Psychometric Analysis of Survey Data

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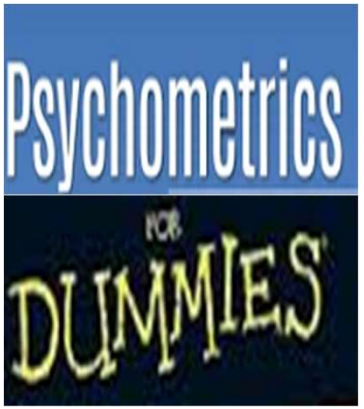
RCMAR Methods Seminar

February 26, 2024

(3:15-4:15 pm)



Acknowledgements

- José L. Calderón: "*Mitigating Cognitive Demand for Completion of CAHPS® Surveys by Aging Latinos: CAHPS® Visual Display and Cognitive Design Revision*." RCMAR Pilot (2015-16 Cohort)
  - National Institute on Aging (Grant Number P30-AG021684)
- Agency for Healthcare and Research Quality (Contract number U18HS029321)
- https://drjoe.life/obituary/ (November 16, 2023)

AHRQ's CAHPS® Program

- **Agency for Healthcare Research and Quality**
  - **Research and development agency in the U.S. Department of Health and Human Services**
  - Since 1995, AHRQ's CAHPS Program has advanced the science of patient experience:
    - Surveys that can be used for high-stakes purposes
    - Quality improvement tools to improve patient experience
    - Research to advance the science of patient experience, including best methods to administer CAHPS surveys and report CAHPS survey findings

The Patient's Voice

CAHPS Surveys reflect the patient's voice.

All CAHPS survey development begins with asking patients/consumers about what's important to measure and report. The resulting survey reflects their input.

CAHPS CG 3.1 Survey

Form Approved
OMB No. 0935-0124
Exp. Date 1/31/2024

Your Experiences with Health Care

EZ Survey

Form Approved
OMB No. 0935-0124
Exp. Date 1/31/2024

Your Health Care

How do you feel about
your health care?
Please let us know!

Answer this survey
This survey is easy to read and takes about 10 minutes to complete.
THANK YOU!!

CAHPS Versus "Easy" (EZ) Item

CG-CAHPS 3.1 Item

Passive lead before query ->

In the last 6 months, when you contacted this provider's office to get an appointment for care **you needed right away**, how often did you get an appointment as soon as you needed?

← Random Truncation of Item Lines

Flesh-Kincaid Readability Score:
14th Grade Level
Difficult to Read

EZ Item

How often do you get care as soon as you needed?

← Stanzaic Versification of Item Lines

Flesh-Kincaid Readability Score:
3rd Grade Level
Very Easy to Read

CAHPS Clinician and Group 3.1 Survey

- **31 questions**

  9 "About You" questions.

  1 global rating question: Using any number from 0 to 10, where 0 is the worst provider possible, what number would you use to rate this provider?

  Four multi-item scales (12 reports about care items)

Timely Care

6. In the last 6 months, when you contacted this provider's office to get an appointment for care you needed right away, how often did you get an appointment as soon as you needed?
8. In the last 6 months, when you made an appointment for a check-up or routine care with this provider, how often did you get an appointment as soon as you needed?
10. In the last 6 months, when you contacted this provider's office during regular office hours, how often did you get an answer to your medical question that same day?

CAHPS Clinician and Group 3.1 Survey

Communication

11. In the last 6 months, how often did this provider explain things in a way that was easy to understand?
12. In the last 6 months, how often did this provider listen carefully to you?
14. In the last 6 months, how often did this provider show respect for what you had to say?
15. In the last 6 months, how often did this provider spend enough time with you?

Coordination of Care

13. In the last 6 months, how often did this provider seem to know the important information about your medical history?
17. In the last 6 months, when this provider ordered a blood test, x-ray, or other test for you, how often did someone from this provider's office follow up to give you those results?
20. In the last 6 months, how often did you and someone from this provider's office talk about all the prescription medicines you were taking?

Office Staff

21. In the last 6 months, how often were clerks and receptionists at this provider's office as helpful as you thought they should be?
22. In the last 6 months, how often did clerks and receptionists at this provider's office treat you with courtesy and respect?

EZ Survey

- **31 questions**

  9 "About You" questions.

  1 global rating question: Rate the care this doctor gave you in the last 6 months. Pick a number from 0 to 10. The Worst doctor is 0. The Best doctor is 10

  Four multi-item scales (12 reports about care items)

Timely Care

6. How often did you get care as soon as you needed?
8. How often did you get an appointment as soon as you needed?
10. How often did you get answers to your medical questions the same day?

EZ Survey

- ***Communication***

13. How often did this doctor explain things in a way you understood?
14. How often did this doctor listen to you carefully?
16. How often did this doctor show respect for what you had to say?
17. How often did this doctor spend enough time with you?

- ***Coordination of Care***

15. How often did this doctor seem to know what is important to you about your health?
19. How often did this doctor explain the test results to you?
21. How often did this doctor talk about all the medicine you took?

- ***Office Staff***

11. How often were clerks and receptionists as helpful as they should be in the last 6 months?
12. How often did clerks and receptionists treat you with respect in the last 6 months?

Data Collection

- Safety net healthcare provider in Los Angeles
- CAHPS C-G 3.1 and EZ Paper Surveys
  - Pre-notification letter in advance of survey
  - Personalized letters and survey packets
  - Used first-class postage
  - Sent a second survey to non-respondents
  - English and Spanish surveys
- August 1, 2023, through December 31, 2023.
- n = 264 surveys returned (16 providers)
  - 7 doctors, 5 NPs, 4 PAs

Analysis Plan

- Response rate
- Failure to follow skip patterns
- Missing data
- Item frequencies
- Multi-item scale means (SDs)
- Internal consistency reliability
- Patient-level correlations among measures
- Provider-level reliability
- Multi-trait scaling
- Factor analyses (exploratory and confirmatory)

Survey response rate

- 18% overall (n =264)
- 20% for CG 3.1 Survey (n = 147)
- 16% for EZ Survey (n = 117)
- Response rate did not differ significantly by the amount of incentive ($2 vs $5)
- Analytic sample (n = 232)
  - n = 133 (CG 3.1) and 99 (EZ) surveys where respondents reported care from sampled provider

Sample Characteristics

Variable	Percentage
Female	64%
Hispanic	66%
Black	14%
White	14%
Asian	7%
Spanish language survey	44%
High school education or less	33%
Modal age category	55-64 (40%)
Excellent physical health	15%
Very good physical health	15%
Good physical health	40%
Excellent mental health	24%
Very good mental health	18%
Good mental health	36%

Percent of Sample Failing to Skip on CG and EZ Survey

Skip #	*CG 3.1 Survey*	*EZ Survey*
1	12% (n =8)	33% (n = 12)
2	38% (n = 8)	83% (n = 6)
3	25% (n = 44)	39% (n = 28)
4	28% (n = 29)	55% (n = 11)
5	25% (n = 55)	44% (n = 39)
6	8% (n = 26)	55% (n = 11)
7	36% (n = 11)	27% (n = 15)
8	5% (n = 132)	4% (n = 99)

Item missing data was rare

- 24 items asked of everyone
- Mean missing
  - 0.53 for CG 3.1 survey
  - 1.04 for EZ survey
- $t = 1.78$, $p = 0.0769$

Percentage of Sample Selecting Each Response Option for CG (EZ) Surveys

Items	Never	Sometimes	Usually	Always
Timely Care				
Care as soon as needed	11 (0)	19 (21)	25 (37)	46 (41)
Got appointment as soon as needed	6 (1)	13 (21)	36 (40)	46 (37)
Got answers to medical questions same day	10 (11)	19 (25)	21 (22)	50 (41)
Communication				
Provider explain things in a way you understand	2 (3)	8 (9)	33 (31)	57 (57)
Provider listen to you carefully	2 (3)	6 (7)	25 (13)	68 (77)
Provider show respect for what you had to say	3 (1)	6 (5)	11 (19)	80 (75)
Provider spend enough time with you	4 (4)	5 (6)	14 (11)	77 (78)
Coordination				
Provider know what is important about your health	2 (2)	2 (2)	12 (12)	83 (83)
Provider explain the test results to you	5 (2)	6 (9)	21 (23)	68 (65)
Provider talk about all medicine you take	4 (2)	7 (7)	22 (18)	67 (73)
Office Staff				
Clerks and receptionists helpful	18 (5)	13 (10)	12 (13)	58 (72)
Clerks and receptions treat you with respect	15 (9)	15 (11)	25 (11)	46 (69)

Patient-Level Means, SDs, Alphas

	--------CG---------			----------EZ----------		
	Mean	SD	Alpha*	Mean	SD	Alpha*
Timely	3.09	0.91	0.90	3.06	0.83	0.81
Communication	3.65	0.65	0.92	3.65	0.62	0.83
Coordination	3.22	0.80	0.65	3.52	0.75	0.80
Office Staff	3.52	0.65	0.83	3.53	0.73	0.88

*$(MS_{BMS}-MS_{EMS})/MS_{BMS}$ MS_{EMS} = Patient x Item interaction

Correlations Among Scales and Global Doctor Rating (CG above and EZ below diagonal)

	Timely	*Communication*	*Coordination*	*Office Staff*	*Global Rating*
Timely	1.00	0.26	0.36	0.28	0.31
Communication	0.34	1.00	0.61	0.48	0.73
Coordination	0.40	0.82	1.00	0.48	0.46
Office Staff	0.38	0.53	0.53	1.00	0.42
Global Rating	0.37	0.73	0.77	0.33	1.00

Provider-Level Reliability Estimates

	CG		EZ	
	Reliability	N for 0.70	Reliability	N for 0.70
Timely	0.00	∞	0.44	19
Communication	0.00	∞	0.47	17
Coordination	0.08	207	0.19	65
Office Staff	0.00	∞	0.00	∞
Global Rating	0.38	31	0.41	21

$(MS_{BMS}-MS_{WMS})/MS_{BMS}$ Where MS_{WMS} = Within mean square.

MULTI -- MULTITRAIT SCALING PROGRAM

CAHPS CG SURVEY

item	Timely3	Comm4	Coord3	Couresp2	
Q6	0.82*	0.30	0.32	0.35	
Q8	0.84*	0.26	0.37	0.39	
Q10	0.71*	0.25	0.31	0.39	
Q11	0.26	0.88*	0.59	0.53	
Q12	0.26	0.88*	0.61	0.54	
Q14	0.23	0.76*	0.49	0.42	
Q15	0.28	0.75*	0.46	0.39	
Q13	0.30	0.82	0.42*	0.50	How often did this provider seem to know the important information about medical history?
Q17	0.29	0.35	0.59*	0.40	
Q20	0.27	0.35	0.57*	0.36	
Q21	0.39	0.42	0.50	0.70*	
Q22	0.34	0.54	0.46	0.70*	

MULTI -- MULTITRAIT SCALING PROGRAM

CAHPS CG SURVEY

Primary Care First Patient Experience of Care Survey:
https://pcfpecs.org/General-Information/About-PCF-PECS

item	Timely3	Comm4	Coord3	Couresp2	
Q6	0.82*	0.30	0.32	0.35	
Q8	0.84*	0.26	0.37	0.39	
Q10	0.71*	0.25	0.31	0.39	
Q11	0.26	0.88*	0.59	0.53	
Q12	0.26	0.88*	0.61	0.54	
Q14	0.23	0.76*	0.49	0.42	
Q15	0.28	0.75*	0.46	0.39	
Q13	0.30	0.82	0.42*	0.50	How often did this provider seem to know the important information about medical history?
Q17	0.29	0.35	0.59*	0.40	
Q20	0.27	0.35	0.57*	0.36	
Q21	0.39	0.42	0.50	0.70*	
Q22	0.34	0.54	0.46	0.70*	

Exploratory Factor Analysis

CG Survey
PRINCIPAL COMPONENTS ANALYSIS
GUTTMAN'S WEAKEST LOWER BOUND
LOOKING FOR EIGENVALUES>=1

The FACTOR Procedure
Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 12 Average = 1				
	Eigenvalue	Difference	Proportion	Cumulative
1	5.61993719	3.44114111	0.4683	0.4683
2	2.17879608	1.12350641	0.1816	0.6499
3	1.05528967	0.12358322	0.0879	0.7378
4	0.93170645	0.40698858	0.0776	0.8155
5	0.52471787	0.09175144	0.0437	0.8592
6	0.43296642	0.04691628	0.0361	0.8953
7	0.38605015	0.07254840	0.0322	0.9275
8	0.31350174	0.06237872	0.0261	0.9536
9	0.25112302	0.11509493	0.0209	0.9745
10	0.13602809	0.01477922	0.0113	0.9858
11	0.12124888	0.07261443	0.0101	0.9959
12	0.04863445		0.0041	1.0000

7.31, 1.97, and 0.98 eigenvalues for polychoric correlations

```
PARALLEL.EXE: LATENT ROOTS OF RANDOM DATA CORRELATION MATRICES PROGRAM
PROGRAMMER: RON HAYS, RAND CORPORATION
FOR 131 SUBJECTS AND 12 VARIABLES AND 100 SAMPLES
************************************************************
Hays, R. D.  (1987).  PARALLEL:  A program for performing parallel
  analysis.  Applied Psychological Measurement, 11, 58.
************************************************************

EIGENVALUES FOR FACTOR ANALYSIS SMC ESTIMATES FOLLOW:

             OBSERVED       RANDOM         SLOPE
            =========     =========     =========
LAMBDA    1= 5.129700     0.668903      ---------
                                       -3.028500
LAMBDA    2= 2.101200     0.489875      ---------
                                       -1.416800 ***
LAMBDA    3= 0.684400     0.393931      ---------
                                       -0.185500
LAMBDA    4= 0.498900     0.323764      ---------
                                       -0.287800 ***
LAMBDA    5= 0.211100     0.234022      ---------
                                       -0.034300
LAMBDA    6= 0.176800     0.157072      ---------


(CAN'T COMPUTE LAMBDA 7 :LOG OF ZERO OR NEGATIVE IS UNDEFINED)

Results of Parallel Analysis Indicate Maximum of   4 Factors.
Slopes followed by asterisks indicate discontinuity points
that may be suggestive of the number of factors to retain.
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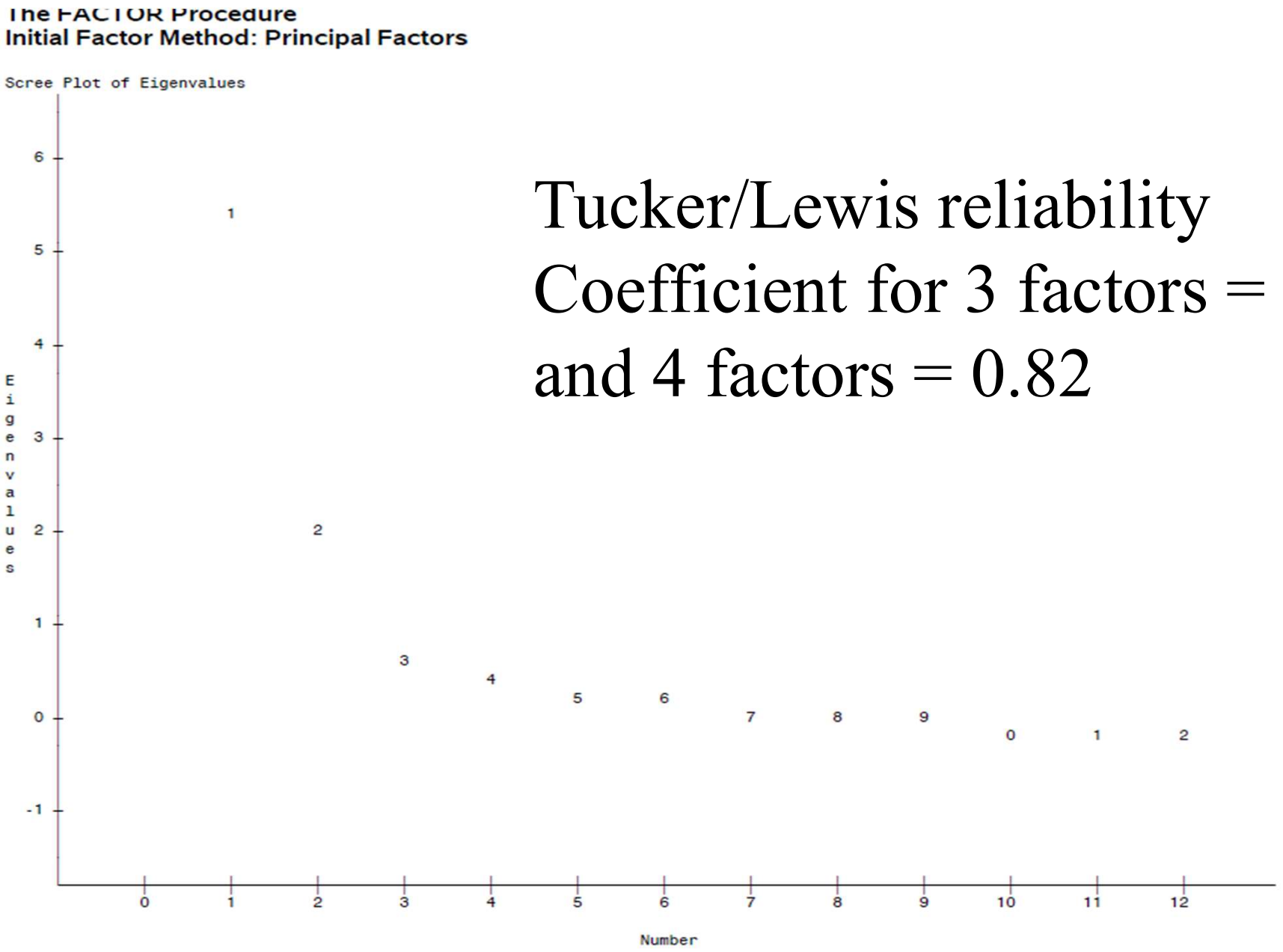
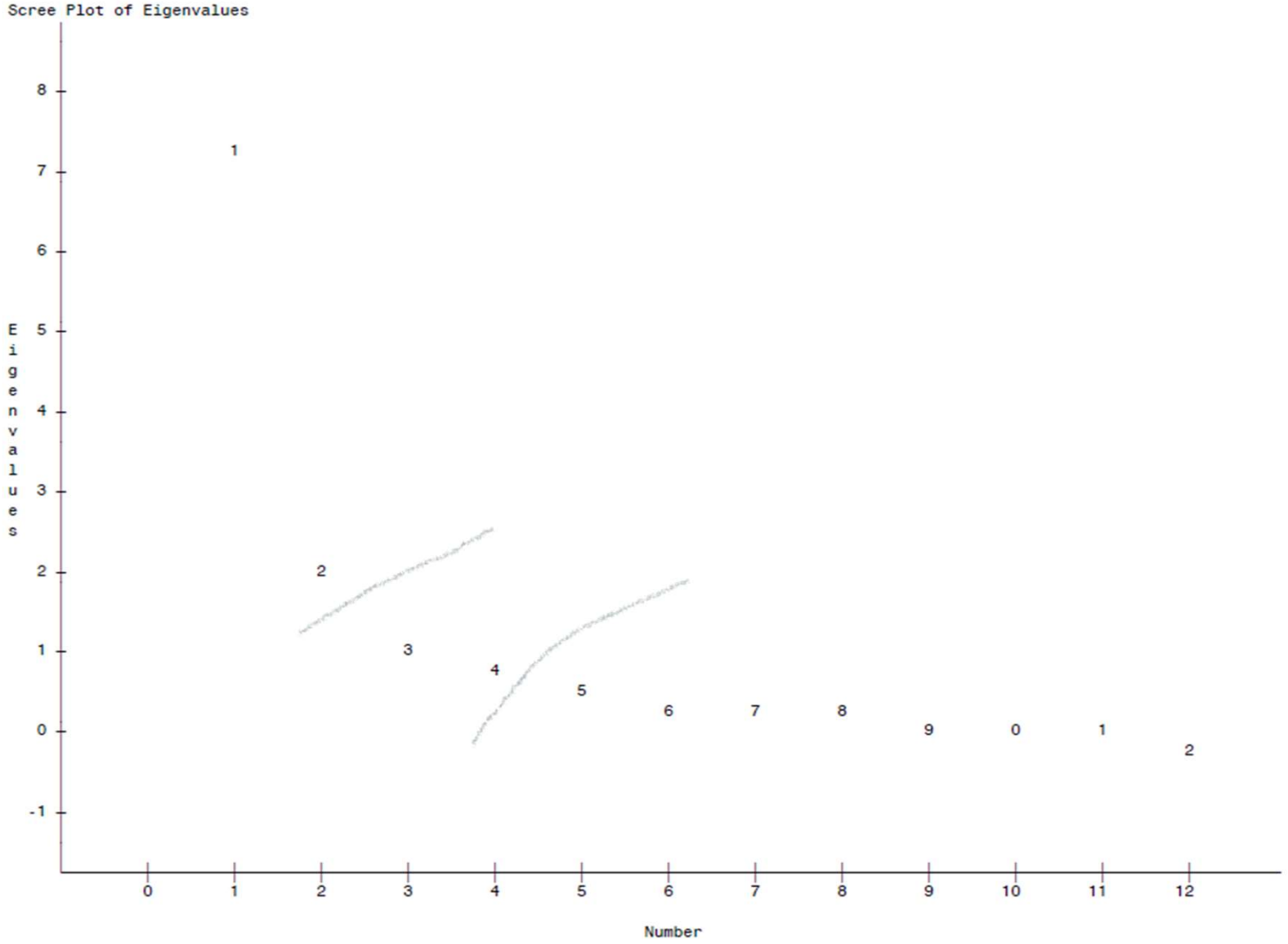
Scree Plot



Tucker/Lewis reliability Coefficient for 3 factors = 0.80 and 4 factors = 0.82

Polychoric Correlations



OBLIQUE PROMAX ROTATION -- 4 FACTOR SOLUTION satisfaction sco
COMMON FACTOR ANALYSIS
SQUARED MULTIPLE CORRELATIONS AS PRIOR COMMUNALITIES ES

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Rotated Factor Pattern (Standardized Regression Coefficients)					
		Factor1	Factor2	Factor3	Factor4
Q11	Q11	0.90162	-0.02213	0.07187	-0.01761
Q12	Q12	0.87963	-0.05304	0.07360	0.07399
Q13	Q13	0.83030	0.02288	0.02859	0.04306
Q14	Q14	0.81941	0.00383	0.02628	-0.06644
Q15	Q15	0.81097	0.04420	-0.11529	0.07241
Q8	Q8	-0.03014	0.93497	-0.02639	0.05938
Q6	Q6	0.15636	0.92633	0.00326	-0.15567
Q10	Q10	-0.14797	0.60869	0.05063	0.23116
Q22	Q22	0.10378	-0.01726	0.78082	-0.05110
Q21	Q21	0.01794	0.05482	0.74874	0.06879
Q20	Q20	0.09261	-0.01493	-0.06442	0.71117
Q17	Q17	0.02310	0.13730	0.12152	0.60273

Inter-Factor Correlations				
	Factor1	Factor2	Factor3	Factor4
Factor1	1.00000	0.27320	0.56104	0.36463
Factor2	0.27320	1.00000	0.41458	0.44485
Factor3	0.56104	0.41458	1.00000	0.49657
Factor4	0.36463	0.44485	0.49657	1.00000

OBLIQUE PROMAX ROTATION -- 4 FACTOR SOLUTION
COMMON FACTOR ANALYSIS
SQUARED MULTIPLE CORRELATIONS AS PRIOR COMMUNALITIES ESTIMATES

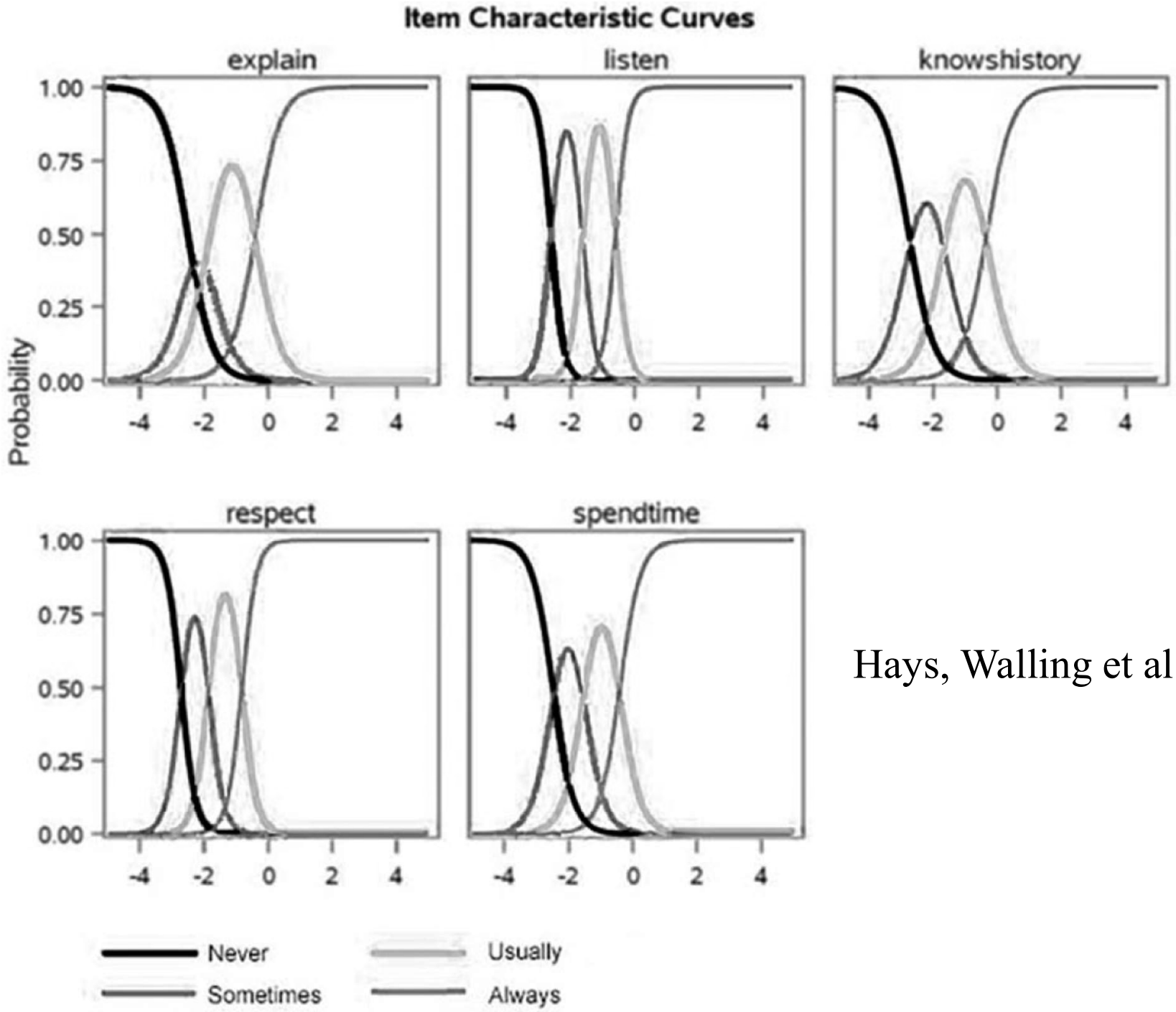
The FACTOR Procedure
Rotation Method: Promax (power = 3)

Rotated Factor Pattern (Standardized Regression Coefficients)					
		Factor1	Factor2	Factor3	Factor4
Q15	Q15	0.97694	0.09429	-0.04157	-0.23714
Q13	Q13	0.93432	0.08869	-0.00913	-0.01028
Q14	Q14	0.93396	-0.08749	-0.00360	0.06967
Q12	Q12	0.91413	0.00053	0.07142	0.06640
Q11	Q11	0.89476	0.04113	0.12845	-0.01225
Q20	Q20	0.89372	-0.07638	0.02099	0.25091
Q6	Q6	0.06504	0.99723	-0.04723	-0.03030
Q8	Q8	0.00382	0.91485	0.02135	0.10993
Q21	Q21	0.00885	-0.00072	0.94597	0.02325
Q22	Q22	0.19383	-0.02382	0.87073	-0.03926
Q17	Q17	0.11339	-0.02798	-0.10549	0.95409
Q10	Q10	-0.16854	0.25073	0.22476	0.64823

Standardized Factor Loadings for 3-Factor Categorical Factor Analytic Model

Item	Timely	Communication	Office
Q6 Care as soon as needed	0.92		
Q8 Got an appointment as soon as needed	0.95		
Q10 Got answers to questions same day	0.75		
Q11 Explained things in a way you understand		0.94	
Q12 Listen to you carefully		0.94	
Q14 Show respect for what you had to say		0.80	
Q15 Spent enough time with you		0.77	
Q13 Know what is important about your health		0.87	
Q17 Explain the test results to you		0.32	
Q20 Talk about the medicine you take		0.56	
Q21 Staff helpful			0.82
Q22 Staff courtesy and respect			0.88

Comparative fit index = 0.95; RMSEA = 0.09

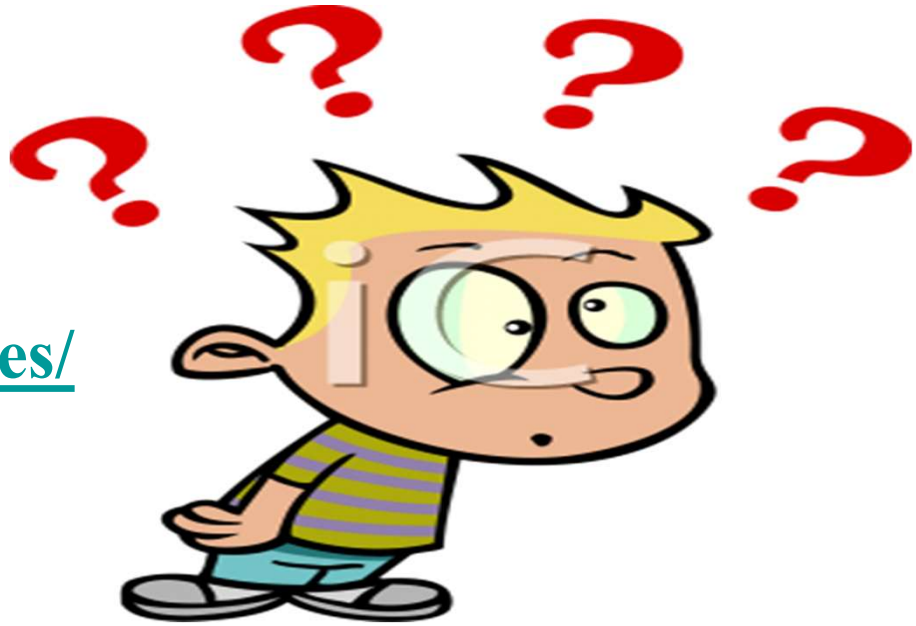


Hays, Walling et al. (2023)

FIG. 1. Item characteristic curves for CAHPS Communication Items.

Email: drhays@ucla.edu

https://labs.dgsom.ucla.edu/hays/pages/



We thank Charleen Mikail for her immense assistance with the study.

For further reading see:

Cappelleri, J. C., Lundy, J.J., & Hays, R. D. (2014). Overview of classical test theory and item response theory for quantitative assessment of items in developing patient-reported outcome measures. Clinical Therapeutics., 36 (5), 648-662.

Hays, R. D., Walling, A. M., Sudore, R. L., Chau, A., & Wenger, N. S. (2023). Support for the use of Consumer Assessment of Healthcare Providers and Systems communication items among seriously ill patients. J Palliat Med, 26(9), 1234-1239.