

PSİKOLOJİ ALANINDA R KULLANIMI

Why R? Turkey 2021

17/04/2021

Eren Halil ÖZBERK



İTİM

HACETTEPE
ÜNİVERSİTESİ



NEYİM



HACETTEPE
ÜNİVERSİTESİ



TRAKYA
ÜNİVERSİTESİ
Geleceğe Keşri...

fBi

LEIBNIZ INSTITUTE FOR
EDUCATIONAL TRAJECTORIES

NEPS
National Educational Panel Study

R ile Veri Analizi ve Psikometri Uygulamaları

Burcu ATAR - Kübra ATALAY KABASAKAL
Elif Bengi ÜNAL ÖZBERK - Eren Halil ÖZBERK
Nermin KIBRISLIOĞLU UYSAL



R ile İstatistiksel Uygulamalar Eğitimi



Eğitimin tüm geliri SMA hastası
çocuklardan Ada Çelikle
bağışlanacaktır.



Eğitim için
kullanılabilir.

Kitabın yazarı
eğitim için



ONLINE EĞİTİMDE
GÖREV ALACAK EĞİTİMCİLER:

- Doç. Dr. Burcu ATAR
Hacettepe Üniversitesi
- Doç. Dr. Önder SÜNDÜL
Mersin Üniversitesi
- Dr. Öğr. Üyesi. İlhan KOYUNCU
Adıyaman Üniversitesi
- Dr. Öğr. Üyesi. Meltem YURTÇU
İnönü Üniversitesi
- Dr. Öğr. Üyesi. Halil ÖZBERK
Trakya Üniversitesi
- Dr. Öğr. Üyesi. Kübra ATALAY KABASAKAL
Hacettepe Üniversitesi

PROJE KOORDİNATÖRÜ:
Prof. Dr. Cem Oktay GÜZELLER

EPD2016 Kongresi - R Yazılı
Giriş Çalıştayı

[Follow](#)



Serhat Kalkınma Ajansı -
Uygulamalı R Yazılımı Veri

[Follow](#)



LEIBNIZ
INSTITUTE FOR
EDUCATIONAL
TRAJECTORIES

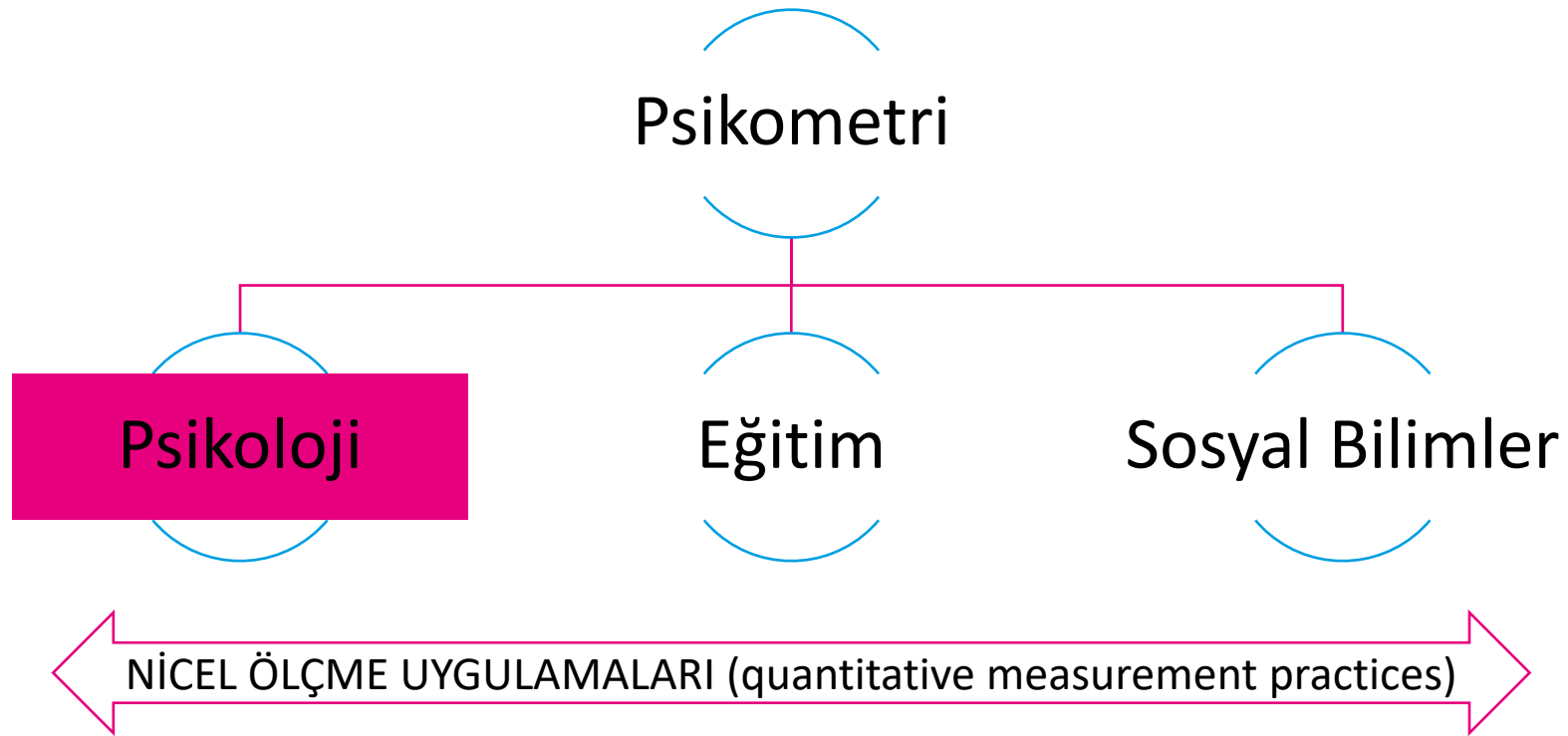
It is rather surprising that systematic studies of human abilities were not undertaken until the second half of the last century... An accurate method was available for measuring the circumference of the earth 2,000 years before the first systematic measures of human ability were developed

Jum Nunnally, Psychometric Theory (1967)

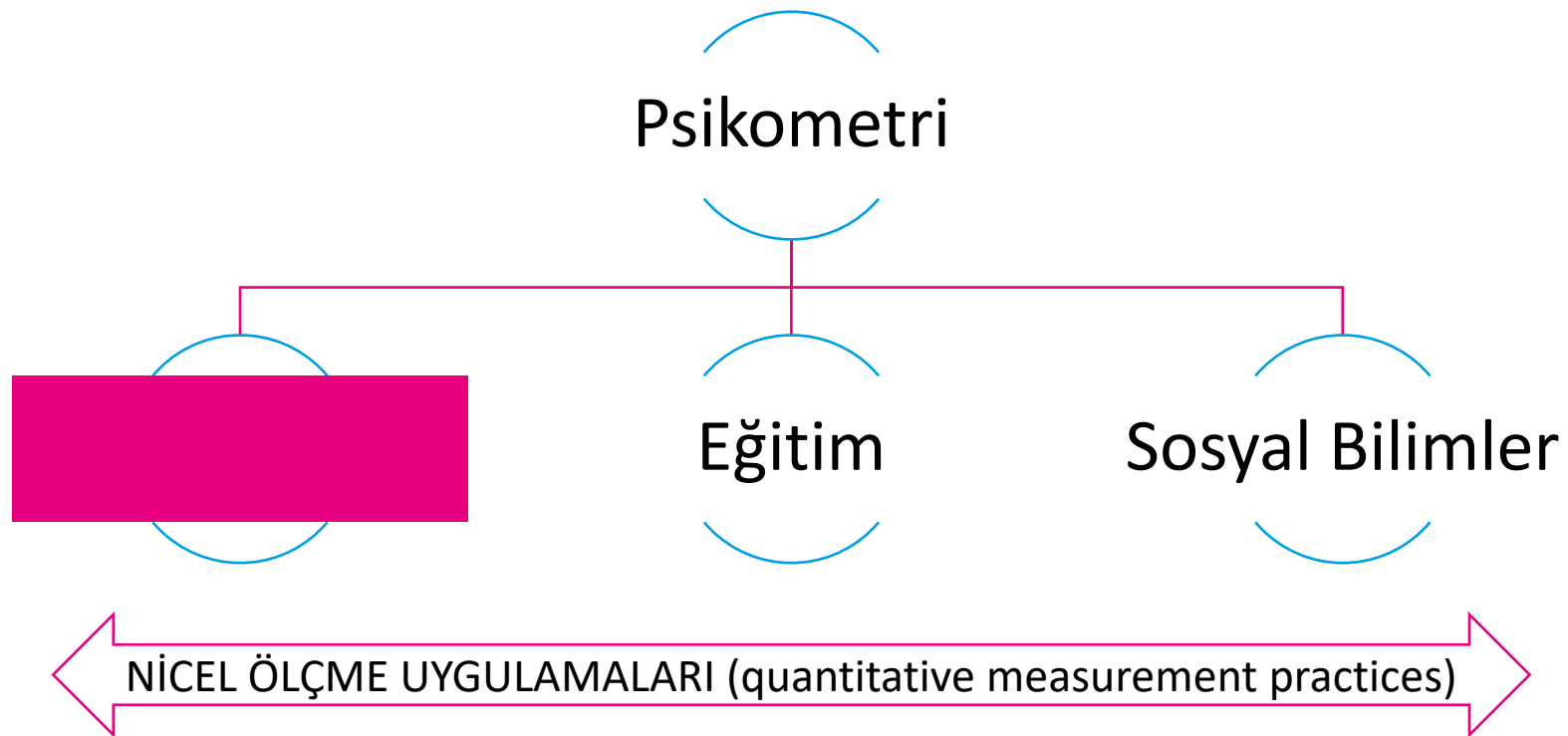
Psychometry, it is hardly necessary to say, means the art of imposing measurement and number upon operations of the mind ...”

Francis Galton, “Psychometric Experiments” (1879)

KOMETRİ NEDİR?



KOMETRİ NEDİR?



KOMETRİ NEDİR?

Ölçme araçlarının geliştirilmesi

Gözlenen değişkenler (Zeka testi maddeleri) ile teorik yapıların (Zeka) ilişkilendirilmesi

Yeteneğin belirlenmesi

NGİ YÖNTEMLER

Psikolojik Ölçekleme (Psychological Scaling)

Stevens (1951) Ölçme objelere ve olayları numaralandırma anlamına gelir.
Thurstone, bu numaralandırmayı standartlaştırmak için «scale» kavramı üzerinde duruyor.

Psikometrik Ölçme (Psychological measurement-test theory)

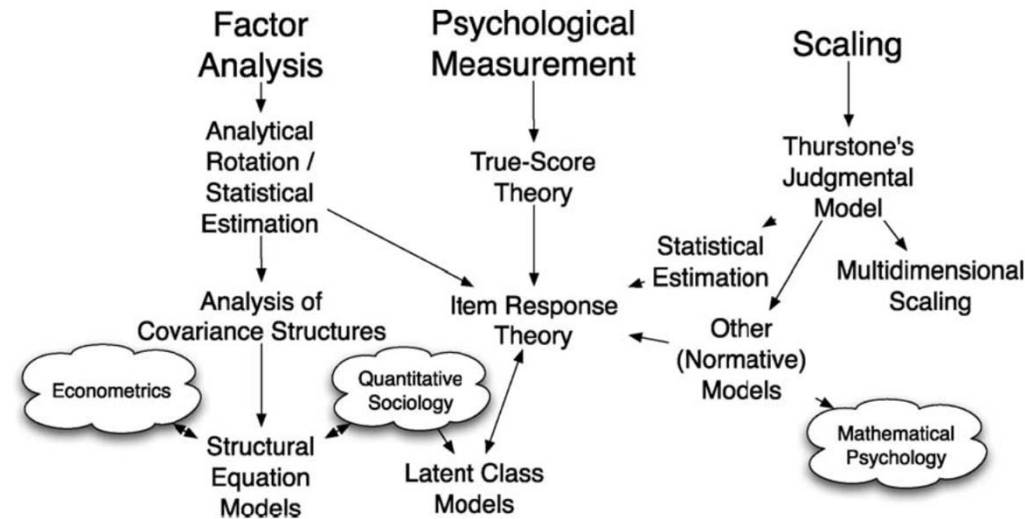
Gerçek Puanlar Teorisi (True Score Theory) – Güvenirlik Geçerlik
Madde Tepki Kuramı (Item Response Theory) – Rasch, Parameter based LM, GRM, PCM, NRM
DIF, DMF Değişen madde fonksiyonu

Faktör Analizi

Temel Bileşenler Analizi
Kovaryans Yapıları
Örtük Sınıf/Profil Analizleri
Yapısal Eşitlik Modeli

Psikolojik İstatistikler

Survey /Anket
Betimsel
Veri Görselleştirme



Jones, L. V., & Thissen, D. (2006). 1 A History and Overview of Psychometrics. *Handbook of statistics*, 26, 1

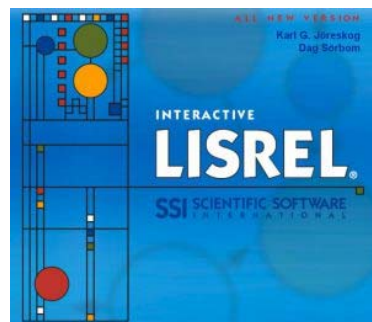
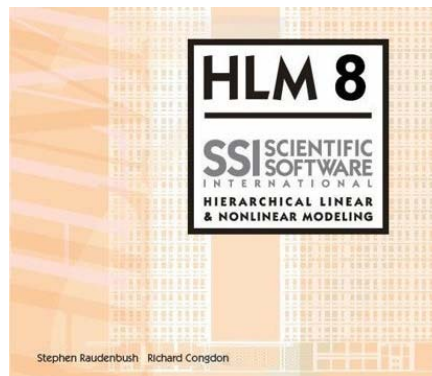
Kİ R BU İŞİN NERESİNDE



About



PARSCALE for Windows
Version: 4.1.2328.4
January 2003



Mplus



Xcalibre 4.2

IRT Item parameter calibration

Copyright © 2014 - Assessment Systems Corporation



LEIBNIZ INSTITUT
EDUCATIONAL TR

Kİ R BU İŞİN NERESİNDE



Kİ R BU İŞİN NERESİNDE

Output kullanımı

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.497 ^a	.247	.232	20.362	.247	15.767	1	48	.000
2	.614 ^b	.377	.351	18.719	.130	9.796	1	47	.003
3	.680 ^c	.462	.427	17.587	.085	7.248	1	46	.010
4	.691 ^d	.477	.431	17.521	.016	1.344	1	45	.252
5	.695 ^e	.483	.424	17.631	.005	.441	1	44	.510

a. Predictors: (Constant), I have good labor conditions

b. Predictors: (Constant), I have good labor conditions, My work is interesting

c. Predictors: (Constant), I have good labor conditions, My work is interesting, My workplace is good

d. Predictors: (Constant), I have good labor conditions, My work is interesting, My workplace is good, I have nice colleagues

e. Predictors: (Constant), I have good labor conditions, My work is interesting, My workplace is good, I have nice colleagues, I have a nice supervisor

© 2018 www.spss-tutorials.com

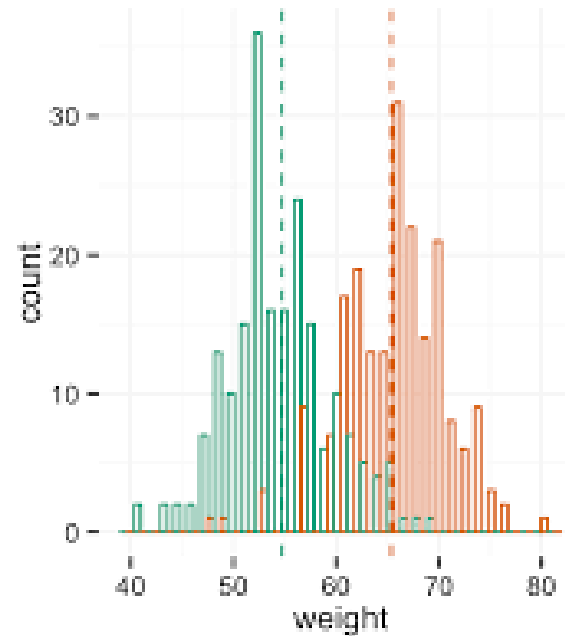
Correlations

		Wechsel IQ Test Score	Depression Test Score	Anxiety Test Score	Social Functioning Test Score	Ge Beir
Wechsel IQ Test Score	Pearson Correlation	1	.121	.152	-.151	
	Sig. (2-tailed)		.194	.110	.104	
	N	122	116	112	117	
Depression Test Score	Pearson Correlation	.121	1	.282**	-.328**	
	Sig. (2-tailed)	.194		.003	.000	
	N	116	122	112	116	
Anxiety Test Score	Pearson Correlation	.152	.282**	1	-.534**	
	Sig. (2-tailed)	.110	.003		.000	
	N	112	112	117	111	
Social Functioning Test Score	Pearson Correlation	-.151	-.328**	-.534**	1	
	Sig. (2-tailed)	.104	.000	.000		
	N	117	116	111	122	
Generall Well Being Test Score	Pearson Correlation	-.080	-.801**	-.296**	.333**	
	Sig. (2-tailed)	.393	.000	.001	.000	
	N	117	117	113	117	

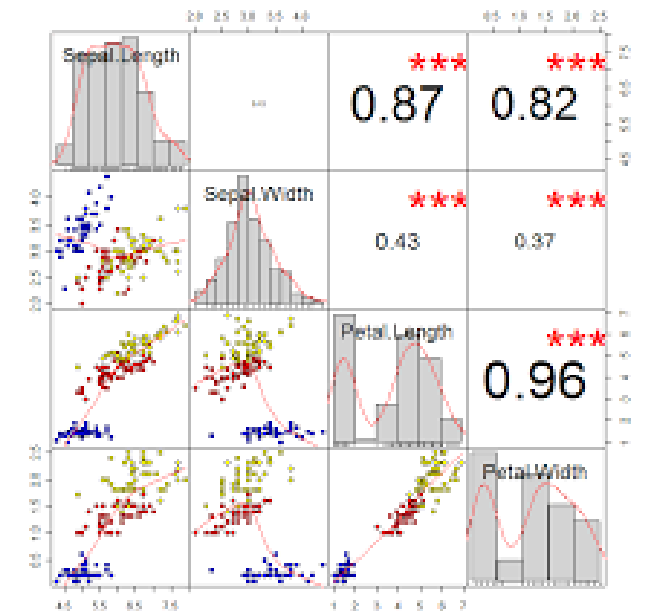
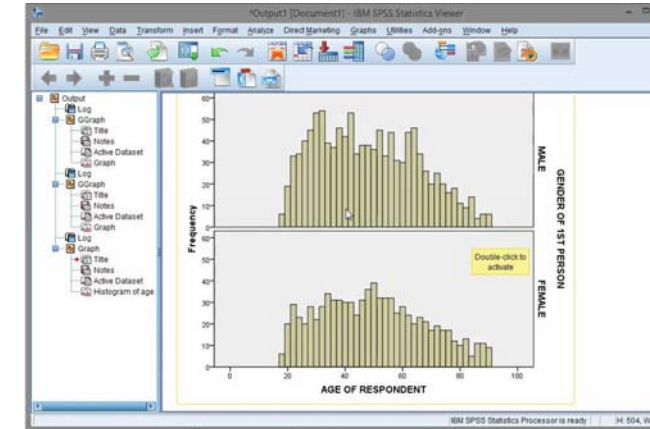
** Correlation is significant at the 0.01 level (2-tailed). © 2017 www.spss-tutorials.com

Kİ R BU İŞİN NERESİNDE

Output kullanımı
Veri görselleştirme

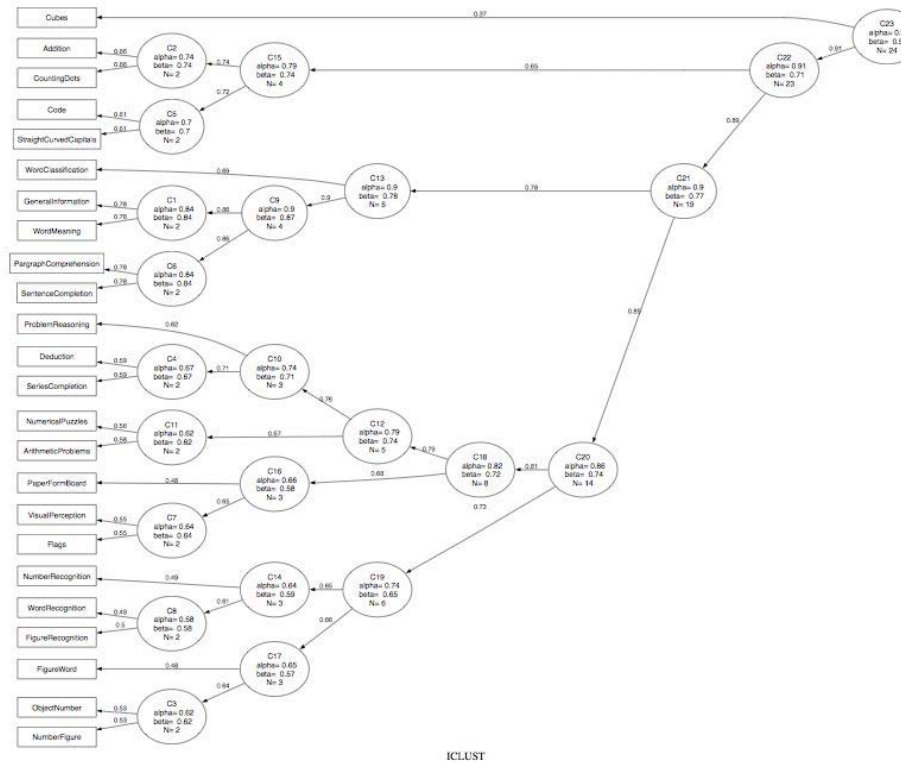


sex
F
M



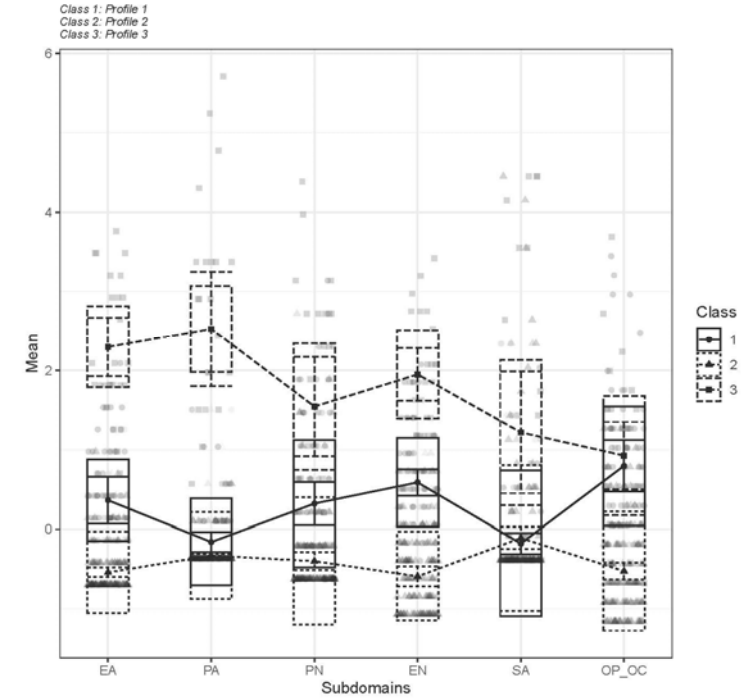
Kİ R BU İŞİN NERESİNDE

Output kullanımı
Veri görselleştirme
Psikometrik analizler



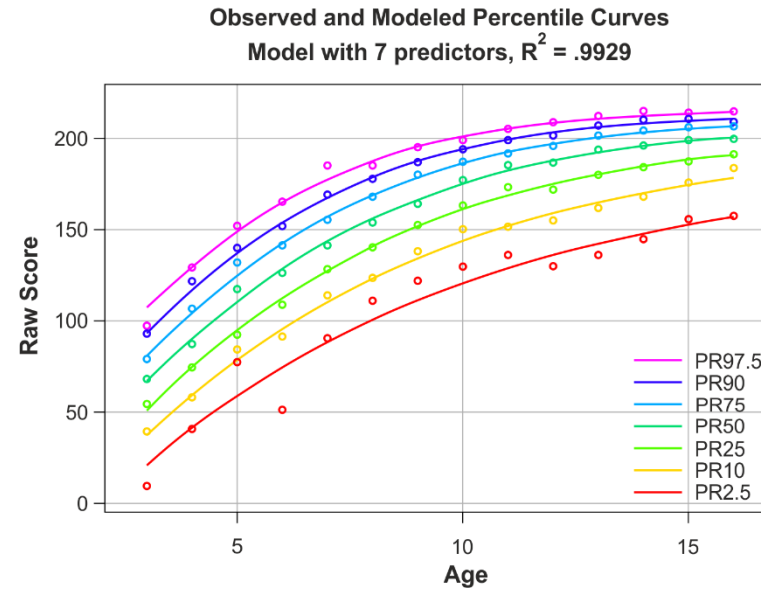
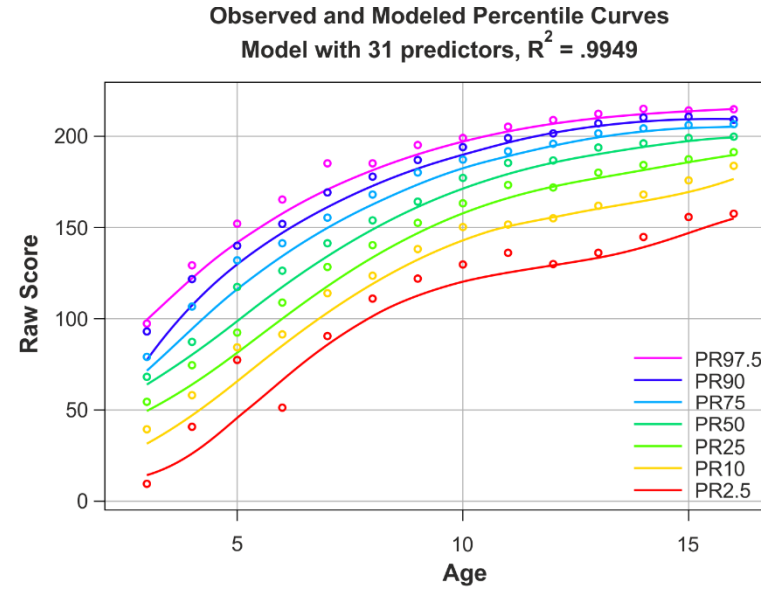
ICLUST

Estimated Latent Profiles for the CERQ (father)



Kİ R BU İŞİN NERESİNDE

Output kullanımı
Veri görselleştirme
Psikometrik analizler
Yaş Normları



Kİ R BU İŞİN NERESİNDE

Output kullanımı
Veri görselleştirme
Psikometrik analizler
Yaş Normları
Denklemlerin Kontrolü

```
irf <- function( theta = 0      # ability parameter
                 ,a = 1         # item discrimination
                 ,b = 0         # item difficulty
                 ,cc = 0        # guessing parameter
                 ,type = "3pl"){
  if (type == "3pl"){
    prob <- cc+(1-cc)/(1+exp(-a*(theta-b)))
  }
  if (type == "norm"){
    prob <- cc+(1-cc)*pnorm(a*(theta-b))
  }
  return(prob)
}
```

The equation for the three-parameter model is:

$$P(\theta) = c + (1 - c) \frac{1}{1 + e^{-a(\theta - b)}}$$

where: b is the difficulty parameter
 a is the discrimination parameter
 c is the guessing parameter and
 θ is the ability level

```
# Notice the function returns whatever variable is at the end

# Skipper tells how many lines to skip at the top of a file
readParscale <- function(file_and_path, skipper){

  #Line lengths 77, 20, 20
  IRTParams <- read.fwf(file_and_path,
    width=list(c(7,-13,7,-3,7,-2,8,-3,7,-4,7,-2,7),c(-2,8,-2,8,-2,8),c(-1)), skip=skipper,
    col.names=c("ItemID", "slope", "slopeSE",
      "loc", "locSE", "guess", "guessSE", "loc1", "loc2", "loc3"), as.is=T)
  IRTParams
}

readParscale("RN.par",9)

#
# An improvement to automatically determine the number of skip lines
#

readParscale <- function(file_and_path){

  FindSkip <- read.fwf(file_and_path,8,as.is=TRUE)
  FindSkip <- FindSkip == "GROUP 01"
  FindSkip <- order(FindSkip,decreasing=TRUE)[1]

  #Line lengths 77, 20, 20
  IRTParams <- read.fwf(file_and_path,
    width=list(c(7,-13,7,-3,7,-2,8,-3,7,-4,7,-2,7),c(-2,8,-2,8,-2,8),c(-1)), skip=FindSkip,
    col.names=c("ItemID", "slope", "slopeSE",
      "loc", "locSE", "guess", "guessSE", "loc1", "loc2", "loc3"), as.is=T)
  IRTParams
}
```

KOLOJİNİN ÇALIŞMA ALANLARI (PSİKOLOJİ ÖZELİNDE)

Örgütsel

Davranış Bilimleri

Nöropsikoloji

Klinik

Sosyal



International Journal of Assessment Tools in Education

2021, Vol. 8, No. 2, 296–309



<https://doi.org/10.21449/ijate.728362>

Published at <https://ijate.net/>

<https://dergipark.org.tr/en/pub/ijate>

Research Article

Examining the Dimensionality and Monotonicity of an Attitude Dataset based on the Item Response Theory Models

Seval Kula Kartal ^{1,*}, **Ezgi Mor Dirlik** ²





International Journal of Assessment Tools in Education

2020, Vol. 7, No. 1, 18–29





<https://dx.doi.org/10.21449/ijate.629584>

Published at <http://www.ijate.net>

<http://dergipark.org.tr/en/pub/ijate>

Research Article

Use of Item Response Theory to Validate Cyberbullying Sensibility Scale for University Students

Osman Tolga Arıcak ¹, Akif Avcu ^{2,*}, Feyza Topçu ¹, Merve Gülçin Tutlu ¹

How Many IRT Parameters Does It Take to Model Psychopathology Items?

Steven P. Reise

University of California, Los Angeles

Niels G. Waller

Vanderbilt University

The authors compared the fit of the 2- and 3-parameter logistic models (2PLM; 3PLM) on 15 unidimensional factor scales derived from the Minnesota Multiphasic Personality Inventory—Adolescent item pool. Log-likelihood chi-square deviance tests indicated that a 3PLM provided an improved fit. However, residual statistics indicated that the difference in fit between the 2 models was negligible. An unexpected finding was that from 10% to 30% of the items had substantial lower asymptote parameters ($c \geq .10$) when the scales were scored in the pathology or nonpathology directions. The authors argue that the large lower asymptote param-

Article

A Demonstration of Mokken Scale Analysis Methods Applied to Cognitive Test Validation Using the Egyptian WAIS-IV

Journal of Psychoeducational Assessment

1–14

© The Author(s) 2019

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0734282919862144

journals.sagepub.com/home/jpa



Gomaa S. M. Abdelhamid^{1,2} , Juana Gómez-Benito¹ ,
Ahmed T. M. Abdeltawwab², Mostafa H. S. Abu Bakr²,
and Amina M. Kazem³

Abstract

The fourth edition of the Wechsler Adult Intelligence Scale (WAIS-IV) has been used extensively for assessing adult intelligence. This study uses Mokken scale analysis to investigate the psychometric proprieties of WAIS-IV subtests adapted for the Egyptian population in a sample of 250 adults between 18 and 25 years of age. The monotone homogeneity model and the double monotonicity model were consistent with the subtest data. The items of all subtests except Matrix Reasoning, Information, Similarities, and Vocabulary formed a unidimensional scale. The WAIS-IV subtests have discriminatory and invariantly ordered items, although some items violated the invariant item ordering and scalability criteria. Therefore, the WAIS-IV subtests—with the exception of some items—are hierarchical scales that allow items to be ordered according to difficulty and subtests to be ordered using the sum scores. In conclusion,

Application of the Double Monotonicity Model to Polytomous Items

Scalability of the Beck Depression Items
on Subjects with Eating Disorders

Teresa Rivas, Rosa Bersabé, and Carmen Berrocal

Facultad de Psicología, Universidad de Málaga, Spain

Abstract. This paper investigates the item scalability of the Beck Depression Inventory (BDI) in 252 subjects; 126 with and 126 without eating disorders. To do so, an order was established regarding the BDI items according to the clinical characteristics of the subjects with eating disorders. The nonparametric Item Response Theory (NIRT) model was applied to evaluate Monotone Homogeneity and Double Monotonicity of items, as well as the reliability of the scale in both groups. The results show that the order of the items is satisfied in the group with eating disorders, but not in the control group. Therefore, the results obtained allow the ordering of depression scores of subjects with eating disorders according to their clinical characteristics. This order is not valid for the depression scores of subjects who did not have eating disorders. It should be noted that the application of the Double Monotonicity model to polytomous items provides new and relevant information when compared to the data provided by the Classical Test Model. In addition, it is very useful for other items and subjects having certain characteristics.

Article

Exploratory Mokken Scale Analysis as a Dimensionality Assessment Tool: Why Scalability Does Not Imply Unidimensionality

Applied Psychological Measurement
36(6) 516–539

© The Author(s) 2012

Reprints and permission:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/0146621612451050

<http://apm.sagepub.com>



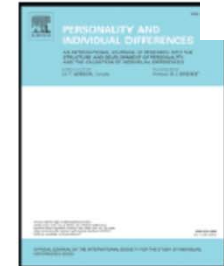
Iris A. M. Smits¹, Marieke E. Timmerman¹, and Rob R. Meijer¹



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid



Psychometric qualities of the Thought Suppression Inventory-Revised in different age groups



Kevin van Schie ^{a,b,*}, Sabine Wanmaker ^b, Iris Yocarini ^b, Samantha Bouwmeester ^b

^a Clinical Psychology, Utrecht University, PO Box 80140, NL-3508 TC Utrecht, The Netherlands

^b Institute of Psychology, Erasmus University Rotterdam, PO Box 1738, 3000 DR Rotterdam, The Netherlands

KETLER

psych: Procedures for Psychological, Psychometric, and Personality Research

A general-purpose toolbox for personality, psychometric theory and experimental psychology. Functions are primarily for multivariate analysis and scale construction using factor analysis, principal component analysis, cluster analysis and reliability analysis, although others provide basic descriptive statistics. Item Response Theory is done using factor analysis of tetrachoric and polychoric correlations. Functions for analyzing data at multiple levels include within and between group statistics, including correlations and factor analysis. Functions for simulating and testing particular item and test structures are included. Several functions serve as a useful front end for structural equation modeling. Graphical displays of path diagrams, factor analysis and structural equation models are created using basic graphics.

NetworkToolbox: Methods and Measures for Brain, Cognitive, and Psychometric Network Analysis

Implements network analysis and graph theory measures used in neuroscience, cognitive science, and psychology. Aims to provide researchers with state-of-the-art methods and measures for estimating and analyzing brain, cognitive, and psychometric networks.

KETLER

psychometric: Applied Psychometric Theory

Contains functions useful for correlation theory, meta-analysis (validity-generalization), reliability, item analysis, inter-rater reliability, and classical utility

lavaan: Latent Variable Analysis

Fit a variety of latent variable models, including confirmatory factor analysis, structural equation modeling and latent growth curve models.

sem: Structural Equation Models

Functions for fitting general linear structural equation models (with observed and latent variables) using the RAM approach, and for fitting structural equations in observed-variable models by two-stage least squares.

cnorm: Continuous Norming

Conventional methods for producing standard scores in psychometrics or biometrics are often plagued with "jumps" or "gaps" (i.e., discontinuities) in norm tables and low confidence for assessing extreme scores.

GULAMA - WECHSLER ADULT INTELLIGENCE SCALE-REVISED (WAIS-R)

McArdle and Prescott (1992, p.90) verisi

IN information

CO comprehension

SI similarities

VO vocabulary

PC picture completion

BD block design

PA picture arrangement

OA object assembly

Arithmetic, Memory Span for Digits, ve Digit Symbol Substitution dışarıda tutulmuştur.

GULAMA - WECHSLER ADULT INTELLIGENCE SCALE-REVISED (WAIS-R)

McArdle and Prescott (1992, p.90) verisi

IN information

CO comprehension

SI similarities

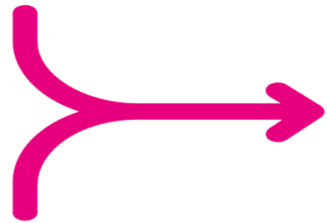
VO vocabulary

PC picture completion

BD block design

PA picture arrangement

OA object assembly



Verbal

Arithmetic, Memory Span for Digits, ve Digit Symbol Substitution dışarıda tutulmuştur.

GULAMA - WECHSLER ADULT INTELLIGENCE SCALE-REVISED (WAIS-R)

McArdle and Prescott (1992, p.90) verisi

IN information

CO comprehension

SI similarities

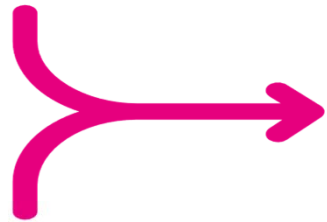
VO vocabulary

PC picture completion

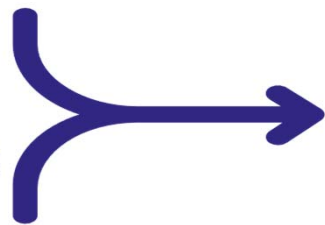
BD block design

PA picture arrangement

OA object assembly



Verbal

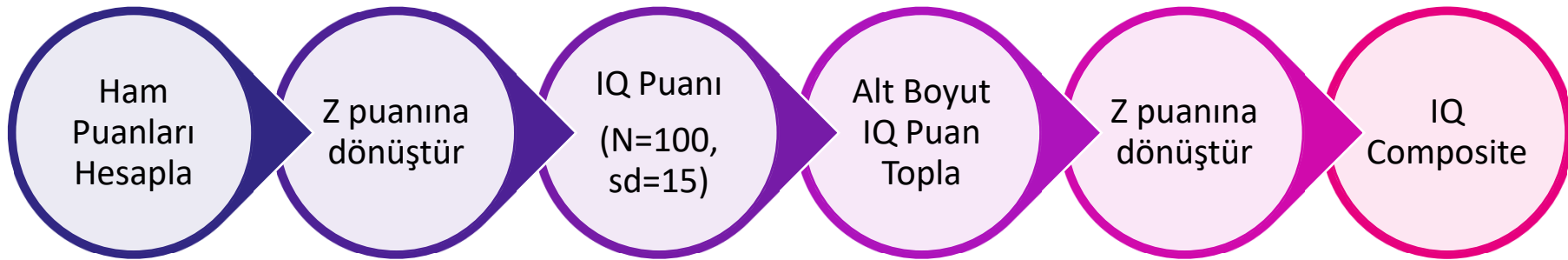


Performance

Arithmetic, Memory Span for Digits, ve Digit Symbol Substitution dışarıda tutulmuştur.

GULAMA - WECHSLER ADULT INTELLIGENCE SCALE-REVISED (WAIS-R)

WAIS Zeka Puanı Hesaplama Yöntemi,



WISC-IV
WECHSLER INTELLIGENCE SCALE
FOR CHILDREN - FOURTH EDITION

Child's Name _____
Examiner's Name _____

Calculation of Child's Age

	Year	Month	Day
Date of Testing			
Date of Birth			
Age at Testing			

Total Raw Score to Scaled Score Conversions

Subtest	Raw Score	Scaled Score
Block Design		
Similarities		
Digit Span		
Picture Concepts		
Coding		
Vocabulary		
Letter-Number Seq.		
Matrix Reasoning		
Comprehension		
Symbol Search		
Picture Completion		
Cancellation		
Information		
Arithmetic		
Word Reasoning		

Sums of Scaled Scores

Verbal Comp.	Percept. Rang.	Work. Mem.	Proc. Speed	Full Scale

Sum of Scaled Scores to Composite Score Conversions

Scale	Sum of Scaled Scores	Composite Score	Percentile Rank	% Confidence Interval
Verbal Comprehension		VC		
Perceptual Reasoning		PR		
Working Memory		WM		
Processing Speed		PS		
Full Scale		FSIQ		

Record Form

Subtest Scaled Score Profile

	Verbal Comprehension				Perceptual Reasoning				Working Memory				Processing Speed			
	SI	VO	CO	DB	WB	BD	PC	MR	PC	DS	LN	AM	CD	SS	CA	
19																
18																
17																
16																
15																
14																
13																
12																
11																
10																
9																
8																
7																
6																
5																
4																
3																
2																
1																

Composite Score Profile

VC	PR	WM	PS	FSIQ
160				
150				
140				
130				
120				
110				
100				
90				
80				
70				
60				
50				
40				

THE PSYCHOLOGICAL CORPORATION
Copyright © 2003 by The Psychological Corporation, a Harcourt Assessment Company. All rights reserved. Printed in the United States of America.
Harcourt Assessment Company 5 6 7 8 9 10 11 12 B C D E
To reorder WISC-IV Record Forms, call 1-800-872-1726

WAIS RECORD FORM
Wechsler Adult Intelligence Scale

Occupation _____

Name _____
Birth Date _____ Age _____ Sex _____ Marital: S M D W
Nat. _____ Color _____ Tested by _____
Place of Examination _____ Date _____
Education _____

TABLE OF SCALED SCORE EQUIVALENTS*																
Scaled Score	RAW SCORE															Scaled Score
	Information	Comprehension	Arithmetic	Similarities	Digit Span	Vocabulary	Digit Symbol	Picture Completion	Block Design	Picture Arrangement	Object Assembly					
19	29	27-28		26	17	78-80	87-90					19				
18	28	26		25		76-77	83-86	21		36	44	18				
17	27	25	18	24		74-75	79-82		48	35	43	17				
16	26	24	17	23	16	71-73	76-78	20	47	34	42	16				
15	25	23	16	22	15	67-70	72-75		46	33	41	15				
14	23-24	22	15	21	14	63-66	69-71	19	44-45	32	40	14				
13	21-22	21	14	19-20		59-62	66-68	18	42-43	30-31	38-39	13				
12	19-20	20	13	17-18	13	54-58	62-65	17	39-41	28-29	36-37	12				
11	17-18	19	12	15-16	12	47-53	58-61	15-16	35-38	26-27	34-35	11				
10	15-16	17-18	11	13-14	11	40-46	52-57	14	31-34	23-25	31-33	10				
9	13-14	15-16	10	11-12	10	32-39	47-51	12-13	28-30	20-22	28-30	9				
8	11-12	14	9	9-10		26-31	41-46	10-11	25-27	18-19	25-27	8				
7	9-10	12-13	7-8	7-8	9	22-25	35-40	8-9	21-24	15-17	22-24	7				
6	7-8	10-11	6	5-6	8	18-21	29-34	6-7	17-20	12-14	19-21	6				
5	5-6	8-9	5	4		14-17	23-28	5	13-16	9-11	15-18	5				
4	4	6-7	4	3	7	11-13	18-22	4	10-12	8	11-14	4				
3	3	5	3	2		10	15-17	3	6-9	7	8-10	3				
2	2	4	2	1	6	9	13-14	2	3-5	6	5-7	2				
1	1	3	1		4-5	8	12	1	2	5	3-4	1				
0	0	0-2	0	0	0-3	0-7	0-11	0	0-1	0-4	0-2	0				

SUMMARY			
TEST	Raw Score	Scaled Score	
Information			
Comprehension			
Arithmetic			
Similarities			
Digit Span			
Vocabulary			
Verbal Score			
Digit Symbol			
Picture Completion			
Block Design			
Picture Arrangement			
Object Assembly			
Performance Score			
Total Score			
VERBAL SCORE			IQ
PERFORMANCE SCORE			IQ
FULL SCALE SCORE			IQ

*Clinicians who wish to draw a "psychograph" on the above table may do so by connecting the subject's raw scores. The interpretation of any such profile, however, should take into account the reliabilities of the subtests and the lower reliabilities of differences between subtest scores.

I. INFORMATION		SCORE 1 or 0			SCORE 1 or 0			SCORE 1 or 0
1. Flag			11. Height			21. Senators		
2. Bell			12. Italy			22. Genesis		
3. Months			13. Clothes			23. Temperature		
4. Thermometer			14. Washington			24. Iliad		
5. Rubber			15. Hamlet			25. Blood vessels		
6. Presidents			16. Vatican			26. Koran		
7. Longfellow			17. Paris			27. Faust		
8. Weeks			18. Egypt			28. Ethnology		
9. Panama			19. Yeast			29. Apocrypha		
10. Brazil			20. Population					

OBSERVATIONS:

Table 1
Conversion Table for Calculating Performance IQ When Symbol Search is Substituted for Coding on the WISC-III

Sum of scaled scores	IQ	Percentile rank	Confidence intervals		Sum of scaled scores	IQ	Percentile rank	Confidence intervals	
			90%	95%				90%	95%
5	44		42-56	41-57	51	102	55	95-109	94-110
6	46	< 0.1	44-58	43-59	52	103	58	95-109	95-111
7	47	< 0.1	45-58	44-60	53	104	61	97-110	96-112
8	48	< 0.1	46-59	45-61	54	105	66	98-111	96-112
9	49	< 0.1	47-60	45-62	55	107	68	100-113	98-114
10	51	0.1	49-62	47-63	56	108	70	101-114	99-115
11	52	0.1	49-63	48-65	57	109	75	101-115	100-116
12	53	0.1	50-64	49-65	58	110	77	102-116	101-117
13	54	0.1	51-65	50-66	59	112	79	104-118	103-119
14	56	0.2	53-67	52-68	60	113	81	105-119	104-120
15	57	0.3	54-68	53-69	61	114	84	106-119	105-121
16	58	0.3	55-68	54-70	62	115	86	107-120	106-122
17	59	0.4	56-69	55-71	63	116	87	108-121	106-122
18	61	1	58-71	56-72	64	118	90	110-123	108-124
19	62	1	59-72	57-73	65	119	91	110-124	109-125
20	63	1	60-73	58-74	66	120	92	111-125	110-126
21	64	1	60-74	59-75	67	121	94	113-127	112-128
22	66	1	62-76	61-77	68	123	95	114-127	112-129
23	67	2	63-77	62-78	69	124	96	115-128	114-130
24	68	2	64-78	63-79	70	125	96	116-129	115-131
25	69	2	65-78	64-80	71	126	97	117-130	115-131
26	71	3	67-80	66-82	72	128	98	119-132	117-132
27	72	3	68-81	66-83	73	129	98	119-133	118-134
28	73	4	69-82	67-83	74	130	98	120-134	119-135
29	74	4	70-83	68-84	75	131	99	121-135	120-136
30	76	5	72-85	70-86	76	133	99	123-137	122-138
31	77	6	72-86	71-87	77	134	99	124-137	123-139
32	78	7	73-87	72-88	78	135	99	125-138	124-140
33	79	8	74-88	73-89	79	136	99.5	126-139	124-141
34	80	9	75-89	74-90	80	138	99.6	128-141	126-142
35	82	10	77-90	76-92	81	139	99.7	129-142	127-143
36	82	12	78-91	77-93	82	140	99.7	129-143	128-144
37	83	13	79-92	78-94	83	141	99.8	130-144	129-145
38	84	14	80-93	78-94	84	143	99.9	132-146	131-147
39	85	18	82-95	80-96	85	144	99.9	133-147	132-148
40	87	19	82-96	81-97	86	145	99.9	134-148	133-149
41	89	23	83-97	82-98	87	146	99.9	135-148	134-150
42	90	25	84-98	83-99	88	147	> 99.9	136-149	134-151
43	92	27	86-100	85-101	89	149	> 99.9	138-151	136-152
44	93	32	87-100	86-102	90	150	> 99.9	139-152	137-153
45	94	34	88-101	87-103	91	151	> 99.9	139-153	138-154
46	95	37	89-102	87-103	92	152	> 99.9	140-154	139-155
47	97	39	91-104	88-104	93	154	> 99.9	142-156	141-157
48	98	45	91-105	90-106	94	155	> 99.9	143-157	142-158
49	99	47	92-106	91-107	95	156	> 99.9	144-159	143-159
50	100	50	93-107	92-108					

Note. WISC-III = Wechsler Intelligence Scale for Children-III.

YNAKÇA

- ONES, L. V., & THISSEN, D. (2006). 1 A HISTORY AND OVERVIEW OF PSYCHOMETRICS. HANDBOOK OF STATISTICS, 26, 1-27.
- MCARDLE, J. J., & PRESCOTT, C. A. (1992). AGE-BASED CONSTRUCT VALIDATION USING STRUCTURAL EQUATION MODELING. EXPERIMENTAL AGING RESEARCH, 18, 87-115.
- NIE, N. H., BENT, D. H., & HULL, C. H. (1975). SPSS: STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (VOL. 227). NEW YORK: MCGRAW-HILL.
- ROSENBERG, J. M., BEYMER, P. N., ANDERSON, D. J., VAN LISSA, C. J., & SCHMIDT, J. A. (2019). EASYLPA: AN R PACKAGE TO EASILY CARRY OUT LATENT PROFILE ANALYSIS (LPA) USING OPEN-SOURCE OR COMMERCIAL SOFTWARE. JOURNAL OF OPEN SOURCE SOFTWARE, 3(30), 978.
- REVELLE, W., & REVELLE, M. W. (2015). PACKAGE 'PSYCH'. THE COMPREHENSIVE R ARCHIVE NETWORK, 337, 338.
- STOUT, W. (2002). PSYCHOMETRICS: FROM PRACTICE TO THEORY AND BACK. PSYCHOMETRIKA, 67(4), 485-518.

ŞEKKÜRLER



LEIBNIZ INSTITUTE FOR
EDUCATIONAL TRAJECTORIES

Wilhelmsplatz 3
96047 Bamberg | Germany
www.lifbi.de

Dr. Eren Halil Özberk
Phone: +49 951 863-3420
eren.ozberk@lifbi.de

