Classical Test Theory Reliability and Items Analysis in SPSS and SAS

The data from this example come from Study 2 of this publication:

Summers, J. A., Hoffman, L., Marquis, J., Turnbull, A. P., Poston, D. P., & Nelson, L. G. L. (2005). Measuring the quality of family-professional partnerships in special education services. *Exceptional Children, 72*(1), 65-81.

We are measuring the importance of various aspects of Parent-Professional partnerships for families who have children with disabilities. We begin with two subscales that were identified and refined through exploratory factor analysis in a previous study: Child (11 items) and Family (10 items). We will examine the child scale using SPSS and the family scale using SAS.

```
/* Reliability analysis in SPSS:
    VARIABLES lists all variables to be included
    SCALE (name) = variables included or ALL
    MODEL options: alpha, split(N), guttman, parallel, strictparallel
    STATISTICS gives item-level or scale-level stats
    SUMMARY gives more item statistics -- TOTAL gives discriminations */.

TITLE "11-item Child Subscale".
RELIABILITY
  /VARIABLES = pi5 pi6 pi7 pi8 pi9 pi10 pi11 pi12 pi13 pi14 pi15
  /SCALE(child11) = ALL
  /MODEL = ALPHA
  /STATISTICS = DESCRIPTIVE CORRELATIONS SCALE
  /SUMMARY = TOTAL .
```

Scale: CHILD11

Case Processing Summary

		N	%
Cases	Valid	169	88.5
	Excluded[a]	22	11.5
	Total	191	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.913	.919	11

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
50.45	35.689	5.974	11

Item Statistics

	Mean	Std. Deviation	N
pi5 Help you gain skills or information to get what your child needs.	4.42	.856	169
pi6 Have the skills to help your child succeed.	4.75	.625	169
pi7 Provide services that meet the individual needs of your child.	4.73	.632	169
pi8 Speak up for your child's best interests when working with other service providers.	4.44	.885	169
pi9 Let you know about the good things your child does.	4.40	.874	169
pi10 Are available when you need them.	4.36	.826	169
pi11 Treat your child with dignity.	4.73	.661	169
pi12 Build on your child's strengths.	4.57	.737	169
pi13 Value your opinion about your child's needs.	4.62	.698	169
pi14 Are honest, even when they have bad news.	4.57	.745	169
pi15 Keep your child safe when your child is in their care.	4.85	.531	169

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
pi5 Help you gain skills or information to get what your child needs.	46.03	29.457	.592	.418	.910
pi6 Have the skills to help your child succeed.	45.70	30.902	.633	.597	.907
pi7 Provide services that meet the individual needs of your child.	45.72	30.574	.675	.588	.905
pi8 Speak up for your child's best interests when working with other service providers.	46.01	28.708	.653	.520	.907
pi9 Let you know about the good things your child does.	46.05	28.777	.655	.550	.907
pi10 Are available when you need them.	46.09	29.086	.664	.531	.906
pi11 Treat your child with dignity.	45.72	29.964	.730	.575	.903
pi12 Build on your child's strengths.	45.88	28.788	.804	.713	.898
pi13 Value your opinion about your child's needs.	45.83	29.643	.732	.669	.902
pi14 Are honest, even when they have bad news.	45.88	30.407	.575	.432	.910
pi15 Keep your child safe when your child is in their care.	45.60	30.956	.754	.691	.904

```
TITLE "10-item Child Subscale -- drop 14".
RELIABILITY
  /VARIABLES = pi5 pi6 pi7 pi8 pi9 pi10 pi11 pi12 pi13 pi15
  /SCALE(child10) = ALL
  /MODEL = ALPHA
  /STATISTICS = DESCRIPTIVE CORRELATIONS SCALE
  /SUMMARY = TOTAL .
```

Scale: CHILD10

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.910	.917	10

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
45.88	30.407	5.514	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
pi5 Help you gain skills or information to get what your child needs.	41.46	24.690	.586	.407	.908
pi6 Have the skills to help your child succeed.	41.12	25.943	.640	.596	.903
pi7 Provide services that meet the individual needs of your child.	41.14	25.646	.682	.587	.901
pi8 Speak up for your child's best interests when working with other service providers.	41.43	23.854	.667	.518	.902
pi9 Let you know about the good things your child does.	41.48	24.001	.659	.550	.903
pi10 Are available when you need them.	41.52	24.465	.643	.483	.903
pi11 Treat your child with dignity.	41.15	25.091	.736	.575	.898
pi12 Build on your child's strengths.	41.30	24.057	.803	.713	.893
pi13 Value your opinion about your child's needs.	41.25	24.917	.718	.655	.899
pi15 Keep your child safe when your child is in their care.	41.02	26.095	.744	.679	.900

```
TITLE "9-item Child Subscale -- drop 10".
RELIABILITY
  /VARIABLES = pi5 pi6 pi7 pi8 pi9 pi10 pi11 pi12 pi13 pi15
  /SCALE(child9) = ALL
  /MODEL = ALPHA
  /STATISTICS = DESCRIPTIVE CORRELATIONS SCALE
  /SUMMARY = TOTAL .
```

Scale: CHILD9

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.903	.911	9

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
41.52	24.465	4.946	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
pi5 Help you gain skills or information to get what your child needs.	37.10	19.353	.581	.398	.902
pi6 Have the skills to help your child succeed.	36.77	20.321	.666	.572	.894
pi7 Provide services that meet the individual needs of your child.	36.79	20.204	.680	.584	.893
pi8 Speak up for your child's best interests when working with other service providers.	37.08	18.690	.652	.487	.896
pi9 Let you know about the good things your child does.	37.12	18.812	.645	.544	.896
pi11 Treat your child with dignity.	36.79	19.760	.726	.563	.889
pi12 Build on your child's strengths.	36.95	18.825	.797	.710	.883
pi13 Value your opinion about your child's needs.	36.90	19.531	.721	.655	.889
pi15 Keep your child safe when your child is in their care.	36.67	20.580	.749	.673	.891

Reliability in SAS

```
****** Reliability with Partnership data from FT2;

* Output options: all can be turned on/off by adding or removing the 'NO':
  page number, date, centering, or page breaks, page length and width;
      OPTIONS nonumber nodate nocenter formdlim='-' pagesize=MAX linesize=MAX;
      TITLE;

* Location of original SPSS data files;
      LIBNAME import SPSS "F:\16_CLP948\FT2part.por";
* Import to work library;
      DATA partner; SET import.FT2part; RUN;

* Send output to word file -- easier to work with;
      ODS RTF FILE="F:\16_CLP948\Family Scale.rtf";

TITLE1 "12-item Family Subscale";
PROC CORR DATA=partner ALPHA NOMISS;
      VAR pi10 pi14 pi16 pi17 pi18 pi19 pi20 pi21 pi22 pi23 pi24 pi25; RUN;

* Close word file;
      ODS RTF CLOSE;
```

12-Item Family Subscale

Simple Statistics							
Variable	N	Mean	SD	Sum	Minimum	Maximum	Label
PI10	175	4.33	0.83	758	1	5	pi10 Are available when you need them.
PI14	175	4.58	0.73	802	2	5	pi14 Are honest, even when they have bad news.
PI16	175	4.10	1.01	718	1	5	pi16 Use words that you understand.
PI17	175	4.21	0.89	736	1	5	pi17 Plan meetings at times and places that are good for you and your family.
PI18	175	4.39	0.82	769	1	5	pi18 Return your messages.
PI19	175	4.37	0.76	765	3	5	pi19 Keep appointments with your child and family.
PI20	175	4.43	0.81	775	2	5	pi20 Protect your family's privacy.
PI21	175	4.45	0.78	779	1	5	pi21 Show respect for your family's values and beliefs.
PI22	175	4.41	0.77	771	1	5	pi22 Listen without judging your child or family.
PI23	175	4.52	0.73	791	1	5	pi23 Are dependable.
PI24	175	4.56	0.71	798	1	5	pi24 Pay attention to what you have to say.
PI25	175	4.23	0.88	741	1	5	pi25 Are friendly.

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.922039
Standardized	0.923440

	Cronbach Coefficient Alpha with Deleted Variable				
	Raw Variables		**Standardized Variables**		
Deleted Variable	**Correlation with Total**	**Alpha**	**Correlation with Total**	**Alpha**	**Label**
PI10	0.711	0.914	0.713	0.916	pi10 Are available when you need them.
PI14	0.544	0.921	0.548	0.922	pi14 Are honest, even when they have bad news.
PI16	0.661	0.917	0.658	0.918	pi16 Use words that you understand.
PI17	0.766	0.911	0.761	0.914	pi17 Plan meetings at times and places that are good for you and your family.
PI18	0.741	0.913	0.743	0.914	pi18 Return your messages.
PI19	0.762	0.912	0.754	0.914	pi19 Keep appointments with your child and family.
PI20	0.497	0.923	0.492	0.925	pi20 Protect your family's privacy.
PI21	0.758	0.912	0.760	0.914	pi21 Show respect for your family's values and beliefs.
PI22	0.672	0.916	0.675	0.917	pi22 Listen without judging your child or family.
PI23	0.697	0.915	0.703	0.916	pi23 Are dependable.
PI24	0.689	0.915	0.694	0.916	pi24 Pay attention to what you have to say.
PI25	0.646	0.917	0.644	0.918	pi25 Are friendly.

```
TITLE1 "11-item Family Subscale -- drop 19";
PROC CORR DATA=partner ALPHA NOMISS;
      VAR pi10 pi14 pi16 pi17 pi18 pi20 pi21 pi22 pi23 pi24 pi25; RUN;
```

11-Item Family Subscale – drop 19

Cronbach Coefficient Alpha	
Variables	**Alpha**
Raw	0.912138
Standardized	0.913888

	Cronbach Coefficient Alpha with Deleted Variable				
	Raw Variables		**Stand. Variables**		
Deleted Variable	**Corr with Total**	**Alpha**	**Corr with Total**	**Alpha**	**Label**
PI10	0.710	0.902	0.711	0.904	pi10 Are available when you need them.
PI14	0.545	0.910	0.550	0.912	pi14 Are honest, even when they have bad news.
PI16	0.640	0.907	0.637	0.908	pi16 Use words that you understand.
PI17	0.762	0.899	0.756	0.902	pi17 Plan meetings at times and places that are good for you /your family.
PI18	0.722	0.901	0.723	0.903	pi18 Return your messages.
PI20	0.485	0.913	0.478	0.916	pi20 Protect your family's privacy.
PI21	0.763	0.899	0.765	0.901	pi21 Show respect for your family's values and beliefs.
PI22	0.676	0.904	0.680	0.905	pi22 Listen without judging your child or family.
PI23	0.706	0.902	0.713	0.904	pi23 Are dependable.
PI24	0.695	0.903	0.701	0.904	pi24 Pay attention to what you have to say.
PI25	0.637	0.906	0.634	0.908	pi25 Are friendly.

```
TITLE1 "9-item Family Subscale -- drop 17 and 18";
PROC CORR DATA=partner ALPHA NOMISS;
      VAR pi10 pi14 pi16 pi20 pi21 pi22 pi23 pi24 pi25; RUN;
```

9-Item Family Subscale – drop 17 and 18

Cronbach Coefficient Alpha	
Variables	**Alpha**
Raw	0.882878
Standardized	0.886353

Cronbach Coefficient Alpha with Deleted Variable					
	Raw Variables		**Standardized Variables**		
Deleted Variable	**Correlation with Total**	**Alpha**	**Correlation with Total**	**Alpha**	**Label**
PI10	0.682	0.866	0.684	0.870	pi10 Are available when you need them.
PI14	0.541	0.877	0.547	0.881	pi14 Are honest, even when they have bad news.
PI16	0.615	0.874	0.612	0.876	pi16 Use words that you understand.
PI20	0.475	0.883	0.466	0.888	pi20 Protect your family's privacy.
PI21	0.746	0.860	0.747	0.865	pi21 Show respect for your family's values and beliefs.
PI22	0.664	0.867	0.667	0.871	pi22 Listen without judging your child or family.
PI23	0.710	0.864	0.718	0.867	pi23 Are dependable.
PI24	0.685	0.867	0.691	0.869	pi24 Pay attention to what you have to say.
PI25	0.613	0.872	0.610	0.876	pi25 Are friendly.