

PROG REG: A SAS® Macro to Determine Cut Score for a Universal Pre-School Maladaptive Screener

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ABSTRACT

Linear Regression is a commonly and widely used statistical tool for determining relationships (or lack thereof) of variables. In SAS, we use the REG procedure, or PROC REG, which fits linear regression models using least-squares, to carry out the analyses. We will focus on the very basics of PROC REG and, needless to say, explanation of many features is beyond the scope of this proposal. Using Ordinary Least-squares estimates (OLS) in statistical analyses involves many assumptions, such as homoscedasticity, independence, correct model, random sample (uncorrelated error terms), and normally distributed error terms. We will avoid possible complications with these assumptions for the purpose of this demonstration. We will use educational research data on a pre-school children maladaptive screener to demonstrate how we use a SAS Macro to yield a score that determines if a child is deemed to have maladaptive behavior.

INTRODUCTION

The BASC-2 Behavioral and Emotional Screening System (BASC-2 BESS) was designed to determine behavioral and emotional strengths and weaknesses in children and adolescents from pre-school to high school. Numerous epidemiological studies and related research findings have shown that most children in need of early intervention or services for behavioral and emotional problems remain unidentified. If these problems go unnoticed, they can lead to significant costs to society. The BASC-2 Behavioral and Emotional Screening System was designed to increase the likelihood that children with problems are identified early and accurately. This project will focus on three forms in this system and investigate whether the short form of BESS that contains 25 items can replace the two long forms: BASC-2 and ASEBA, both of which consists of 100 items.

The BASC-2 Behavioral and Emotional Screening System is a multiple informant system, consisting of three screening measures of child and adolescent behavioral and emotional status: Externalizing Problems, internalizing Problems, and Adaptive Skills. Teachers, parents, and students can easily complete each form, making large-scale testing practical. The BASC-2 Behavioral and Emotional Screening System may be used as part of a school, medical, or community system designed to improve the behavioral and emotional adaptation of children and adolescents. The most comprehensive method of gathering behavioral and emotional information on a group of children and adolescents is to administer the Teacher and Parent Forms, and to include administration of the Student Form for individuals in Grade 3 and above. The age of child or adolescent is the primary factor in determining which form to use. Since our research focuses on preschool children, both the parent and teacher forms are viable options. Therefore, we choose the teacher forms, namely BESS, BASC-2, and ASEBA, for this project. The three forms are: Achenbach System of Empirically Based Assessment (ASEBA): Caregiver-Teacher Report Form for Age 1.5-5 (CTRF; Achenbach & Rescorla, 2000), Behavioral Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004): Teacher Rating Scales (TRS), and BESS forms for age 2-5.

Behavioral Symptoms Index (BSI) on the parent form of BASC-2 is the total score, while ASEBA total score is for the ASEBA form. The higher the score is, the more problematic the children are. We propose to use these three forms to indicate whether the three dimensions of BESS forms can predict the total scores of BASC-2 and ASEBA. The three dimensions include: internalizing problems, externalizing problems, and adaptive skills. Internalizing problems indicate a child might have introverted problems, such as reluctant to talk to others; externalizing problems show a child tends to be extroverted and may use violence toward others. If the total scores for these two dimensions are high, a child is more problematic. The adaptive skills total score is the opposite and this dimension indicates whether a child can successfully adapt to a new environment.

We distributed these three forms to most pre-schools in South Carolina and asked teachers to fill out the teacher form for each child. When the forms were returned, data were entered into special software which gave us the total scores of ASEBA and BASC-2, as well as scores for each BESS question. These were the data used in SAS for regression.

STEP ONE: DATA PREPARATION

After we collected the forms and entered the data into the special BESS software, we got the ASEBA total score and the BASC-2 total score BSI directly. For BESS, we only got 25 raw scores. Since these are not continuous scores, they need to be changed into Z scores and then subsequently t scores. However, the mean and standard deviation that we used for transforming the raw score comes from a normal data set. The scale for normal data is 0 to 3 while the scale for raw data is 1 to 4. Therefore, we first needed to change the scale of our raw scores to be the same as the normal data set. We use the array, do over code.

CODE:

```
PROC IMPORT OUT=project541
DATAFILE="c:\Users\pan6\desktop\stat541.xls"
DBMS=xls replace;
SHEET="SHEET1";
RUN;

PROC SQL;
CREATE TABLE work.project541 AS
SELECT* FROM work.stat541;
QUIT;

DATA work.project541;
SET work.project541;
ARRAY x BESS2-BESS25;
DO OVER x;
x=x-1;
END;
RUN;
```

Next we try to figure out the three dimensions with our scaled scores. The BESS manual shows which items correspond to each dimension. We run another code to get the total scores of the three dimensions.

CODE:

```
DATA work.project541;
SET work.project541;
EXT=BESS2 + BESS4 + BESS6 + BESS13 + BESS15 + BESS16 + BESS18;
INT=BESS3 + BESS7 + BESS10 + BESS11 + BESS14 + BESS21 + BESS23 + BESS25;
ADAPT=BESS5 + BESS9 + BESS12 + BESS17 + BESS19 + BESS22 + BESS24;
RUN;
```

Following the formula for the Z and t scores, as well as the mean and standard deviation from the normal data set, we use the following SAS code to change our three dimension scores into t scores and get them ready for regression.

CODE:

```
%MACRO subscales (dataset);
data &dataset;
set &dataset;
EXT_T=50+ ((EXT- 3.5535) / 4.01548)*10;
INT_T=50+ ((INT-4.3881) / 3.87903)*10;
ADAPT_T=50+ ((ADAPT-11.5165) / 4.95202)*10;
proc print data=&dataset;
run;
```

```
%MEND;
%subscals(dataset=project541)
```

STEP TWO: DATA MANAGEMENT

Before we conduct regression, we delete the missing data, and use dummy coding to change the variables.

CODE:

```
DATA work.project541;
  SET work.project541;
  IF cmiss(of EXT) THEN DELETE;
  IF cmiss(of INT) THEN DELETE;
  IF cmiss(of ADAPT) THEN DELETE;
RUN;

PROC FORMAT;
  VALUE $sc 'f'=1 'm'=0;
  VALUE $etc 'B'=1 'W'=2 'M'=3 'A'=3 'H'=3;
  VALUE $lc 'F'=1 'R'=2 'P'=3;
RUN;

DATA project541;
  SET project541;
  IF ESL=9 and 1 THEN ESL=1;
  ELSE ESL=0;
  FORMAT sex $sc. ethnicity$etc. lunch $lc.;
RUN;

PROC PRINT DATA=project541;
RUN;
```

Now that the data has been successfully put in the proper form for regression, we can define the variables to be used.

Variable definitions:

- INTA =internalizing problem score
- EXTA =externalizing problem score
- ADAPTA =adaptive skills
- FEMALE = 0 if student is male
 = 1 if student is female
- ESL = 0 if English is the student's first language
 = 1 if English is the student's second language
- ETHNICITY = 1 if the student is Black
 = 2 if the student is White
 = 3 if the student is a Minority
- LUNCH = 1 if the student receives a free lunch
 = 2 if the student receives lunch at a reduced price
 = 3 if the student buys his or her own lunch
- ASEBA =total score for ASEBA form
- BSI = total score on parent form of BASC-2

STEP THREE: DATA ANALYSES

After we finish the regression analyses, we create a macro to select both BSI and ASEBA scores which are higher than 60. This group of children is labeled as evaluated since the higher the score, the more problematic they are. We want their teacher to pay attention to these pre-schoolers.

CODE:

```
%MACRO printsubset(category, dataset, score);
proc print data=&dataset;
where &category gt &score;
title "evaluated for &category";
run;
%MEND printsubset;

%printsubset(BSI_T, project, "60")
%printsubset(ASEBA_Tot_Prob_T, project, 60)
```

REFERENCES

Achenbach, T. M., & Rescorla, L. A. (2000). Manual for the ASEBA Preschool Forms & Profiles. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Reynolds, C. R., & Kamphaus, R. W. (2004). *BASC-2: Behavior assessment system for children, second edition manual*. Circle Pines, MN: American Guidance Service.

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