REGRESSION-BASED NORMING OF THE TRIPOD'S MENTAL ABILITY SCALE (VVS/4) WITH GAMLSS.

Helle Pullmann[1,2], Liisa Raudsepp[1,3], & Maria Veltmann[1]

[1]Assessment Centre Tripod, Estonia

[2]University of Tartu, Estonia

[3] Tallinn University of Technology, Estonia

Introduction

Standardized psychological tests are widely used. They play a crucial role in individual assessments and in psychological research. A core feature of high-quality standardized tests is that they have well-normed scores. The majority of psychological tests have norm-referenced scores, including intelligence tests.

The advantages of the regression-based norming method over traditional norming are its flexible nature and efficiency (Timmerman, Voncken, & Albers, 2020). It has readily available statistical criteria for model selection and model assessment. Also there is no need for discretizing a continuous variable as age, thereby avoiding the arbitrary and possibly influential decision on the interval width.

INTRODUCTION

The goal of this study was to apply a regression-based norming, using the generalized additive models for location, scale, and shape (*GAMLSS*). The approach used in regression-based norming is to model the raw test score distribution as a continuous function of age.

GAMLSS is a parametric modeling approach to estimate norm-referenced scores that depend on one or more individual characteristics (Voncken, Albers, & Timmerman, 2019).

This approach consists of providing a visual representation of distributions to fit the data and choosing the best distribution that fits the raw data for further analyses. The Box-Cox power exponential distribution (*PCPE*) is a flexible, in practice often well-fitting continuous distribution (see *Figure 1*).

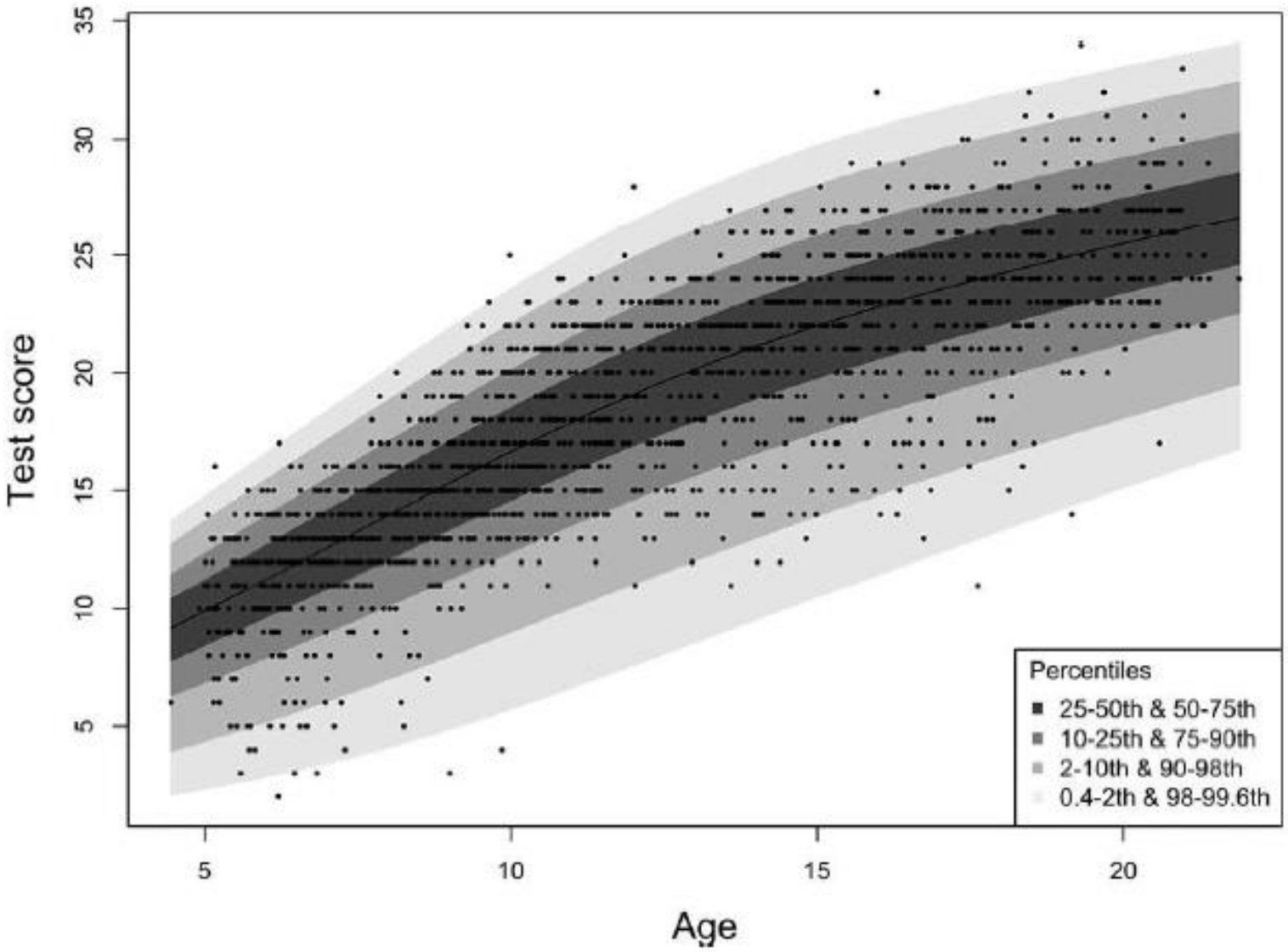

Figure 1. Test scores as a function of age for the illustrative normative sample of Test, and the percentile curves (.4, 2, 10, 25, 50, 75, 90, 98, 99.6 percentile) of the default BCPE model (Timmerman et al., 2020, p. 9)

METHOD

The sample consisted of 16.287 Estonians (36% males) with a mean age of 32.6 (*SD* = 9.7) years, ranging from 18 to 70. Different occupational backgrounds and educational levels were represented.

The Estonian version of the Tripod's mental ability scale (VVS/4) consisted of 49 tasks and three subscales (*Verbal*, *Arithmetical*, and *Spatial Ability*). The item scores were binary (*0=false; 1=correct*), histogram of the total scores is graphically presented in *Figure 2*.

The scale was administered online in the Tripod's testing system (www.tripod.ee) during 2005-2020. The internal reliability of the total scale was $\alpha = .86$ ($r = .11$).

The data were analyzed using the GAMLSS package in the *R* (R Core Team, 2019).

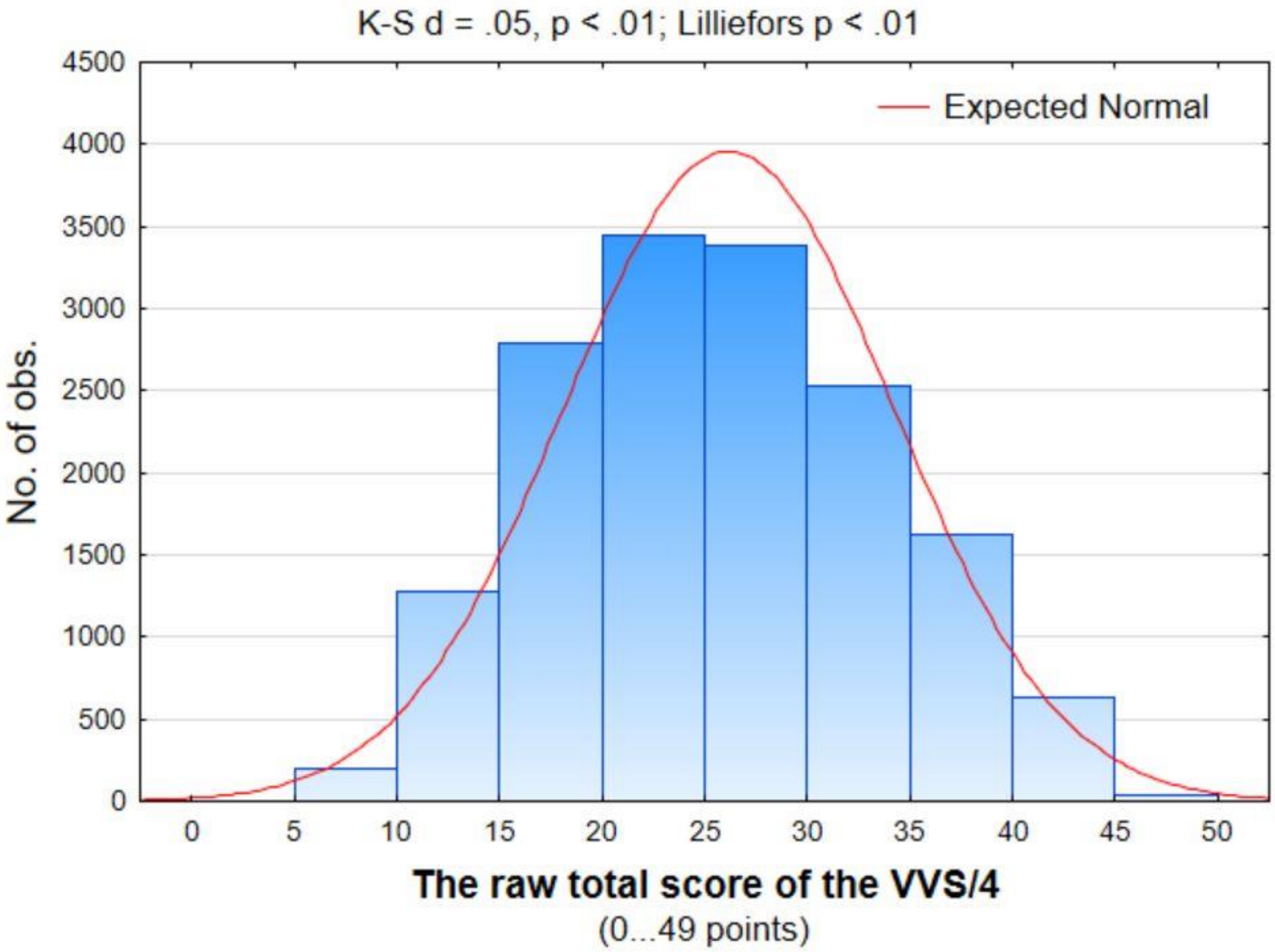

Figure 2. Distribution of the raw total scores of the Tripod's mental ability scale (VVS/4). *N* = 16.287.

Unfortunately we can not to demonstrate the results of the study graphically here. Please accept our sincere apologies and contact us for further information <helle@tripod.ee>.

REFERENCES

Timmerman, M. E., Voncken, L., & Albers, C. J. (2020). A tutorial on regression-based norming of psychological tests with GAMLSS. *Psychological Methods*, pp. 1-17.

Voncken, L., Albers, C. J., & Timmerman, M. E. (2019). Model selection in continuous test norming with GAMLSS. *Assessment*, *26*(7), 1329-1346.