Skillbuilder Series (Part 5): Tests of Mean Differences

with Dr. Zin Htway

Saturday, October 15, 2016

Walden University

Academic Skills Center

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We'll be getting started in a few minutes.

For any questions, please use the chat box.

And at the end of the event, we'll take time for Q & A.

So I will also try to keep your questions on a side note for Zin so we don't lose everybody.

We have a nice group.

It's not too big, so we should be okay.

So if you have any questions regarding the Academic Skills Tutor Services program, I'm actually the coordinator of the program.
So you can put your questions in the chat. I will try to point you in the direction of any links that you have for any resources.
I can also provide you my email at the end of the session.

Any of the links we do provide you are interactive, so if you click on them, they should take you to where you need to go.

And again, if you need to contact me, I'm at ASCTutoring@Waldenu.edu.

And the presentation will be up on our website I would say -- since it's the weekend, I would probably say give me until about Tuesday or Wednesday.

And if you want the data set, Dr. Htway uses his own data set, so if you would like the data set to follow along, you can email me at ASCTutoring@Waldenu.edu.

We've got a couple more minutes before we go live.
21  >> Kim Palermo-Kielb: Welcome,
22      everybody, to One-Way ANCOVA.
23      And this is our second to our last
24      session.
25      I think Part 6 runs on the 29th.
1  >> Dr. Zin Htway: Right.

2  And I think that's on MANOVA.

3  >> Kim Palermo-Kielb: Yeah.

4  I'll check to make sure as well.

5  And let me see if I can find that

6  link.

7  Actually, while we're waiting, I'm

8  going to put that link for students

9  if they want to go in and register

10  for that.

11  >> Kim Palermo-Kielb: Welcome,

12  everybody to Tests of Mean

13  Differences Series, Part 5, the

14  One-Way ANCOVA with Dr. Zin Htway.

15  Good morning, Zin.

16  >> Dr. Zin Htway: Good morning, Kim.

17  Good morning.

18  >> Kim Palermo-Kielb: Okay.

19  So just to give you a little bit of

20  background on Dr. Htway, he holds his
Ph.D. in public health, epidemiology,
from Walden University and an MBA in
healthcare management from Western
Governor's University and an
undergraduate degree in clinical
1 science, cytotechnology from
2 California State University -
3 Dominguez Hills.
4 Dr. Htway is a board certified
5 cytotechnologist and works as a
6 supervisor and operations manager at
7 an anatomic pathology lab at Los
8 Robles Medical Center in Thousand
9 Oaks, California.
10 He is also a full-time lecturer at
11 the California State University -
12 Channel Islands since 2008 and
13 recently became a contributing
14 faculty member at Walden University
15 teaching advanced biostatistics.
16 Dr. Htway works part-time as an
17 instructional support specialist here
18 with the Academic Skills Center at
19 Walden University tutoring students
20 in dissertation-related statistics.
21 Professionally, he's worked as a
22 researcher in community-based
23 research settings in a variety of
24 areas including Avian influenza and
25 diabetes in Hispanic populations and
has served as methodology statistics expert in many of those projects. He has a number of presentations on community-based and health-related research projects.

>> Dr. Zin Htway: Thank you for that kind introduction, Kim.

For today's Skill-Builder Webinar, I'm going to present one example of a research question for a pilot study with explanation of one-way ANCOVA. I'll mainly focus on the SPSS utilities and write-up for doctoral research. And for those of you who may be new to this test and means analysis, I suggest I take the time to strengthen your understanding of this family of statistical tests.

So the one-way ANCOVA, there's a few
21 different applications of this, also
22 known as the analysis of covariance.
23 It's a multivariate statistical
24 method in which the dependent
25 variable and a quantitative variable
and the independent variables are a mixture of nominal variables and quantitative variables. This is the way they define it from Page Publication from Lehigh Education. They look at ANCOVA as analysis of covariance where it's used to test the main and interaction effects of categorical variables on a continuous dependent variable controlling for the effects of selected other continuous variables, which covary with the dependent. The control variables are also known as covariates, and we're going to look at something similar to that today. The testing itself is actually relatively straightforward, and I
21 think once we get into it, you'll get
22 a better understanding of what I mean
23 by that.
24 And lastly, from Laerd statistics,
25 they look at the one-way ANCOVA is
used to determine whether there are any significant differences between two or more independent unrelated groups on a dependent variable. However, where the ANOVA, which we looked at last week -- or not last week but a previous section -- looks at differences in mean groups, the ANCOVA looks for differences in adjusted means. The mathematics behind it are a little bit different, but they will help you with your multiple groups for analysis. So here are some examples where it would be appropriate to use the one-way ANCOVA. You know, in experimental designs, when you're trying to control for factors which cannot be randomized
but which can be measured on an interval scale, we also have observational designs to remove the effects of variabilities which modify the relationship of the categorical
independents to the interval

dependent variable because we're always looking at the effect of the independent variables onto the dependent variable, which is our variable of interest.

In regression models, we can use it to fit regressions where there are both categorical and interval independents.

So but moving on, we'll look at the statistical assumptions. All statistical tests have assumptions, and there's quite a few for the ANCOVA, and it's important to be able to meet all these assumptions before you go ahead and commit yourself to using the ANCOVA. The dependent and independent variable should be used on a scale.
21 Just kind of two or more categorical
22 independent groups.
23 These are similar to the ANOVA and
24 the t tests and such.
25 We should always have independent
observations, and that's critical when you have any of the tests and means with exception of the pair t test. You want to make sure that your samples are only within one group, not a blend of, not associated with the two or other groups that you're analyzing. There should be no significant outliers in the differences between the two related groups or the two or more related groups. And outliers can always skew your results quite significantly. One thing that's important to remember about outliers and when you investigate the outlier data point, they can sometimes be the most interesting of all of your data.
When we consider the residuals, they should be approximately normally distributed for each category of the independent variable.

And there should be, of course, the
homogeneity of variances, which you can test with the Levene's test. The covariate should be linearly related to the dependent variable at each level of the independent variable. You want to make sure there's a linear relationship with the covariate variable that you're interested in. Of course, we have homoscedasticity of the standardized residuals, and this is different from other statistical tests where we're just considering homoscedasticity. We actually take the residuals, and we standardize them. SPSS will do that for you. Analysis of the slopes and homoscedasticity of the residuals is
a little beyond our webinar for this morning, but it's definitely something that you can look up either on the web or in some of the textbooks that we have.
So for our research scenario, which is a little bit different from our normal research question, we -- actually, the researcher is conducting a pilot study to determine if an oral treatment intervention will have an effect on the oral condition of cancer patients. That's our research scenario, and we're looking at a pilot study. So available smaller sample size. Our first research question is does the treatment intervention, aloe juice, predict the oral condition of cancer patients. And our second research question in this pilot study: Is initial cancer stage a contributing predictor of oral condition of cancer patients receiving aloe juice treatment?
And so in this scenario, we have aloe juice treatment as our independent variable, which is our groups, cancer stage as a covariate to predict the oral condition of cancer patients.
And in this data set, which Kim will make available on the ASC website, we will start off with SPSS. Of course, we launch SPSS. Go to the analyze drop-down menu. Look at general linear models from the drop-down menu. And then from the side bar menu, we click on univariate. Another window will open up. And into the dependent list, we're going to put in week six, oral condition. We actually have different measures for the cancer patients, but in this example we're just using the oral condition at week six, and that's our dependent variable. So we're going to move that into the dependent variable box.
In the fixed factor box, we're going to put in treatment group. Now, this analysis will relate to our first research question. Because we just want to know if
there’s a relationship between the treatment group, those that are getting aloe juice versus those that are not on the oral condition of these cancer patients six weeks out. Under the options button, we’ll click the descriptive statistics section, and then we’ll hit continue. And SPSS, of course, put out lots of tables. The first table that we’re interested in is the descriptives table, and we can see that the dependent variable is a six-week oral condition. And it’s important to read the title of the table. In this example, we’re just using one dependent variable, but if you had several analyses that you were running, you want to be sure that
you're looking at the correct table.

So what we can see is we have -- on

the far left side, we have our

treatment group.

We've got the placebo group, and then
the aloe juice group.

It's a typical case and control study.

We can see the mean level for the placebo group.

Now, this is -- the oral condition is 9.93.

And then the aloe juice group is 8.78.

So we can see that the aloe juice group has less severity, or the oral condition is better because we're hoping the lower the number, the better off we're going to be for these patients.

We get our standard deviation, and then we can look at our sample size.

We have a total of 23 participants, but we have 14 in the placebo group and 9 in the treatment group.
21 Because this is a pilot study.
22 The next thing we look at is a test
23 between subjects effects.
24 And we can see that on the source
25 we've got our treatment group, which
1 is the third row.

2 We can actually go ahead and cross --

3 we'll go all the way across, and we

4 can see that the sig value is .453.

5 I know we're all familiar with the

6 .05 for P-value as our threshold.

7 But being that this is a pilot study,

8 we want to take a look to see what

9 the sig value actually is.

10 So our P-value is essentially .453

11 being as not significant, which of

12 course tells us that the treatment is

13 not related so much to the

14 condition -- the oral condition of

15 these cancer patients.

16 Below this table we have the

17 R-squared.

18 The R-squared for this analysis, for

19 this calculation is .027.

20 Now, R-squared is an explanation of
21 how well the model explains the 
22 variability of the data points. 
23 It's in percentages. 
24 The highest being 1.0, or 100% of the 
25 variability.
So this being 2.7% is relatively low.

So we just keep that in mind.

We've got a sig value of .453, and then we've got our R-squared of .027.

So we're going to run the analysis again, except for this time we're going to add in our covariate of cancer stage, which makes it ANCOVA.

The previous analysis was more of just a regular ANOVA, or a t test.

I'm sorry.

It's just the ANOVA.

So we go back to SPSS.

We go analyze general linear models univariate just like before.

This time we'll keep the dependent variable as our six week oral condition.

And this time we're going to add in the covariate of initial cancer.
stage.

These are coded 1 through 4.

That's a stage, and it goes into what would be the fourth box, which is the covariates.
Since SPSS keeps all of our previous selections, we can just go ahead and click okay. Well, we'll go through the options first to make sure we're still under the statistics. Now, we don't have to look at the descriptive statistics because we know that hasn't changed. We have 14 participants in the placebo group and 9 participants in the treatment group. So we look at the test between subjects effects, and we can see that the treatment group -- now the sig value has decreased quite a bit. Earlier it was decreased to .188, whereas without the staging included we have .458. And also, too, if we look at the
21 R-squared underneath, the R-squared
22 has increased quite a bit to almost
23 30% or .3, whereas, previously, it
24 was .027 or 2.7%.
25 So from this analysis, we can see
that even though we do not have a statistically significant result for treatment, there is quite a bit of improvement in the model with the addition of the covariate of cancer stage.

So once again, we're trying to predict the oral condition of cancer patients whether or not the aloe juice treatment is working for them. And when we add in the covariate cancer stage, we can see it's becoming much, much better as a predictor.

The ANCOVA analysis was conducted to investigate the pilot study of aloe juice treatment would improve the oral condition of cancer patients after week six.

The oral condition of the placebo
group was 14, or 9.93, was higher than the treatment group, sample size nine, mean of 8.78, indicating an improvement of oral condition. That's our first suggestion of
However, the between subjects effects was not significant. At the .05 level for this pilot study, including the covariate initial cancer stage into the analysis improved the model, P-value is reduced to .181, the R-squared of .299. Even though the addition of initial cancer stage is not statistically significant in the model, there is an improvement of omnibus statistical significance and R-squared value indicating support for further studies.

Here we have an APA style write-up for the results of our pilot study. That's pretty much it for the ANCOVA. It's pretty straightforward.
21 Just understand what you're looking
22 at is you've got multiple groups and
23 you're comparing the multiple groups,
24 except for this time we're actually
25 adding in a covariate to see what the
effect is on the overall, if the covariate is a predictor or has any effect in terms of or improvement on your mathematical model.

Another example that we see commonly is that when we look at educational interventions of, say, for instance, we'll use the example of having a group of third grade boys in mathematics.

We give them a pre-test, an intervention, and a post test, and we'll see whether or not there's improvement between the pre-test and the post test.

And we have another group where the students do not get the intervention. They just get the pre-test and the post test.

And that seems like a pretty
straightforward ANOVA.

But you take into account for the pre-test scores, does it determine whether or not students with the varying pre-test scores, how the
intervention affects them.

Then all of a sudden the pre-test score becomes a covariate.

And then you would use the ANCOVA to calculate that mathematical model.

So the ANCOVA does benefit, give you a bit more information, but then again, you are using another variable.

So we've got a few minutes left.

So if there are any questions, please feel free to type them into the chat and questions box.

Is this PowerPoint available on the Walden page?

>> Kim Palermo-Kielb: Yes.

Yeah.

Clarissa, it will be available, yeah.

The presentation will be along with the recording and the transcript will
be on our archived page.

And I'll put that -- oh, I'm sorry.

Zin, someone wrote they wanted the previous interpretation back on the screen.
>> Dr. Zin Htway: Vicki, is that the write-up?

Okay.

And, you know, with these write-ups, if you look at them as a template, just take out my variables and my names and numbers, and then you can go ahead and essentially plug in your answers or your results, your SPSS output.

But definitely go back and read the write-up to make sure that it makes sense.

You know, your results may vary a little bit.

You know, you can make sure that it's appropriate for your manuscript.

So what is the limitations of this statistical analysis?

The limitations of the ANCOVA are you
have to meet the assumptions of the ANCOVA to use the ANCOVA. And that's pretty much where your limitations are. It's actually asking a robust test if
you meet all nine of the assumptions.

But if you're not meeting all nine of the assumptions, then you're going to have to look for another statistical test to run to help you answer your research questions.

I hope that answers your question, Medhanie.

Okay.

John is asking are there any other ANCOVA instructors on YouTube in addition to Walden websites?

Well, actually, John, there's quite a lot of statistical instructors on YouTube.

I think you just have to go ahead and make a search for them.

Is R-squared the strength of your finding?

Yes and no.
Helen, the R-squared actually is a representation of how much of the variability the model explains. And I know that's sort of a hard concept to grasp.
And sometimes when I work with students, you know, we see a scatterplot, and within that scatterplot we'll have a regression line. The regression line represents essentially our mathematical model. When the $R^2$ is high, in essence, the scatterplot with all the data points is rather narrow and fits closely to that regression line. If the $R^2$ is low, imagine that the scatterplot or the little shotgun blast of pellets, as I often call it, is actually quite wide. The higher the $R^2$, the more favorable your mathematical model is. If you just had two variables, it's pretty easy to get the conceptual idea.
But when you have multiple variables, you know, we only use three variables here, a dependent and independent and covariate. But if you have say, four, five, or
six variables, then it becomes a little bit more difficult to actually visualize the scatterplot. So the higher the $R^2$ squared, the better off you're going to be. Another indicator of the strength of the findings is to look at the $P$-value. I know that we all are familiar with that .05 as being our threshold, but you also have to look at the $P$-value in terms of getting a lowering of the $P$-value. And in this example, you know, because it's a pilot study, we started out with .45, which is rather large, which is almost -- we were hitting like 50% in terms of the false-positive rate, but then adding in the covariate stage, the $P$-value
dropped from .45 to .18.

So that's actually pretty good.

So that's an indication that the model is essentially getting stronger.
So, let's see.

John is asking I meant instructions.

Are there any instructions on YouTube in addition to Walden websites?

>> Kim Palermo-Kielb: You know, Zin,

I gave him the playlist from the link.

He can search through our playlist,

or he can search in general YouTube for ANCOVA.

There was also a question if we have any webinars on correlation.

And I believe we did one.

I'm trying to find it.

>> Dr. Zin Htway: We did a few on correlation.

We did a whole series on linear regression.

I think there was six of those actually.
Kim Palermo-Kielb: I'm going to give the archived page. They can search that. With SPSS, yeah, typically, if we do a correlation webinar, Kenneth, we'll
1. do like a presentation involving SPSS, like running a correlation.
2. >> Dr. Zin Htway: Right.
3. My question is I'm doing a quality improvement D and P capstone project.
4. I will introduce an N shift handoff tool and determine the before and after scores, perceived level of carry effectiveness.
5. What would be the best statistical analysis to get the results of my project?
6. We need a bit more information on that.
7. And I would recommend you schedule an appointment with a statistical tutor to help you with this just because we need to look at all of the variables and the research questions in detail to make sure that we can suggest an
appropriate statistical test for your capstone project.

Let's see.

Kenneth is asking -- all right.

He was asking about the correlation
test, right, with SPSS.

And right, as Kim just said, we have a number of videos archived on linear regression as well as logistic regression.

I think we just did those within the last 18 months Kim that we did them?

>> Kim Palermo-Kielb: We have so much. It's taking me a while to find them.

I'm sorry. Students may not know this. Not only do we archive them on our website, they're on our YouTube channel.

So if you go to that link, I already put it in the chat for YouTube. If they click on that link and that takes us to the our YouTube channel, and they look at the playlists, we
have them under -- they're called --

under the 2016 statistics and SPSS webinars.

They can find them.

And they just search by name because
there's -- oh, my goodness, there are
so many.

>> Dr. Zin Htway: Yeah.

We do these all the time.

And, you know, if you find a webinar
that you like, and you've got some
questions, because, you know, we did
these live originally, but now they
are all recorded, you can always
email us with your questions, and the
statistical tutors, you know, we've
got really great tutors, and
responses come back right away.

Most of them are back the same day.

And I think there are three or four
of us that actually go through the
roll accounts to make sure that
students' questions are answered.

But sometimes questions are a bit
more complex, and we can answer in
email, and it's more appropriate to

to schedule an appointment with a tutor.


I'm going to go to the last slides,

and maybe I have some information.
For students, this is for Kenneth.

Right where it says subscribe to our YouTube channel, that link should be interactive.

That should take you to our channel, and then you'll be able to find whatever webinar you're looking for that we've done.

If there's something that we haven't done and you can't find, email ASCtutoring@waldenu.edu, and I will search for it, and maybe we can create a webinar for that topic.

Let's see.

Are there any t test webinars in the near future, John wrote.

>> Dr. Zin Htway: Well, we have the -- the last one is the MANOVA.

>> Kim Palermo-Kielb: Yes.

We just did t tests in the last
month, right, Zin?

>> Dr. Zin Htway: Yeah.

We started with the independent samples t test, then a one sample, then a parent sample.
The ANOVA, and here today the ANCOVA, and the last one is actually MANOVA. It's actually a very complicated test.

That's a biggy.
So yeah, John, if you go to our archive page, and you go to the test and mean differences series, you'll see Zin did a whole bunch on t tests.
So there's one for the different type of t tests.
I'll put that link again in the chat for everybody.

>> Dr. Zin Htway: And Helen is asking, if I'm to determine the strength after study using ANOVA, what will be the best analysis to use?
Helen, I'm not exactly sure when
you're looking for the strength of a study using ANOVA in the analysis.

ANOVA is an analysis, a statistical analysis.

So I'm not exactly sure how to best
1 answer your question.
2 If you can give us more detail,
3 please feel free to go ahead and
4 email us, and then we'll definitely
5 get back to you or get you in the
6 right direction or help you out the
7 best that we can.
8 And sometimes it's always good to go
9 ahead and schedule an appointment
10 with a tutor.
11 You know, you get that one on one,
12 and it is synchronous, it's live.
13 So that's all really good, too.
14 And plus, you get about an hour, so.
15 >> Kim Palermo-Kielb: I'll put the
16 link here for the WC online students
17 if they want to make an appointment.
18 You know, the links that I place --
19 it's funny, I think there's something
20 going on with the Walden website
because it looks really different
than what it used to look like.
So I don't know if the links are
going to work because they're taking
me to different places.
1 I think they're doing something with
2 our website.
3 I apologize, everybody, because I'm
4 putting these links in there, and I
5 don't know if they're getting me to
6 where I need to go.
7 They like revamped the website over
8 the weekend.
9 It looks different.
10 But you know what?
11 If anyone needs anything, you can
12 just email me.
13 I'm going to put my email here.
14 And my Walden email is Kim -- I'll
15 give you my personal email.
16 I'm the coordinator.
17 I'm the coordinator of ASC tutoring,
18 so I help run the program.
19 You can email me if you have any
20 questions.
>> Dr. Zin Htway: And you do a
wonderful job running the program.

>> Kim Palermo-Kielb: Oh, thank you,
Zin, thank you.
Thank you.
Also, too, yeah, as Zin was saying,
the stats support, our stats tutor is
the stat support email.
I'm going to put that in again.
It's monitored by our statistics
tutors, and yeah, they try to get
back to you within 24 hours.
So any questions, you can email them.
They also can help out with
biostatistics.
They can help out with math.
They can help out with Excel also at
that roll account right there.
So we have about a minute left.
I know, Zin, you have a tutoring
session, so.
>> Dr. Zin Htway: Yes, I'm going to
cut out, Kim.
But it was great having everybody
here today.
And thanks, Kim.

>> Kim Palermo-Kielb: Yeah, sure.

Enjoy your tutoring session.

Thanks, Zin.

>> Dr. Zin Htway: All right.
Thanks, everybody.
Bye.


>> Dr. Zin Htway: Bye, Kim.

>> Kim Palermo-Kielb: I'm going to stop the meeting, stop the recording.

So we have about a minute.

If anybody has any questions about tutoring, I'm here to answer them.

You're welcome.

I hope everyone got something out of this.

Hi, Candace.

Candace is one of our tutors, everyone.

Oh, good.

Thank you so much, everyone.

And that stats support roll account, you can also reach Candace.

She's one of our tutors.
21 She's brand new.
22 She's great.
23 All right.
24 I have 11:30 a.m. so I'm going to be
25 respectful of everybody's time, so
1 I'm going to end the webinar.
2 Oh, Helen, to make an appointment, go
3 to that WC online link.
4 I'll put that in there again for you.
5 I'll pop it in there for you, Helen.
6 Just go on to that link, and you just
7 have to fill out a form.
8 It's just a registration form.
9 If you're not already registered, use
10 your Walden student email and create
11 a password, and then you can select
12 the schedules that you need.
13 Yes, John, use that link, and you can
14 also register.
15 You're welcome.
16 Okay.
17 Thank you, everybody!
18 Have a great weekend.
19 Talk to everybody soon.
20 Go to the Skillbuilder web page, and
21 Zin's last session in this series is
22 on the 29th if you want to register.
23 So we'll hope to see you there.
24 Bye, everyone.
25 DISCLAIMER: This text is being
provided in a rough draft format.

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