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EVALUATION OF SOME BODY DIMENSIONS WITH CRONBACH ALPHA COEFFICIENT IN SAANEN KIDS

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Abstract

Cronbach's alpha coefficient (α), which was developed by Cronbach (1951), is an internal consistency estimation method, and still remains the most widely used measure of scale reliability. Although reliability analysis is mostly used in the social sciences, in this study it is applied to some body measurements for 82 head of Saanen kids at third months of age. The independent variables were determined as X=(x1, x2, x3, x4); the withers height (x1=WH), body length (x2=BL), chest depth (x3=CD), rump height (x4=RH). As the dependent variable, sixth month live weight (Y=LW) was taken. Thus, by calculating, it is aimed to investigate whether the explanatory variables constitutes to explain a homogeneous structure in whole. The total for 4 independent variables is calculated as 0,900. On the other hand, since the coefficient of CD variable was calculated as 0.908. This variable was excluded from the analysis because of decreasing the reliability. As a result of the reliability analysis, decreasing the number of variables decreased the R2 value and increased the Mean Square Error (MSE). According to this; The R2 value for the 4 variables is 75.80% and for the 3 variables 69.50% which is lover. In this study, it was determined that the reliability of the variable had no effect on the model. This may be due to the nature of the data. As a result, 3 independent variables were found to confirm that they form a whole explanation for a homogeneous structure.

Keywords: Cronbach's alpha coefficient, Body measurements, Homogeneous structure, Saanen kids

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1. Introduction

The measurability of a concept is the main condition in scientific and measurements are indicated by numerical expressions within certain rules. The qualifications of the measurement tool can be counted as validity, usefulness and reliability. In this study, reliability will be discussed. Reliability can be briefly defined as following the same processes and giving the same results to be measured using the same criteria. (Cakmur, 2002; Saturated, 2009; Drost, 2011). Reliability is a characteristic of the available data or measurements, it cannot be considered as a property of the test (body measurement) itself (Bademci, 2006). According to Tavakol and Dennick, 2011, Cronbach's alpha coefficient (α), which was developed by Cronbach in 1951, is an internal consistency estimation method, and still remains the most widely used measure of scale reliability. These researchers described the concept of internal consistency reliability as confirming the homogeneity of a test (body measurements). Peterson (1994) reported that the variables are the same (the whole) state of measurement. Cater and Xu (2018) stated that a number of elements are used to determine

how well they measure the same thing. Bonet and Wright (2014) reported that there is no minimal validity value for and this value changes considering to researchers.
Reliability analysis is mostly used in social sciences. As a result of literature examination, no reliability research was found for body measurements taken from farm animals. In this study, reliability analysis was applied to the body measurements of Saanen kids at the third months of age. Thus, by calculating α, it is aimed to investigate whether the k variable constitutes to explain a homogeneous structure in whole.

2. Material and Method

2.1. Material

The data used in this study was taken from Saanen kids raised at a commercial farm located in Bafra province of Samsun. IBM SPSS Statistics Professional Authorized User V 23 for Windows was used with Sheep Breeding Research Institute license. The independent variables belonging to the 3rd month age of Saanen kids were X=(x1, x2, x3, x4), the withers height (x1=WH), body length (x2=BL), chest depth (x3=CD), rump height (x4=RH). As the dependent variable, sixth month live weight (Y=LW) was taken.

2.2. Method

α method is a average of weighted standard variance, which is calculated by dividing the sum of the variances of the k items (variable) in the scale to the total variance.

$$\alpha = \left(k/k-1\right)\left[1-\frac{\sum_{i=1}^{k} s_i^2}{s_P^2}\right] \quad (1)$$

Here;
α: Cronbach Alpha Coefficient (ranges from 0 to 1),
k : The number of variables,
S_i^2 : variance of the i th variable,
S_p^2 : Indicates total score variance (Vale ve ark, 1997).
There may be a total α for all variables, or an average α for each variable can be calculated separately.
If α is rising when a variable is removed from the scale, it means that this variable reduces reliability and it should be removed from the scale.
If a variable is removed from the scale and α decreased below the total alpha value, the reliability decreases. This situation show that the variable is indispensable for the scale and it should not be removed (Özdemir, 2014).

3. Results and Discussion

Descriptive statistics for Saanen kids measurements were given in Table 1.

Table 1. Third Month Descriptive Statistics for Body Measures

3th Month Body Measures	*n*	$\bar{X} \mp S_{\bar{x}}$	Min	Max
WH	82	50.470 ± 1.803	46.50	54.50
BL	82	49.006 ± 2.216	44.00	55.00
CD	82	19.140 ± 1.408	16.50	23.00
RH	82	48.726 ± 2.077	43.00	53.00

If Table 2 was examined, the total α for 4 independent variables was calculated as 0.900. On the other hand, since the coefficient of CD variable was 0.908. It is decided that this variable decreased the reliability and should be excluded from the analysis.
When the significances of regression coefficients were examined, it was seen that WH and RH variables were not significant. The constant coefficient was not significant.

Table 2. Reliability analysis and importance control of regression coefficients for 4 variables

Total α = 0.900			
3. Month Body Measures	*n*	if α is deleted	Sig.
Constant			0.131
WH	82	0.859	0.101
BL	82	0.841	0.027*
CD	82	0.908	0.000*
RH	82	0.864	0.204

*: statistically significant at p<0.05.

In Table 3, the reliability analysis was repeated by removing the CD which reduces the reliability. When Table 3 and Table 4 were compared in terms of the significance of the regression coefficients, it was found that the non-significant WH in the first analysis became significant after deleting CD. It was observed that the significance of RH variable was not changed. The constant coefficient changed significantly.

Table 3. Reliability analysis and importance control of regression coefficients for 3 variables

Total α = 0.908			
3. Month Body Measures	n	if α is deleted	Sig.
Constant			0.034*
WH	82	0.881	0.039*
BL	82	0.853	0.000*
RH	82	0.868	0.270

*: statistically significant at p<0.05.

In Table 4, as a result of the reliability analysis, decreasing the number of variables decreases the R^2 value and increases the Mean Square Error (MSE).

According to this; The R^2 value for the 4 variables is 77.80 %, but lover for the 3 variables which is 69.50%. It can be interpreted that 78% of response variable can be explained by WH, BL and RH variables, and for the rest, other variables are needed.

Finally, it was observed that the significance of the regression coefficients, including the constant coefficient, increased from 2 to 3. The regression model created by considering the number of both variables is important.

Regression model for 3 variables:

LW= -12,522+0,409* WH+ 0,645*BL-0,191*RH (2)

Table 4. Comparison of criterions based on number of variables

	With 4 variables	**With 3 variables**
Determination Coefficient (R^2)	0.758	0.695
Mean Square Error (MSE)	2.838	3.410
Total α	0.900	0.908
Significance of Regression Model	<0.05	<0.05
Significant regression coefficients (including constant)	2	3

Considering all these evaluations; before applying multivariate statistical analysis methods such as regression analysis, it is possible to determine the variables with high reliability with α. In this study, it was determined that the reliability of the variable had no effect on the model. This may be due to the nature of the data.

As a result, 3 independent variables were found to confirm that they form a whole to explain a homogeneous structure.

Conflict of interest

The authors declare that there is no conflict of interest.

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