Survey Design

Due at the Start of Lab: Lab Assignment 3

Rationale for Today's Lab Session

This tutorial supplements your lecture notes on "Measurement" by providing you with basic analytic skills needed for developing useful surveys. The field of psychometrics, which refers to the development and evaluation of tests and surveys, is relatively unique to psychology. You will practice these skills further in your lab assignment, and many of you that go on to be involved with research will use these skills regularly. Tulane's lab course Testing and Measurement (PSYC 3180) focuses extensively on these skills.

Instructions

Warning
SPSS periodically changes the visual display and organization of menus. The instructions presented in this tutorial may need to be augmented marginally depending on the version of SPSS you are using. If you get stuck, use Google, or ask the lab instructor for help.

Accessing SPSS
Once you log on, go to the Start menu in the lower left corner of the screen and find SPSS. If you have difficulty finding it, ask the lab assistant for help.

Data File
For this tutorial, you will use the DGI Data Set in the Week 10 folder on Canvas (see Canvas →
Data Files → Week 10 → DGI Data Set). Participants in the study completed a 35-item survey called the Delaying Gratification Inventory (DGI-35; Hoerger et al., 2011, Study 2), which assesses the extent to which people defer immediate pleasure for the sake of long-term rewards (e.g., studying instead of partying for the sake of long-term achievement outcomes). The data set includes 7,771 participants from that study and only includes data from a short-form of the DGI-35, which was a 10-item version called the DGI-10. The wording of each survey item is noted in Variable View the Label column in the SPSS data file. This tutorial walks you through how to examine some of the basic psychometrics (statistical properties) of the 10-item scale and how to devise a leaner 5-item scale from the best items.

Review

Using the SPSS file, find the following information. If you get stuck, review the previous SPSS tutorial and/or seek help from the lab instructor. If your neighbor is stuck on this tutorial, feel free to help them.

1. Participants responded to each survey item using a 5-point response scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Examine histograms and descriptive statistics for each item (Mean, Median, Mode, SD, minimum, maximum, frequencies). Do participants use all five of the response options? Are there any items with more skewed distributions than others?

2. Make a correlation table that includes all ten of the items. All of the items are designed to measure the same construct – delay of gratification – so they should generally correlate with each other. Why are some of the correlations negative?

Reverse-Coding Variables

In your correlation table, you noted that some of the variables had negative correlations. This is because some of the survey items are positively coded, such that higher scores indicate higher levels of delay of gratification (e.g., "I have given up physical pleasure or comfort to reach my goals"). Other survey items are negatively coded, such that higher scores indicate lower levels of delay of gratification (e.g., "I cannot motivate myself to accomplish long-term goals"). Usually surveys perform better statistically if they have a mix of positively and negatively coded items because this combination reduces the likelihood of some responses biases, such as a participant merely choosing "strongly agree" for every item.

In order to produce a total score for each participant and examine some scale properties, such as internal consistency reliability (Cronbach's alpha), the negatively coded items need to be reverse-coded. In the present data set, five items need to be reverse-coded: dgi6, dgi19, dgi23, dgi25, and dgi27.

Go to the Transform menu and select Recode Into Same Variables.
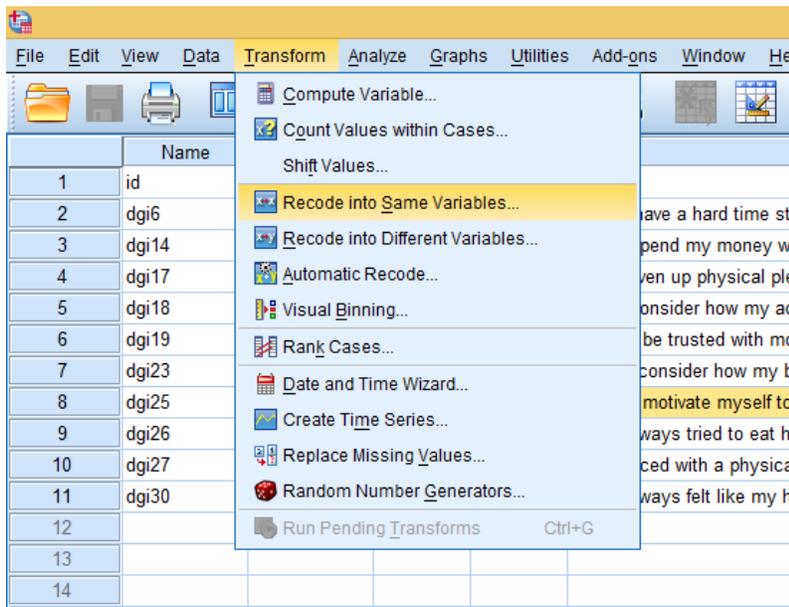
VERY CAREFULLY select and move the five negatively coded items (dgi6, dgi19, dgi23, dgi25, and dgi27) to the right pane. Check this very closely, as messing up this step will mess up how the variables are coded and cause all future analyses to be incorrect.
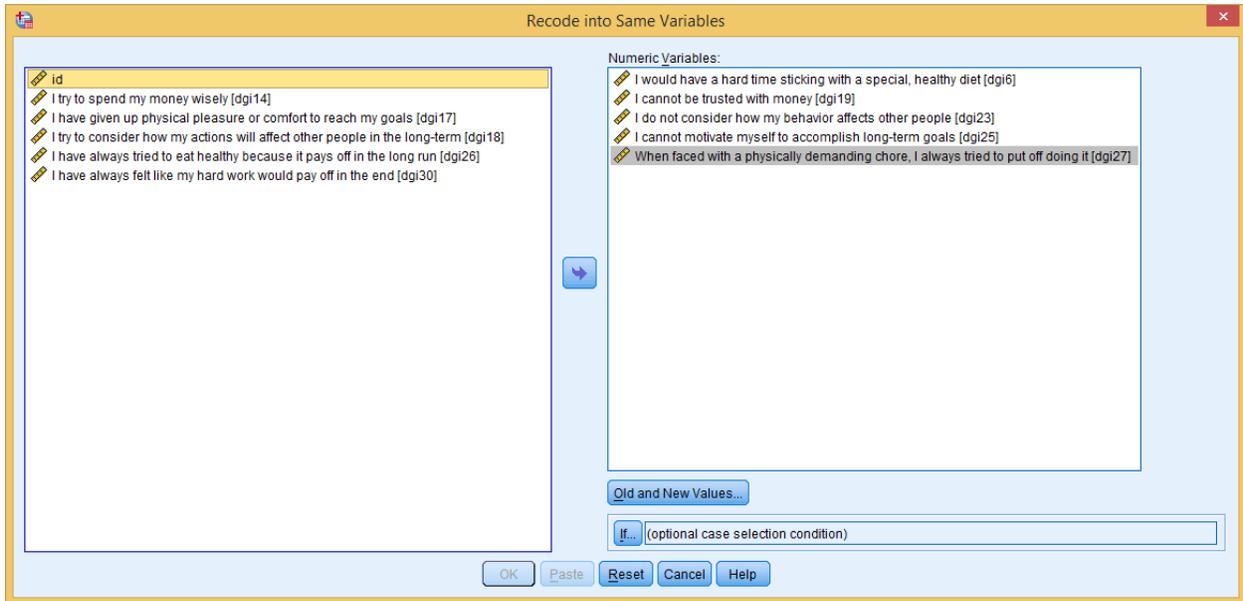
Click on the button marked Old and New Values. In the window that pops up, type a "1" (without quotation marks) where it says Value in the Old Values section. Then, type a "5" (without quotes) were it says Value in the New Values section. Then, click on the Add button.
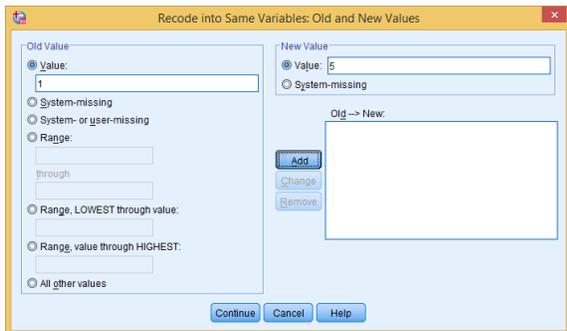
Notice that the "Old→New" box now says "1→5"
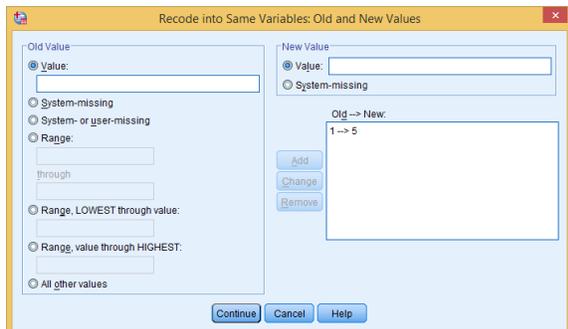
Repeat this step to change an old value of 2 into a new value of 4, then an old value of 3 into a new value of 3, then an old value of 4 into a new value of 2, and an old value of 5 into a new value of 1. Since the survey used a 5-point scale, this will reverse how each of the negatively-coded items are scored in the data set.

Recode into Same Variables: Old and New Values

Old Value
- ◉ Value: [ ]
- ○ System-missing
- ○ System- or user-missing
- ○ Range: [ ] through [ ]
- ○ Range, LOWEST through value: [ ]
- ○ Range, value through HIGHEST: [ ]
- ○ All other values

New Value
- ◉ Value: [ ]
- ○ System-missing

Old --> New:
```
1 --> 5
2 --> 4
3 --> 3
4 --> 2
5 --> 1
```
Add | Change | Remove

Continue | Cancel | Help
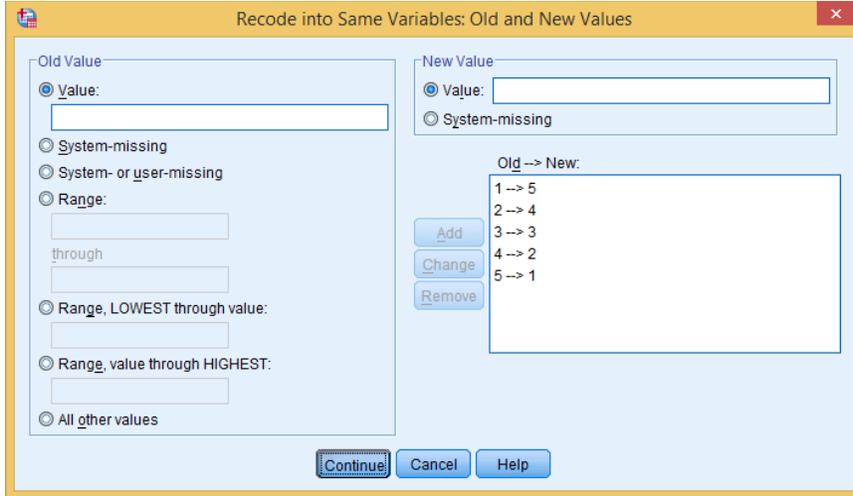
Press Continue and then OK.

The five items have now been recoded. Rerun the correlation table from earlier. Notice that most of the items are now positively correlated because they are all coded in the same direction, such that higher scores indicate increased tendencies to delay gratification.

Correlations

		I would have a hard time sticking with a special, healthy diet	I have always tried to eat healthy because it pays off in the long run	I have given up physical pleasure or comfort to reach my goals	When faced with a physically demanding chore, I always tried to put off doing it	I try to consider how my actions will affect other people in the long-term	I do not consider how my behavior affects other people	I try to spend my money wisely	I cannot be trusted with money	I cannot motivate myself to accomplish long-term goals	I have always felt like my hard work would pay off in the end
I would have a hard time sticking with a special, healthy diet	Pearson Correlation	1	.448**	.195**	.248**	.111**	.093**	.178**	.182**	.265**	.151**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I have always tried to eat healthy because it pays off in the long run	Pearson Correlation	.448**	1	.227**	.285**	.200**	.149**	.287**	.213**	.300**	.267**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I have given up physical pleasure or comfort to reach my goals	Pearson Correlation	.195**	.227**	1	.288**	.288**	.191**	.269**	.200**	.353**	.304**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
When faced with a physically demanding chore, I always tried to put off doing it	Pearson Correlation	.248**	.285**	.288**	1	.265**	.260**	.322**	.339**	.480**	.322**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I try to consider how my actions will affect other people in the long-term	Pearson Correlation	.111**	.200**	.288**	.265**	1	.587**	.273**	.217**	.302**	.290**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I do not consider how my behavior affects other people	Pearson Correlation	.093**	.149**	.191**	.260**	.587**	1	.257**	.249**	.264**	.226**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I try to spend my money wisely	Pearson Correlation	.178**	.287**	.269**	.322**	.273**	.257**	1	.486**	.291**	.303**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I cannot be trusted with money	Pearson Correlation	.182**	.213**	.200**	.339**	.217**	.249**	.486**	1	.301**	.257**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I cannot motivate myself to accomplish long-term goals	Pearson Correlation	.265**	.300**	.353**	.480**	.302**	.264**	.291**	.301**	1	.476**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771
I have always felt like my hard work would pay off in the end	Pearson Correlation	.151**	.267**	.304**	.322**	.290**	.226**	.303**	.257**	.476**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	7771	7771	7771	7771	7771	7771	7771	7771	7771	7771

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

Summated Scale Scores

Now that all of the items are coded in the same direction, it is easy to make a total score. There are many ways to make a total score. The simplest way is just to add up the scores from each of the ten items, and this is often called a "summated scale score" (meaning the scores were just summed or added). Other times, researchers may use more complex methods, such as weighting individual items differently, standardizing (Z-scoring) items and then adding them, or making any number of different types of factor scores. For this tutorial, we will just make a summated scale score.

Go to the Transform menu and choose Compute Variable.
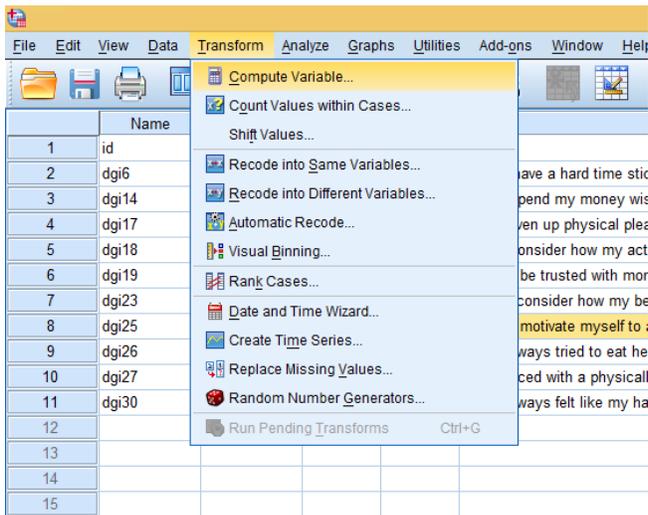
Where is says Target Variable, type "total" or something similar, which will be a new variable name for the summated scale score we are computing. Where it says Numeric Expression, we need to enter an equation. Click on the first DGI variable, then the arrow to move it to the Numeric Expression pane. Then type a plus sign (+). Then, enter the next variable, then another plus sign. Continue until all variables are entered. The window should look like the following. It is easy to accidentally miss a variable or enter a variable more than once, so check that you have included all ten variables, that each variable is different, and that they're each separated by plus signs.
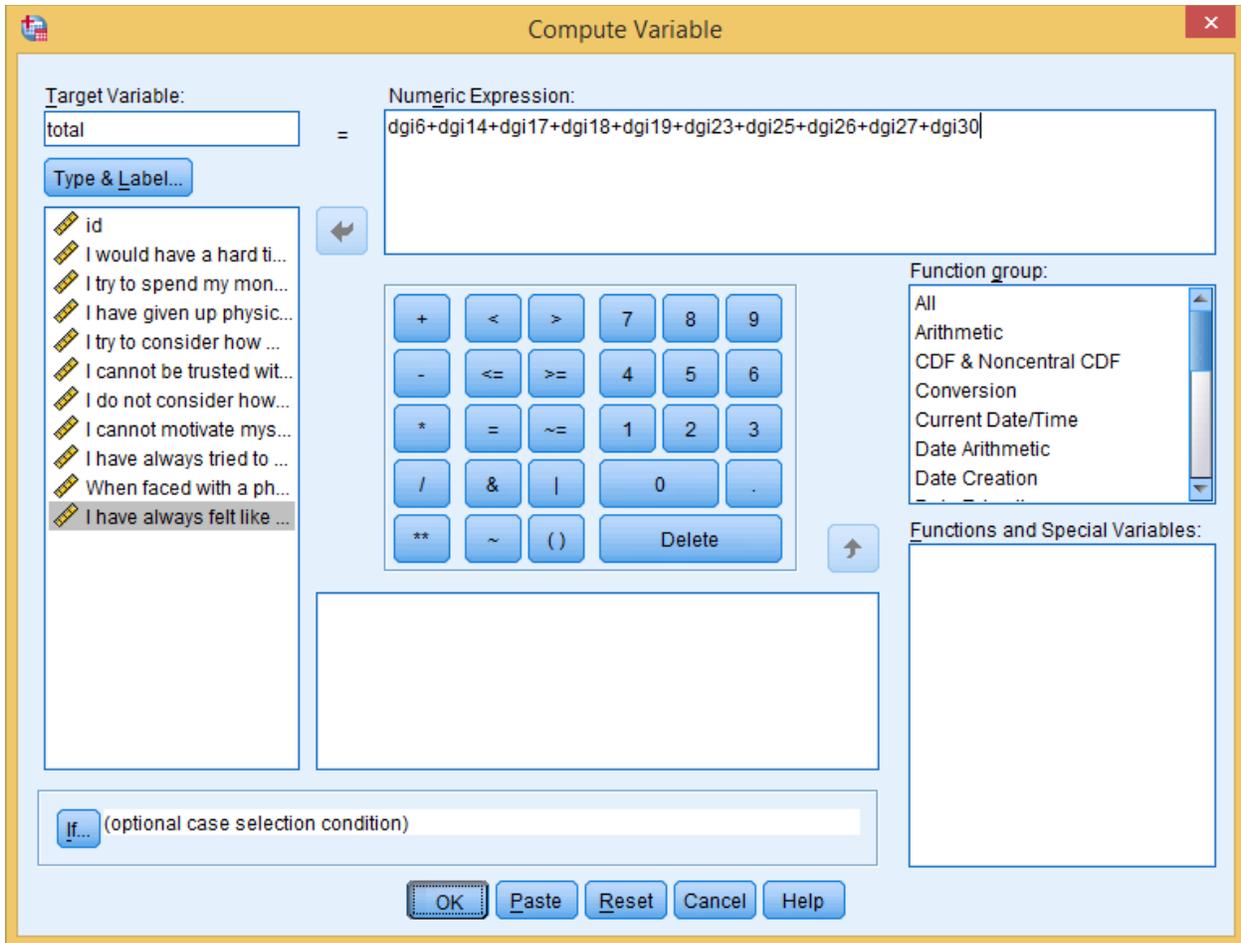
Click the OK button.

Under Variable View, give the new variable a descriptive Label, such as "DGI-10 Summated Scale Score"

Using the Frequencies command, examine the histogram and descriptive statistics for the summated scale score (Mean, Median, Mode, SD, minimum, maximum). If you have executed the steps correctly, you should get the following descriptive statistics and a comparable histogram (histograms may vary slightly across SPSS versions due to default bin settings). Overall, the scale is pretty reasonable. The scores are mainly normally distributed, cover a broad range of values, and have a slight negative (left-sided) tail, which means the survey can detect very-low (pathological) levels of preferences for delay of gratification (people who only seek immediate pleasures).

Statistics

DGI-10 Summated Scale Score

N	Valid	7771
	Missing	0
Mean		36.3245
Median		37.0000
Mode		38.00
Std. Deviation		6.74175
Minimum		11.00
Maximum		50.00

Histogram

Mean = 36.32
Std. Dev. = 6.742
N = 7,771
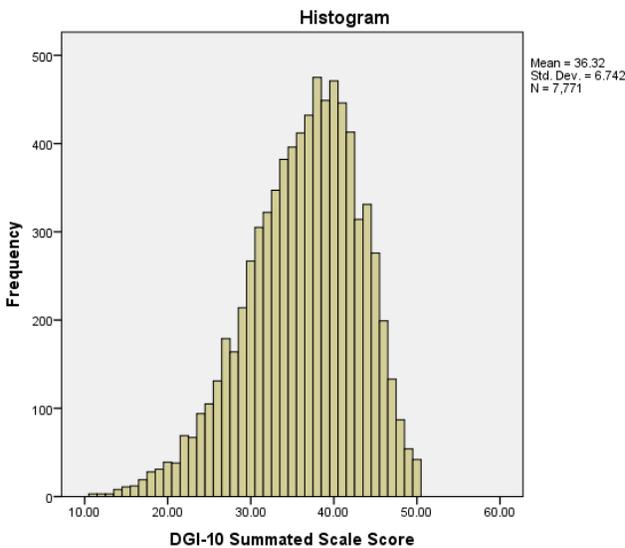
Next, run a correlation table. Put the total score in first, and then each of the ten items. The first column in the Output will tell you how well each item correlates with the total score, which can give you a rough estimate of which item is the "best" indicator of delay of gratification. If you could only ask 1 of the 10 questions to assess delay of gratification, which single question would you ask?

		DGI-10 Summated Scale Score	I would have a hard time sticking with special, healthy die
DGI-10 Summated Scale Score	Pearson Correlation	1	.516
	Sig. (2-tailed)		.00
	N	7771	777
I would have a hard time sticking with a special, healthy diet	Pearson Correlation	.516[**]	
	Sig. (2-tailed)	.000	
	N	7771	777
I try to spend my money wisely	Pearson Correlation	.595[**]	.178
	Sig. (2-tailed)	.000	.00
	N	7771	777
I have given up physical pleasure or comfort to reach my goals	Pearson Correlation	.575[**]	.195
	Sig. (2-tailed)	.000	.00
	N	7771	777
I try to consider how my actions will affect other people in the long-term	Pearson Correlation	.566[**]	.111
	Sig. (2-tailed)	.000	.00
	N	7771	777
I cannot be trusted with money	Pearson Correlation	.561[**]	.182
	Sig. (2-tailed)	.000	.00
	N	7771	777
I do not consider how my behavior affects other people	Pearson Correlation	.514[**]	.093
	Sig. (2-tailed)	.000	.00
	N	7771	777
I cannot motivate myself to accomplish long-term goals	Pearson Correlation	.709[**]	.265
	Sig. (2-tailed)	.000	.00
	N	7771	777
I have always tried to eat healthy because it pays off in the long run	Pearson Correlation	.587[**]	.448
	Sig. (2-tailed)	.000	.00
	N	7771	777
When faced with a physically demanding chore, I always tried to put off doing it	Pearson Correlation	.664[**]	.248
	Sig. (2-tailed)	.000	.00
	N	7771	777
I have always felt like my hard work would pay off in the end	Pearson Correlation	.604[**]	.151
	Sig. (2-tailed)	.000	.00
	N	7771	777

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

Internal Consistency Reliability (Cronbach's alpha)

Cronbach's alpha provides one indicator of reliability and is easily computed in SPSS. Importantly, all negative items must be reverse-coded (as we already did), or SPSS will mistakenly compute Cronbach's alpha incorrectly (very low, near zero, or even taking impossible, negative values). To determine Cronbach's alpha, go to the Analyze menu, point to Scale, and choose Reliability Analysis.
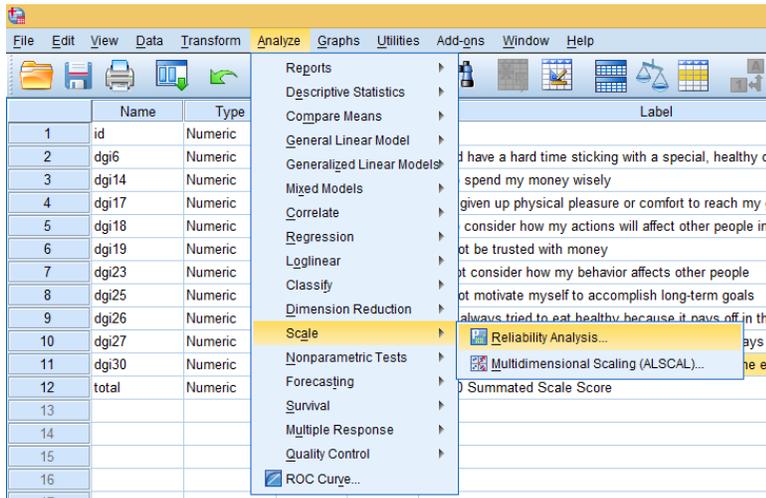
Enter the 10 individual items (but not ID, and not the total score). Then, click OK. The Output should tell you that Cronbach's alpha was .79 and there were 10 items.

Reliability Statistics
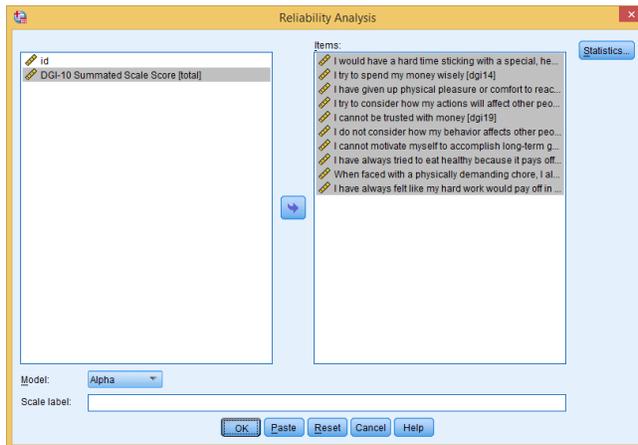
Cronbach's Alpha	N of Items
.790	10

Often, the following adjectives are used to describe Cronbach's alpha: unacceptable ($\alpha < .50$), poor (α from .50 to .59), fair (α from .60 to .69), acceptable (α from .70 to .79), good (α from .80 to .89), and excellent ($\alpha \geq .90$). In APA-style, one might summarize the finding as "The 10-item scale measured delay of gratification with acceptable internal-consistency reliability (Cronbach's $\alpha = .79$)."

Producing Short Forms (Brief Surveys)

There are many situations in which researchers need to develop brief versions of surveys and tests. One of the most common occurrences is when a researcher has developed and used a new survey for a particular study. They may have written 20 survey items knowing that several or many would perform poorly psychometrically (e.g., correlated weakly with other items or in the opposite direction of what was anticipated), and therefore derive a shorter survey for use in further analyses and perhaps future studies. To practice this, we will derive a five-item scale reflecting the "best" items from the DGI-10.

To begin, go to the Analyze menu, point to Scale, and choose Reliability again. This time, click on the button labeled Statistics.
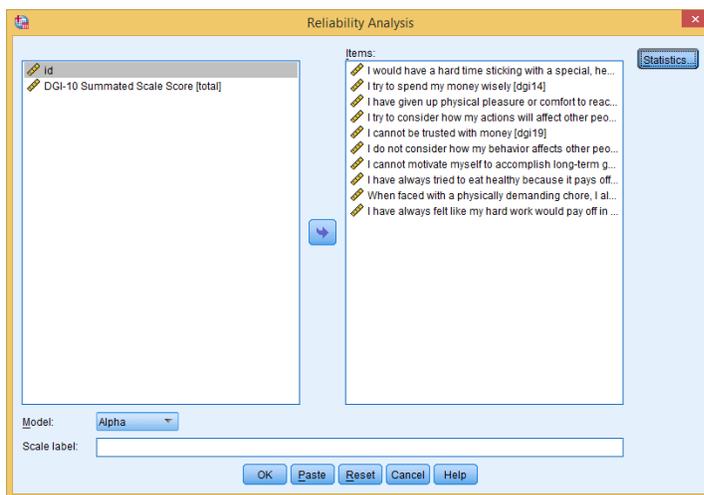
There are many options that can provide useful information for different analyses. Click to select Descriptives for Item, Scale, and Scale if item deleted. Click Continue and then OK.
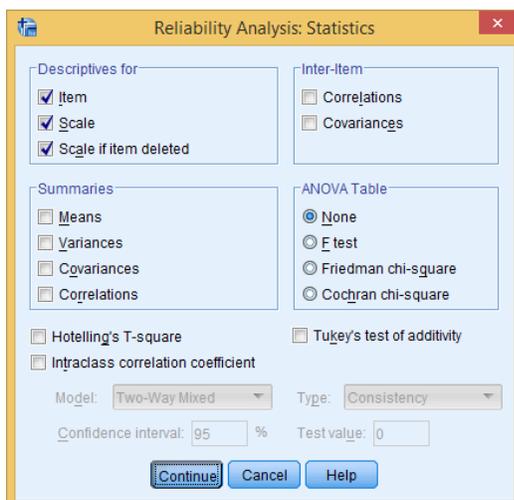
SPSS can only compute Cronbach's alpha if the variables are coded in the same direction, which is one reason we needed to reverse-coded the negatively coded items in the first place.

In the far-right column of the 4th box in the Output, you will see a column labeled "Cronbach's Alpha if Item Deleted," which tells you what would happen to Cronbach's alpha if any particular item were deleted from the 10-item scale to make a 9-item scale. Notice that the first item has the highest value (.786) in that column, meaning that of all the items that could be deleted, deleting the first one would do the least to bring down Cronbach's alpha. In contrast, deleting the 7th item listed would bring Cronbach's alpha down the most (to .755), as it is arguably the best indicator of the construct or "best" item.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I would have a hard time sticking with a special, healthy diet	33.5333	38.110	.353	.786
I try to spend my money wisely	32.2413	38.622	.490	.769
I have given up physical pleasure or comfort to reach my goals	33.1372	37.335	.431	.775
I try to consider how my actions will affect other people in the long-term	32.3386	38.910	.454	.773
I cannot be trusted with money	31.9591	38.868	.446	.773
I do not consider how my behavior affects other people	32.0288	39.954	.404	.778
I cannot motivate myself to accomplish long-term goals	32.9319	34.176	.581	.755
I have always tried to eat healthy because it pays off in the long run	33.0548	37.381	.451	.773
When faced with a physically demanding chore, I always tried to put off doing it	33.2944	35.457	.533	.762
I have always felt like my hard work would pay off in the end	32.4015	37.949	.490	.768

Rerun the analyses, this time removing the first item.
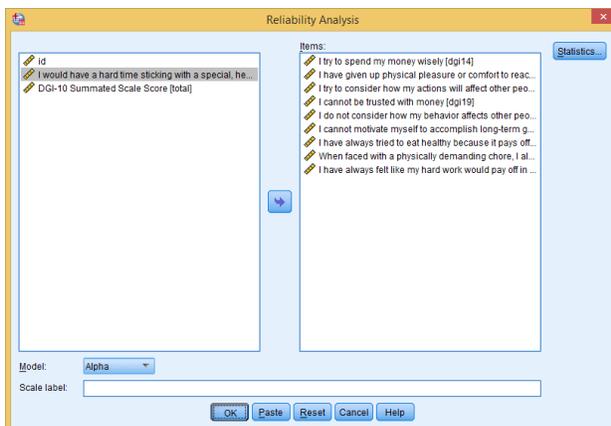
The relevant Output looks like this:

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I try to spend my money wisely	29.4500	31.729	.499	.763
I have given up physical pleasure or comfort to reach my goals	30.3459	30.626	.430	.773
I try to consider how my actions will affect other people in the long-term	29.5473	31.853	.476	.766
I cannot be trusted with money	29.1678	31.999	.450	.769
I do not consider how my behavior affects other people	29.2375	32.832	.425	.773
I cannot motivate myself to accomplish long-term goals	30.1407	27.784	.579	.749
I have always tried to eat healthy because it pays off in the long run	30.2635	31.437	.388	.778
When faced with a physically demanding chore, I always tried to put off doing it	30.5032	28.956	.530	.757
I have always felt like my hard work would pay off in the end	29.6102	31.022	.507	.761

Of the remaining items, "I always tried to eat healthy…" has the highest value (.778), meaning it can be deleted while harming Cronbach's alpha the least. Rerun the analyses again removing that item. Continue to delete the "worst" item and rerun the analyses until left with a 5-item scale. It should have an alpha of .73 and include just these 5 items: dgi14, dgi19, dgi25, dgi27, dgi30.

Reliability Statistics

Cronbach's Alpha	N of Items
.732	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I try to spend my money wisely	14.7112	12.007	.470	.697
I cannot be trusted with money	14.4290	11.883	.464	.698
I cannot motivate myself to accomplish long-term goals	15.4019	9.463	.557	.662
When faced with a physically demanding chore, I always tried to put off doing it	15.7644	10.072	.521	.676
I have always felt like my hard work would pay off in the end	14.8714	11.530	.480	.692

Lab Assignment

You are now ready to begin working on your next homework assignment, "Lab Assignment 4" (see "Due" column on the Course Calendar). Note that you have a little breathing room on the deadline since this is a crazy week and you will want to recovery during spring break. However, delay some gratification and get moving on it early so you're not swamped preparing for Paper 2 at the last minute!

Dismissal

The lab instructor can dismiss students after they have developed a plan for the lab assignment.