Supplementary Material

Belonging to: Psychometric properties of the Patient-Reported Outcomes Measurement Information System (PROMIS®) Pediatric item bank Peer Relationships in the Dutch general population (Luijten et al., 2021).

Contents

Appendix A – Sociodemographic characteristics of the pediatric and adolescent study samples in comparison to the general population.

Appendix B – Assessment of unidimensionality through confirmatory factor analysis and bi-factor analyses.

Appendix C – Estimated item parameters and item fit of the pediatric PROMIS Peer Relationships item bank in the Dutch general population (n=527).

Appendix D – Raw output of IRTPRO DIF analyses.
Psychometric properties of the Patient-Reported Outcomes Measurement Information System (PROMIS®) Pediatric item bank Peer Relationships in the Dutch general population (Luijten et al., 2021).

Appendix A – Sociodemographic Characteristics
Appendix A. Sociodemographic characteristics of the pediatric and adolescent study samples in comparison to the general population.

|                       | 8 – 12 years | 13 – 18 years |
|-----------------------|--------------|---------------|
| **Pediatric study sample (N=492)** | Sample (N) | Sample (%) | Dutch Population* (%) | Sample (N) | Sample (%) | Dutch Population* (%) |
| **Age (years)**       |             |            |                     |             |            |                     |
| 8                     | 90          | 18.3       | 19.1                | 13          | 101        | 16.7               | 16.9               |
| 9                     | 92          | 18.7       | 19.4                | 14          | 106        | 17.5               | 17.2               |
| 10                    | 98          | 19.9       | 20.0                | 15          | 106        | 17.5               | 16.8               |
| 11                    | 104         | 21.1       | 20.7                | 16          | 100        | 16.5               | 16.7               |
| 12                    | 108         | 22.0       | 20.8                | 17          | 86         | 14.2               | 16.2               |
|                       |             |            |                     | 18          | 107        | 17.7               | 16.3               |
| **Gender**            |             |            |                     |             |            |                     |
| Male                  | 241         | 51.0       | 51.1                | 316         | 52.1       | 51.1               |                     |
| Female                | 251         | 49.0       | 48.9                | 290         | 47.9       | 48.9               |                     |
| **Ethnicity**         |             |            |                     |             |            |                     |
| Dutch                 | 386         | 78.5       | 76.0                | 510         | 84.2       | 76.3               |                     |
| Non-western immigrants| 85          | 17.3       | 17.4                | 63          | 10.4       | 16.9               |                     |
| Western immigrants    | 21          | 4.3        | 6.6                 | 33          | 5.4        | 6.8                |                     |
| **Educational Level** |             |            |                     |             |            |                     |
| Elementary\(^1\)      | 6           | 1.0        | 0.6                 |             |            |                     |
| Lower vocational      | 149         | 24.6       | 23.2                |             |            |                     |
| LBO/VMBO\(^1\)       |             |            |                     |             |            |                     |
| Lower vocational      | 189         | 31.2       | 30.1                |             |            |                     |
| MAVO\(^1\)           |             |            |                     |             |            |                     |
| Secondary vocational  | 118         | 19.5       | 20.1                |             |            |                     |
| MBO\(^1\)            |             |            |                     |             |            |                     |
| General secondary     | 129         | 21.3       | 21.8                |             |            |                     |
| education HAVO/VWO\(^3\)|           |            |                     |             |            |                     |
| HBO/WO Bachelor\(^3\) | 15          | 2.5        | 4.1                 |             |            |                     |
| WO Master or Doctorate\(^3\)| 0          | 0.0        | 0.2                 |             |            |                     |

Note: * = Based on the Gold Standard 2017 (Statistics Netherlands; www.cbs.nl/en-gb) population numbers; \(^1\), Low educational level; \(^2\), Intermediate educational level; \(^3\), High educational level.
Appendix B – Unidimensionality Analyses
### Appendix B. Assessment of unidimensionality through confirmatory factor analysis (CFA) and bi-factor analyses.

| Items                                                                 | Unidimensional | Bi-factor | Bi-factor | Bi-factor | Bi-factor |
|-----------------------------------------------------------------------|----------------|-----------|-----------|-----------|-----------|
|                                                                        | CFA            | G         | F1        | F2        | F3        |
| I felt accepted by other kids my age.                                 | 0.82           | 0.72      | 0.09      | 0.16      | 0.17      |
| I was able to count on my friends.                                    | 0.88           | 0.77      | -0.01     | -0.01     | 0.55      |
| I was able to talk about everything with my friends.                  | 0.83           | 0.73      | 0.04      | 0.06      | 0.35      |
| I was good at making friends.                                         | 0.81           | 0.73      | 0.12      | 0.19      | 0.07      |
| My friends and I helped each other out.                               | 0.89           | 0.80      | 0.10      | 0.05      | 0.28      |
| Other kids wanted to be my friend.                                    | 0.85           | 0.68      | -0.01     | 0.54      | 0.03      |
| Other kids wanted to be with me.                                      | 0.89           | 0.70      | -0.01     | 0.59      | 0.00      |
| Other kids wanted to talk to me.                                      | 0.87           | 0.71      | 0.04      | 0.47      | 0.00      |
| I felt good about my friendships.                                     | 0.88           | 0.80      | 0.15      | 0.08      | 0.14      |
| I liked being around other kids my age.                               | 0.80           | 0.73      | 0.18      | 0.11      | 0.01      |
| I played alone and kept to myself.                                    | 0.39           | 0.38      | 0.14      | -0.04     | -0.01     |
| I shared with other kids (food, games, pens, etc.).                   | 0.71           | 0.62      | 0.13      | 0.21      | -0.04     |
| I spent time with my friends.                                         | 0.84           | 0.79      | 0.21      | 0.07      | 0.02      |
| I was a good friend.                                                  | 0.81           | 0.74      | 0.23      | -0.01     | 0.00      |
| I was able to have fun with my friends.                               | 0.88           | 0.83      | 0.26      | -0.05     | 0.02      |

**Fit Indices**

| CFA          | Scaled CFI | 0.95          |
|--------------|------------|---------------|
| Scaled TLI   | 0.94       |               |
| Scaled RMSEA | 0.15       |               |
| Bi-factor    |            |               |
| Omega H      | 0.88       |               |
| ECV          | 0.81       |               |

*Note: G; General factor; F1-F3, random factors.*
Appendix C – Item Parameters and Item Fit Statistics
### Appendix C. Estimated item parameters and item fit of the pediatric PROMIS Peer Relationships item bank in the Dutch general population (n=527).

| Item                                                                 | Item Parameters and item fit statistics | DIF   | R²       |
|----------------------------------------------------------------------|-----------------------------------------|-------|----------|
|                                                                        | α  | β₁     | β₂   | β₃   | β₄   | S-X² | Df | P   |            |
| I felt accepted by other kids my age.                               | 2.82| -2.79  | -2.20| -1.22| 0.04| 53.52 | 37 | 0.04  | 0.011     |
| I was able to count on my friends.                                  | 3.18| -2.56  | -2.07| -1.11| 0.09| 43.31 | 36 | 0.19  | 0.011     |
| I was able to talk about everything with my friends.                | 2.58| -2.69  | -1.81| -0.73| 0.31| 40.68 | 43 | 0.57  | 0.014     |
| I was good at making friends.                                        | 2.67| -2.22  | -1.56| -0.67| 0.33| 34.66 | 47 | 0.91  | 0.000     |
| My friends and I helped each other out.                             | 3.72| -2.82  | -2.19| -1.10| 0.12| 33.64 | 31 | 0.34  | 0.003     |
| Other kids wanted to be my friend.                                  | 2.50| -2.41  | -1.54| -0.27| 0.91| 59.54 | 47 | 0.10  | 0.001     |
| Other kids wanted to be with me.                                    | 2.76| -2.32  | -1.60| -0.40| 0.96| 50.83 | 42 | 0.16  | 0.004     |
| Other kids wanted to talk to me.                                    | 2.83| -2.97  | -1.90| -0.68| 0.63| 33.67 | 38 | 0.67  | 0.001     |
| I felt good about my friendships.                                   | 3.57| -2.56  | -1.83| -1.12| 0.12| 39.59 | 34 | 0.23  | 0.000     |
| I liked being around other kids my age.                             | 2.56| -2.60  | -2.01| -0.94| 0.37| 51.08 | 40 | 0.11  | 0.005     |
| I played alone and kept to myself.                                  | 0.78| -3.76  | -2.37| -0.54| 2.00| 140.52| 82 | 0.00  | 0.006     |
| I shared with other kids (food, games, pens, etc.).                 | 1.96| -2.78  | -1.83| -0.66| 0.79| 77.36 | 53 | 0.02  | 0.000     |
| I spent time with my friends.                                        | 3.02| -2.37  | -1.73| -0.75| 0.58| 34.97 | 38 | 0.61  | 0.000     |
| I was a good friend.                                                 | 2.73| -3.23  | -2.35| -1.20| 0.28| 48.02 | 35 | 0.07  | 0.025^    |
| I was able to have fun with my friends.                             | 3.69| -2.81  | -2.27| -1.21| 0.02| 27.25 | 27 | 0.45  | 0.004     |

**Note:** DIF; Differential item functioning between Dutch and U.S. parameters as measured by McFadden’s Pseudo R². α; discrimination parameter, β₁-₄; threshold parameters, *; Significant at p < 0.001, ^; Weak effect.
Appendix D – Raw output of IRTPRO DIF Analyses
IRTPRO Version 4.2
Output generated by IRTPRO estimation engine Version 5.20 (64-bit)

Table of Contents
Graded Model Item Parameter Estimates for Group 1, logit: α(f - b)
Summed-Score Based Item Diagnostic Tables and X^2s for Group 1
Graded Model Item Parameter Estimates for Group 2, logit: α(f - b)
Summed-Score Based Item Diagnostic Tables and X^2s for Group 2
Group Parameter Estimates
Diff Statistics for Graded Items
Marginal fit (X^2) and Standardized LD X^2 Statistics for Group 1
Marginal fit (X^2) and Standardized LD X^2 Statistics for Group 2
Item Information Function Values for Group 1 at 15 Values of θ from -2.8 to 2.8
Item Information Function Values for Group 2 at 15 Values of θ from -2.8 to 2.8
Likelihood-based Values and Goodness of Fit Statistics
Summary of the Data and Control Parameters
Graded Model Item Parameter Estimates, logit: α(f + c)
Graded Model Item Parameter Estimates for Group 1, logit: α(f - b)
(Back to TOC)
Summed-Score Based Item Diagnostic Tables and X^2s for Group 1
(Back to TOC)
S^2 Item Level Diagnostic Statistics
Graded Model Item Parameter Estimates, logit: α(f + c)

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**Graded Model Item Parameter Estimates, logit: α(f + c)**

| Item | Label   | a   | s.e. | c_1  | s.e. | c_2  | s.e. | c_3  | s.e. | c_4  | s.e. |
|------|---------|-----|------|------|------|------|------|------|------|------|------|
| 1    | P5018R1r_PEER | 2.12| 0.10| 4.38 | 0.14| 3.61 | 0.12| 1.97 | 0.08| 0.42 | 0.06|
| 2    | P5058R1r_PEER | 1.92| 0.09| 4.07 | 0.13| 3.55 | 0.11| 1.61 | 0.07| 0.11 | 0.06|
| 3    | P5056R1r_PEER | 1.71| 0.07| 3.54 | 0.11| 2.72 | 0.09| 1.76 | 0.06| 0.50 | 0.06|
| 4    | P1147R1r_PEER | 2.08| 0.10| 4.97 | 0.17| 4.14 | 0.14| 2.05 | 0.08| 0.42 | 0.06|
| 5    | P5505R1r_PEER | 2.12| 0.10| 5.17 | 0.19| 4.47 | 0.16| 2.24 | 0.09| 0.60 | 0.06|
| 6    | P233R2r_PEER | 2.04| 0.10| 4.45 | 0.17| 3.57 | 0.13| 1.37 | 0.07| 0.59 | 0.06|
| 7    | P1219R1r_PEER | 2.37| 0.11| 5.17 | 0.19| 4.31 | 0.15| 1.58 | 0.08| 0.51 | 0.07|
| 8    | P5920R1r_PEER | 2.23| 0.11| 5.47 | 0.19| 4.32 | 0.15| 1.98 | 0.08| 0.04 | 0.06|
| 9    | P726aR2r_PEER | 1.83| 0.12| 4.98 | 0.22| 4.41 | 0.19| 2.62 | 0.12| 1.12 | 0.08|
| 10   | P5019r_PEER | 1.89| 0.12| 4.92 | 0.22| 4.30 | 0.18| 2.23 | 0.11| 0.86 | 0.08|
| 11   | P5152R1r_PEER | 0.82| 0.07| 3.16 | 0.12| 2.25 | 0.09| 0.73 | 0.06| 0.32 | 0.06|
| 12   | P5150R1r_PEER | 1.28| 0.08| 3.44 | 0.13| 2.64 | 0.10| 1.09 | 0.07| 0.26 | 0.06|
| 13   | P5052R1r_PEER | 1.60| 0.10| 4.19 | 0.17| 3.48 | 0.14| 1.65 | 0.08| 0.09 | 0.07|
| 14   | P733R1r_PEER | 1.71| 0.11| 5.53 | 0.25| 5.20 | 0.23| 3.21 | 0.13| 1.43 | 0.09|
| 15   | P2964R1r_PEER | 2.27| 0.16| 5.39 | 0.25| 4.80 | 0.22| 3.18 | 0.15| 1.52 | 0.10|

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**Summed-Score Based Item Diagnostic Tables and X^2s for Group 1**

| Item | Label     | X^2 | DF | Probability |
|------|-----------|-----|----|-------------|
| 1    | P5018R1r_PEER | 87.16 | 78 | 0.1797  |
| 2    | P5058R1r_PEER | 97.20 | 76 | 0.0510  |
| 3    | P5056R1r_PEER | 94.69 | 85 | 0.2210  |
| 4    | P1147R1r_PEER | 108.29 | 69 | 0.0018  |
| 5    | P5505R1r_PEER | 82.43 | 67 | 0.0968  |
| 6    | P233R2r_PEER | 78.93 | 75 | 0.3553  |
| 7    | P2191r_PEER | 82.92 | 66 | 0.0777  |
| 8    | P5920R1r_PEER | 82.58 | 67 | 0.0949  |
| 9    | P726aR2r_PEER | 69.46 | 65 | 0.3291  |
| 10   | P5019r_PEER | 69.17 | 66 | 0.3703  |
| 11   | P5152R1r_PEER | 155.96 | 91 | 0.0016  |
| 12   | P5150R1r_PEER | 79.56 | 87 | 0.7025  |
| 13   | P5052R1r_PEER | 86.48 | 75 | 0.1715  |
| 14   | P733R1r_PEER | 108.50 | 56 | 0.0001  |
| 15   | P2964R1r_PEER | 100.85 | 62 | 0.0013  |

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**Graded Model Item Parameter Estimates, logit: α(f + c)**

| Item | Label     | a   | s.e. | c_1  | s.e. | c_2  | s.e. | c_3  | s.e. | c_4  | s.e. |
|------|-----------|-----|------|------|------|------|------|------|------|------|------|
| 1    | P5018R1r_PEER | 3.18| 0.25| 8.89 | 0.88| 7.24 | 0.50| 4.47 | 0.31| 0.91 | 0.19|
| 2    | P5058R1r_PEER | 3.57| 0.29| 9.28 | 0.69| 7.72 | 0.54| 4.69 | 0.34| 0.86 | 0.21|

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**Item Information Function Values for Group 1 at 15 Values of θ from -2.8 to 2.8**

**Item Information Function Values for Group 2 at 15 Values of θ from -2.8 to 2.8**

**Likelihood-based Values and Goodness of Fit Statistics**

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**Summary of the Data and Control Parameters**

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**Back to TOC**
Summed-Score Item Level Diagnostic Statistics for Group 2 (Back to TOC)

| Item | Label | x² | df | Probability |
|------|-------|----|----|-------------|
| 1    | P5018R1r_PEER | 52.41 | 51 | 0.4204 |
| 2    | P506B1r_PEER | 59.95 | 48 | 0.1152 |
| 3    | P506R1r_PEER | 57.87 | 57 | 0.0479 |
| 4    | P1147R1r_PEER | 59.64 | 65 | 0.6850 |
| 5    | P505R1r_PEER | 46.38 | 29 | 0.2959 |
| 6    | P233R1r_PEER | 79.64 | 65 | 0.1044 |
| 7    | P210R1r_PEER | 78.07 | 59 | 0.0488 |
| 8    | P503R1r_PEER | 63.48 | 54 | 0.1767 |
| 9    | P7262R1r_PEER | 55.73 | 49 | 0.2361 |
| 10   | P9019r_PEER | 70.17 | 57 | 0.1127 |
| 11   | P5152R1r_PEER | 214.34 | 107 | 0.0001 |
| 12   | P5150R1r_PEER | 85.01 | 71 | 0.1226 |
| 13   | P5052R1r_PEER | 51.80 | 57 | 0.6707 |
| 14   | P733R1r_PEER | 66.09 | 47 | 0.0344 |
| 15   | P2964R1r_PEER | 51.96 | 39 | 0.0799 |

Group Parameter Estimates (Back to TOC)

DIF Statistics for Graded Items (Back to TOC)

Marginal fit (x²) and Standardized LD x² Statistics for Group 1 (Back to TOC)
Likelihood
Item Information Function Values for Group 2 at 15 Values of Marginal fit ($0.30$ to $2.60$)

| Item                                      | 0.3 |
|-------------------------------------------|-----|
| P5018R1r_PEER                             | 2.5 |
| P5052R1r_PEER                             | 4.3 |
| P733R1r_PEER                              | 1.2 |
| P2964R1r_PEER                             | 1.5 |

Marginal fit ($X^2$) and Standardized LD $X^2$ Statistics for Group 2

| Item                                      | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|-------------------------------------------|----|----|----|----|----|----|----|----|----|----|
| P5018R1r_PEER                             | 0.3|
| P5052R1r_PEER                             | 2.5|
| P5058R1r_PEER                             | 0.9|
| P1147R1r_PEER                             | 1.0|
| P5055R1r_PEER                             | 2.6|
| P733R1r_PEER                              | 0.9|
| P210R1r_PEER                              | 0.6|
| P9020R1r_PEER                             | 0.2|
| P732B1r_PEER                              | 1.0|
| P9015r_PEER                               | 0.4|
| P5018R1r_PEER                             | 1.0|
| P5052R1r_PEER                             | 0.3|
| P5058R1r_PEER                             | 0.4|
| P733R1r_PEER                              | 1.1|
| P2964R1r_PEER                             | 2.2|

Item Information Function Values for Group 1 at 15 Values of $0.28$ to $2.8$ (Back to TOC)

| Item                                      | 0.8 |
|-------------------------------------------|-----|
| P5018R1r_PEER                             | 0.64|
| P5058R1r_PEER                             | 0.63|
| P5056R1r_PEER                             | 0.52|
| P1147R1r_PEER                             | 0.04|
| P5055R1r_PEER                             | 0.73|
| P233R2j_PEER                              | 0.73|
| P210R1r_PEER                              | 0.97|
| P9020R1r_PEER                             | 1.11|
| P5058R1r_PEER                             | 0.93|
| P1147R1r_PEER                             | 0.93|
| P5055R1r_PEER                             | 0.76|
| P233R2j_PEER                              | 0.68|
| P210R1r_PEER                              | 0.86|
| P9020R1r_PEER                             | 1.06|

Test Information

- Expected s.e.: 0.28
- Test Information: 23.32

Marginal Reliability for Response Pattern Scores: 0.98

Item Information Function Values for Group 2 at 15 Values of $0.28$ to $2.8$ (Back to TOC)

| Item                                      | 0.8 |
|-------------------------------------------|-----|
| P5018R1r_PEER                             | 2.80|
| P5058R1r_PEER                             | 2.89|
| P5056R1r_PEER                             | 2.18|
| P1147R1r_PEER                             | 1.35|
| P5055R1r_PEER                             | 4.74|
| P233R2j_PEER                              | 1.60|
| P210R1r_PEER                              | 1.64|
| P9020R1r_PEER                             | 2.64|
| P5058R1r_PEER                             | 3.46|
| P1147R1r_PEER                             | 2.60|
| P5055R1r_PEER                             | 2.06|
| P233R2j_PEER                              | 1.33|
| P1147R1r_PEER                             | 2.02|
| P5055R1r_PEER                             | 0.24|
| P210R1r_PEER                              | 1.33|
| P9020R1r_PEER                             | 2.02|
| P733R1r_PEER                              | 2.59|
| P2964R1r_PEER                             | 4.75|

Test Information

- Expected s.e.: 0.16
- Test Information: 37.56

Marginal Reliability for Response Pattern Scores: 0.90
Summary of the Data and Control Parameters

Group 1

Parameter Estimation Control Values

DIF Analysis

All items are evaluated for DIF (Conditional on population distribution estimates obtained with all items constrained equal)

Contrasts among groups:

Contrast 1

Miscellaneous Control Values

Processing times (in seconds)

Output Files

Convergence and Numerical Stability

Engine status: Normal termination
SEM algorithm status: Normal
First-order test: Convergence criteria satisfied
Condition number of information matrix: 1.58e+003
Second-order test: Solution is a possible local maximum

Bayesian Information Criterion (BIC): 79348.52

Statistics based on the full item x item x ... classification
The table is too sparse to compute the general multinomial goodness of fit statistics.

Statistics based on one- and two-way marginal tables
M_2 statistics not available for this estimation method.

Sample Size

Group 1 Group 2

Number of Items 15 15
Number of Dimensions 1 1

Item | Label | Categories | Model | Item | Label | Categories | Model |
--- | --- | --- | --- | --- | --- | --- | --- |
1 | P5018R1r_PEER | 5 | Graded | 1 | P5018R1r_PEER | 5 | Graded |
2 | P5058R1r_PEER | 5 | Graded | 2 | P5058R1r_PEER | 5 | Graded |
3 | P5056R1r_PEER | 5 | Graded | 3 | P5056R1r_PEER | 5 | Graded |
4 | P1147R1r_PEER | 5 | Graded | 4 | P1147R1r_PEER | 5 | Graded |
5 | P5055R1r_PEER | 5 | Graded | 5 | P5055R1r_PEER | 5 | Graded |
6 | P233R2r_PEER | 5 | Graded | 6 | P233R2r_PEER | 5 | Graded |
7 | P210R1r_PEER | 5 | Graded | 7 | P210R1r_PEER | 5 | Graded |
8 | P9020R1r_PEER | 5 | Graded | 8 | P9020R1r_PEER | 5 | Graded |
9 | P726aR2r_PEER | 5 | Graded | 9 | P726aR2r_PEER | 5 | Graded |
10 | P9019r_PEER | 5 | Graded | 10 | P9019r_PEER | 5 | Graded |
11 | P5152R1r_PEER | 5 | Graded | 11 | P5152R1r_PEER | 5 | Graded |
12 | P5150R1r_PEER | 5 | Graded | 12 | P5150R1r_PEER | 5 | Graded |
13 | P5052R1r_PEER | 5 | Graded | 13 | P5052R1r_PEER | 5 | Graded |
14 | P733R1r_PEER | 5 | Graded | 14 | P733R1r_PEER | 5 | Graded |
15 | P2964R1r_PEER | 5 | Graded | 15 | P2964R1r_PEER | 5 | Graded |

SEM algorithm tolerance: 1.00e-003
Standard error computation algorithm: Supplemented EM

Maximum number of cycles: 500
Convergence criterion: 1.00e-005
Maximum number of M-step iterations: 50
Convergence criterion for iterative M-steps: 1.00e-006
Number of rectangular quadrature points: 49
SEM algorithm tolerance: 1.00e-003
Standard error computation algorithm: Supplemented EM

Contrast 1

1.000 -1.000

Print parameter numbers? Yes
2 tolerance, max. abs. logit value: 50.00
Number of processor cores used: 8
Number of cycles completed: 221
Maximum parameter change: 0.00e+000
Number of free parameters: 150

Processing times (in seconds)

E-step computations: 0.29
M-step computations: 0.21
Standard error computations: 1.38
Goodness-of-fit statistics: 0.08
Total: 1.95

HTML results and control parameters: C:\AMC Werk\IRT PRO\PeerrelDIFvoorIRT PRO-ReverseGroupCoding. Test1-rt.htm

Engine status: Normal termination
SEM algorithm status: Normal
First-order test: Convergence criteria satisfied
Condition number of information matrix: 1.58e+003
Second-order test: Solution is a possible local maximum