

Data Analysis and SPSS Refresher 7 March 2019

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1. Variables

A **variable** is anything that varies and has more than one unique category.

Examples

- Age in years: 1, 2, 3, 4, 5, 6, ..., 48, 49, 50, etc.
- Weight in pounds: 0, 1, 2, 3, ...190, 191, 192, etc.
- Test Scores: percentage correct, from 0% to 100% correct.
- Eye color: black, blue, brown, green, etc.

A **constant** occurs when only one category of a variable is present for a study.

Examples

(a) If everyone in this class is female, is sex a variable in this class?

If only females are present, then sex is a constant in this class.

(b) Students in urban areas whose parents are educators will perform better in mathematics than students whose parents are not educators.

Variables

Parent's occupation (educator vs. non-educator).
Math performance

Constants

Urban location (no other location identified)
Students (non-students not included)

Exercise

What are the variables in these hypotheses?

(a) There is no difference in Body Mass Index (BMI) between females and males.

Answer

Answer

(b) The higher one's level of academic self-efficacy, the lower will be one's test anxiety. (Note that academic self-efficacy and test anxiety are measured on 20-point scales ranging from 1 = low to 20 = high).

Answer

(c) Below is a description of students in a classroom; which are variables and constants?

- Age = all students are 21 years of age
- GPA = ranges between 1.65 and 3.86 for students in class
- Race = students are Asian, Amer. Indian, or Pacific Islanders
- Transportation to class = all students walk to class

Answer

2. Measurement

Summary Definition

Systematic process of assigning labels or numbers to categories of a variable.

Detailed Definition

Systematic procedure for assigning numeric values or labels to distinct units or characteristics associated with a given variable; or, quantifying or assigning a number to express the degree to which a characteristic is present or assigning labels to characteristics to express distinctions that are present in a variable. Measurement results in an observation of some phenomenon (e.g., current temperature is 86F or 36C, his test score is 7 of 10 correct, her anxiety score is 12 from a maximum of 15).

Examples

(a) Please identify your biological sex:

- ☐ Female
- ☐ Intersex
- ☐ Male

(b) Rate your instructor on the following item: Organization of course content.

1. Very Disorganized
2. Disorganized
3. Somewhat organized
4. Organized
5. Very Organized

(c) How many whole apples are you bag? ____

3. Scales of Measurement

There are four scales of measurement: Nominal, Ordinal, Interval, and Ratio. Each are described below.

Nominal: Categories

Just categories present with no inherent rank among categories, so there is no inherent way to rank or sort categories of the variable.

Examples

- Sex (female, intersex, male)
- Race/Ethnicity (Asian, Amer. Indian, Black or Afr. Amer., Latino/Latina, etc.)
- Type of flower (daisy, dandelion, petunia, rose, etc.)

Ordinal: Ranked Categories

Categories present, but also with inherent rank among categories so one could sort categories from less to more, worst to best, lowest to highest, etc.

Examples

(a) Rate your instructor on the following item: Organization of course content.

Very Disorganized
Disorganized
Somewhat organized
Organized
Very Organized

With this example we can sort responses from least to most organized, but we could not pinpoint exact difference among categories because the scale is loosely defined and subject to interpretation by those who provide responses.

(b) Rate your instructor on the following item: Organization of course content.

1. Very Disorganized
2. Disorganized
3. Somewhat organized
4. Organized
5. Very Organized

Do adding identifying response option numbers change the underlying measurement of this item? Do adding numbers change this from Ordinal to Interval or Ratio; do the numbers add precision and definition to the categories?

(c) SES, socio-economic status, originally measured by three indicators: educational level, income, and occupational prestige.

High
Middle
Low

These categories can be ranked, but without more information, without more precision in measurement, we don't know the exact difference among each category.

Interval: Ranked Categories with Equal Intervals of Measurement

Categories, that can be ranked, with equal interval based upon the scale or device used to measure that variable.

- Equal interval means that the scale used for measurement produces that same units across the scale, e.g., distance in inches is well defined and the differences between 1 and 2 inches is the same as the difference between 6 and 7 inches, i.e., 1 inch remains the same throughout the scale.
- Other examples: time measured in seconds, weight measured in kilos
- The difficulty with interval scaling is finding variables that lack a true zero point (the fourth requirement used to define Ratio variables, see below); few variables with equal interval scales have no true zero point (i.e., 0.00 = absence of a quantity for the variable).
- True zero means there is a beginning/starting point or ending point to the scale. Most measures with such precise measurement have true zero points.
- Possible interval examples:
 - IRT/Rasch scale ability scores where logits range from $-\infty$ to ∞ with a midpoint of 0.00. This is not a true 0.00 point, however, since 0.00 does not represent the absence of the latent variable measured; instead 0.00 represents a mid-point on the scale.
 - Temperature in Celsius or Fahrenheit where 0.00 does not signify the absence of heat or cold (this disregards 0 Kelvin which theoretically implies the absence of heat energy).

Ratio: Ranked Categories with Equal Intervals of Measurement and True Zero

Variables that possess categories, natural rank among categories, equal interval with scale/device used to measure those variables, and true zero point.

Examples

- time to complete a task
- counting books in a room
- number of points scored during a game

This is the only type of variable for which one can compute ratios (e.g., if it takes me 10 seconds to complete at task, but takes you only 5 seconds, then it took me, $10/5 = 2$, twice as long).

Equal interval characteristics – this is a function of the measuring scale or device used, not of the categories themselves. Examples of measurement scales that produce equal intervals:

- ruler in millimeters or inches,
- stop watch to record seconds,
- counts of number of items scored correctly on tests,
- percentage of items scored correctly on tests, e.g., Test 1 scores:
 Bryan = 45%
 Miriam = 85%
 Melinda = 100%
 Ratio = $45/100 = .45 \times 100 = 45\%$

4. Variables: Categorical/Qualitative vs. Quantitative

The distinction between these two classifications rests solely on the scale of measurement for each variable:

- Nominal = Qualitative/Categorical
- Ordinal = Categorical (2, 3, or 4 categories) or Quantitative (4 or more categories) *
- Interval = Quantitative
- Ratio = Quantitative

* This is an arbitrary classification that I have found useful in research and data analysis.

In general, if categories of a variable can be ranked, it is quantitative, if not ranked then categorical (except for ordinal variables with limited number of categories as noted above).

Categorical/Qualitative Variable

Nominal or categorical (i.e., no inherent rank to categories), or ordinal variable with limited number of categories (e.g., SES with three categories of low, middle, high).

Examples

- Race/Ethnicity
- Types of flowers
- Make of automobile

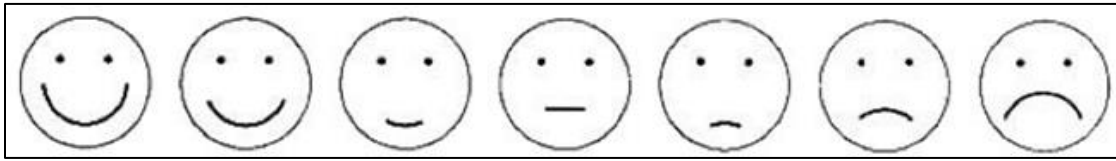
Quantitative Variable

Ranked categories (ordinal, interval, or ratio, assuming the ordinal measure contains many ranked categories or is a composite taken from several ordinal variables (e.g., scale with 3 ordinal indicators may be summed and treated as quantitative)).

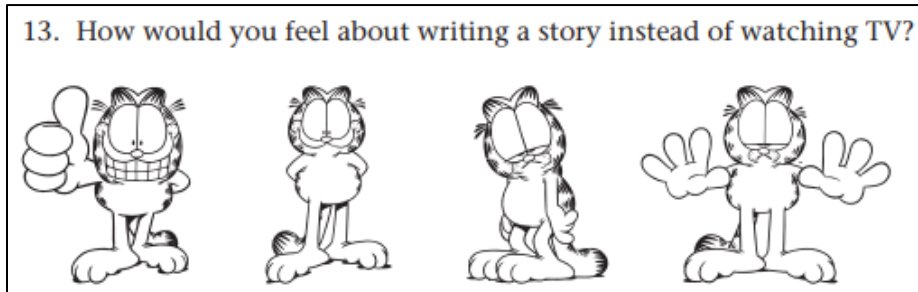
Examples

- Number of test items answered correctly
- Weight in lbs.
- Number of pages read over the summer
- Age
- Score on Test 1

Sometimes folks equate quantitative variables with numbers and assume that if numbers are not present then the variable cannot be quantitative. Consider the two scales below designed to measure one's current level of happiness with life or interest in writing.



Source: <http://www.backtosafety.com/posts/emotional-check-in-chart/>



Source: Kear, D. J., Coffman, G. A., McKenna, M. C., & Ambrosio, A. L. (2000). Measuring attitude toward writing: A new tool for teachers. *The Reading Teacher*, 54(1), 10-23.

Things to notice:

- no numbers are used in either scale
- despite lack of numbers, the scales demonstrate a quantitative response since categories can be sorted by level of happiness or interest
- yet, due to lack of precision of measurement, this scale is at best ordinal

Exercise

Identify the

- variable or variables for each statement/hypothesis,
- indicate whether the variable is categorical or quantitative, and
- identify the scale of measurement for each variable (Nominal, Ordinal, Interval, or Ratio).

(a) Everyone buys a bag of apples, and we each count the number of whole apples in our bags.

Answer

- Categories:
- Rank:
- Equal Intervals:
- True Zero:

(b) The classification of people into student groups in high school (e.g., nerds, athletes, and druggies).

Answer

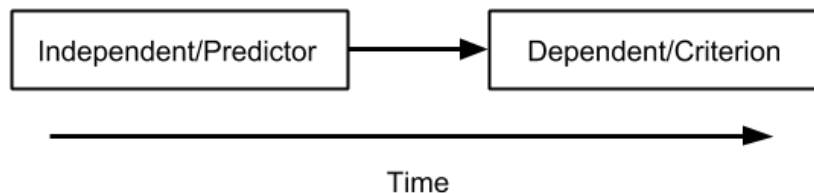
(c) Take the classification used above (nerds, athletes, druggies) and provide a different label now with numbers: group 1, group 2, and group 3.

Answer

5. Independent/Predictor vs. Dependent/Criterion Variables

The easiest way to identify independent (IV) and dependent (DV) variables is to consider the logical, theoretical, or observed time sequence for the variables.

- Independent/Predictor: variable that comes first in time sequence
- Dependent/Criterion: variable that follows IV in time sequence



- I use independent variable and predictor synonymously and view dependent and criterion as synonyms too.
- For some an independent variable is one manipulated by a researcher in an experimental study and a dependent variable is that observed after manipulating the independent variable. Thus, use of terms independent and dependent imply causation.
- If variables are not manipulated, or the outcome of manipulation, or if one is studying only relationships, predictions, or correlations, then some argue variables should be called predictors and criterions (or is it criteria?).

Exercise

For each, identify the IV and DV and determine whether each is categorical or quantitative.

(a) Among 3rd grade students, there will be a difference in graded reading performance scores between males and females.

Answer

IV =

DV =

Reason =

(b) Students in larger classes tend to score lower on standardized mathematics tests.

Answer

IV =

DV =

(c) Students whose parents are educators will have higher academic self-efficacy than students whose parents are not educators. The academic self-efficacy scale ranges from 5 = low to 15 = high.

Answer

IV =

DV =

(d) For females in public schools, researchers found that one's mathematics attitude predicts well one's mathematics achievement. (Mathematics attitude is a latent variable and is formed as a composite score from responses to several indicators and has a range of 20 = low to 85 = high.)

Answer

IV =

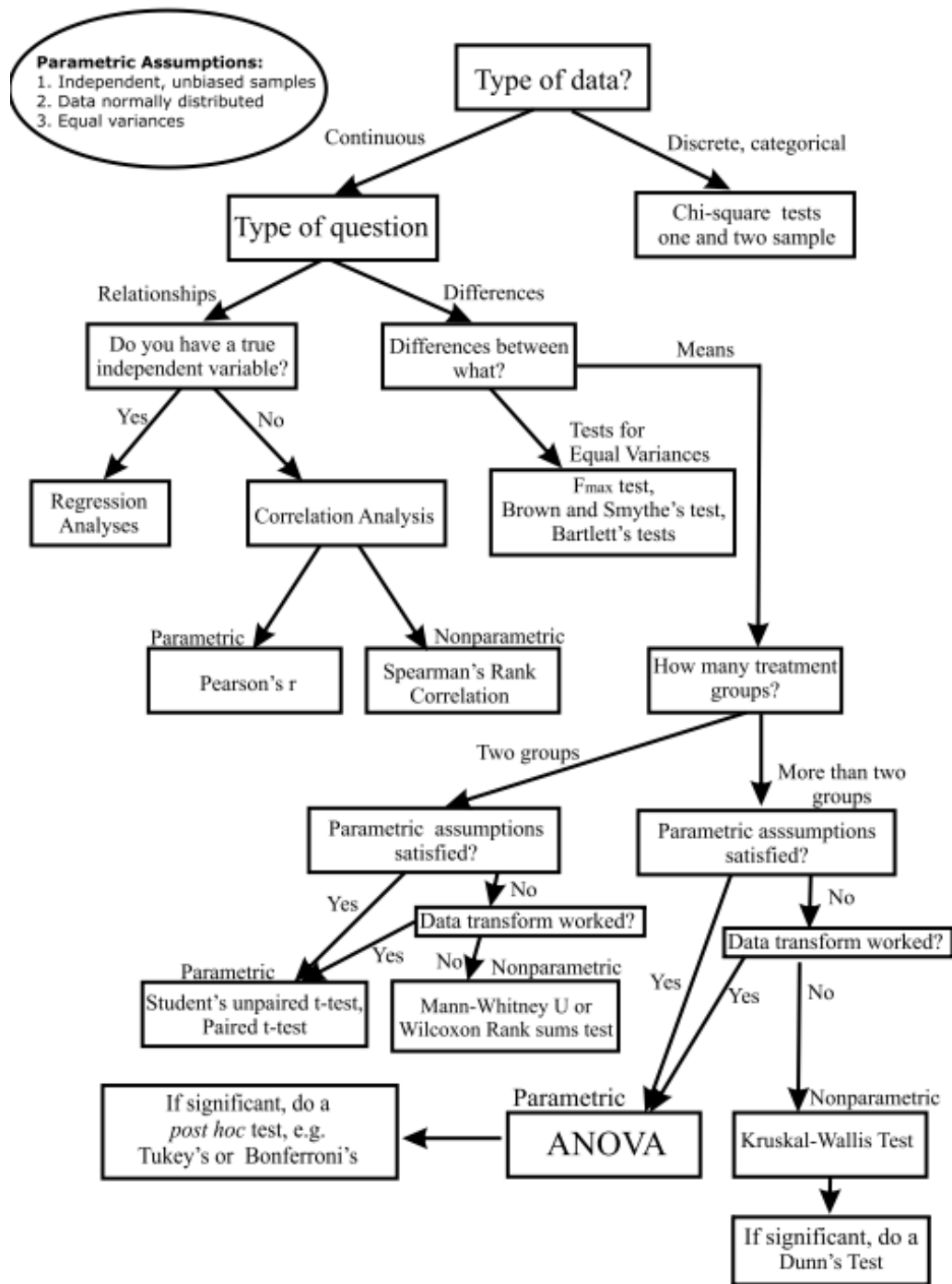
DV =

Constants:

6. Selecting Basic Statistical Analyses

Many flow charts exist to help researchers identify which statistical tests to use in various situations. Below is one example found on the internet – author unknown.

Flow Chart for Selecting Commonly Used Statistical Tests



Source: http://abacus.bates.edu/~ganderso/biology/resources/stats_flow_chart_v2014.pdf

Another approach is to consider the number and type of variables one has and then identify tests that fit those variables. The table below identifies the nature of variables for eight analysis procedures taught in EDUR 8131 (Intro. to Statistics).

Statistical Tests Taught in EDUR 8131

Statistical Test	Independent Variable	Dependent Variable	Special Note	Example
One-sample t-test	One Quantitative Variable		One variable compared against some set score.	Does Mrs. Jones' 8 th grade PE class weigh more than national mean of 105 lbs.?
Chi-square Goodness-of-fit	One Categorical Variable		One variable, frequencies of category for that variable compared against theoretical (expected) values for those categories.	Is student sex equally distributed within an educational research course (i.e., are there equal numbers of males and females)?
Two independent samples t-test	Categorical (2 groups)	Quantitative	IV has two groups	Is there a difference in weight between males and females in PE class?
Correlated samples t-test	Categorical (2 sets of scores)	Quantitative	Scores are linked or matched in some way across the two sets of scores.	Does the weight of 8 th grade students change before and after taking a PE class for one semester?
Pearson r	Quantitative	Quantitative	Works when IV and DV identified, or one wants correlation between two variables that are not identified as IV or DV.	Is there an association between number of hours studied the week before a test and scores obtained on that test?
ANOVA	Categorical (2 or more groups)	Quantitative	IV has 2 or more groups; mathematically same as two-group t-test if only two groups examined.	Is there a difference in mean weight between 6 th , 7 th , and 8 th grade PE classes?
Linear Regression	Quantitative (Categorical, also)	Quantitative	Provides prediction equation or determines which IVs contribute to modeling DV variation.	Which among house size, age of house, or number of features best predict sale price of a house?
Chi-square Test of Association	Categorical	Categorical	Are two Categorical (nominal) variables associated?	Do dropout rates differ among three racial groups in Georgia (Black, Hispanic, and White students)? Note that the DV dropout is nominal (in school or out of school).

To use this table, do the following:

1. Identify the variables involved and, if possible, determine which are IV and DV
2. Determine scale of measurement for each variable
3. Determine whether any special circumstances apply (i.e., matched data, 2+ groups).
4. Identify correct statistical test based upon steps 1 through 3 above.

Exercise

For each scenario determine which statistical test would be suitable from among those listed in the table above.

(a) Do females in single-sex classes perform better than females in co-educational classes in high school biology? Below are end of course test scores in 9th grade biology for two classes, one taught with female only and one with both males and females present.

Single-sex Class		Co-educational Class	
85	75	79	76
83	83	82	79
79	84	75	81
95	86	94	82
71	91	69	88
86	95	81	84
93	98	87	93

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(b) Assess the association between recreational reading interest and academic reading interest. Both types of interest are measured with Garfield reading interest subscales which ranges 10 = low to 40 = high (McKenna, M. C., & Kear, D. J. 1990. Measuring attitude toward reading: A new tool for teachers. *The reading teacher*, 43(9), 626-639.).

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(c) Does a high school student's decision to apply for college admission (yes vs. no) differs depending upon whether that student's mother attended college (yes vs. no)?

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(d) Foos and Clark (1982) studied the influence of expectations on test performance. They found that the kind of test that a student expected would affect the way in which they studied tested material. Below are scores from an experiment designed to replicate Foos and Clark's research. A total of 20 undergraduate students were given a 3000-word passage to read and were told that they would be tested on that passage. They were then assigned to one of four treatment groups. In the first group, the students were told to expect a multiple-choice test; in the second group, they were told to expect an essay; in the third group, they were told to expect a recall (e.g., fill in blank, matching); and in the fourth group they were not told what to expect. Despite what they were told earlier, all students were given the same test which consisted of multiple-choice and short-answer items. Given below are scores from their test. Is there any evidence that expectation influences performance? (Source: Foos, P. W., & Clark, M. C. (1983). Learning from Text-Effects of Input Order and Expected Test. *Human Learning*, 2(3), 177-185.)

	Type of Test Expected			
	Multiple-Choice	Essay	Recall	Told Nothing
	10	12	19	22
	9	16	23	19
	7	13	19	18
	14	15	21	25
	8	10	23	23

Note. Higher scores indicate better test performance.

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(e) Lynch and Dembo (2004) sought to learn whether (a) Intrinsic Goal Orientation, (b) Self-efficacy for learning and performance, (c) Time and Study Environment, (d) Help Seeking, (e) Internet Self-efficacy, and (f) Verbal Ability predict (g) Final Course Grades. Lynch and Dembo used scales to measure each variable and the scales produced ranked scores such that higher scores indicate more of that measured variable. (Lynch, R., & Dembo, M., 2004, The relationship between self-regulation and online learning in a blended learning context. *International Review of Research in Open and Distributed Learning*, 5.)

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(f) Does premium gasoline (octane of 91) result in better miles per gallon (MPG) than regular gasoline (octane of 87) for typical cars? To test this question, seven cars were filled separately with both types of gasoline and driven on a closed track until the tank emptied. Below are results for MPG under both types of gasoline for the same car. Is there any evidence that one gasoline octane level produced better MPG than the other?

	MPG for Premium Gas	MPG for Regular Gas
Honda Accord	31.3	32.5
Honda Civic	38.7	38.8
Ford Taurus	22.6	22.7
Buick Regal	23.3	23.2
Toyota Camry	28.9	29.1
Dodge Avenger	21.5	21.4
Toyota RAV4	26.8	26.9

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(g) Is there a difference in level of recreational reading interest between students at Portal Elementary School and Brooklet Elementary School? Recreational reading interest is measured using the Garfield reading interest scale which ranges from 10 = low to 40 = high (McKenna & Kear, cited above).

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(h) Who goes to the local library? Library patrons are asked to complete a brief questionnaire that elicits various demographic variables. One variable is patron sex. Library researchers anticipated a 50/50 split between male and female patrons, but actual numbers show the distribution is 63 females and 37 males. How could this difference be tested against the expected 50/50 distribution?

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(i) Is there a change in level of recreational reading interest, using the Garfield scale (range 10 = low to 40 = high), before and after students visit a library?

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(j) Laser toner cartridges for the Hewlett-Packard LaserJet 1200 series are estimated to last approximately 2000 pages per cartridge assuming 5% coverage per page. To test this advertising claim, 15 toner cartridges were purchased and installed in 15 HP LaserJet 1200 printers throughout a school district. Number of pages was recorded for each cartridge until visible lines of non-print became apparent. Below are the number of pages recorded. Is there any evidence that the advertisers' claim of 2000 pages is supported?

Number of pages recorded: 1985, 1675, 1548, 1756, 1865, 1235, 1498, 1195, 1611, 1754, 2056, 1454, 1332, 1444, and 1669

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(k) Does the racial/ethnic distribution of our sample match the expected population distribution, i.e., are the sample and population frequencies or percentages consistent?

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(l) Self-determination theory (SDT) is an explanation for motivation that contains three fundamental constructs: autonomy, relatedness, and competence (Deci & Ryan, 1985). Briefly explained, autonomy refers to individual power and control over important decisions, relatedness is a want for interaction and social experience with others, and competence refers to one's ability to successfully interact with daily tasks and demands. SDT has been applied in many settings including work, well-being, and education. Ntoumanis (2001) examined whether SDT would prove beneficial for motivating students in psychical education (PE). These three constructs were measured with scales composed of several Likert-type items (1 = Strongly Disagree to 5 = Strongly Agree):

- Autonomy in PE by measuring student level of choice (e.g., “I can decide which activities I want to practise in this PE class”)
- Relatedness in PE by assessing social fit (e.g., “Taking part in this PE class makes me feel closer to the other students”)
- Competence in PE by examining skill (e.g., “I am pretty skilled at the activity/sport in this PE class”)

SDT suggests that autonomy, relatedness, and competence should be positively related. Below are fictional data that mimic that obtained by Ntoumanis. Which statistical analysis could be used to examine these possible relations?

Sources:

Deci, E.L., & Ryan, R.M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum.

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British journal of educational psychology*, 71(2), 225-242.

student	autonomy	relatedness	competence
1	5	5	8
2	11	12	12
3	16	12	14
4	11	12	11
5	7	13	14
6	13	17	12
7	9	10	11
8	6	6	7
9	9	14	9
10	13	8	8

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

DV Variable Scale of Measurement:

Statistical Test:

(m) Do student-teacher ratio and average teacher salary simultaneously predict student performance on the mathematics section of the SAT across the 50 states and DC? Which of these variables is the better predictor, if either, once the other is controlled or taken into account? The data for this study are real and were obtained from the College Board website and various national educational websites; the three variables of interest are:

- math_sat: Average mathematics SAT scores in each state.
- pupil_teacher_ratio: Average ratio of students to teacher in each state; a higher number indicates more students per teacher

- average_teacher_salary: Average salary per teacher in each state in thousands of dollars, thus a figure of 25.000 means the average salary per teacher is \$25,000 per year

Analyze these data statistically to determine the predictive nature of pupil-teacher ratio and average teacher salary for predicting mathematics performance on the SAT.

Answer

IV Variable:

IV Variable Scale of Measurement:

DV Variable:

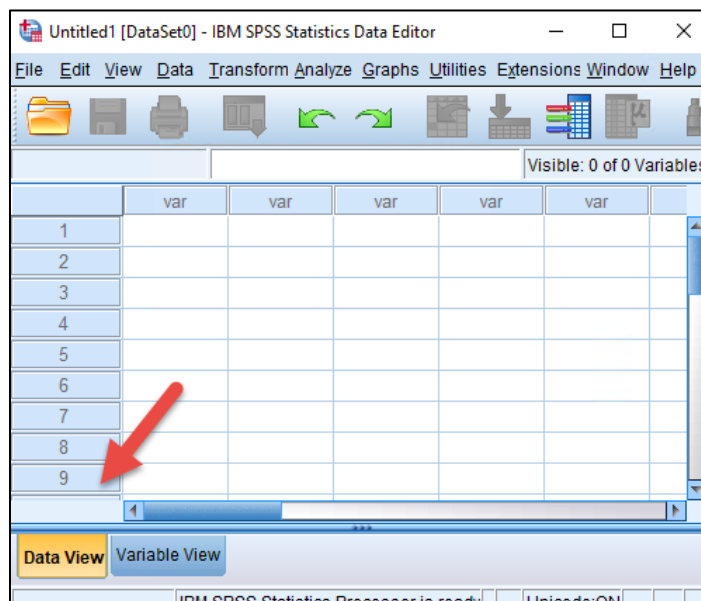
DV Variable Scale of Measurement:

Statistical Test:

7. SPSS: Data Entry

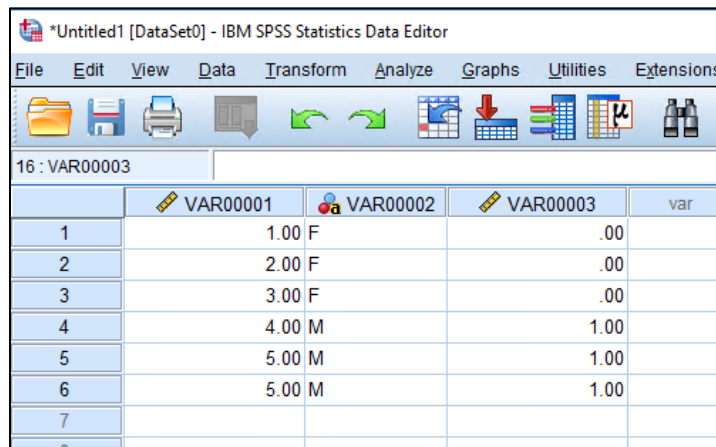
Data Entry

SPSS has a data entry screen that is similar to a spreadsheet. Before entering data, first ensure select Data View is selected.



Enter the following data into SPSS; a screenshot below shows entered data.

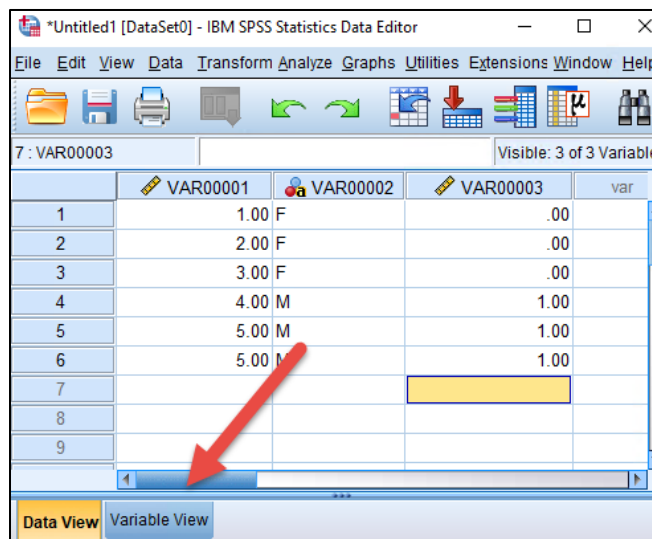
Scores	Sex	Sex as Number
1	F	0
2	F	0
3	F	0
4	M	1
5	M	1
5	M	1



	VAR00001	VAR00002	VAR00003	var
1	1.00 F		.00	
2	2.00 F		.00	
3	3.00 F		.00	
4	4.00 M		1.00	
5	5.00 M		1.00	
6	5.00 M		1.00	
7				

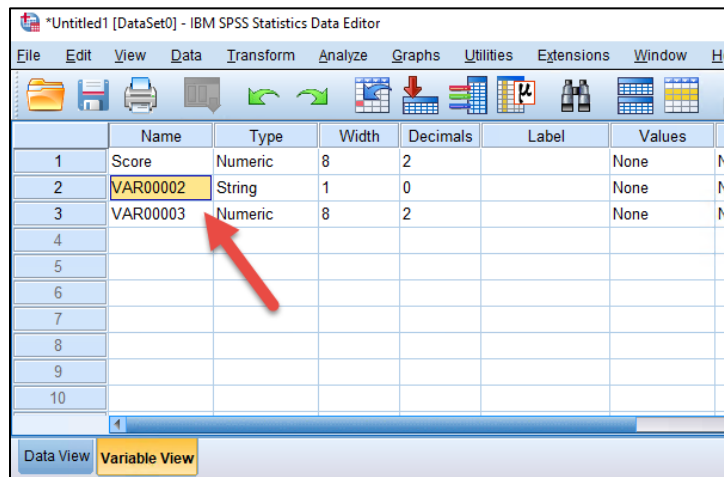
The image above shows different symbols for columns VAR00001 and VAR00002; the different symbols indicate Numeric data (the ruler) and String data (blue and red circles and letter a). String data are typically letters and words. Variable data type – numeric or string – can be changed using Variable View.

Next select Variable View so variable names and labels, and Value labels, can be added, if desired.

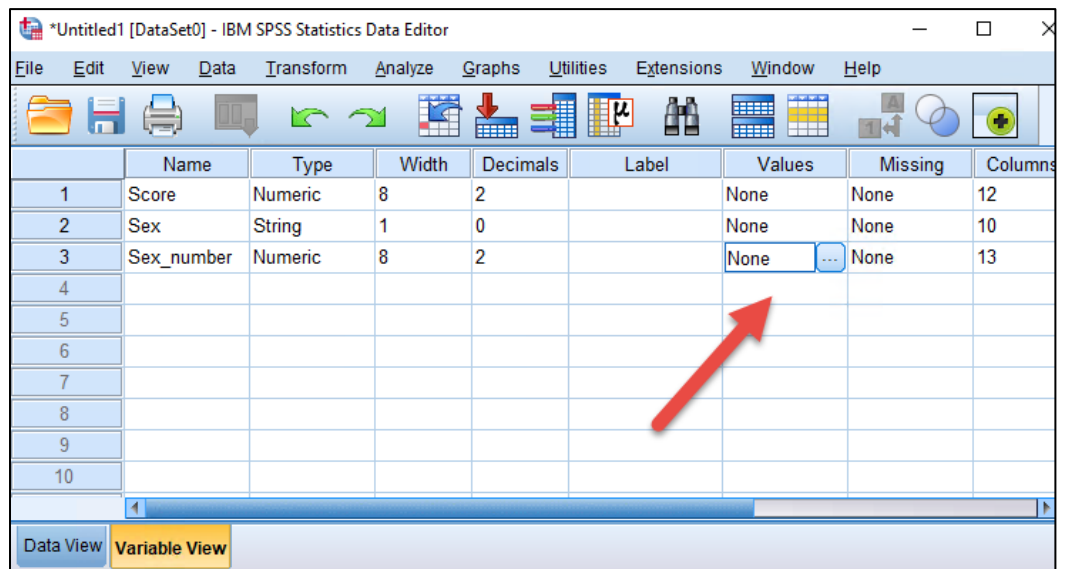


	VAR00001	VAR00002	VAR00003	var
1	1.00 F		.00	
2	2.00 F		.00	
3	3.00 F		.00	
4	4.00 M		1.00	
5	5.00 M		1.00	
6	5.00 M		1.00	
7				
8				
9				

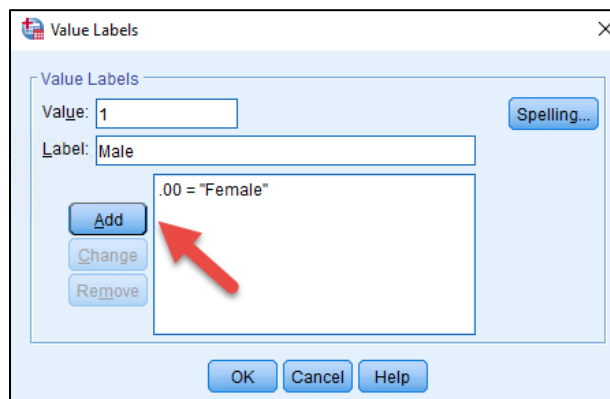
Enter variable names in the first row.



Value labels can also be added to help provide description to variable categories.

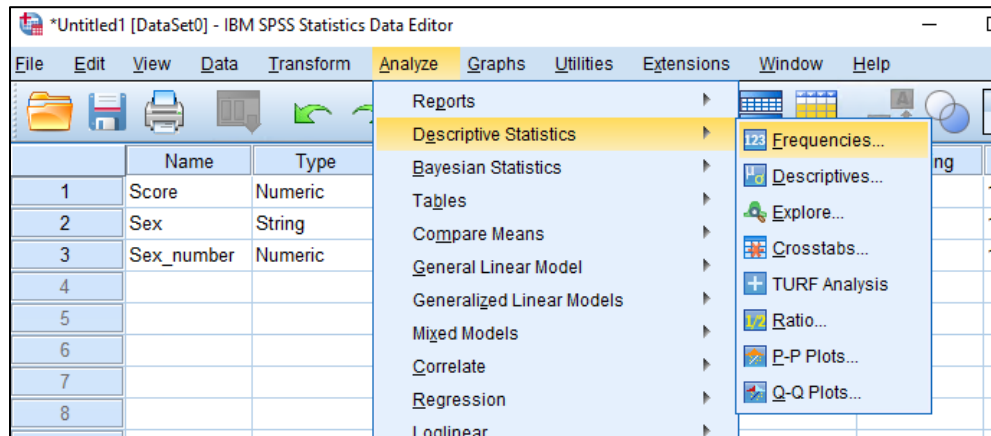


For the variable of interest (Sex_number in the above example), click on the “...” under the Values column to access a menu to add labels. First identify the Value (e.g., 1) then enter the Label (e.g., Male), then click Add. Click OK once all labels are added.

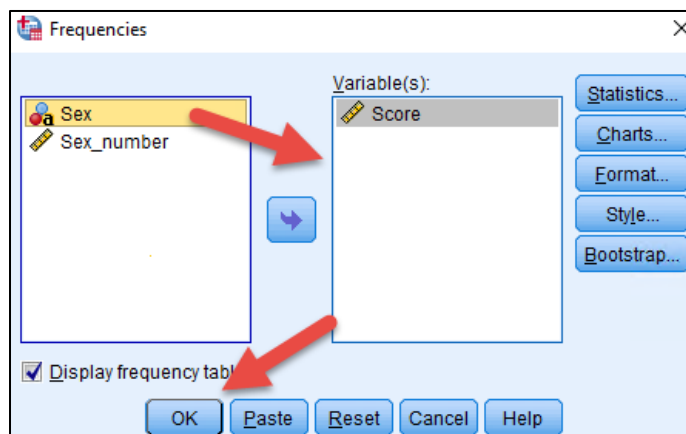


When labels are added to values, labels are displayed in SPSS results. As an example, run Frequencies on the three variables entered.

Analyze → Descriptive Statistics → Frequencies



Highlight and move each variable to the Variables box, then click OK to see results.



Below are Frequency tables; note the displayed labels Female and Male that were added to the **Sex_number** variable.

Score					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	16.7	16.7	16.7
	2.00	1	16.7	16.7	33.3
	3.00	1	16.7	16.7	50.0
	4.00	1	16.7	16.7	66.7
	5.00	2	33.3	33.3	100.0
Total		6	100.0	100.0	

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	3	50.0	50.0	50.0
	M	3	50.0	50.0	100.0
Total		6	100.0	100.0	

Sex_number					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	3	50.0	50.0	50.0
	Male	3	50.0	50.0	100.0
Total		6	100.0	100.0	

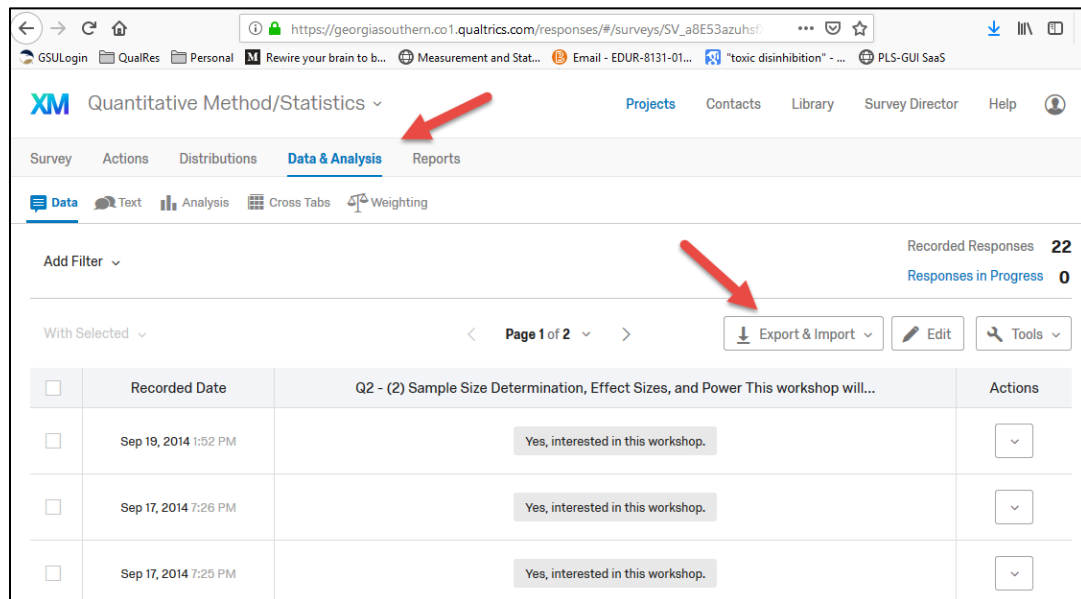
8. Qualtrics: Exporting Data for SPSS

Screenshots below illustrate how to export Qualtrics data in an SPSS file format.

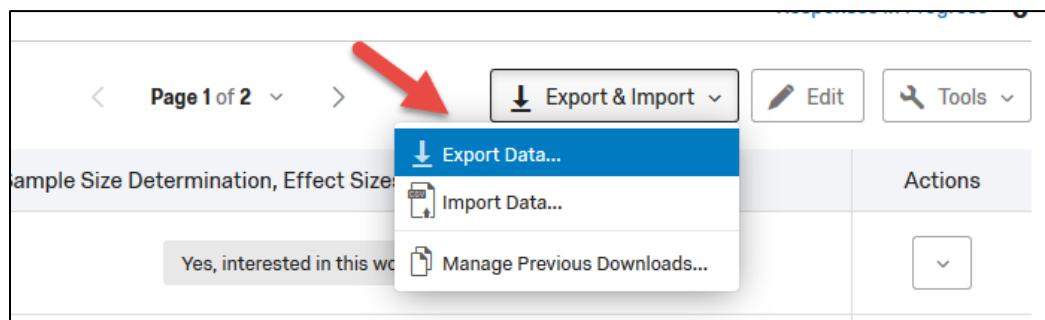
(a) Select the survey to download.

The screenshot shows the Qualtrics web interface. On the left, there is a sidebar with a list of projects: 'All Projects' (9), 'Shared with Me' (3), 'Uncategorized' (7), 'EDUR 8331' (1), 'Quant Methods Workshop' (1), and 'statistics' (0). A red arrow points to the 'Quant Methods Workshop' project. On the right, the details for the 'Quantitative Method/Statistics' survey are displayed. It is marked as 'ACTIVE' and has 2 questions and 22 responses. The survey was modified on Sep 11, 2014. The status is 'ACTIVE', and the number of questions is 2 and responses is 22.

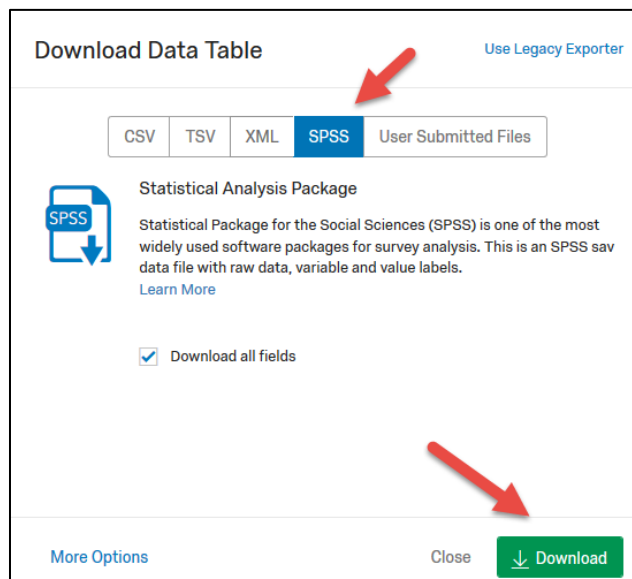
(b) Select “Data & Analysis” from the top menu, then select “Export & Import” from the submenu.



(c) Select Export Data



(d) Lastly, choose SPSS then click Download to obtain a Qualtrics generated SPSS file.



9. SPSS: Frequency Displays and Descriptive Statistics

Frequencies can be helpful for seeing data distributions and identifying data entry errors or problematic coding.

The examples that follow use an SPSS data file located in the link below. If SPSS is installed on your computer, it should launch automatically once these data are downloaded.

<http://www.bwgriffin.com/workshop/2019Sp-workshop-data.sav>

Most of these data were taken from two studies conducted at Georgia Southern. The first included both undergraduate and graduate students and attempted to learn of their social media usage. The second studied cyber-harassment experiences of undergraduate students. Two variables, **MPG** and **Vehicle_weight**, were taken from a 1970s study of autos, and two other variables, **Test2_PerentCorrect** and **Test2_SecondsPerItem**, were data obtained from an educational research course in the early 2000s.

Questionnaire items

(a) What is your race/ethnicity? _____

Workshop SPSS variable = **Race_Ethnicity**. This item was taken from the social media study.

Coded response options

- 1 = American Indian or Alaska Native
- 2 = Asian
- 3 = Black or African American
- 4 = Hawaiian or Pacific Islander
- 5 = Hispanic/Latino
- 6 = White
- 7 = Mixed/Multi-racial

SPSS Frequency result for **Race_Ethnicity**

Race_Ethnicity				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	250	42.2	42.2	42.2
1	1	.2	.2	42.3
2	3	.5	.5	42.8
2,3,4	1	.2	.2	43.0
3	86	14.5	14.5	57.5
4	1	.2	.2	57.7
6	243	41.0	41.0	98.7
7	4	.7	.7	99.3
7 (6+2)	1	.2	.2	99.5
blank	1	.2	.2	99.7
Blank	1	.2	.2	99.8
Dark Skin	1	.2	.2	100.0
Total	593	100.0	100.0	

The frequency table above shows some unexpected responses (e.g., “2,3,4” and “Dark Skin”); item revision may be the number of unexpected responses is large.

(b) Who can see your social media?

Workshop SPSS variable = **See_Social_Account**. This item was taken from the social media study.

The questionnaire item and category coding (in red) are presented below.

6) Who can currently see your social media (ie. Facebook, Twitter, etc) profile and posts?

1	<input type="checkbox"/> Only people selected as my friends
2	<input type="checkbox"/> Public - anyone
3	<input type="checkbox"/> Custom - I select who can see my information
4	<input type="checkbox"/> I do not have any social media accounts

SPSS Frequency result for **See_Social_Account**

See_Social_Account				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	253	42.7	42.7	42.7
0	1	.2	.2	42.8
1	244	41.1	41.1	84.0
1 & 2	3	.5	.5	84.5
1 & 3	1	.2	.2	84.7
1 & 3	1	.2	.2	84.8
1, 2	1	.2	.2	85.0
1,2	2	.3	.3	85.3
1,3	1	.2	.2	85.5
1&3	1	.2	.2	85.7
2	34	5.7	5.7	91.4
2 & 3	1	.2	.2	91.6
2, 3	1	.2	.2	91.7
3	37	6.2	6.2	98.0
4	10	1.7	1.7	99.7
5	1	.2	.2	99.8
6	1	.2	.2	100.0
Total	593	100.0	100.0	

Note the codes of 0, 5, and 6, which are not possible; these are likely data entry errors. Also, multiple categories were selected, and this suggests item revision is needed to reduce this problem with future administrations of this item.

(c) What is your age? _____

Workshop SPSS variable = **Age**. This item was taken from the social media study.

Below are two tables, one showing descriptive statistics for **Age**, and the second showing the frequencies for **Age**.

Since Race/Ethnicity and See Social Media are String variables in SPSS – due to incorporation of letters in responses – descriptive statistics are not calculated for these variables. If descriptive statistics were calculated, they would be mostly meaningless for nominal data.

Statistics				
		Race_Ethnicity	See_Social_Account	Age
N	Valid	593	593	344
	Missing	0	0	249
Mean				24.00
Median				21.00
Mode				20
Std. Deviation				6.781
Variance				45.985
Range				51
Minimum				16
Maximum				67

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16	1	.2	.3	.3
	18	1	.2	.3	.6
	19	46	7.8	13.4	14.0
	20	76	12.8	22.1	36.0
	21	52	8.8	15.1	51.2
	22	25	4.2	7.3	58.4
	23	29	4.9	8.4	66.9
	24	31	5.2	9.0	75.9
	25	12	2.0	3.5	79.4
	26	7	1.2	2.0	81.4
	27	6	1.0	1.7	83.1
	28	7	1.2	2.0	85.2
	29	1	.2	.3	85.5
	30	4	.7	1.2	86.6
	31	5	.8	1.5	88.1
	32	4	.7	1.2	89.2
	33	4	.7	1.2	90.4
	34	2	.3	.6	91.0
	35	4	.7	1.2	92.2
	36	1	.2	.3	92.4
	38	5	.8	1.5	93.9
	39	2	.3	.6	94.5
	40	3	.5	.9	95.3
	41	3	.5	.9	96.2
	42	3	.5	.9	97.1
	43	3	.5	.9	98.0
	46	1	.2	.3	98.3
	48	1	.2	.3	98.5
	49	1	.2	.3	98.8
	50	3	.5	.9	99.7
	67	1	.2	.3	100.0
	Total	344	58.0	100.0	
Missing	System	249	42.0		
Total		593	100.0		

10. SPSS: Graphical Displays

Graphical displays can be helpful for visualizing and relating data to others. They can also be helpful for identifying problematic data (e.g., outliers) and unusual relationships.

Bar Charts

Bar Charts provide a visual depiction of frequencies for nominal variables.

Workshop SPSS variable = **Harrassment_Group4**; item from the cyber-harassment study.

What is the distribution of perpetrator and victim experience with cyber-harassment among GSU undergraduate college students?

Cyber-harassment experience while in college was measured by responses to items that assess victim and perpetrator roles for five different types of online harassing formats. Each are listed below.

Were you a victim of

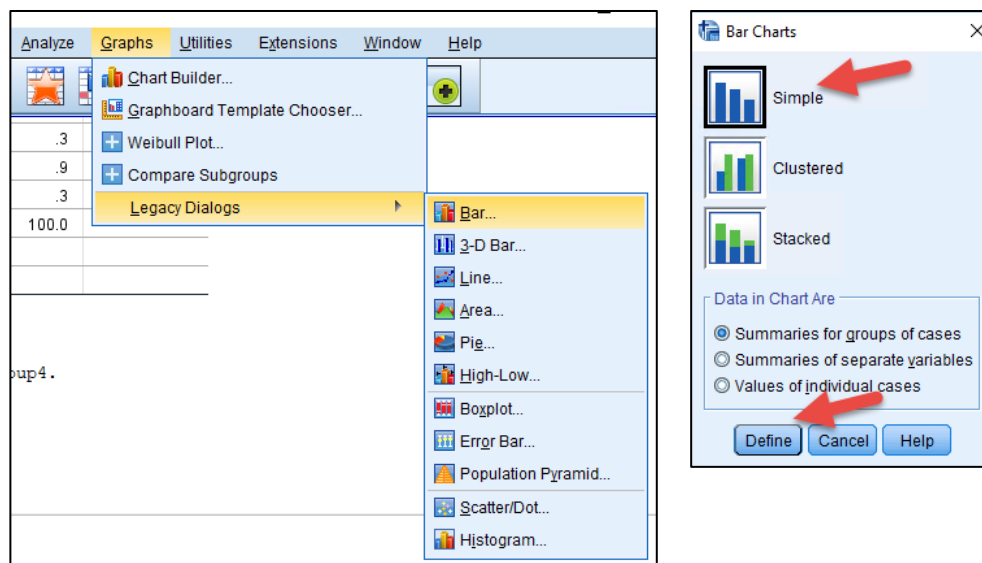
- Spoken Harassment
- Written Harassment
- Visual Harassment
- Hacking or Impersonation
- Social Harassment

Did you do any of the following to someone

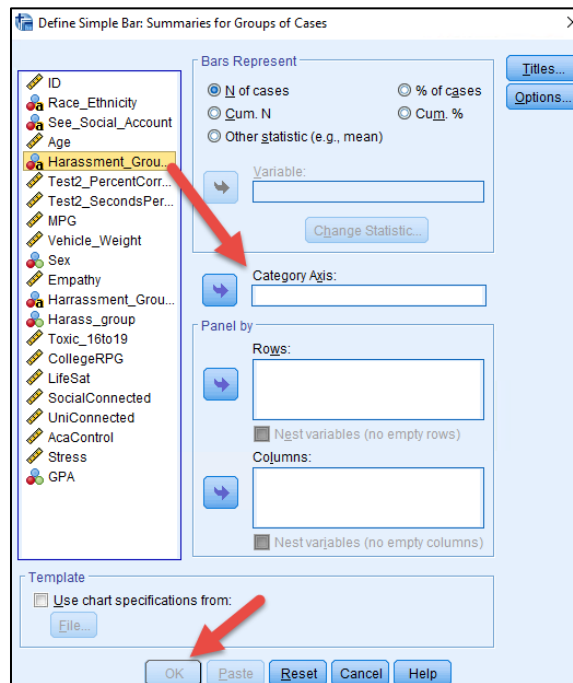
- Spoken Harassment
- Written Harassment
- Visual Harassment
- Hacking or Impersonation
- Social Harassment

Responses to these queries were then grouped into four categories, which are displayed in the bar chart below.

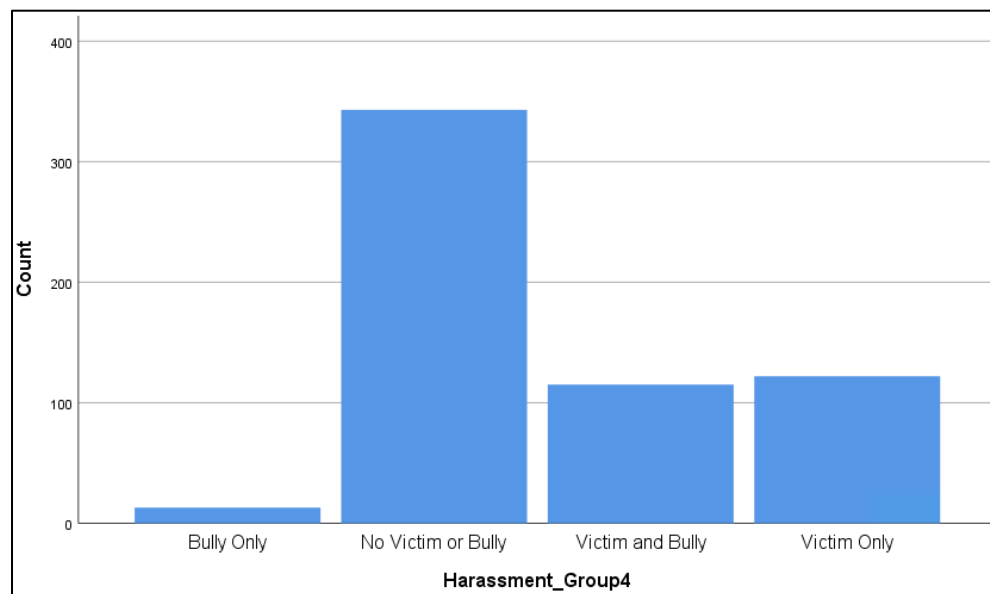
SPSS Commands to obtain a bar chart for **Harrassment_Group4**. Select Bar under Graphics, then Legacy Dialogs. Next select Simple for Bar Chart type, then click on Define.



Next identify the variable of interest and move it to the Category Axis box, then select OK to obtain the Bar Chart.



Below is the bar chart for **Harassment_Group4**. Note that over 300 (58%) of the 593 respondents indicated they were not involved in any type of cyber-harassment while in college. About 122 (21%) were victims of cyber-harassment, 115 (19%) were both victim and perpetrator, and only 13 (2%) were perpetrator only. This suggests that most who perpetrate cyber-harassment in college are also victims of cyber-harassment.



Histograms

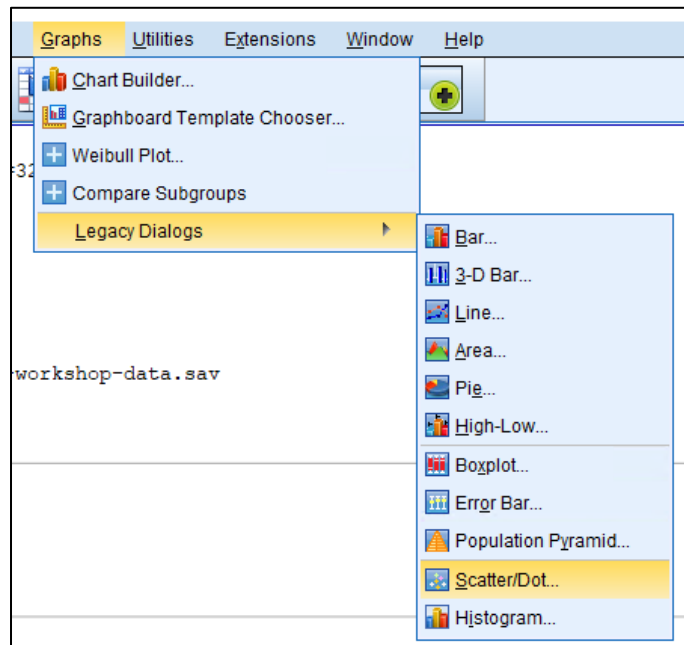
Histograms are the quantitative counterpart to bar charts. The primary difference is that with histograms the bars may touch thus signifying that the categories are consecutive whereas with bar charts the bars do not touch which indicates the categories are not consecutive and therefore may be presented in any order without changing the meaning of the data.

Workshop SPSS variable = **Age** (part of social media study).

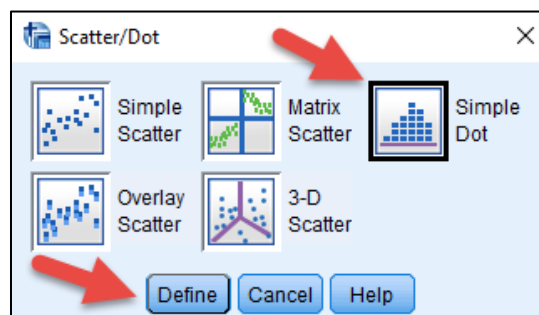
What is the distribution of age for those who provided Race/Ethnicity data?

For this graph we will use a dot-plot which is similar to a histogram but uses dots instead of bars to show frequencies.

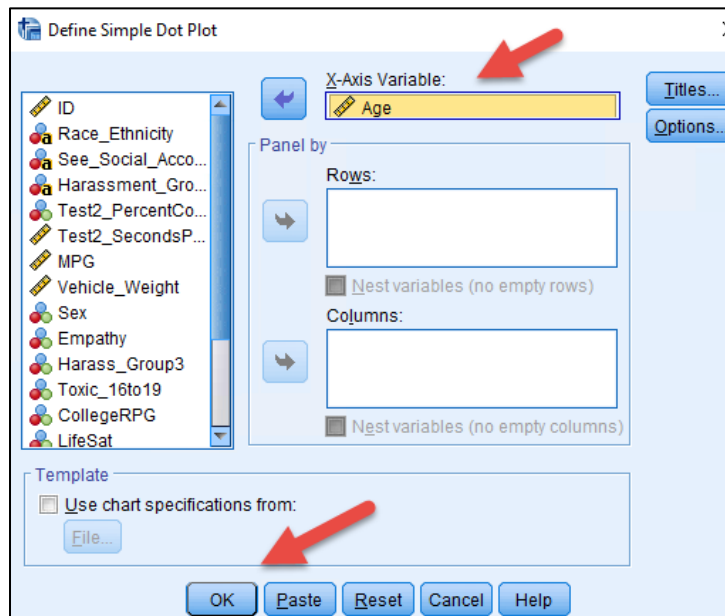
Select Graphs, Legacy Dialogs, then Scatter/Dot.



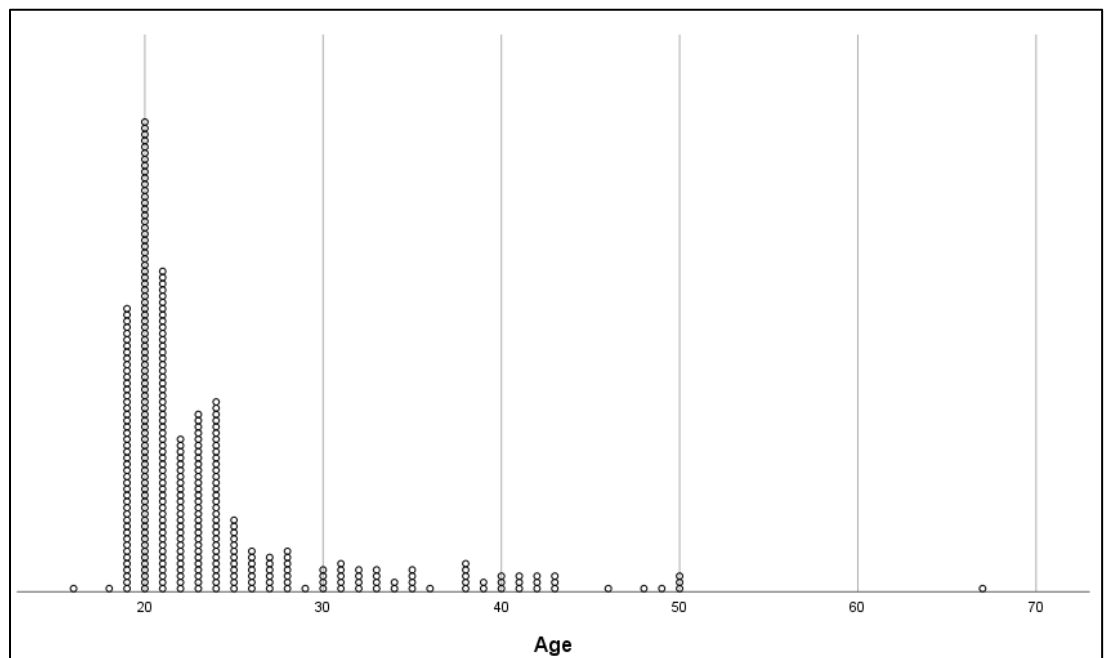
Next, select Simple Dot then Define.



Next, move Age to the X-Axis Variable box, then click OK to obtain the dot plot.



The dot plot is shown below. Most respondents were 19 to 25. One was over 60. The older respondents were likely part of the graduate student sample.



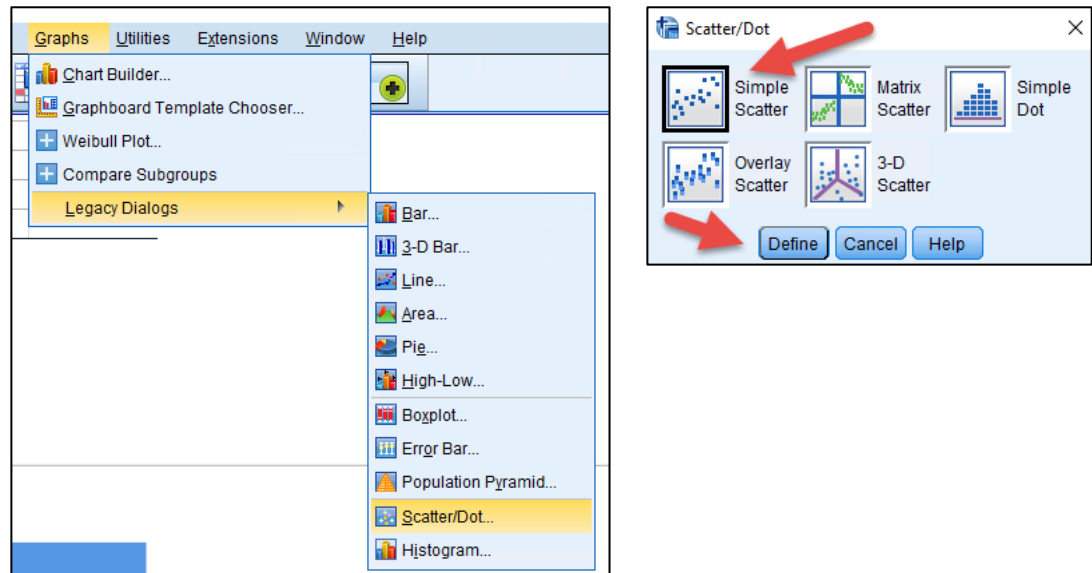
Scatterplot: Test Cheater?

Scatterplot are helpful for showing relations among quantitative variables. They are also helpful for identifying outliers or unusual cases.

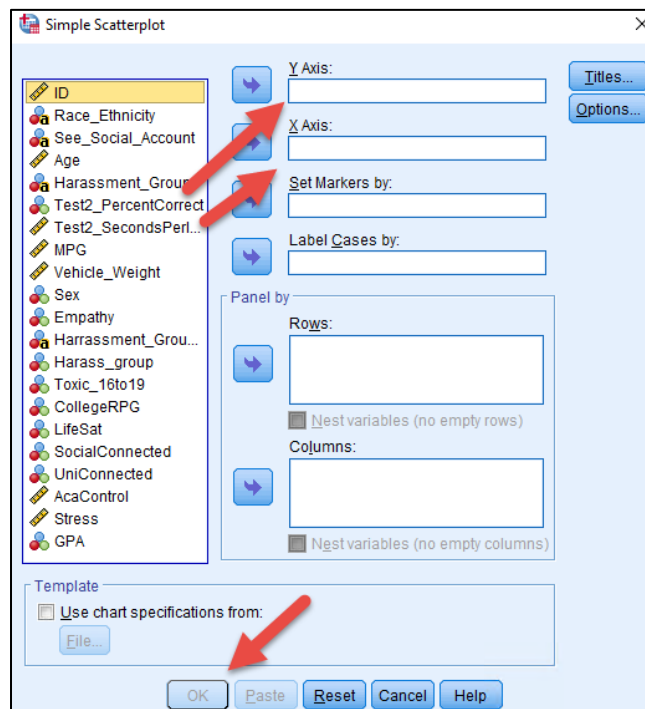
Workshop SPSS variable = **Test2_PerentCorrect** and **Test2_SecondsPerItem**

Does time taken to complete test items (**Test2_SecondsPerItem**) correlate with test scores (**Test2_PerentCorrect**) for students in EDUR 7130 (Intro to Research)?

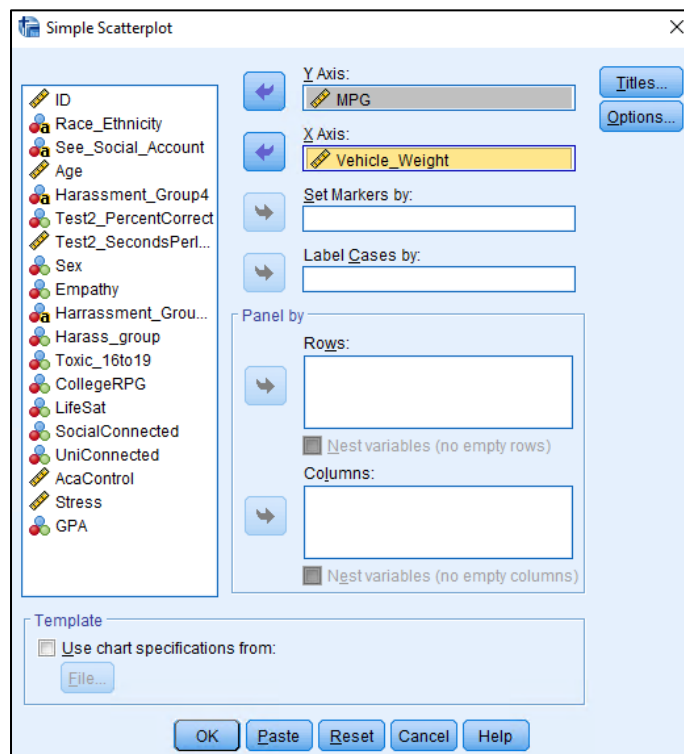
After selecting Scatter, select Simple Scatter, then Define.



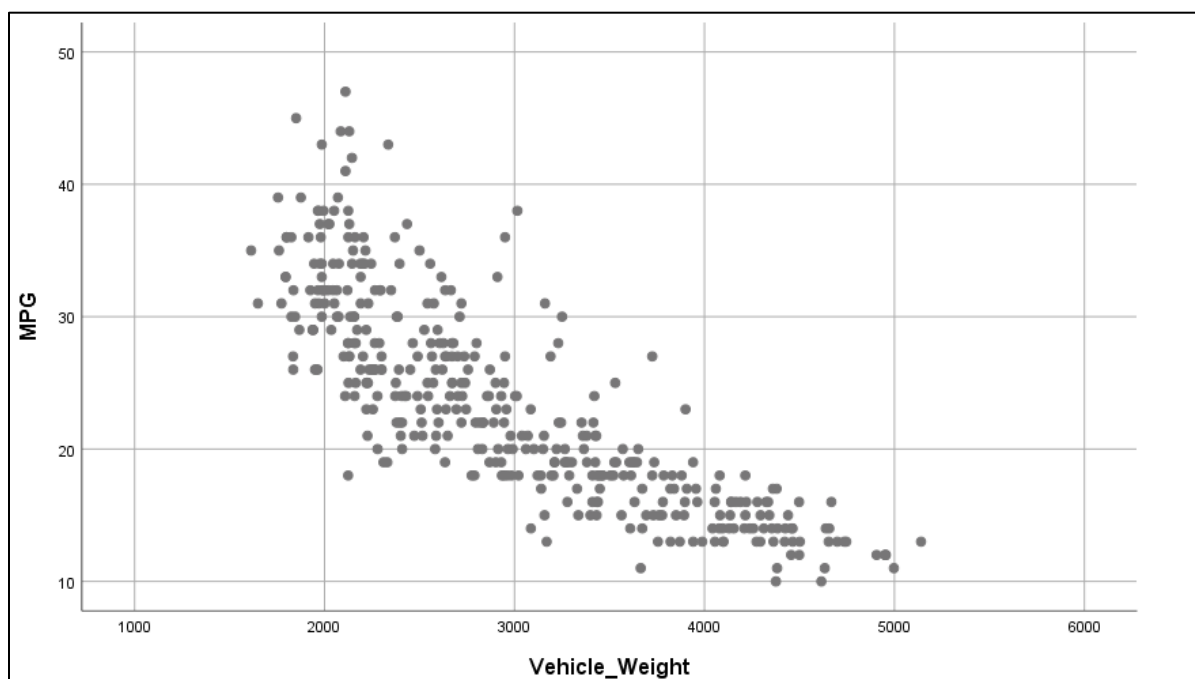
Next move **Test2_PerentCorrect** into the Y Axis box and **Test2_SecondsPerItem** to the X Axis box, then click OK to obtain the scatterplot.



The scatterplot shows that most students took about 2 or more minutes per item (120 seconds or more), but one student was able to complete item in about 40 seconds, on average, and was



The scatterplot shows that there is a general negative relation between MPG and vehicle weight: as weight increases, MPG declines. The relation also appears to have a nonlinear component with a slight curve occurring with weights between 2000 and 2750. Note that these data are from model years 1970 to 1982. As the plot shows, several cars during this time period were able to achieve 30+, and even 40+, MPG.



11. SPSS: Two-group t-test (Empathy Differences by Sex)

The t-test can be used to compare mean scores on a quantitative DV between two groups (the groups form the IV).

For this example, we will use two variables from the SPSS data file: **Sex** and **Empathy**. These data come from the cyber-harassment study.

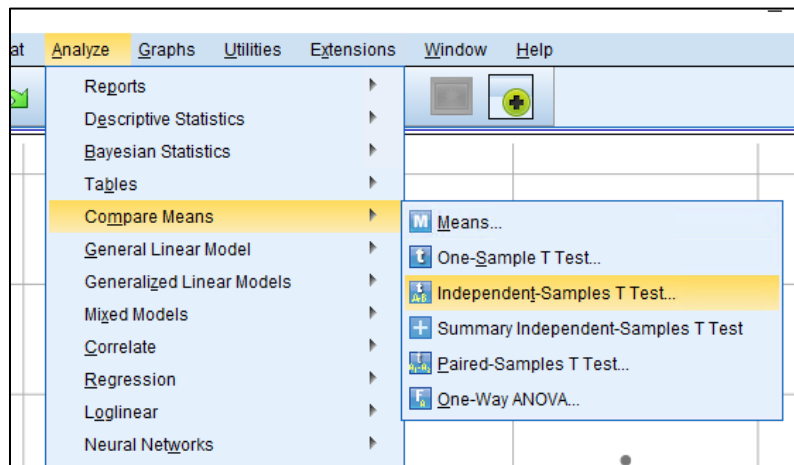
Does empathy differ by sex for GSU college students?

Empathy was measured by taking a mean composite score for responses to the following four items.

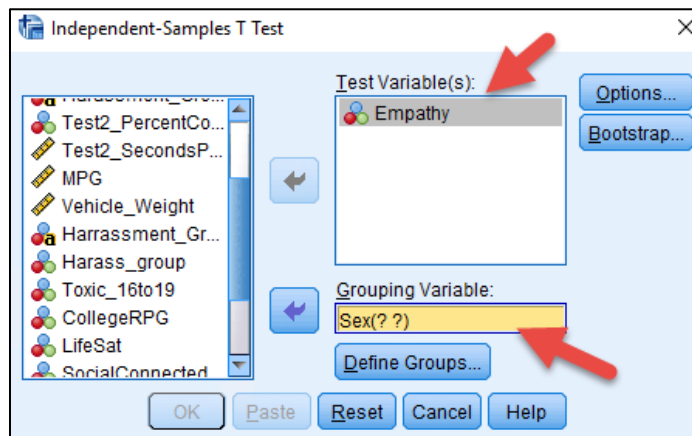
	Strongly Disagree	Disagree	Mix of Disagree and Agree	Agree	Strongly Agree
30. If a classmate is teased, I feel bad thinking about what is happening to him/her.	1	2	3	4	5
31. I am patient with people who do things worse than I do.	1	2	3	4	5
32. I feel the misfortunes of others.	1	2	3	4	5
33. When I see that a friend is sad, I also become sad.	1	2	3	4	5

Source for empathy items: Álvarez-García, D., Barreiro-Collazo, A., Núñez, J. C., & Dobarro, A. (2016). Validity and reliability of the Cyber-aggression Questionnaire for Adolescents (CYBA). *The European Journal of Psychology Applied to Legal Context*, 8(2), 69-77.

SPSS commands – Analyze, then Compare Means, then select Independent Samples t-test



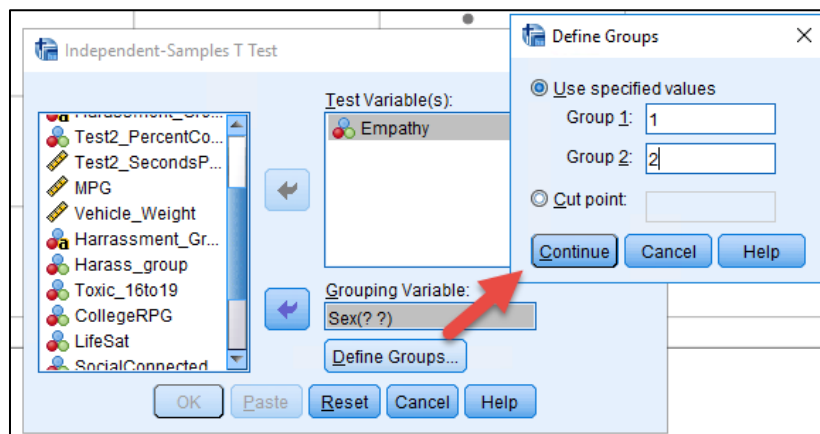
Next, move the **Empathy** variable to the Test Variables box, and move **Sex** to the Grouping Variables box.



Click on Define Groups and indicate the category numbers for the two groups involved. For these data, **Sex** is coded as follows:

- 1 = female
- 2 = male.

Once groups are identified in the Define Groups box, click Continue then OK to run the analysis.



SPSS results are presented below. First, the Group Statistics table shows the mean, standard deviation, sample size, and standard error of the mean for both groups. Note that males, group 2, have a lower mean **Empathy** score than females. The t-test helps us judge whether this observed mean difference is likely due to chance or a real difference between females and males.

The calculated t-value is 6.88 with a p-value of .000 which is less than traditional alpha levels of .05 and .01, so the null hypothesis of no mean difference in empathy between females and males can be rejected. This suggests the observed sample difference in empathy is likely due to a real difference in empathy between females and males. Females appear to demonstrate more empathy for others than males.

Group Statistics					
	Sex	N	Mean	Std. Deviation	Std. Error Mean
Empathy	1	415	4.027	.5198	.0255
	2	178	3.700	.5529	.0414

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Empathy	Equal variances assumed	.442	.506	6.887	591	.000	.3270	.0475	.2337	.4202
	Equal variances not assumed			6.719	317.171	.000	.3270	.0487	.2312	.4227

12. SPSS: ANOVA (Toxic Online Disinhibition and Cyber-harassment Groups)

ANOVA is mathematically identical to the t-test when a quantitative DV is compared between two groups. The benefit of ANOVA is that it can be more efficient, when compared to multiple t-tests, to compare more than two groups.

This example will use two variables from the SPSS data file: **Harass_Group3** and **Toxic_16to19**. These data come from the cyber-harassment study.

Harass_Group3 consists of three groups:

- Bullies and Victims
- Victims Only
- Neither Bully nor Victim (i.e., no cyber-harassment experience in college)
- The fourth group, Bullies Only, shown earlier was dropped from this analysis due to small sample size.

Toxic_16to19 is the label for toxic online disinhibition and refers to the extent to which one believes or feels free to engage in toxic, mean-spirited behavior while online. It is a composite variable formed from responses to four items, shown below. The composite was created by taking the mean of the four items for each respondent.

	Strongly Disagree	Disagree	Mix of Disagree and Agree	Agree	Strongly Agree
16. I don't mind writing insulting things about others online, because it's anonymous.	1	2	3	4	5
17. It is easy to write insulting things online because there are no repercussions.	1	2	3	4	5
18. There are no rules online therefore you can do whatever you want.	1	2	3	4	5

19. Writing insulting things online is not bullying.

1

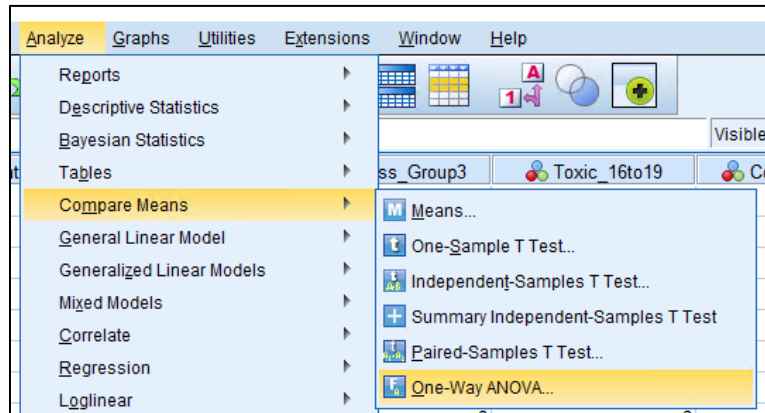
2

3

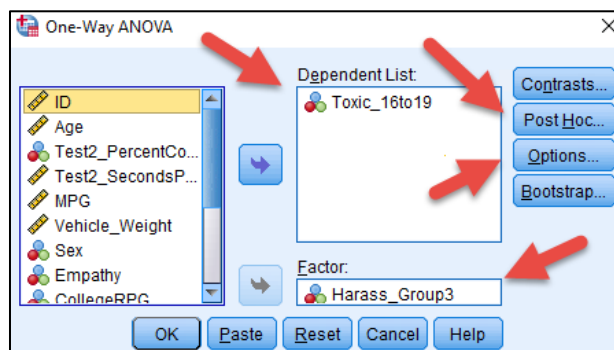
4

5

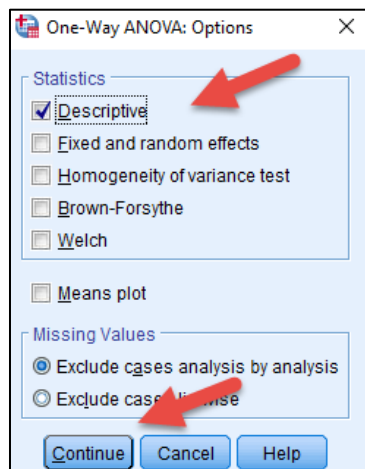
To begin the analysis, select Analyze, Compare Means, then One-way ANOVA.



Next, move the DV, **Toxic_16to19**, to the Dependent List, and move the IV, **Harass_Group3**, to the Factor box. Then click on Options and Post Hoc.



In Options, place a check mark next to Descriptive so means and standard deviations are provided for each group.



In the Post Hoc window, place a mark next to Bonferroni as the multiple comparison procedure used for comparing means across the three groups.

One-Way ANOVA: Post Hoc Multiple Comparisons

Equal Variances Assumed

☐ LSD ☐ S-N-K ☐ Waller-Duncan
☒ Bonferroni ☐ Tukey Type I/Type II Error Ratio: 100
☐ Sidak ☐ Tukey's-b ☐ Dunnett
☐ Scheffe ☐ Duncan Control Category: Last
☐ R-E-G-W F ☐ Hochberg's GT2 Test
☐ R-E-G-W Q ☐ Gabriel ☒ 2-sided ☐ < Control ☐ > Control

Equal Variances Not Assumed

☐ Tamhane's T2 ☐ Dunnett's T3 ☐ Games-Howell ☐ Dunnett's C

Significance level: 0.05

Continue Cancel Help

Click Continue then OK to run the analysis.

Results are presented below. The Descriptives table shows the means for each of the three groups. Given theory and prior research, one would expect those who engage in cyber-harassing behaviors would likely display higher levels of agreement with toxic online disinhibition; that is, bullies should feel freer to harass others than victims or those who have not experienced cyber-harassment. The means show this to be the case – bullies have higher toxic disinhibition scores than the other two groups.

Descriptives								
Toxic_16to19								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
No Victim or Bully	343	1.500	.5871	.0317	1.438	1.562	1.0	3.5
Victim and Bully	115	1.943	.7787	.0726	1.800	2.087	1.0	4.8
Victim Only	122	1.529	.5867	.0531	1.424	1.634	1.0	3.0
Total	580	1.594	.6522	.0271	1.541	1.647	1.0	4.8

ANOVA					
Toxic_16to19					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.597	2	8.798	22.202	.000
Within Groups	228.657	577	.396		
Total	246.254	579			

The ANOVA summary table shows an F ratio of 22.20 with a corresponding p-value of .000 which is less than alpha values of .05 and also .01, so the F ratio is significant which means the null hypothesis of no mean differences in toxic disinhibition among the three groups is rejected.

The multiple comparisons table below shows which group means differ. Results show the Victim and Bully group had means that were statistically higher than the No Victim/Bully group and the Victim Only group. In short, bullies had higher toxic disinhibition scores than the other respondents.

Multiple Comparisons						
Dependent Variable: Toxic_16to19						
Bonferroni						
(I) Harass_Group3	(J) Harass_Group3	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
No Victim or Bully	Victim and Bully	-.4435*	.0678	.000	-.606	-.281
	Victim Only	-.0287	.0664	1.000	-.188	.131
Victim and Bully	No Victim or Bully	.4435*	.0678	.000	.281	.606
	Victim Only	.4148*	.0818	.000	.218	.611
Victim Only	No Victim or Bully	.0287	.0664	1.000	-.131	.188
	Victim and Bully	-.4148*	.0818	.000	-.611	-.218

*. The mean difference is significant at the 0.05 level.

13. SPSS: Pearson Correlation (College RPG Convergent Validity Evidence)

Pearson correlation coefficient, r , can be used to assess the strength of linear relation between quantitative variables. Pearson r ranges from -1 (perfect negative relation) to 1 (perfect positive relation). Values closer to 0.00 indicate no linear relation or weak linear relation.

This analysis example will use seven variables from the SPSS data file; all come from the cyber-harassment study.

- **CollegeRPG:** A measure of student's progression and likely graduation from college. The four items listed below form this scale.

	No or almost never	Rarely	Sometimes	Often	Almost Always
4. Do you think about dropping out of university/college? (Reversed)	1	2	3	4	5
5. Do you think about transferring to another university/college? (Reversed)	1	2	3	4	5
6. Do you think about taking a break from university/college studies for a while and maybe returning later? (Reversed)	1	2	3	4	5

	Not at all Confident	Slightly Confident	Moderately Confident	Mostly Confident	Extremely Confident
7. How confident are you that you will graduate from a university/college?	1	2	3	4	5

Convergent validity is assessed by examining empirical relations among constructs that should be theoretically correlated. If the anticipated relations are found, this suggests the scales are measuring what they were designed to measure. The more relations examined and supported, the stronger the evidence of convergent validity.

In this example the goal is to examine evidence of convergent validity for scores obtained from the College RPG scale. Six constructs will be used to assess validity evidence of College RPG. Note that each construct listed below is answered within the context of college life.

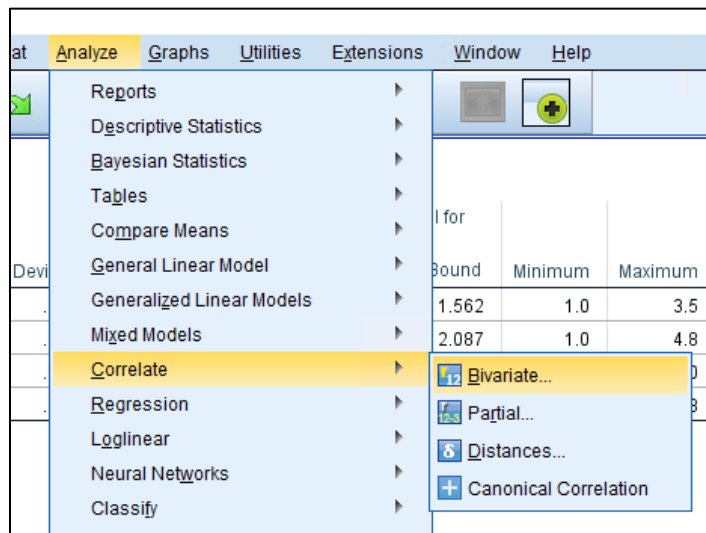
- **LifeSat:** Life satisfaction.
 - Example: In most ways my life is close to ideal.
- **SocialDisconnected:** Socially disconnected, an indication of lack of social relations.
 - Example: Other people seem to have more friends that I do.
- **UniConnected:** University Connectedness, a sense of belonging to the university environment.
 - Example: I am happy to be at this university.
- **AcaControl:** Academic Control, perceived ability to influence one's academic behavior.
 - Example: No matter what I do, I can't seem to do well in my courses.
- **Stress:** Kessler distress index, inability to cope with stressful situations.
 - Example: Since you started college, how often did you feel hopeless?
- **GPA:** Self-reported student grade point averages.

Complete scale items and citations for each of the above variables are provided in the appendix.

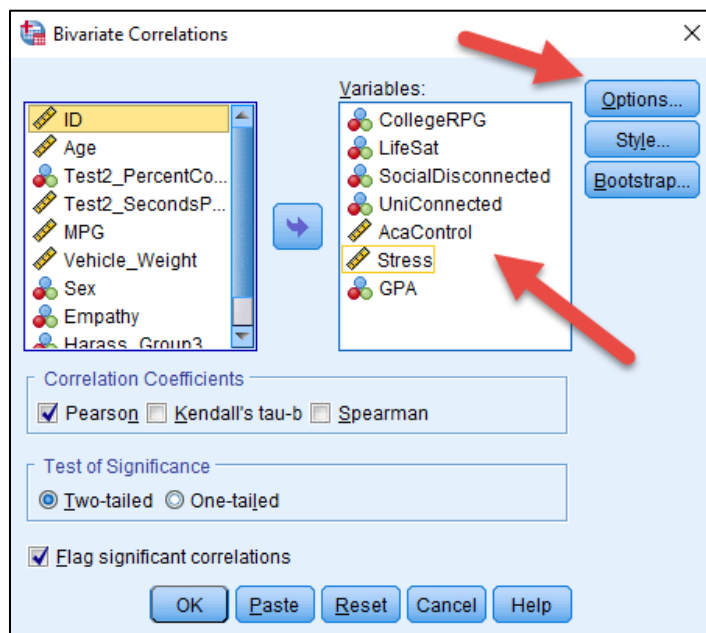
Since these correlations will be used to assess convergent validity evidence for the College RPG scale, it is necessary to form predictions about the nature of the correlations prior to calculating Pearson r values. Predictions are provided below; theoretical rationale for each prediction is not included here. Also included are few predictions about which correlations should be stronger since these select constructs are more closely aligned with academic functioning.

- **CollegeRPG and LifeSat:** Positive
- **CollegeRPG and SocialDisconnected:** Negative
- **CollegeRPG and UniConnected:** Positive - stronger
- **CollegeRPG and AcaControl:** Positive - stronger
- **CollegeRPG and Stress:** Negative
- **CollegeRPG and GPA:** Positive - stronger

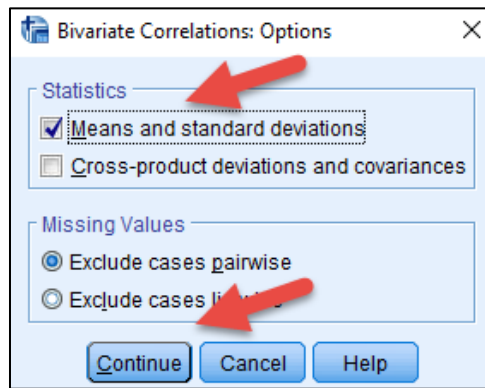
To obtain correlations, use Analyze, Correlate, then Bivariate.



Next select each of the study variables and move them to the Variables box. Tip – include the key variable first, **CollegeRPG**, because it is easier to read the table of correlations for this variable if listed first.



Click on the Options box and place a check next to Means and standard deviations to obtain descriptive statistics for each variable. The click on Continue and OK to obtain results.



SPSS results are provided below. The Descriptive Statistics table shows M, SD, and N for each variable.

Descriptive Statistics			
	Mean	Std. Deviation	N
CollegeRPG	4.1585	.73014	593
LifeSat	3.582	.7252	593
SocialDisconnected	2.61	.979	593
UniConnected	3.697	.7220	593
AcaControl	4.0183	.60308	593
Stress	2.50758853	.772187174	593
GPA	6.72	1.148	590

The Correlations table contains the information of interest for this study. How well does College RPG correlate with each criterion? Correlations are reproduced next to each prediction below and all are statistically significant at the .01 level.

- **$r = .39$ CollegeRPG and LifeSat: Positive**
- **$r = -.23$ CollegeRPG and SocialDisconnected: Negative**
- **$r = .48$ CollegeRPG and UniConnected: Positive - stronger**
- **$r = .38$ CollegeRPG and AcaControl: Positive - stronger**
- **$r = -.34$ CollegeRPG and Stress: Negative**
- **$r = .30$ CollegeRPG and GPA: Positive - stronger**

The directions of correlations (positive vs. negative) were consistent with expectations. Two of the three strongest correlations were as expected, University Connectedness and Academic Control, but Life Satisfaction was more strongly correlated with College RPG than anticipated. Overall the results provide good evidence for the convergent validity of the College PRG scale.

The SPSS Correlations table presents three bits of information for each bivariate relation examined: Pearson r value, p -value for the correlation (labeled as “Sig. (2-tailed)”), and sample size (N). Examples of reading information from the table follows.

Example 1

Correlation between College RPG (**CollegeRPG**) and Life Satisfaction (**LifeSat**)

- $r = .394^{**}$ (correlation is .394 hence positive, the ** means it is significant at .01 level)
- Sig (2-tailed) = .000 (p -value is .000; p -value is compared against alpha for hypothesis testing)
- $N = 593$ (sample size for correlation)

Example 2

Correlation between Grade Point Average (**GPA**) and Distress (**Stress**)

- $r = -.086^*$ (correlation is -.086 hence weak and negative, * means it is significant at .05 level)
- Sig (2-tailed) = .038 (p -value is .038; p -value is compared against alpha for hypothesis testing)
- $N = 590$ (sample size for correlation)

Correlations								
		CollegeRPG	LifeSat	SocialDisconnected	UniConnected	AcaControl	Stress	GPA
CollegeRPG	Pearson Correlation	1	.394**	-.228**	.475**	.375**	-.339**	.304**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	593	593	593	593	593	593	590
LifeSat	Pearson Correlation	.394**	1	-.308**	.444**	.313**	-.423**	.221**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	593	593	593	593	593	593	590
SocialDisconnected	Pearson Correlation	-.228**	-.308**	1	-.385**	-.106*	.420**	.009
	Sig. (2-tailed)	.000	.000		.000	.010	.000	.819
	N	593	593	593	593	593	593	590
UniConnected	Pearson Correlation	.475**	.444**	-.385**	1	.340**	-.338**	.169**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	593	593	593	593	593	593	590
AcaControl	Pearson Correlation	.375**	.313**	-.106*	.340**	1	-.269**	.298**
	Sig. (2-tailed)	.000	.000	.010	.000		.000	.000
	N	593	593	593	593	593	593	590
Stress	Pearson Correlation	-.339**	-.423**	.420**	-.338**	-.269**	1	-.086*
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.038
	N	593	593	593	593	593	593	590
GPA	Pearson Correlation	.304**	.221**	.009	.169**	.298**	-.086*	1
	Sig. (2-tailed)	.000	.000	.819	.000	.000	.038	
	N	590	590	590	590	590	590	590

**.

Correlation is significant at the 0.01 level (2-tailed).

*.

Correlation is significant at the 0.05 level (2-tailed).

Appendix

LifeSat, **SocialDisconnected**, and **UniConnected** were measured by the items listed below. Sources for each are also listed below.

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of personality assessment*, 49(1), 71-75.

Schreiner, L. A., Pothoven, S., Nelson, D., & McIntosh, E. J. (2009, November). College student thriving: Predictors of success and retention. In annual meeting of the Association for the Study of Higher Education, Vancouver, British Columbia.

Thompson, D. R., Iachan, R., Overpeck, M., Ross, J. G., & Gross, L. A. (2006). School connectedness in the health behavior in school-aged children study: the role of student, school, and school neighborhood characteristics. *Journal of School Health*, 76(7), 379-386.

8 9 10 11 12 = Life Satisfaction alpha = .85	Strongly Disagree	Disagree	Mix of Disagree and Agree	Agree	Strongly Agree
8. In most ways my life is close to ideal.	1	2	3	4	5
9. The conditions of my life are excellent.	1	2	3	4	5
10. I am satisfied with my life.	1	2	3	4	5
11. So far I have gotten the important things I want in life.	1	2	3	4	5
12. If I could live my life over, I would change almost nothing.	1	2	3	4	5
13 14 15 = Socially Connected alpha = .73 (.80 if 13 removed)					
13. Other people seem to have more friends than I do.	1	2	3	4	5
14. I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5
15. I don't have many people who want to listen when I need to talk.	1	2	3	4	5
35 to 39 = University Connectedness alpha = .81					
35. I feel close to people at this university.	1	2	3	4	5
36. I am happy to be at this university.	1	2	3	4	5
37. I feel like I am a part of this university.	1	2	3	4	5
38. The instructors at this university treat students fairly.	1	2	3	4	5
39. I feel safe in this university.	1	2	3	4	5

The Academic Control Scale, **AcaControl**, was used and consists of the following eight items.

Stupnisky, R. H., Renaud, R. D., Daniels, L. M., Haynes, T. L., & Perry, R. P. (2008). The interrelation of first-year college students' critical thinking disposition, perceived academic control, and academic achievement. *Research in Higher Education*, 49(6), 513.

40 to 47 = Academic Control $\alpha = .85$	Strongly Disagree	Disagree	Mix of Disagree and Agree	Agree	Strongly Agree
40. My grades are basically determined by things beyond my control and there is little I can do to change.	1	2	3	4	5
41. I see myself as largely responsible for my performance throughout my college career.	1	2	3	4	5
42. No matter what I do, I can't seem to do well in my courses.	1	2	3	4	5
43. There is little I can do about my performance in college/university.	1	2	3	4	5
44. The more effort I put into my courses, the better I do in them.	1	2	3	4	5
45. How well I do in my courses is often the "luck of the draw."	1	2	3	4	5
46. I have a great deal of control over my academic performance in my courses.	1	2	3	4	5
47. When I do poorly in a course, it's usually because I haven't given it my best effort.	1	2	3	4	5

The Kessler distress scale, short form K6, was used to measure distress. Items appear below.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L., ... & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological medicine*, 32(6), 959-976.

54 to 59 = Kessler Stress $\alpha = .84$	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Since you started college, how often did you feel ...					
54. So sad that nothing could cheer you up?	1	2	3	4	5
55. Nervous?	1	2	3	4	5
56. Restless or fidgety?	1	2	3	4	5
57. Hopeless?	1	2	3	4	5
58. That everything was an effort?	1	2	3	4	5
59. Worthless?	1	2	3	4	5

Lastly, GPA was measured by the following item.

3. What is your university grade point average (GPA) – if you don't know precisely, please estimate your GPA:

1. 0.00 to 0.50
2. 0.51 to 1.00
3. 1.01 to 1.50
4. 1.51 to 2.00
5. 2.01 to 2.50
6. 2.51 to 3.00
7. 3.01 to 3.50
8. 3.51 to 4.00