

Answers to Application Activities for One-Way T-Tests in R

1 Torres (2004)

Use the SPSS file called Torres.sav, imported into R as `torres`.

Make sure `torres` is the active data set in R Commander, and then choose STATISTICS > MEANS > SINGLE-SAMPLE T-TEST. Choose the variable of `reading` (you can only choose one at a time). The radio button is set at “Population mean $\neq \mu_0$,” which means that we are testing the hypothesis that the population mean is not zero. However, we want to change this to our neutral value of 3, because we want to test the hypothesis that there is a difference from a neutral value, either positively or negatively, for native speakers. Thus, enter the number “3” in the box at the end of this radio button. You can press the “Apply” button and then immediately choose the other variable of listening. Then press OK. This will give you the 95% confidence interval.

The R code for this is:

```
with(torres, (t.test(reading, alternative='two.sided', mu=3,  
conf.level=.95)))
```

To get the descriptive statistics, in R Commander choose STATISTICS > SUMMARIES > NUMERICAL SUMMARIES. You can pick both variables at once (`listening, reading`) and then press OK for this command. The R code for this is:

```
numSummary(torres[,c("listening", "reading")],
```

```
statistics=c("mean", "sd", "IQR", "quantiles"), quantiles=c(0,.25,.5,.75,1))
```

To get a trimmed mean percentile bootstrap CI, go to the R console and use Wilcox's command

trimpb() (make sure the WRS package is open first):

```
library(WRS) #if necessary
```

```
trimpb(torres$reading, null.value=3) #I only specify values different from the default
```

Repeat with the other variables.

The output is shown in the table.

	Sample size	mean (s.d.)	95% CI for the mean of the variable	95% trimmed mean percentile bootstrap CI	Effect size (Cohen's d)
Reading	102	3.2 (1.16)	2.97, 3.42	2.98, 3.51	$(3.2-3.0)/1.16=.17$
Listening	102	3.29 (1.03)	3.09, 3.49	3.21, 3.68	$(3.29-3.0)/1.03=.28$

For both variables the effect sizes are very small. For Reading the confidence interval runs through zero and is very close to 3, and the tiny effect size confirms that for Reading, there is no

important preference for a native speaker. For listening, the confidence interval does not run through zero, but its lower limit is quite close to zero and the very small effect size shows too that there is not a very strong preference for native speakers in teaching Listening either.

2 Torres (2004)

Continue to use the SPSS file called Torres.sav, imported into R as **torres**.

Repeat the steps in Exercise #1 but now choose the variables of **culture** and **pron** (pronunciation).

The output is shown in the table.

	Sample size	mean (s.d.)	95% CI for the mean of the variable	95% trimmed mean percentile bootstrap CI	Effect size (Cohen's d)
Culture	102	3.52 (.77)	3.37, 3.67	3.42, 3.75	$(3.5-3.0)/.77=.65$
Pronunciation	102	4.31 (.90)	4.14, 4.49	4.34, 4.76	$(4.31-3.0)/.90=1.46$

First of all, there are no big differences between the parametric and bootstrapped CIs, but the means-trimmed and bootstrapped CI for Pronunciation is slightly higher than the parametric CI. For both variables the effect sizes are larger than we saw in the previous variables. For Pronunciation, especially, at almost 1.5 standard deviations of difference from the neutral value

of 3, the mean value has quite a large effect size and shows that most students in this survey higher prefer to have native speakers when it comes to teaching pronunciation. The confidence intervals reflect this fact as well, with a confidence interval for Pronunciation which runs very far away from the neutral value of 3.

3 Dewaele and Pavlenko (2001–2003)

Use the BEQ.sav file, imported into R as `beq`.

Make sure `beq` is the active data set in R Commander, and then choose STATISTICS > MEANS > SINGLE-SAMPLE T-TEST. Choose the variable of `l1comp` (you can only choose one at a time). The radio button is set at “Population mean $\neq \mu_0$,” which means that we are testing the hypothesis that the population mean is not zero. However, we want to change this to our neutral value of 5, because we want to test the hypothesis that there is a difference from a fully proficient score of 5 in the ratings. Thus, enter the number “5” in the box at the end of this radio button. You can press the “Apply” button instead of “OK,” which will let you then choose the other three variables (`l1read`, `l1speak`, `l1write`) in turn. Press OK when you are finished. This will give you the 95% confidence interval for this variable.

The R code for the first variable is:

```
with(beq, (t.test(l1comp, alternative='two.sided', mu=5, conf.level=.95)))
```

To get the descriptive statistics, in R Commander choose STATISTICS > SUMMARIES > NUMERICAL SUMMARIES. You can pick all the variables at once and then press OK for this command. The R code for this is:

```
numSummary(beq[,c("l1comp", "l1read", "l1speak", "l1write")],
statistics=c("mean", "sd", "IQR", "quantiles"), quantiles=c(0,.25,.5,.75,1))
```

To get a trimmed mean percentile bootstrap CI, go to the R console and use Wilcox's command `trimpb()` (make sure the WRS package is open first):

```
library(WRS)# if necessary
trimpb(beq$l1comp, null.value=5)
```

Repeat with the other variables.

The output is shown in the table.

Area	Sample size	mean (s.d.)	95% CI for the mean of the variable	95% trimmed mean percentile bootstrap CI	Effect size (Cohen's d)
L1 Speaking	1574	4.75 (.72)	4.71, 4.78	No CI (it's 5)	(4.75 – 5)/.72 = -

					0.35
L1 Comprehension	1571	4.82 (.61)	4.79, 4.85	No CI (it's 5)	.28
L1 Reading	1565	4.74 (.76)	4.70, 4.78	No CI (it's 5)	.34
L1 Writing	1562	4.59 (.94)	4.54, 4.64	4.95, 5.0	.47

The parametric confidence intervals do not run through zero, meaning that we can reject the null hypothesis that the participants rated themselves as fully proficient in their L1, but the confidence interval for their proficiency ratings are all in the 4s and most quite narrow and closer to 5. For the bootstrapped CIs, because they are means trimmed (20% as default), in most cases there is no range at all but everyone is rated as a 5. Because the group size is so large the confidence intervals are quite precise (and exact even, in the case of 3 of the bootstrapped means-trimmed CIs), meaning we have strong confidence that the true scores will be in a very small range, and very close to 5, but not quite 5 (except for the means-trimmed CIs, where it *is* 5). The effect sizes are small meaning that their difference from the neutral value (that we chose) of 5 is not very significant and not very large.