Interpreting Statistics Jigsaw Activity

Interactive Session
Time: 135 minutes

Part of working with empirical scientists, including psychologists, means interacting with data. While it is not the role of theologians or philosophers to be responsible for statistical analysis as part of a collaborative research relationship, having been exposed to statistics can empower theologians and philosophers to be more confident contributors to discussion of research results. In this session, trainees will practice interpreting statistical results and then will solidify their understanding by teaching another trainee how to interpret the results. The goals of this session are to:

1. Interpret a set of statistical results, increasing in complexity as trainees are comfortable
2. Write a 1-2 sentence summary of those results
3. Teach another trainee how to interpret these results

This session uses a *jigsaw* procedure wherein trainees are split into small groups to become experts on a particular subject. During a second part of the procedure, trainees are mixed into new groups with trainees who gained expertise in different subjects during the first part of the procedure. Collectively, their unique experiences will inform the group's discussion or completion of a task in the second part of the procedure. The number of groups can be adjusted based on the number of trainees and the availability of psychological scientists, however, we recommend approximately 4-5 trainees per group.

Materials:

- Experimental method & results examples
  - Least challenging
  - More challenging
  - Most challenging
- Regression method & results examples
  - Least challenging
  - More challenging
  - Most challenging
- Additional example – this may replace one of the prior examples, may be used as a novel, large group discussion to conclude.

Part 1 (60 minutes): In this session, trainees are divided into small groups and are placed with 1-2 psychological scientist facilitators. Trainees will be given a set of statistical results and a portion of a method section; these may be fabricated or may be simplified from published research. Trainees will work together in their small groups to understand the study design, measures, and procedures, and then they will look at the

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statistical results to interpret what the researchers found. While trainees will have a psychological scientist as part of their teams to help guide discussion and answer questions, trainees should be encouraged to rely on each other and challenge each other to tackle the results together; the extent to which trainees are encouraged to be independent in their discussions should be tailored to the amount of prior exposure to statistical methods trainees have. After trainees feel comfortable with their interpretation of the results, they should write a 1-2 sentence summary, similar to what would be found at the beginning of a discussion section.

After the group feels comfortable with the first set of results and writes a summary, the psychological scientist working with the group will produce a second set of results. These results will be related to the first set but will be more complicated. Once again, trainees will have a psychologist to ask questions of and provide support if needed, but trainees should be encouraged to primarily rely on each other to work through the results (again, depending on the level of prior exposure to statistics trainees have). If groups are successful in interpreting the second set of results, psychological scientists should have a third set of results ready that are even more complicated that trainees can work through.

Trainees should take up to 60 minutes to work through the three sets of results. While it is important that there are at least two different sets of results, facilitators may choose to have more than two different sets of results. Trainees should be encouraged to ask questions and make sure they feel comfortable with the interpretation of the results their group is given. It may be useful to disclose to trainees that in Part 2 of the session, they will be responsible for working with another trainee to *teach* other trainees about the interpretation of the results.

Part 2 (75 minutes): The next session builds off what trainees completed in Part 1. The one difference is that in this session, *trainees* are the expert on the interpretation of the results and it's now their job to teach the other trainees about your results, helping them to move towards writing the same 1-2 sentence summary of the results that small groups completed in Part 1.

Trainees should be mixed up into slightly different small groups. Within each group, it is important to ensure that there are trainees who saw different results in Part 1; if possible, it is helpful to have two trainees who saw the same set of results among a group of 4-6 trainees. Trainees who saw each set of results will teach the other trainees about their results. Trainees can function similarly to a psychologist in this way; let the other trainees (who did not see the set of results under discussion) try to interpret the results, but trainees can step in to provide clarity and guidance. Psychological scientists should still be present with each group, but since trainees are now the experts on the results after Part 1, the psychological scientist should only step in if trainees have significant questions or if challenges arise.

Facilitators can choose to spend as much time on this session as needed. We recommend spending at least 30 minutes on each set of results. Trainees may have seen increasingly complex sets of results within their groups during Part 1. If teams feels comfortable with the simplest set of results during this session, trainees can also introduce a more complex set of results. However, focus on making sure that all trainees are comfortable with the simplest results first. If there is time and interest, trainees may collectively or independently interpret on the final (two-page) set of results.

Experimental Example 1

Background: Prior research has established a relationship between religiosity and prosocial behavior (e.g., helping), but less research has examined the relationship between spirituality and helping. Relying on Piedmont's (1999) theory, spiritual transcendence (ST) was defined as "the capacity of individuals to stand outside of their immediate sense of time and place to view life from a larger, more objective perspective" (p. 988). This theory suggests that ST can be either religious (e.g., ST related to prayer, connection with God, etc.) or nonreligious (e.g., belief that the universe connects all people) in nature.

Research question: Do religious ST and nonreligious ST differentially affect prosocial behaviors?

Participants and procedure: Participants were 95 high school students (M_{age} = 17.32, 72.6% female). After completing the scrambled-sentence paradigm, participants read a description of work completed at the community therapeutic center before recording the number of hours they were willing to work. A scrambled-sentence paradigm was used to prime religious and nonreligious ST activation in two groups of participants (Shariff & Norenzayan, 2007; Srull & Wyer, 1979). In this paradigm, participants unscramble sets of words to form coherent sentences. Participants in the religious ST Activation group unscrambled sets like "dessert, divine, was, fork, this" whereas participants in the nonreligious ST Activation group unscrambled sets like "connected, are, table, people, all."

Measures:

- Helping behavior was measured as the number of hours participants were willing to spend working as volunteers for a local community therapeutic center.

Results:

Two sample t-test results: Dependent variable is reported helping behavior

Condition	*M* (*SD*)	*t*(*df*)	*p*
		-0.14(50)	.445
Religious ST Activation	7.97 (17.18)		
Nonreligious ST Activation	7.44 (11.31)		

Note. *M* = Mean; *SD* = Standard Deviation

The statistics here are fabricated, but are based off real results from Piotrowski, J. P., & Żemojtel-Piotrowska, M. (2022). Spiritual transcendence and helping behavior: Helping toward ingroups and outgroups. *Psychology of Religion and Spirituality*, *14*(4), 525.

Other references:

Piedmont, R. L. (1999). Does spirituality represent the sixth factor of personality? Spiritual transcendence and the five-factor model. *Journal of Personality*, *67*, 985–1013. http://dx.doi.org/10.1111/1467-6494 .00080

Shariff, A. F., & Norenzayan, A. (2007). God is watching you: Priming God concepts increases prosocial behavior in an anonymous economic game. *Psychological Science*, *18*, 803–809. http://dx.doi.org/10.1111/j .1467-9280.2007.01983.x

Srull, T. K., & Wyer, R. S., Jr. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology*, *37*, 1660–1672. http://dx.doi.org/10.1037/0022-3514.37.10.1660

Experimental Example 2

Research question: Do religious ST and nonreligious ST each increase prosocial behavior?

Participants and procedure and measures: Participants were 120 college students in a predominately Catholic country who were taking a psychology course (M_{age} = 22.26, 66.6% female). The procedure and measures were the same as before, but with the addition of a neutral control condition. Participants in the control condition unscrambled sets of words like, "wall, on, hangs, picture, table, the."

One-Way ANOVA results: Dependent variable is reported helping behavior

Condition	*M*(*SD*)	*F*(2, 32)	*p*
		2.74	<.001
Religious ST Activation	7.05(4.01)		
Nonreligious ST Activation	4.43(2.16)		
Control Condition	3.33(1.24)		

Planned comparisons produced the following results:

- religious ST Activation vs. control condition: $t(92) = 5.89$, $p < .001$
- religious ST Activation vs. nonreligious ST activation: $t(62) = -3.68$, $p < .001$
- nonreligious ST activation vs. control condition: $t(101) = -1.50$, $p = .069$

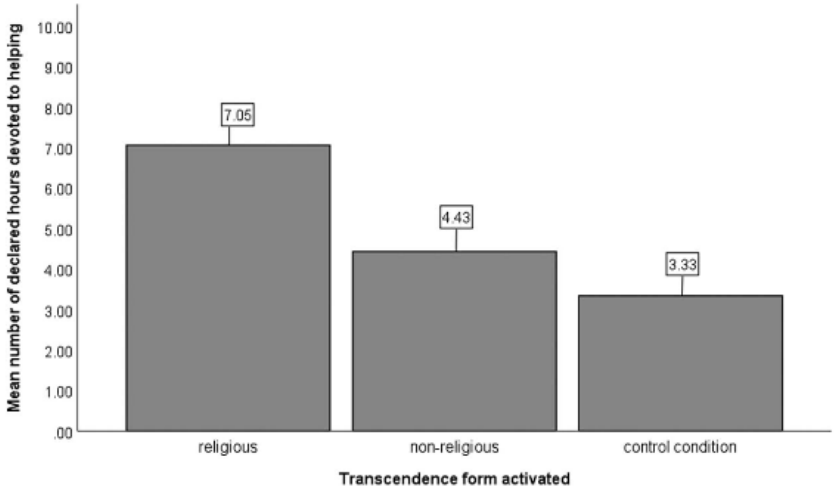

Figure 2. Mean number of declared hours devoted to helping as a function of religious and nonreligious spiritual transcendence activation in Study 2.

Experimental Example 3

Research question: Do the effects of religious ST and nonreligious ST (relative to a control condition) on prosocial behavior depend on whether the targets of the behavior are members of one's ingroup versus outgroup members?

Participants, procedure, and measures: Participants were 93 Polish graduate students who were taking a psychology course (M_{age} = 27.33, 64.5% female). The procedure and measures were the same as before, only this time participants were randomly assigned to read descriptions of the local community center that specifically described it as being led by people of Polish descent (the primary nationality of the participants) or as being led by people of Arab descent (an outgroup).

Results:

Two-Way ANOVA results: Dependent variable is reported helping behavior

Independent Variable	*F*	Df_1	Df_2	*p*
Condition	4.50	2	87	.014
Nationality of Center	0.23	1	87	.630
Condition x Nationality of Center	3.85	2	87	.025

Planned comparisons between the conditions produced the following results:

- In the ingroup condition:
  - control vs. nonreligious ST: p = .393
  - control vs. religious ST: p = .126
  - nonreligious vs. religious ST: p = .565
- In the outgroup condition:
  - control vs. nonreligious ST: p = .004
  - control vs. religious ST: p = 1.000
  - nonreligious ST vs. religious ST: p = .003

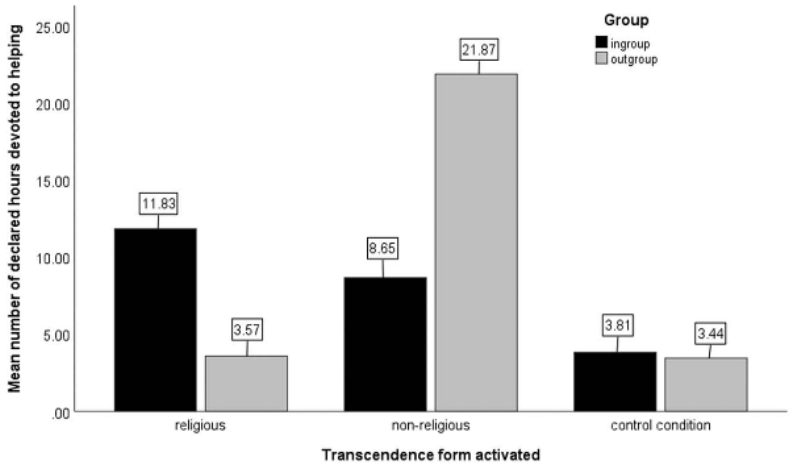

Figure 6. Mean number of declared hours devoted to helping as a function of religious and nonreligious spiritual transcendence activation in Study 4.

Regression Example 1

Background: Self-regulation refers to the ability to autonomously control one's thoughts and behaviors in goal-directed ways. Most research on self-regulation focuses on positive aspects, such as maintaining motivation in the face of adversity and refraining from unhealthy behaviors. Yet some aspects of self-regulation can be maladaptive. To illustrate, self-punishment involves withholding benefits or even delivering harms to the self (e.g., "I can't have the cookie because I didn't work out today"). In this study, the researchers examined the association between a tendency to engage in self-punishment and negative mental health outcomes.

Research question: Is self-punishment associated with stress?

Participants: A total of 318 participants (M_{age} = 53.22, 46.8% female, 51.3% had at least a master's degree) were recruited online.

Measures:

- Self-punishment was measured by the self-punishment subscale of the Revised Self-Leadership Questionnaire (Houghton & Neck, 2002). The three items were summed (sample item: "I tend to be tough on myself in thinking when I have not done well on a task").
- Stress was measured with the Perceived Stress Scale (Cohen et al., 1983). The four items were summed (sample item: "In the last month, how often have you felt that you were unable to control the important things in your life?").

Results:

Variable	B	*SE*	ß
Intercept	3.89	0.22	
Self-Punishment	-0.26***	0.04	-0.39***
	R^2 = .22		

Note. *** indicates $p < .001$; B = unstandardized regression coefficients; ß = standardized regression coefficients.

The statistics presented are fabricated, but are based off real results from Dunaetz, D. R., Yun, J. C., Lord, J., Howard, J., & Gobrail, M. (2023). Self-Leadership, Seeking God's Will, and the Ability to Cope with Stress. *Journal of Psychology and Christianity*, 42(3), 222-236.

Other references:

Houghton, J. D., & Neck, C. P. (2002). The revised self-leadership questionnaire: Testing a hierarchical factor structure for self-leadership. *Journal of Managerial psychology*, *17*(8), 672-691.

Regression Example 2

Background: Within Christian circles, seeking God's will refers to the extent to which one focuses on God's desires; rather than emphasizing self-direction, a Christian considers God's wishes for their behavior, emotions, or plans in any endeavor.

Research question: Is self-punishment associated with stress after accounting for seeking God's will?

Participants: Same as in Example 1.

Measures:

- Seeking God's will was measured by a four-item scale created for the study. The items were summed (sample item: "I think about what God wants whenever I encounter a difficult situation").

Results:

Variable	B	*SE*	ß
Intercept	3.72	0.23	
Self-Punishment	-0.24***	0.04	-0.37***
Seeking God's Will	0.15**	0.05	0.18**
	R^2 = .25		

Note. $^{**}p < .01$, $^{***}p < .001$; B = unstandardized regression coefficients; ß = standardized regression coefficients.

Regression Example 3

Research question: Does the association between self-punishment and stress moderated by sex?

Participants: Same as in Examples 1-2.

Results:

Variable	B	*SE*	ß
Intercept	3.72	0.23	
Self-Punishment	-0.24***	0.04	-0.37***
Seeking God's Will	0.15**	0.05	0.18**
Sex	-0.10	0.08	-0.07
Self-Punishment x Sex	0.18**	0.06	0.21**
	R^2 = .24		

Note. **p < .01, ***p < .001. Sex was coded as: 0 = male, 1 = female. B = unstandardized regression coefficients; ß = standardized regression coefficients.

When examining males and females separately, two different regression coefficients were found. For males, the regression coefficient was -.35 (*SE* = 0.5, p < .001), while for females, the regression coefficient was -.17 (*SE* = 0.5, p < .001).