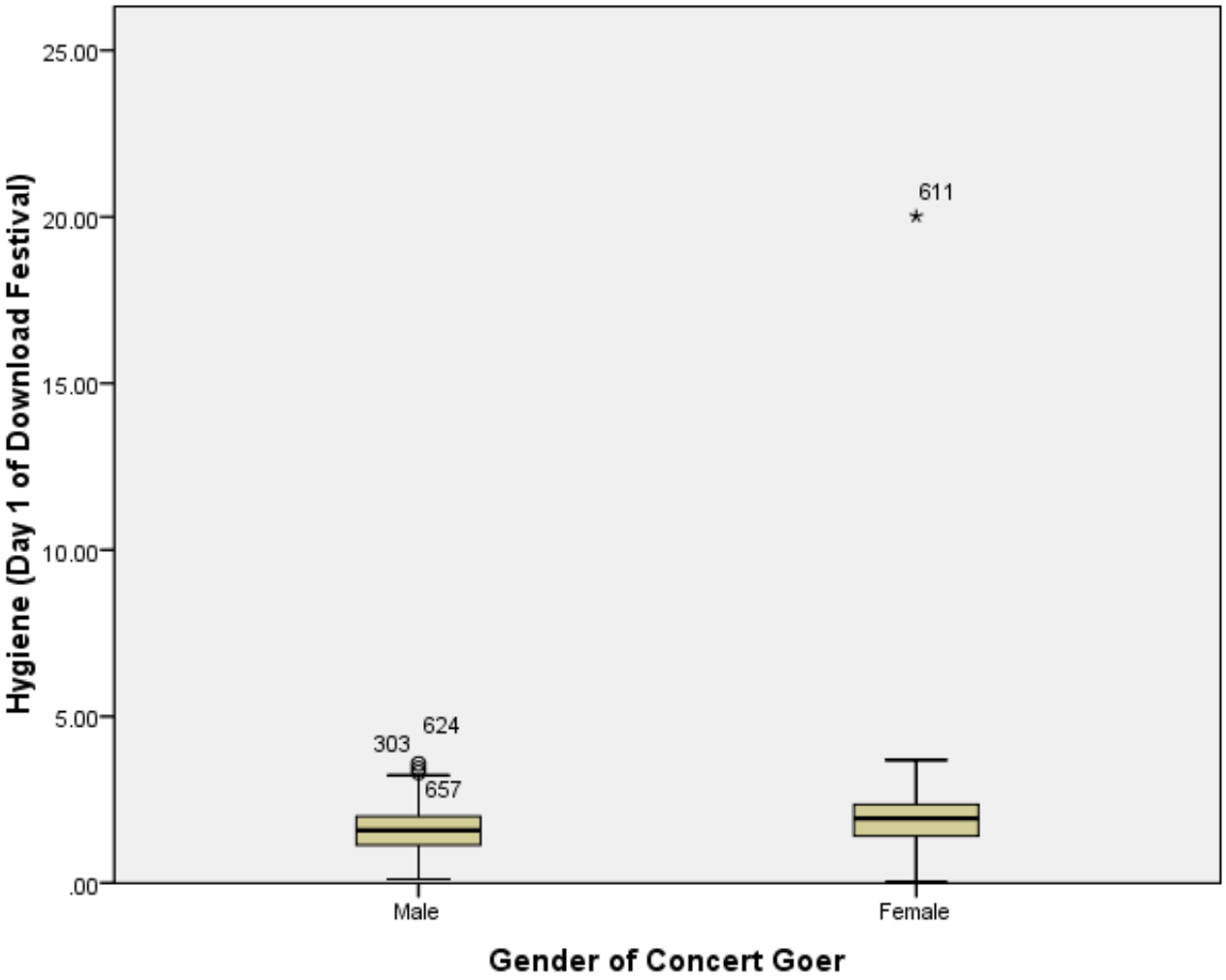
FIGURE 4.11
The boxplot gallery

DISCOVERING STATISTICS USING SPSS THIRD EDITION

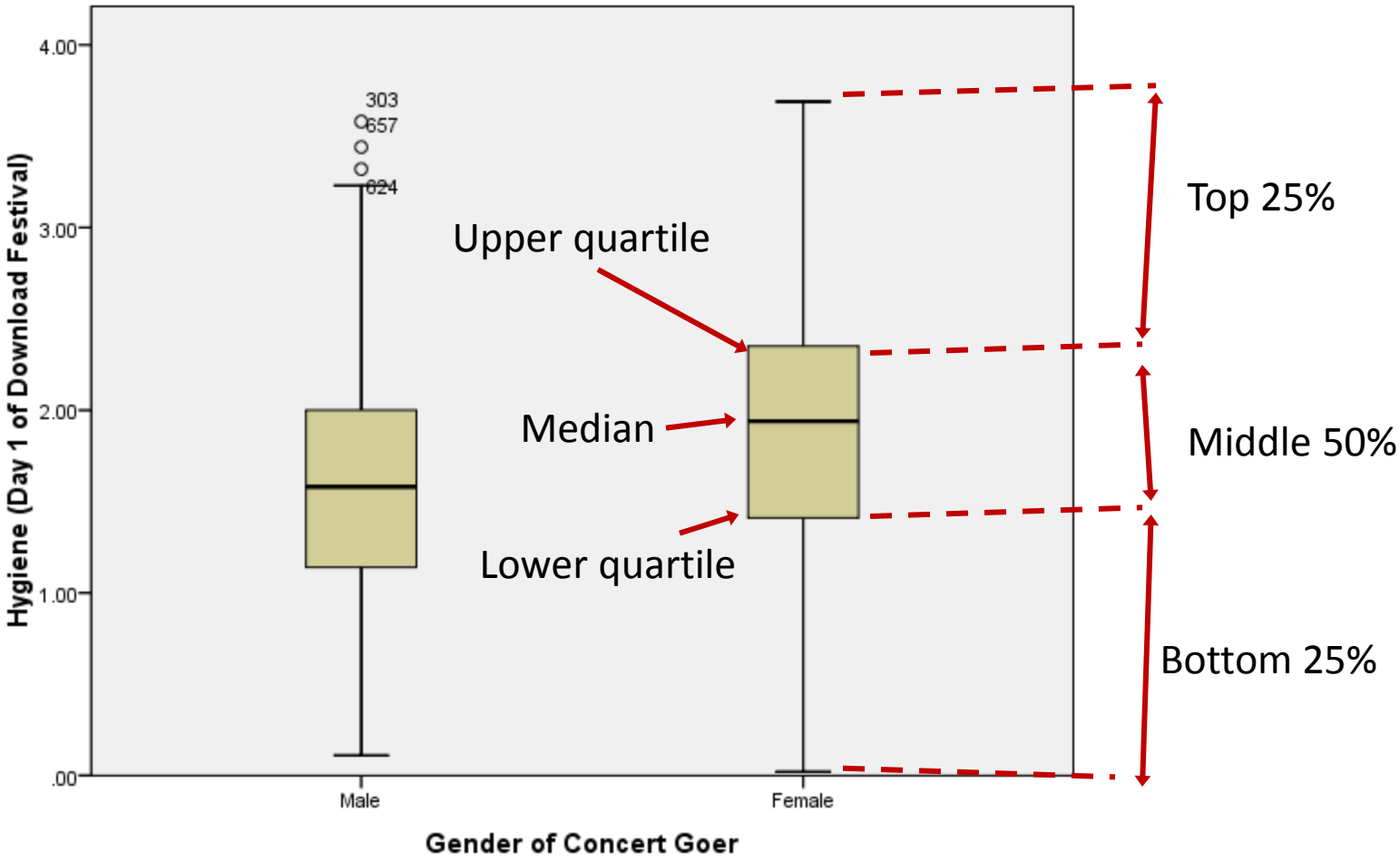


ANDY FIELD

The Boxplot


25.00
20.00
15.00
10.00
5.00
.00
Hygiene (Day 1 of Download Festival)
611
624
303
657
Male
Female
Gender of Concert Goer

What Does The Boxplot Show?

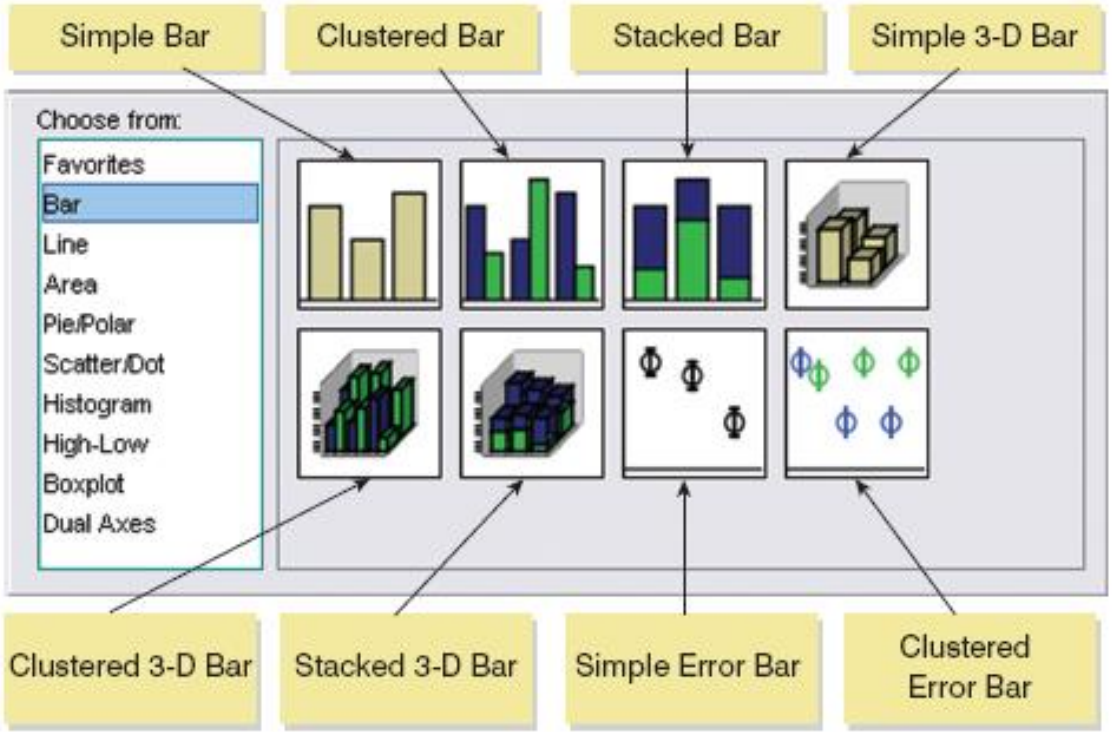


Error Bar Charts

- The bar (usually) shows the mean score
- The error bar sticks out from the bar like a whisker.
- The error bar displays the precision of the mean in one of three ways:
  - The confidence interval (usually 95%)
  - The standard deviation
  - The standard error of the mean

Error Bar Chart Builder

FIGURE 4.15
The bar chart gallery



Setting Bar Chart Properties

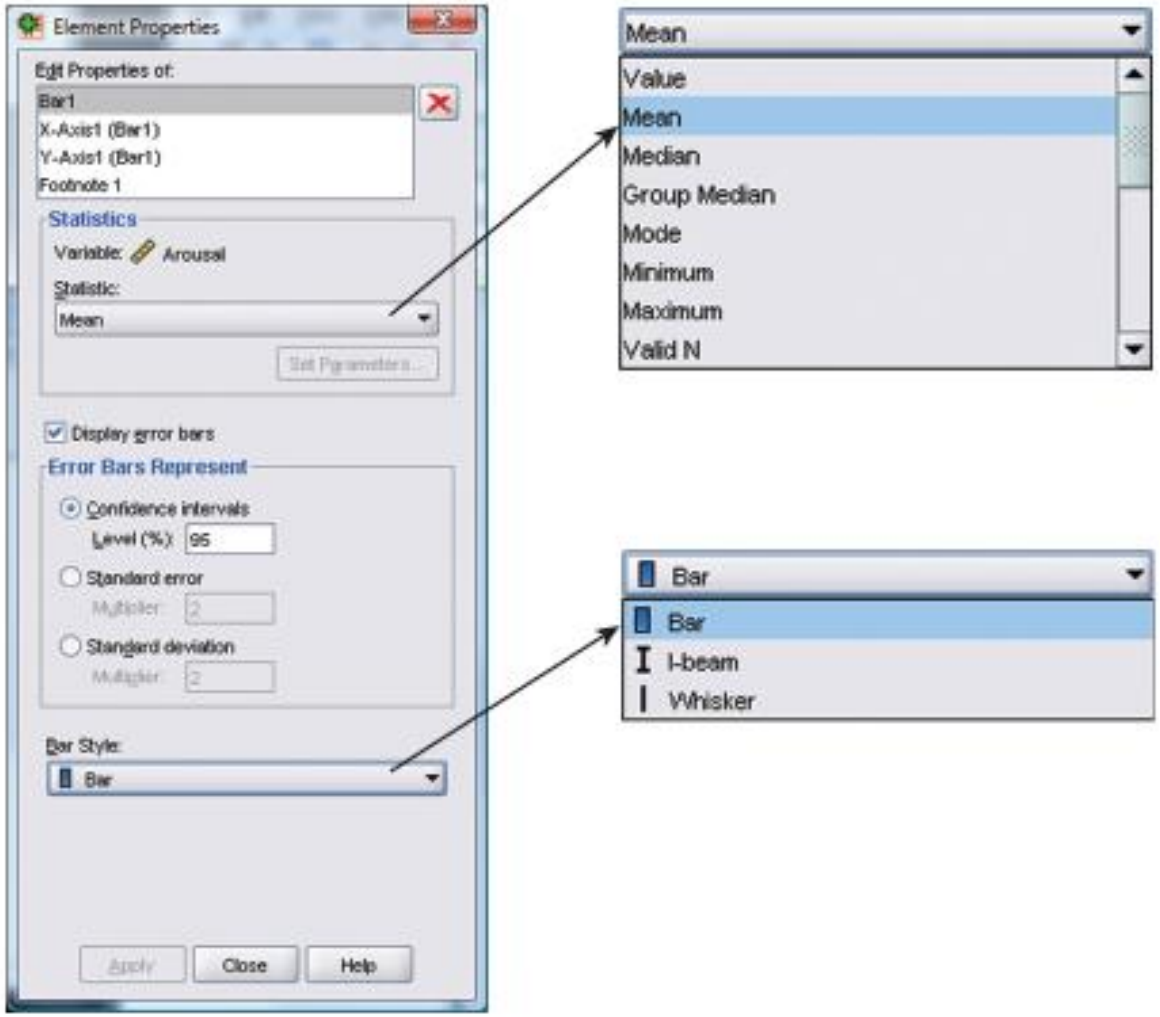
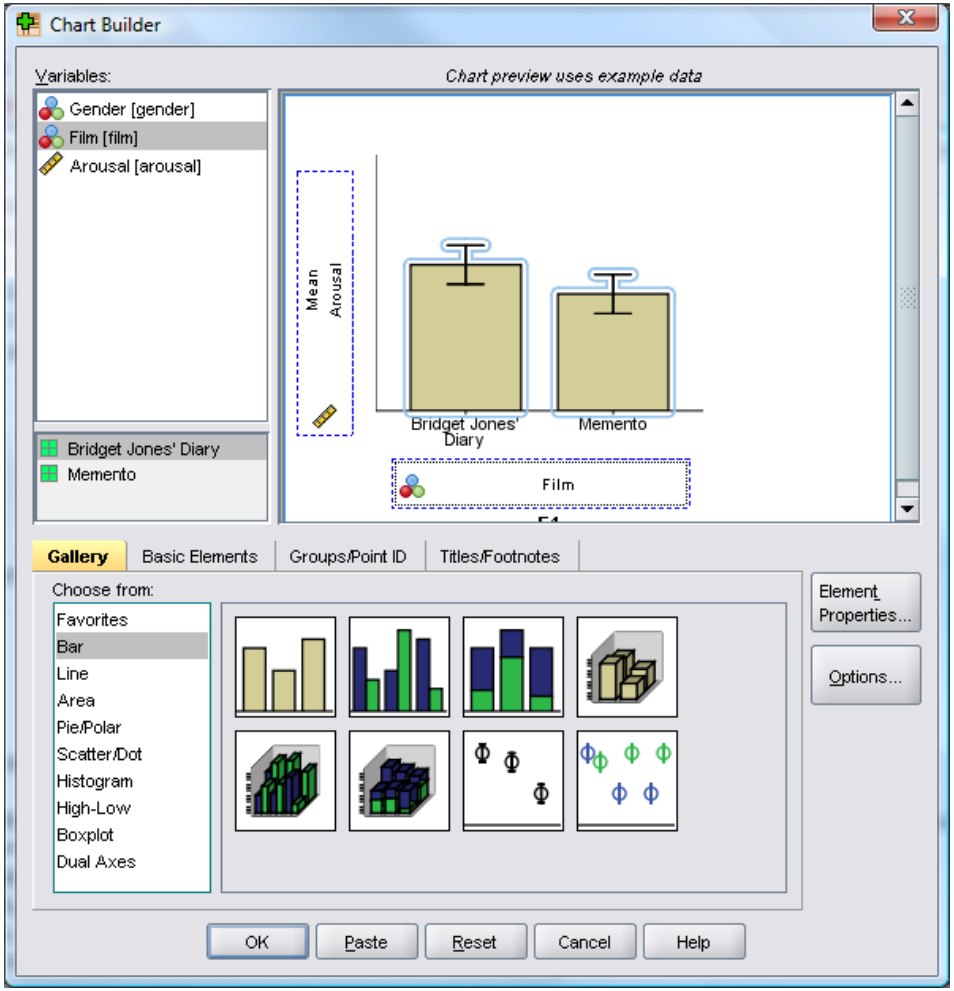


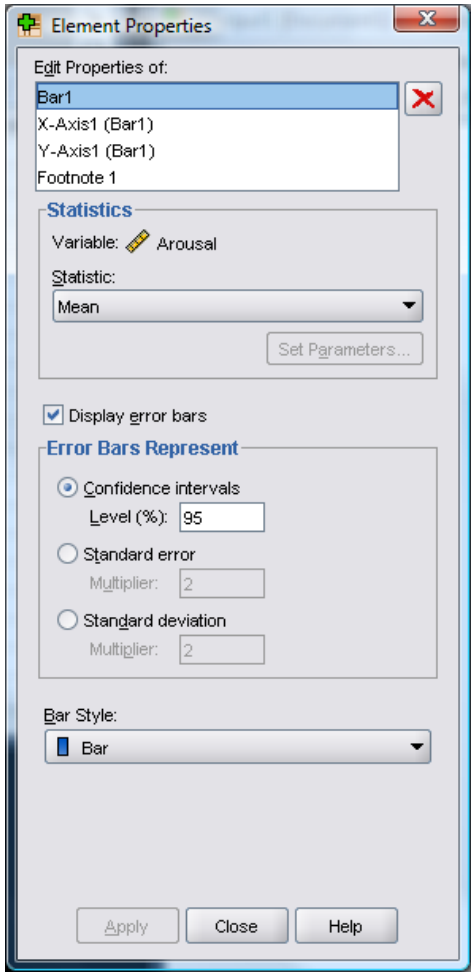
FIGURE 4.16 Element Properties of a bar chart

Bar Chart: One Independent Variable

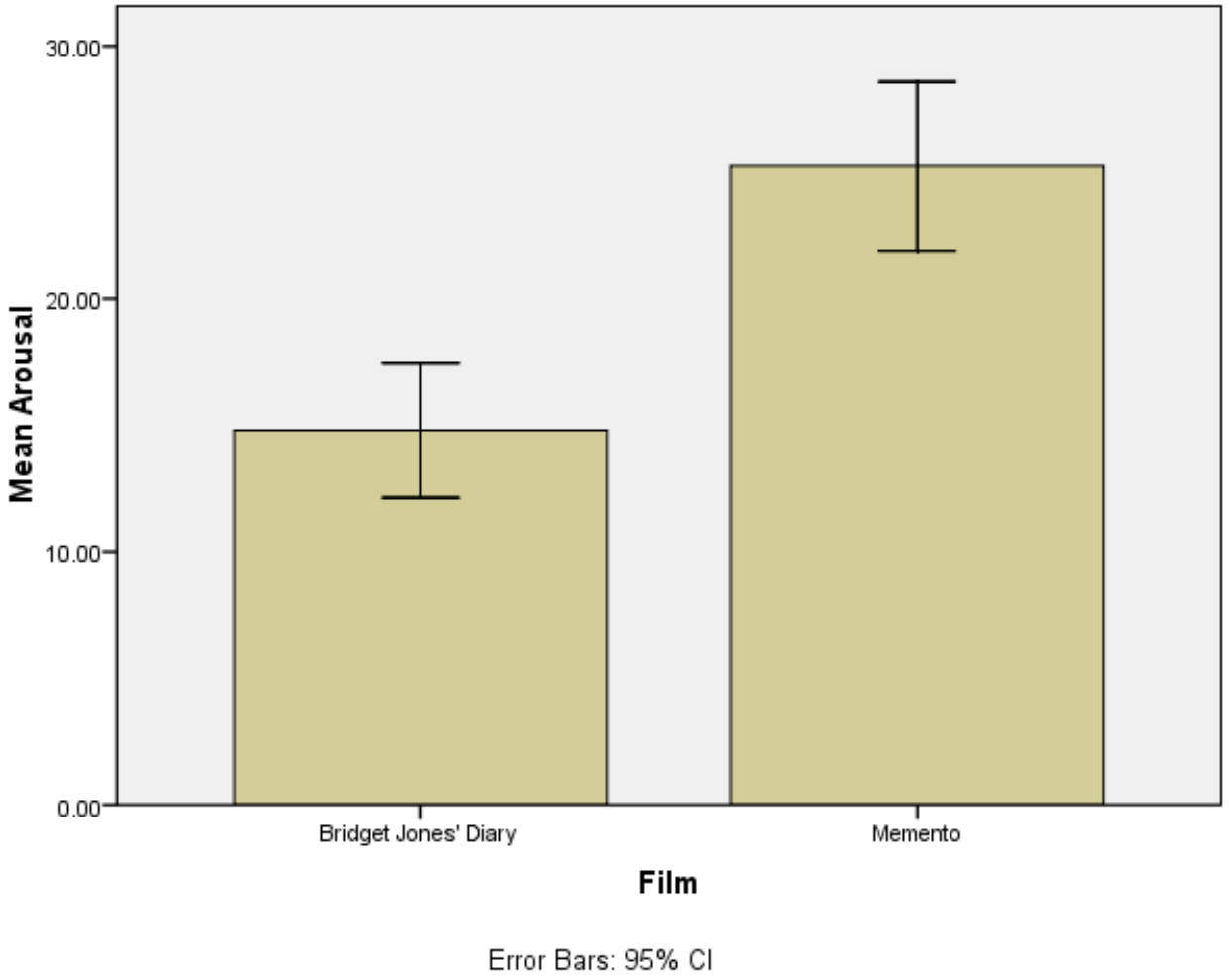
- Is there such a thing as a 'chick flick'?
- Participants:
  - 20 men
  - 20 women
- Half of each sample saw one of two films:
  - A 'chick flick' (Bridget Jones' Diary),
  - Control (Memento).
- Outcome measure
  - Physiological arousal as an indicator of how much they enjoyed the film.

Bar Chart: One Independent Variable

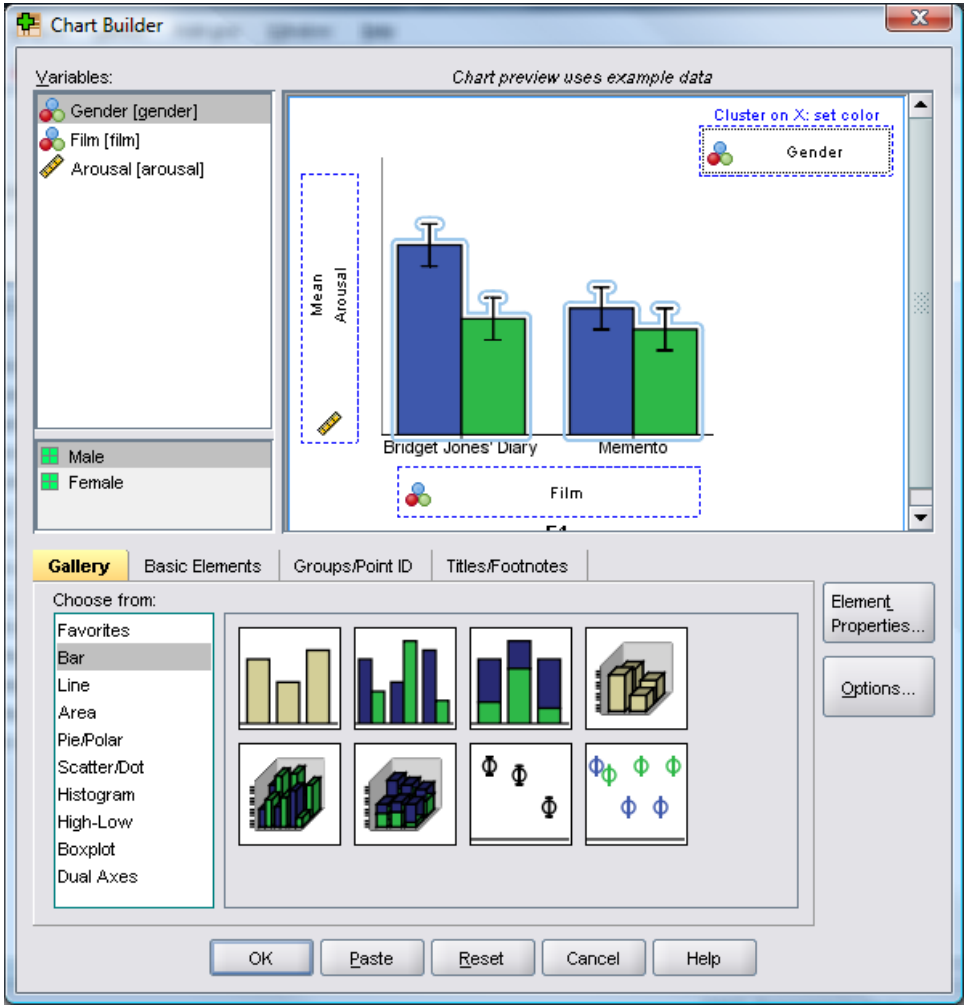


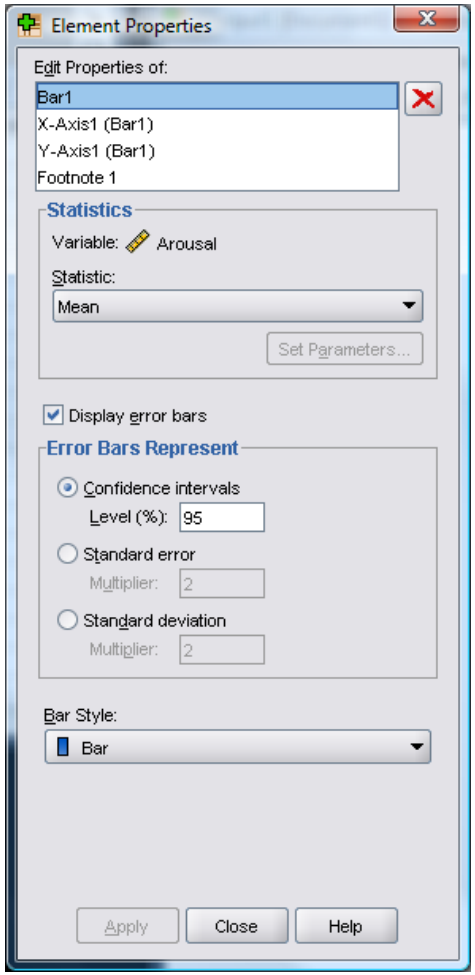


Bar Chart: One Independent Variable

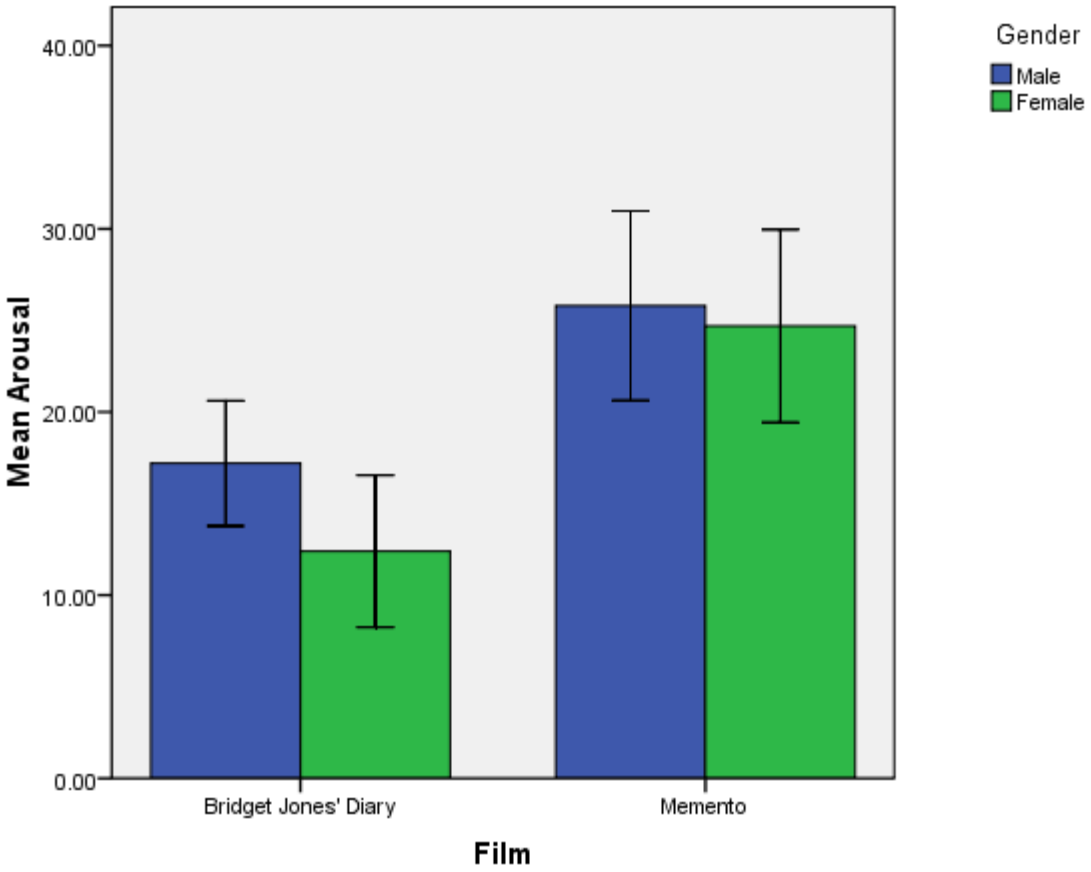


Bar Chart: Two Independent Variables





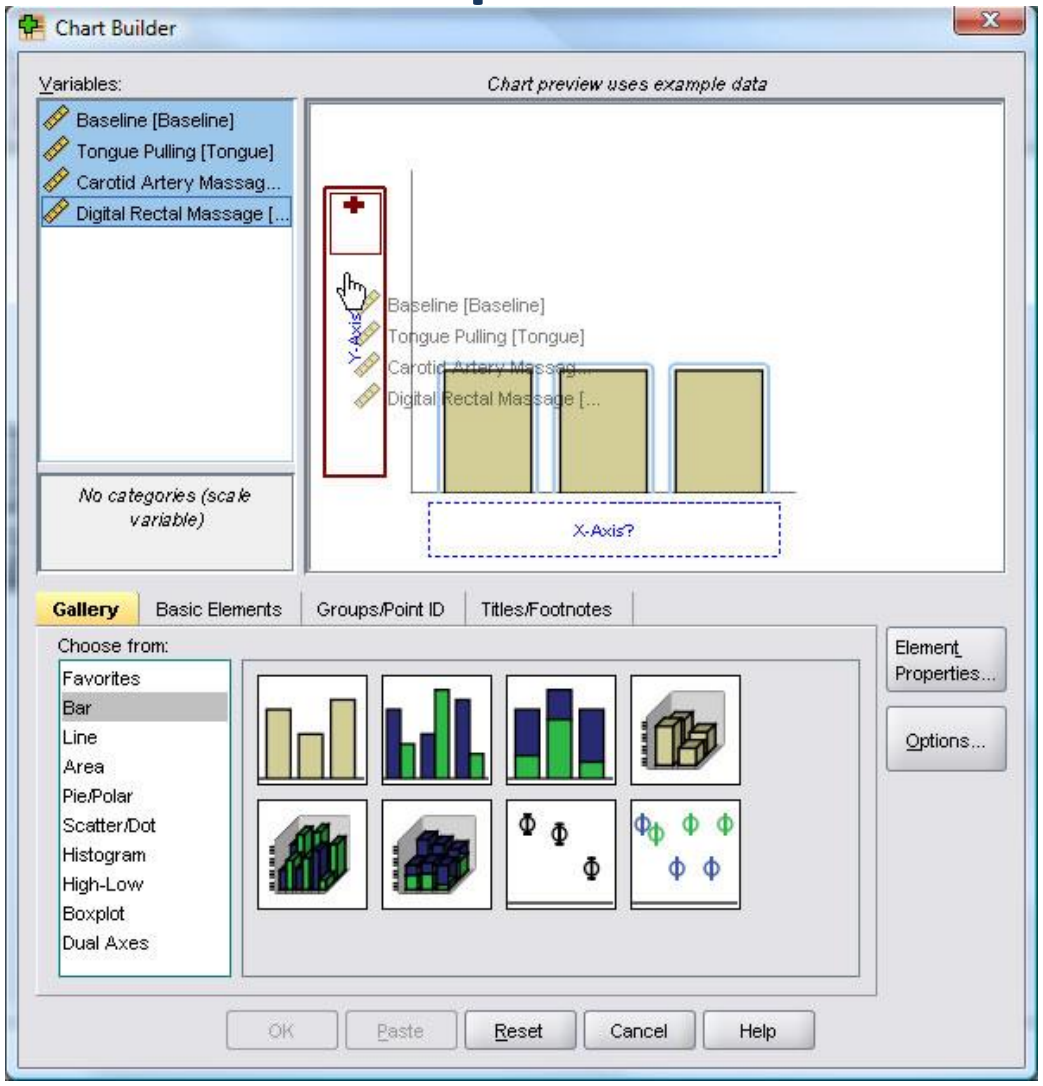
Bar Chart: Two Independent Variables

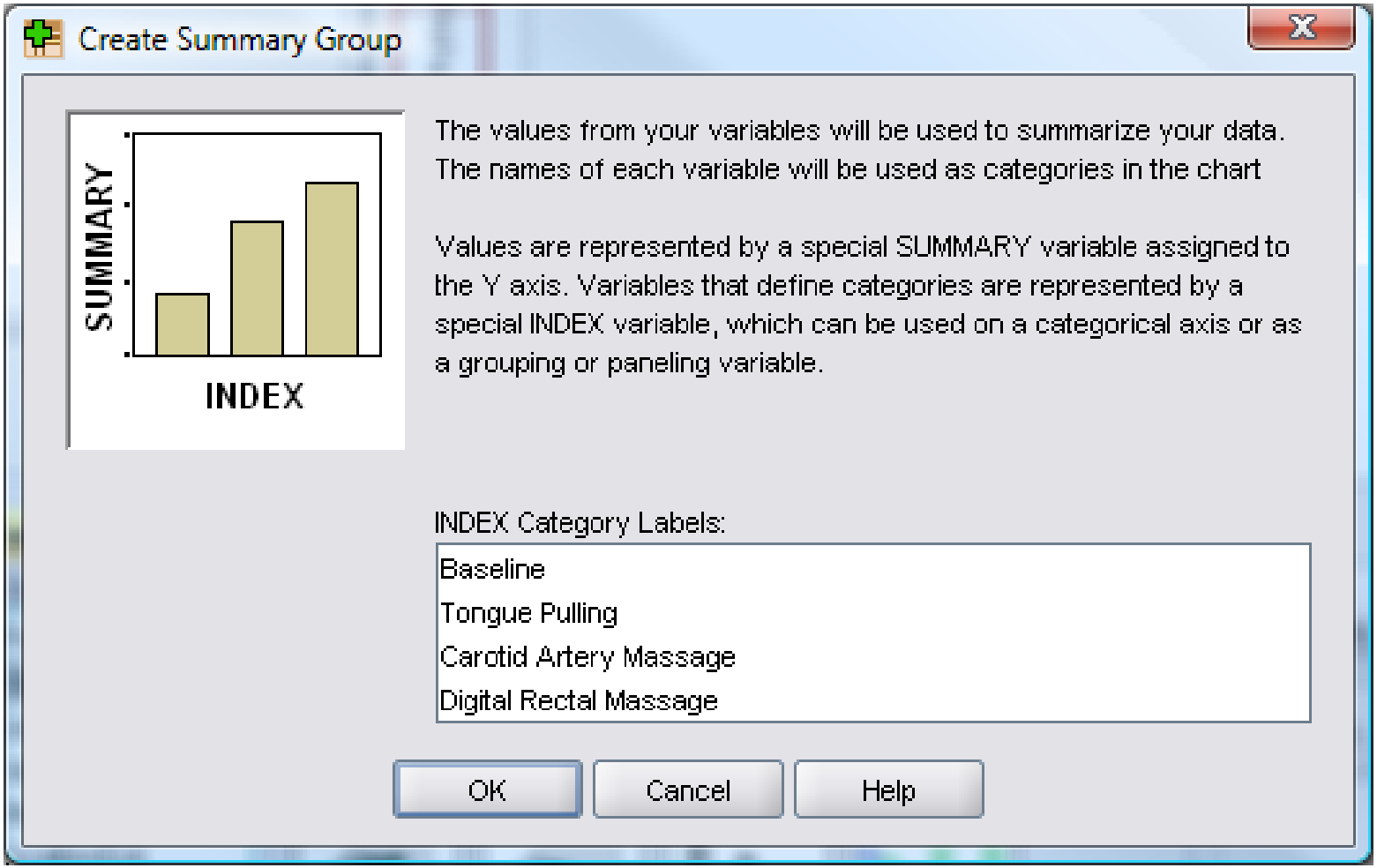


Bar Chart: Repeated Measures

- How to cure hiccups?
- Participants:
  - 15 hiccup sufferers
- Each tries 4 interventions (in random order):
  - Baseline
  - Tongue-pulling manoeuvres,
  - Massage of the carotid artery,
  - Digital rectal massage
- Outcome measure
  - The number of hiccups in the minute after each procedure

Bar Chart: Repeated Measures




Create Summary Group
SUMMARY
INDEX
The values from your variables will be used to summarize your data. The names of each variable will be used as categories in the chart
Values are represented by a special SUMMARY variable assigned to the Y axis. Variables that define categories are represented by a special INDEX variable, which can be used on a categorical axis or as a grouping or paneling variable.
INDEX Category Labels:
Baseline
Tongue Pulling
Carotid Artery Massage
Digital Rectal Massage
OK
Cancel
Help

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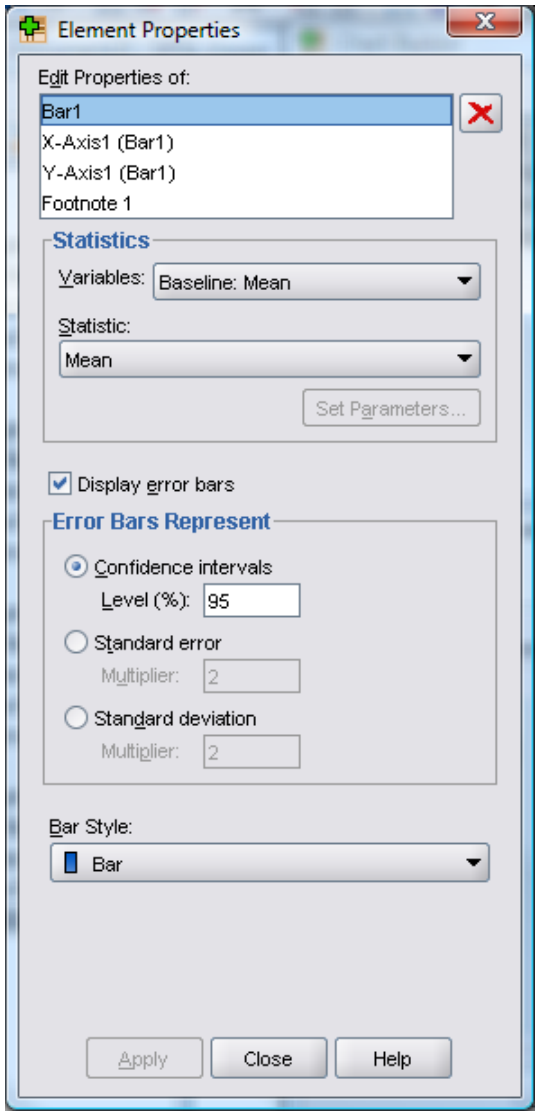
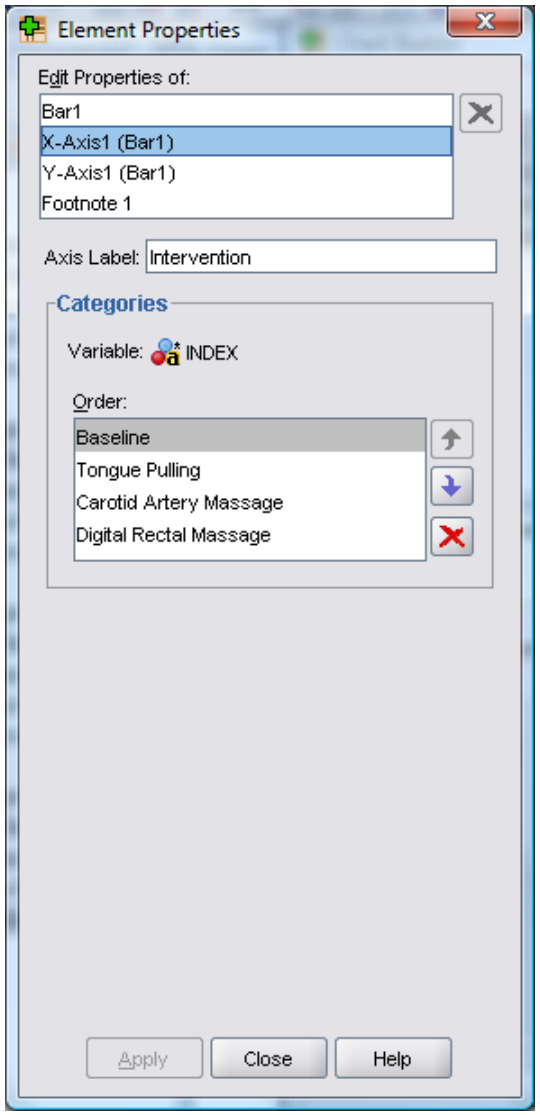
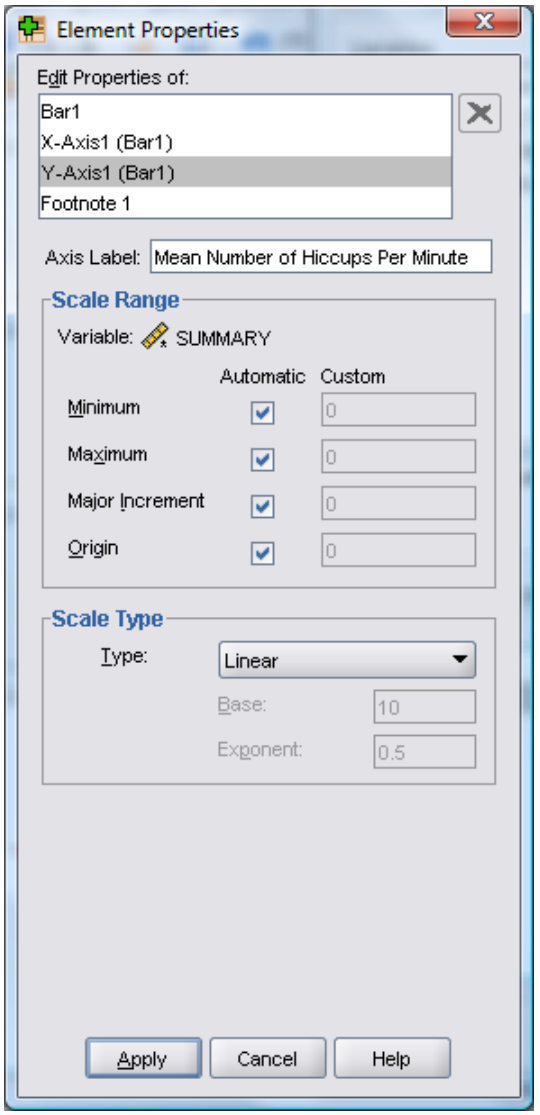
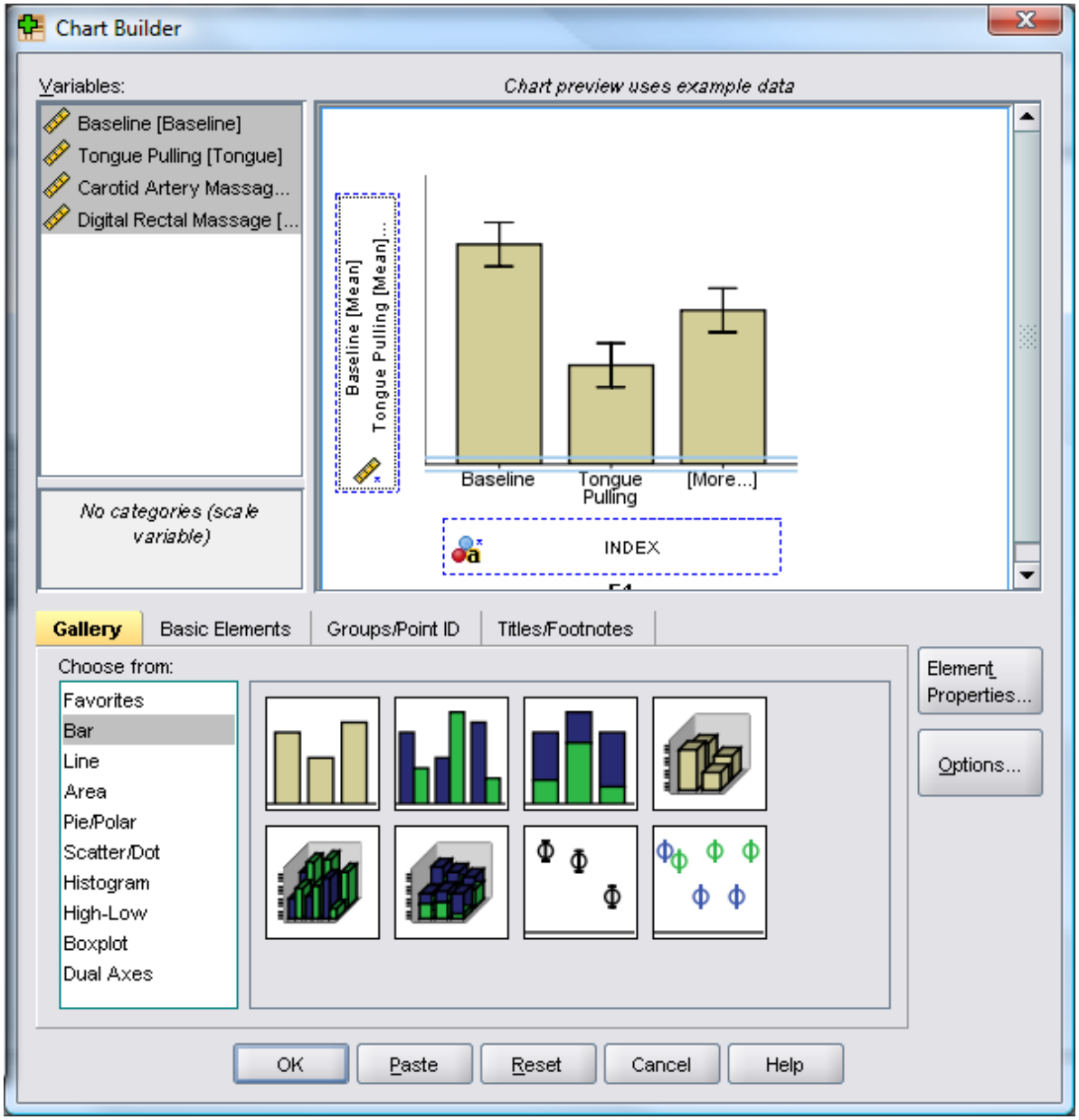






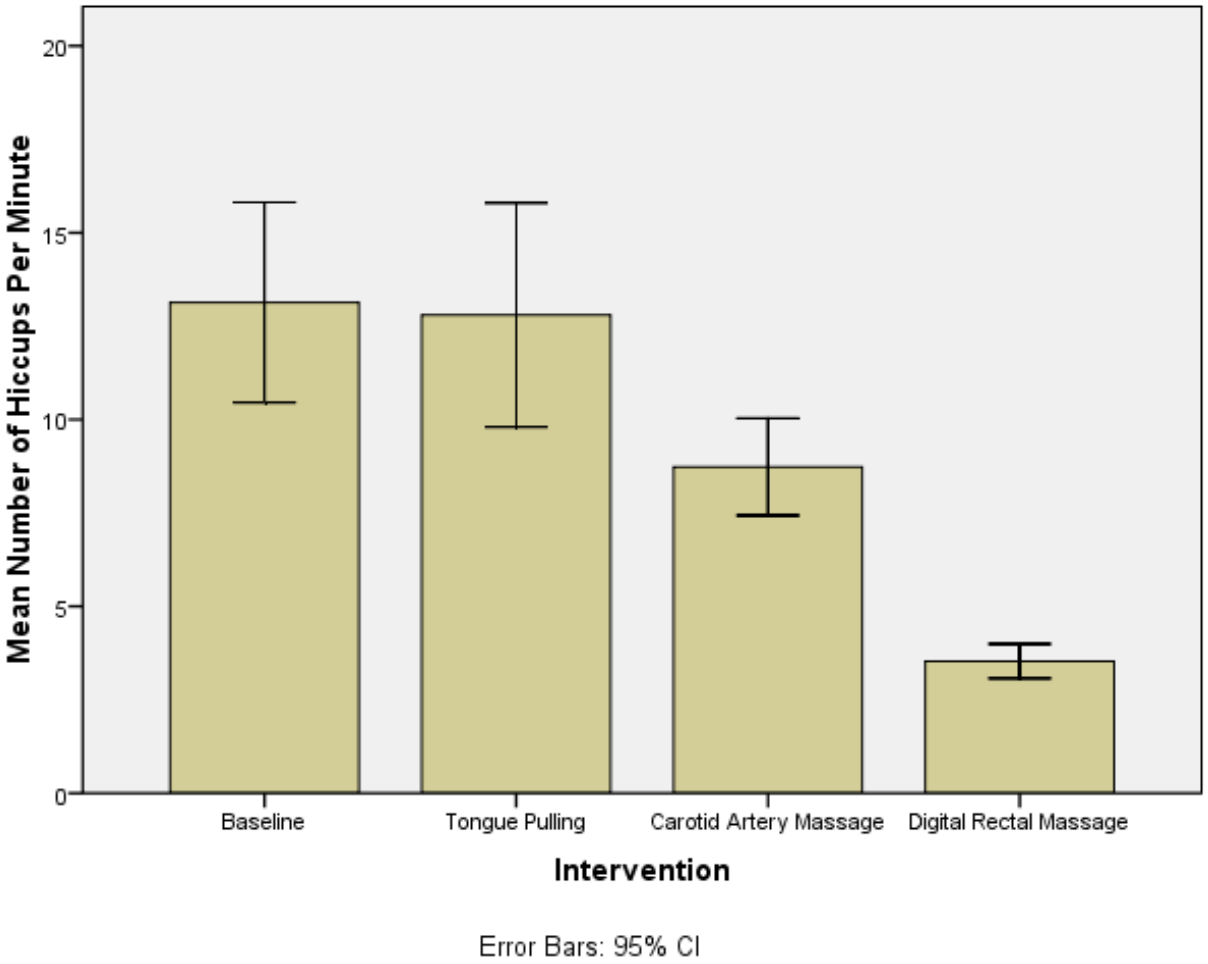
ANDY FIELD

DISCOVERING STATISTICS USING SPSS THIRD EDITION



ANDY FIELD

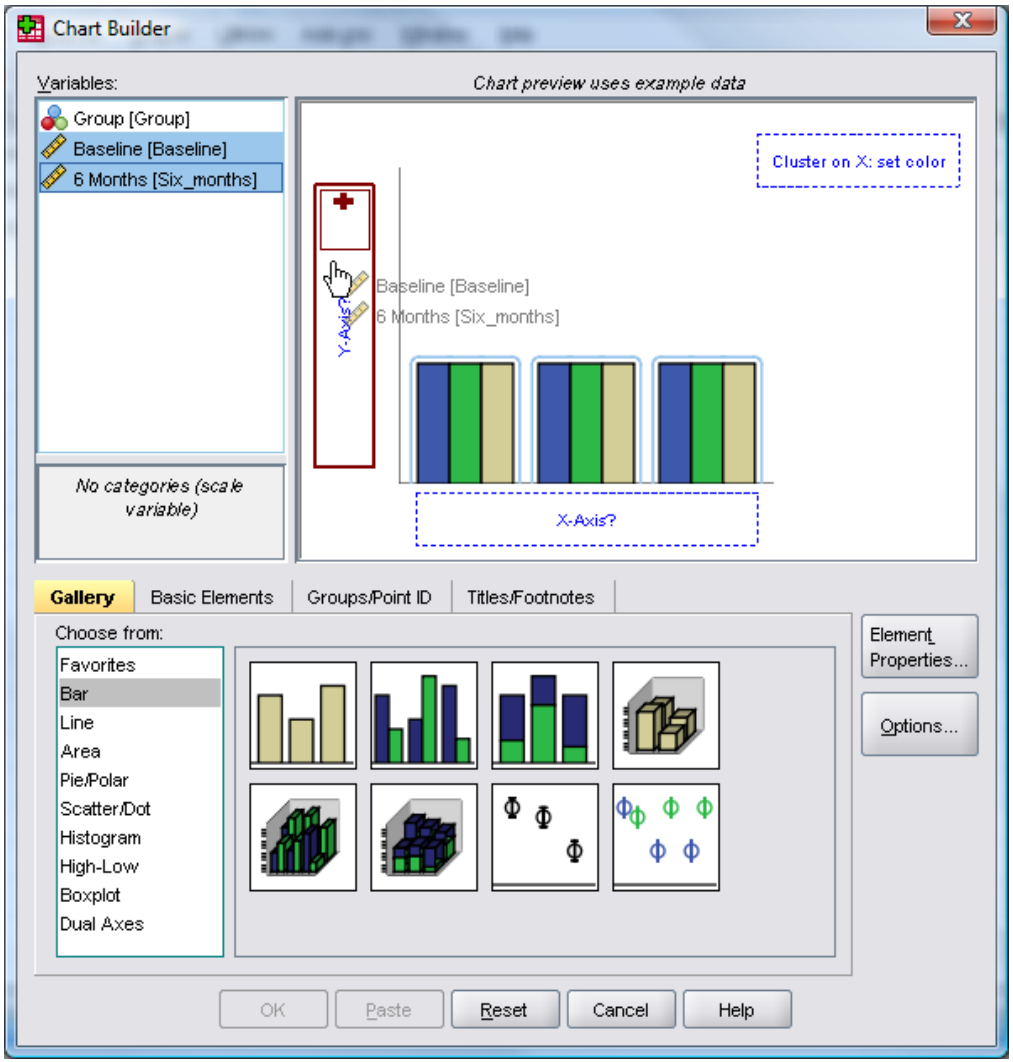
Error Bar Chart for Repeated Measures



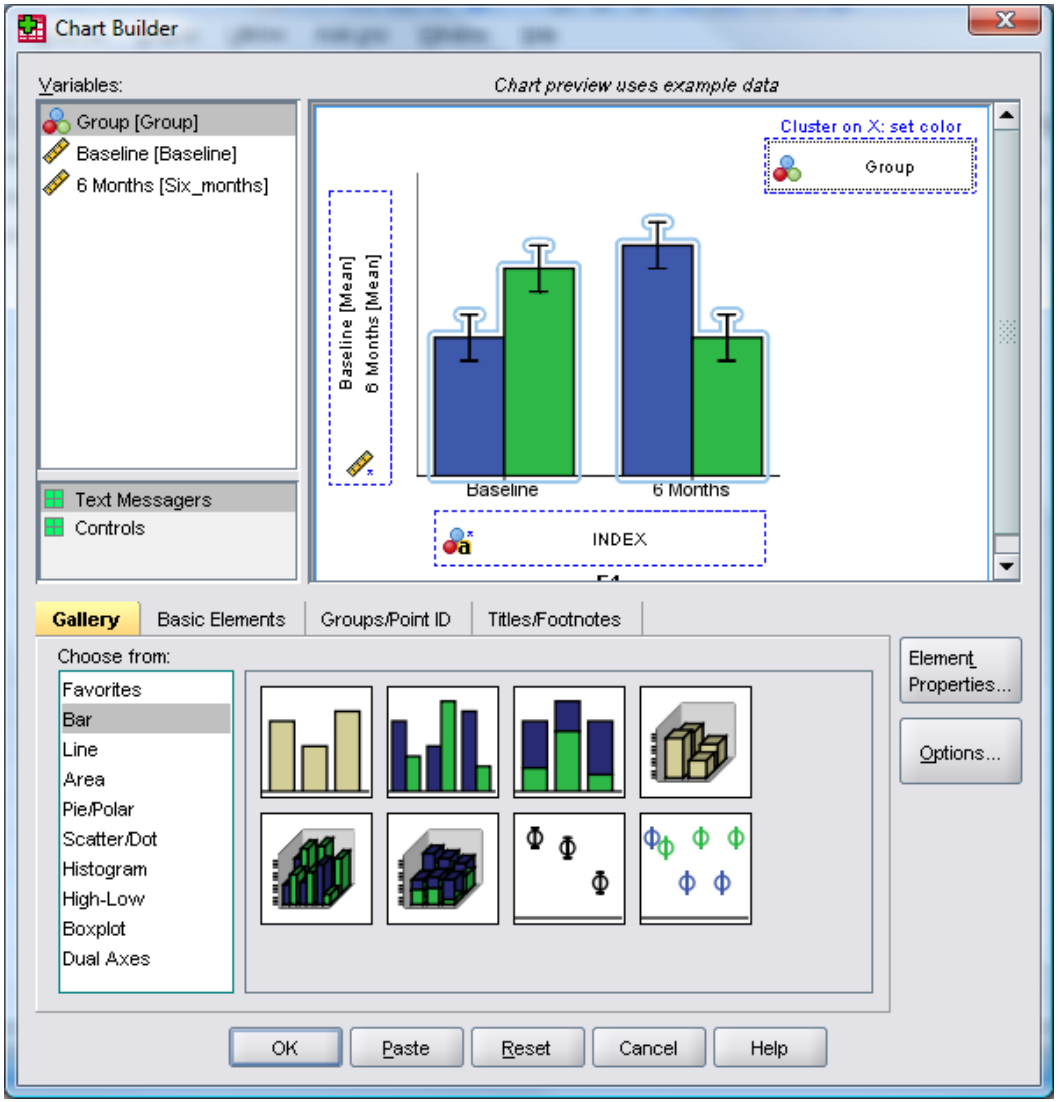
Bar Chart: Mixed Designs

- Is text-messaging bad for your grammar?
- Participants:
  - 50 children
- Children split into two groups:
  - Text-messaging allowed
  - Text-messaging forbidden
- Each child measures at two points in time:
  - Baseline
  - 6 Months later
- Outcome measure
  - Percentage score on a grammar test

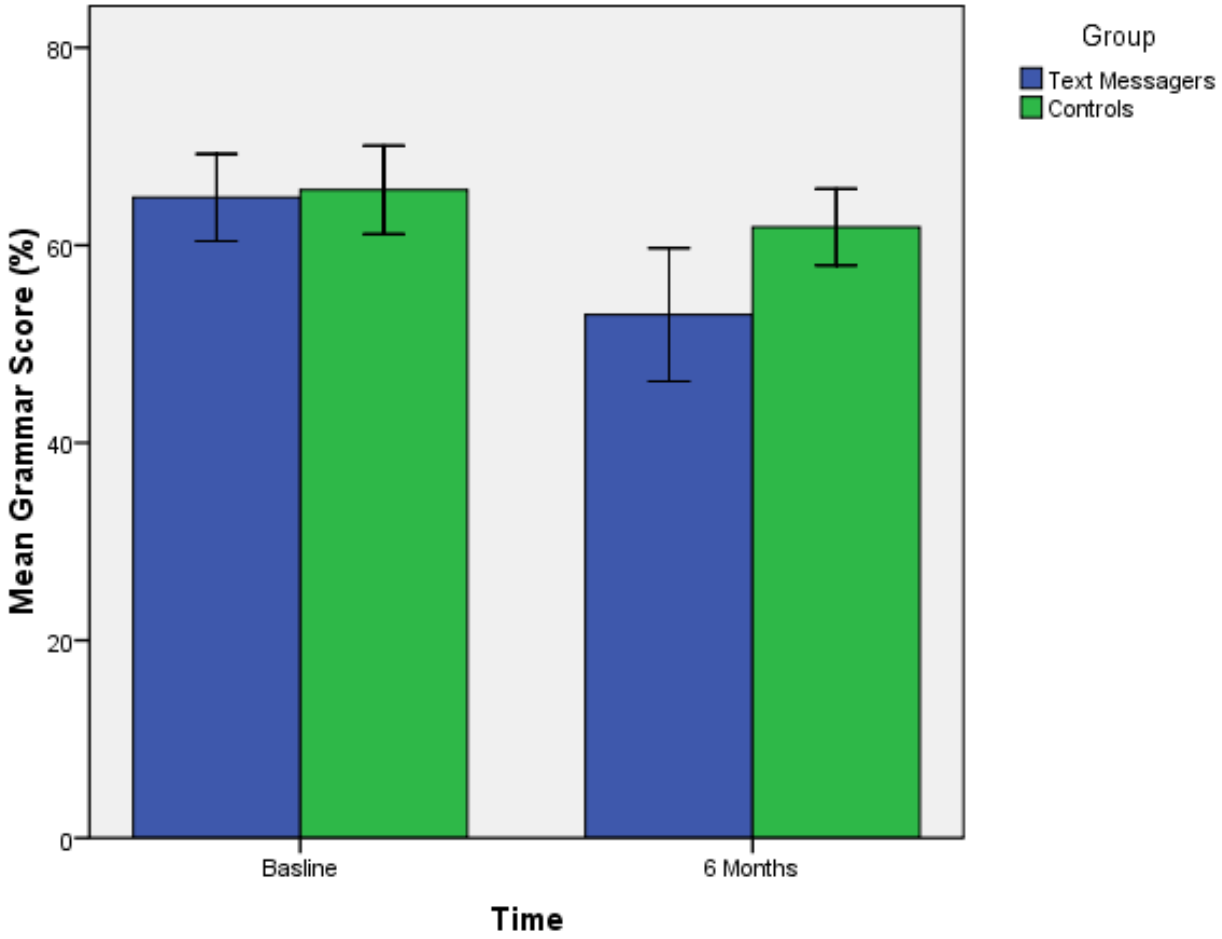
Bar Chart: Mixed Designs



Bar Chart: Mixed Designs



Bar Chart: Mixed Designs

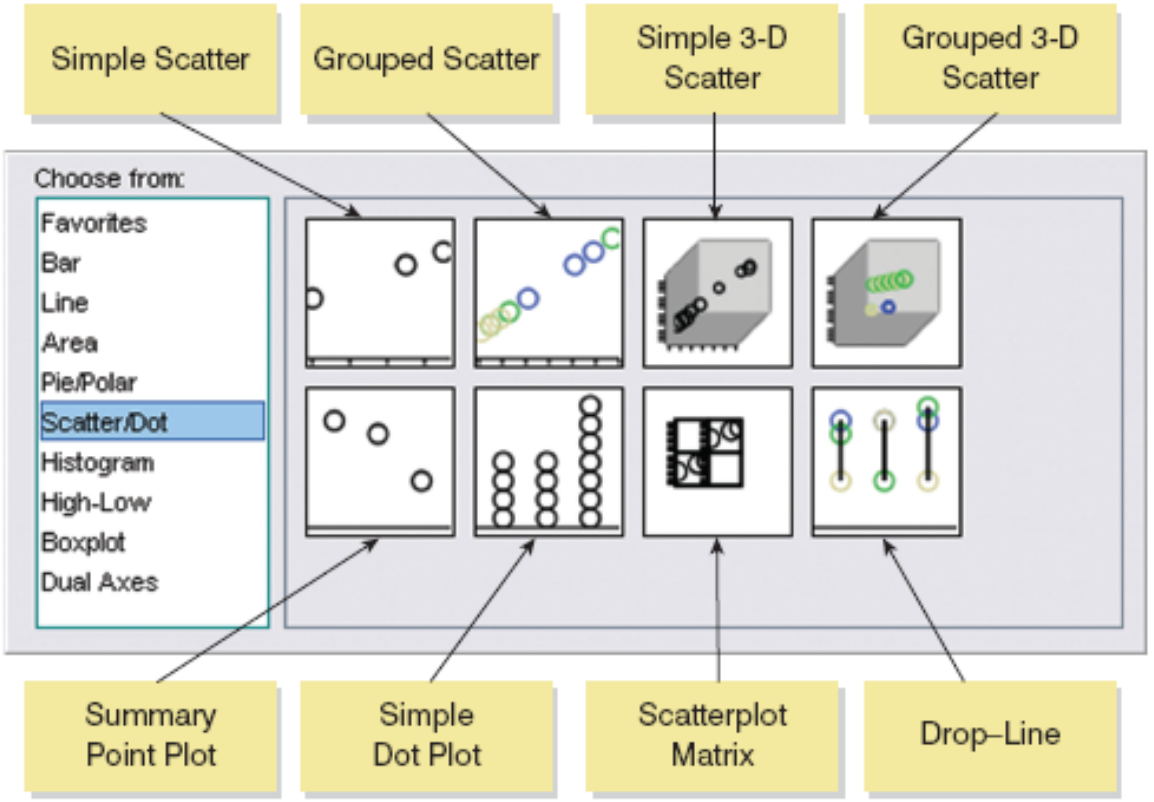


Scatterplots: Example

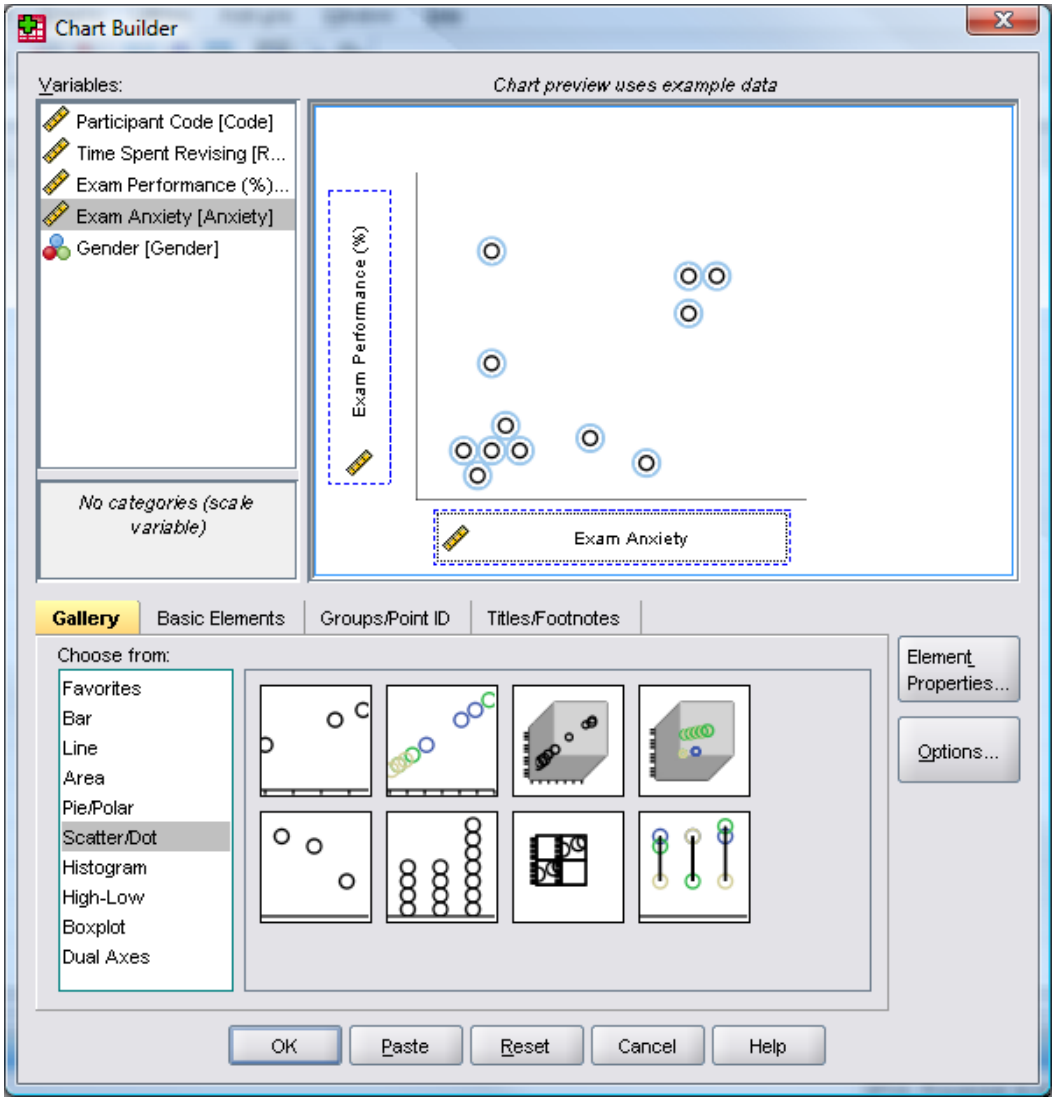
- Anxiety and Exam Performance
- Participants:
  - 103 students
- Measures
  - Time spent revising (hours)
  - Exam performance (%)
  - Exam Anxiety (the EAQ, score out of 100)
  - Gender

Scatterplots

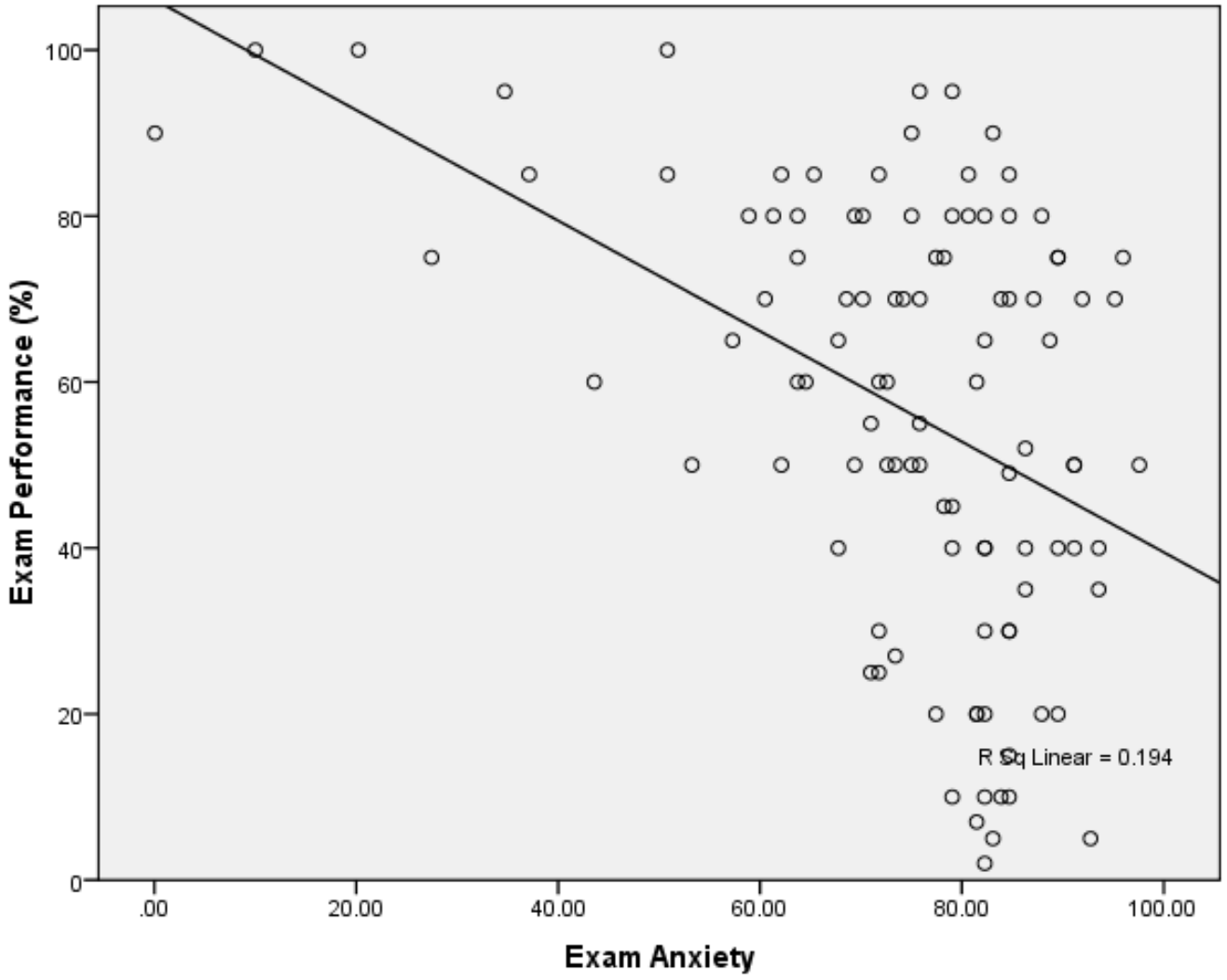
FIGURE 4.30
The scatter/dot gallery



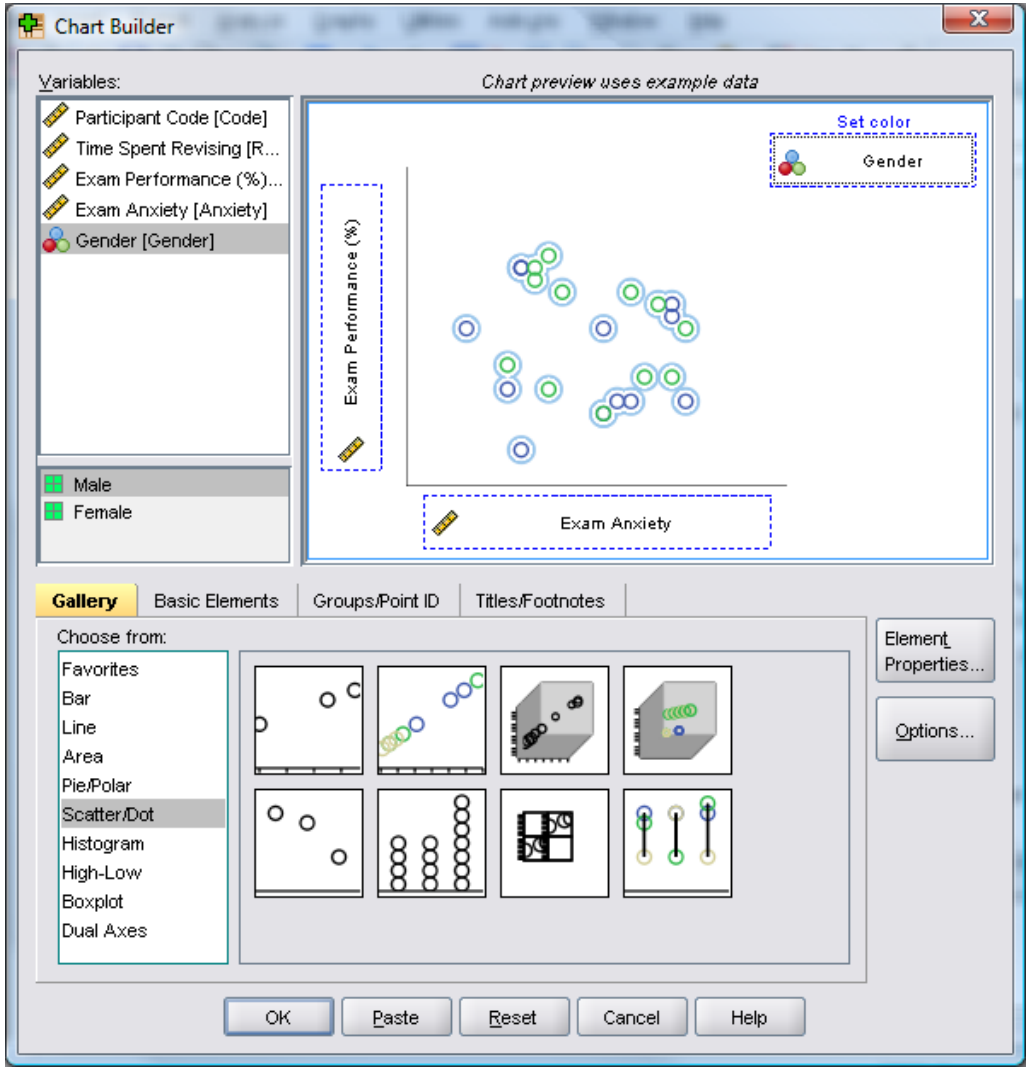
Simple Scatterplot



Simple Scatterplot



Grouped Scatterplot



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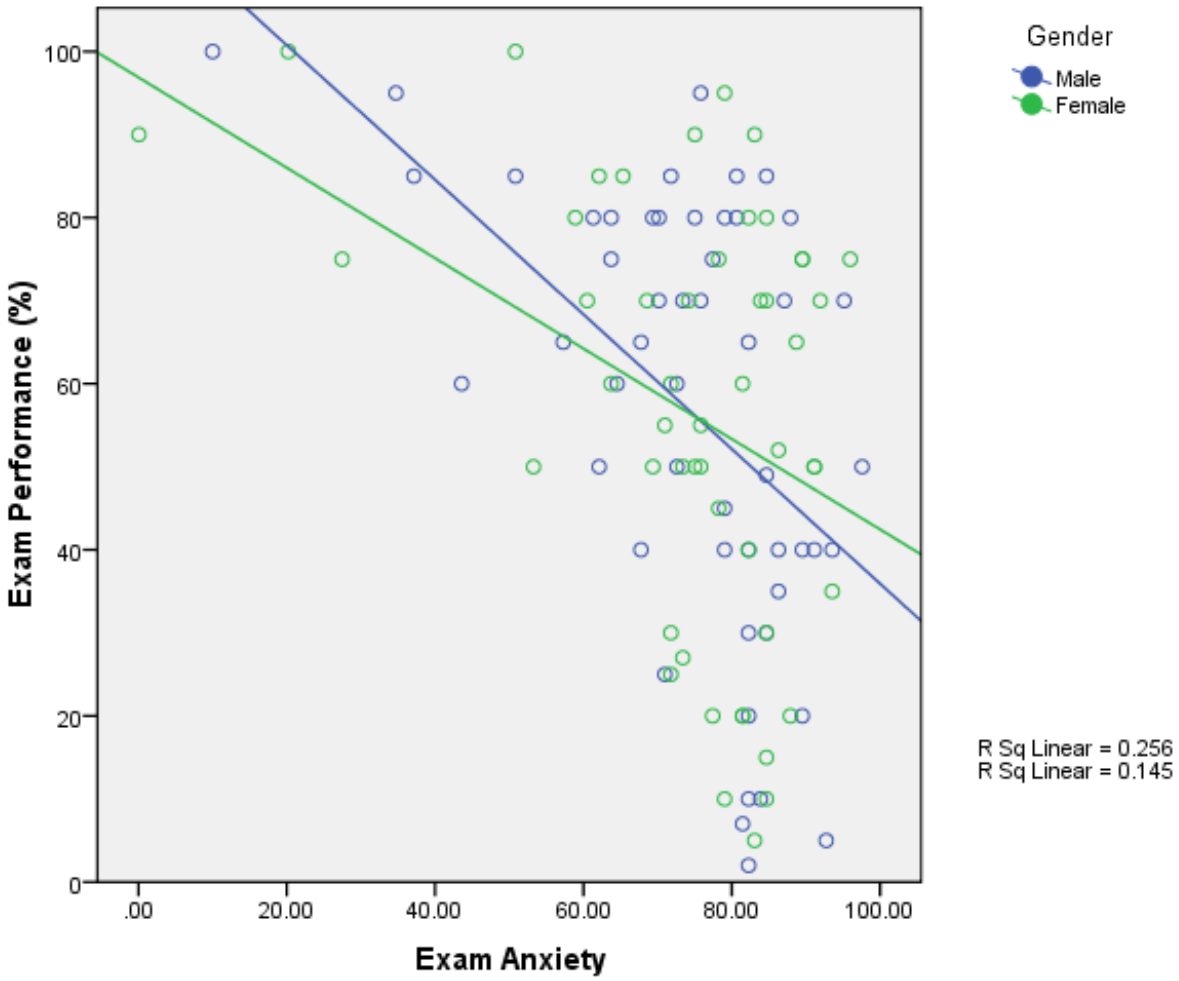
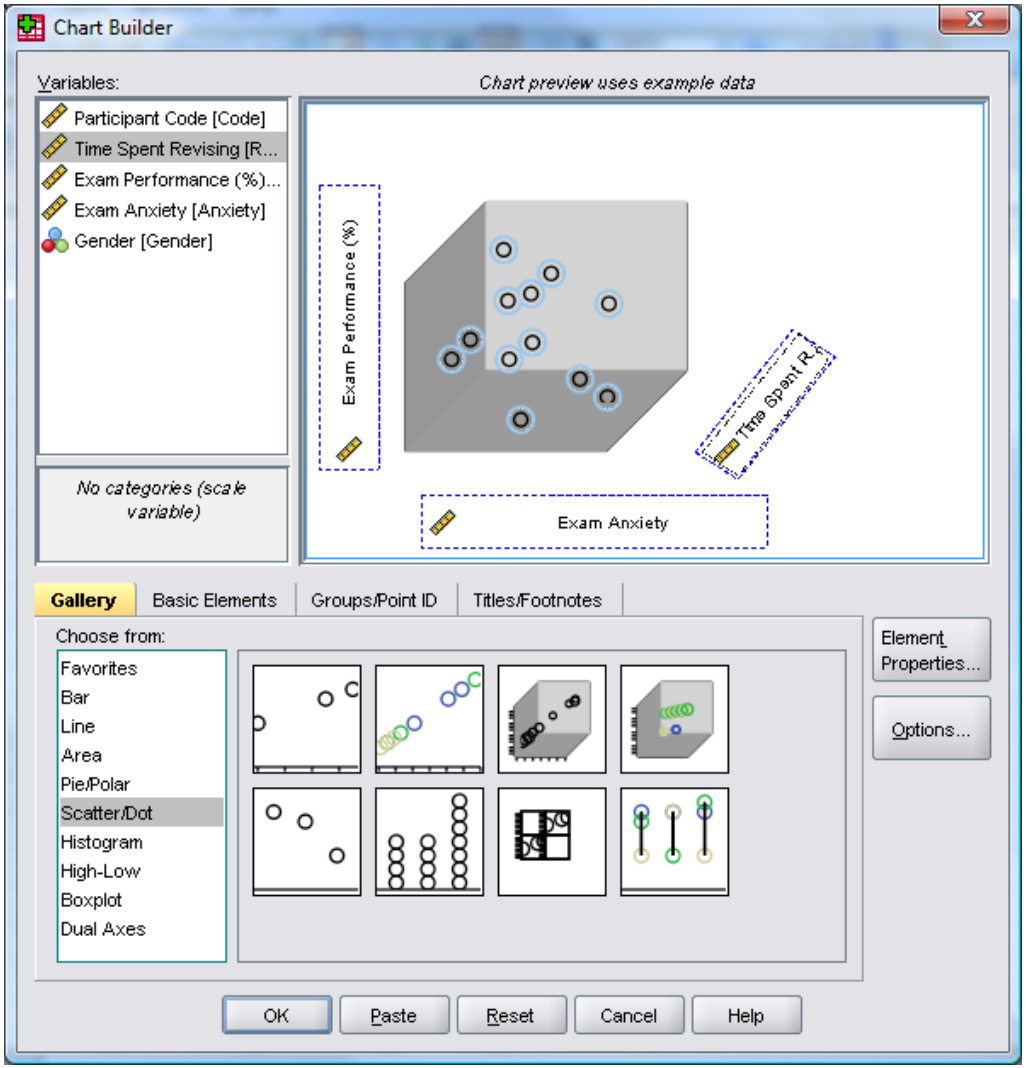
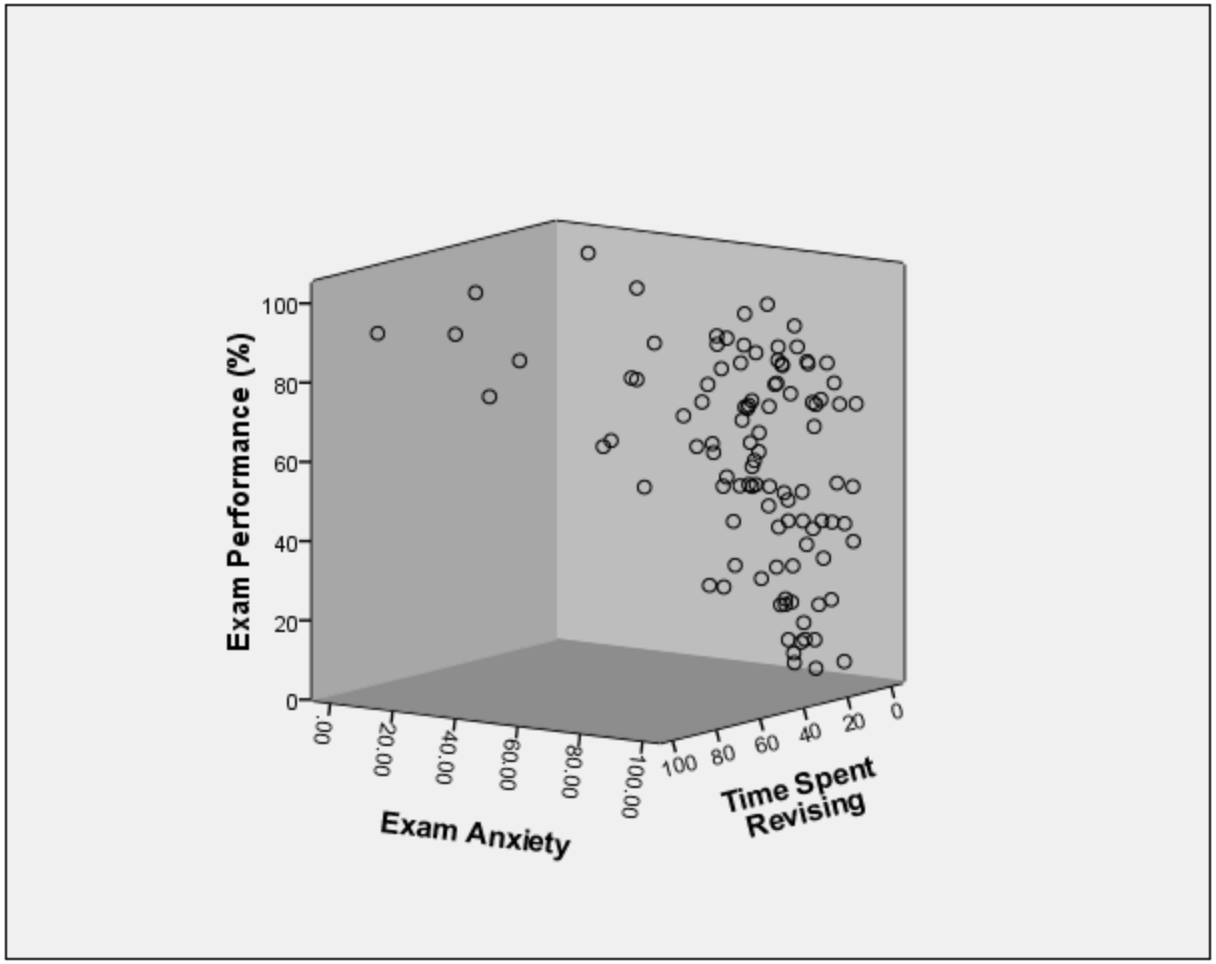


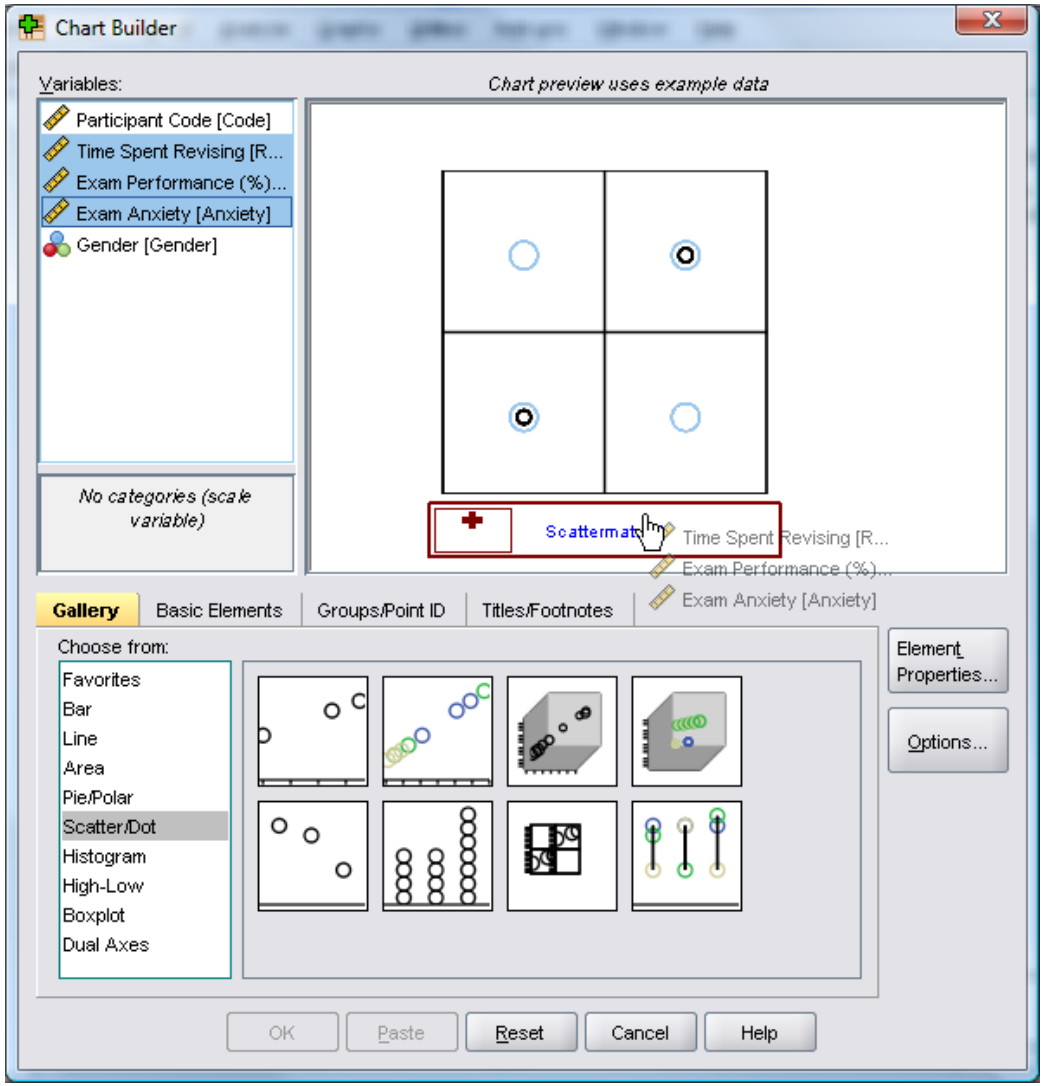
3-D Scatterplot



3-D Scatterplot



Matrix Scatterplot



Matrix Scatterplot