Developing a scale to measure factors influencing skier's self-perceived group dynamics (FISSGD)

Rong Guang

Contents

1 Data Wrangling

For the interest of space, codes in this section will not be shown. Yet they are available in the .rmd file.

1.1 Read in the data

The data were collected across years 2022 (CARE panel, n=218) and 2023 (Students joining an avalanche course, n =59).

1.2 Combine 2022 and 2023 data

They were combined into one data set (n = 277). An index variable was generated as the unique identifier for each case.

1.3 Reomove cases

1.3.1 Remove careless responses (according to attention trap)

Q10_2 and Q10_5, as well as Q19_1 and Q19_4 were same questions with different wordings. If the responses had conflictory results between them, they were regarded as careless responses and hence deleted (n = 24).

1.3.2 Remove cases who did not consent

Respondents who did not consent to participate were removed from the data (n = 4).

1.3.3 Remove cases with NA for if having a leader

Respondents who did not disclose if the ski group had a leader were removed from the data (n = 27).

1.4 Replace value of -99 with NA

-99 was used to label seen but unanswered questions. They were relabeled as NA.

1.5 Unify value labels

Values of some of the variables had been inconsistently labeled by Qualtrics. They were unified here.

1.6 Relabel variables

Properly label the variables so that the interpretation can be better managed. For the label, see Table 1

1.7 Create data sets

Four data sets were created. They are a. 18 item with leader; b. 6 item with leader; c. 17 item without leader; d. 5 item without leader; 3. background. The case identifier is "index" variable across data sets.

1.7.1 Create with-leader and without-leader data-sets

Before generating 4 data sets, the data were first separated according to with (n = 104) or with-out leader (n = 118).

```
## [1] 104
```

1.7.2 Remove cases with 50% NAs across major questions for each data sets

Within in each data set (with/without leader), cases with 50% NAs were removed from data. Three cases (#213,253,276) were removed from with-leader group; Four cases (#94, 252, 258, 275) were removed from without-leader group.

1.7.3 Create data set: 17 item without leader

Without-leader group respondents answered 22 out of 26 questions in the survey (the remaining 4 questions were about leader). Within the 22 questions, 17 were adapted from Zeiweiful's long version, 5 were from short version. They were further split into two data sets. They were subsequently referred to as without-leader long and without-leader short, respectively. The sample size is 114. According the publications, the minimum sample size for an exploratory factor analysis should be 5 × (number of items). In our case, the without-leader group's long version analysis involves 17 items, indicating at least 17×5=85 samples. Our sample size meets this requirement.

1.7.4 Create data set: 5 item without leader

According the publications, the minimum sample size for an exploratory factor analysis should be 5 × (number of items). In our case, the without-leader group's long version analysis involves 5 items, indicating at least 5×5=25 samples. Our sample size meets this requirement.

1.7.5 Create data set: 20 item with leader

Without-leader group respondents answered all 26 questions in the survey. Among the questions, 20 were adapted from Zeiweiful's long version, 6 were from short version. They were further split into two data sets. They were subsequently referred to as with-leader long and with-leader short, respectively. The sample size is 101. According the publications, the minimum sample size for an exploratory factor analysis should be 5 × (number of items). In our case, the without-leader group's long version analysis involves 20 items, indicating at least 20×5=100 samples. Our sample size meets this requirement.

1.7.6 Create data set: 6 item with leader

According the publications, the minimum sample size for an exploratory factor analysis should be 5 × (number of items). In our case, the without-leader group's long version analysis involves 5 items, indicating at least 6×5=30 samples. Our sample size meets this requirement.

2 Check and impute NAs and IDNs

2.1 Discritpive statistics

Table 1: Descriptive statistics for with-leader group (long)

					Central tendency		Dispersion tendency	
var	Question	n*	n of IDN†	n of NA	Mean	Median	SD	Q1~Q3
i_leader2	The leader (formal or informal) communicated openly and clearly	100	2	1	4.3	4.0	0.8	4.0 ~ 5.0
i_leader3	Everyone could voice their concerns to the leader (formal or informal)	100	3	1	4.6	5.0	0.7	4.0 ~ 5.0
i_skill1	The least knowledgeable group member could conduct satisfactory avalanche assessments for this trip	101	1	0	3.2	4.0	1.3	2.0 ~ 4.0
i_skill2	There was no large gap in avalanche assessment skills between the group members	101	2	0	2.5	2.0	1.3	1.0 ~ 4.0
i_skill3	There was no important difference in skiing skill level between group members, given the terrain	101	1	0	2.9	3.0	1.4	2.0 ~ 4.0
i_skill4	All group members were equipped with standard avalanche safety equipment (beacon, shovel, probe) and trained in the use of it	101	2	0	4.3	5.0	1.1	4.0 ~ 5.0
i_orga1	The group members knew each other well	101	0	0	3.8	4.0	1.2	3.0 ~ 5.0
i_orga2	The group size was appropriate for the trip (time, difficulty)	100	1	1	4.5	5.0	0.8	4.0 ~ 5.0
i_orga3	The roles of the group members were clearly defined	101	1	0	3.2	3.0	1.2	2.0 ~ 4.0
i_orga4	Some or all group members met each other for the first time on this trip	101	0	0	2.1	1.0	1.6	1.0 ~ 2.0
i_comm1	Decisions concerning avalanche hazard were well discussed in the group	101	1	0	4.1	4.0	0.9	4.0 ~ 5.0
i_comm2	Everyone in the group understood the decisions that were made	101	4	0	4.1	4.0	1.0	4.0 ~ 5.0
i_comm3	Everyone voiced their concerns whenever they felt necessary	101	5	0	4.0	4.0	1.1	3.0 ~ 5.0
i_iden1	There were clear expectations of each group member	101	1	0	3.4	3.0	1.0	3.0 ~ 4.0
i_iden2	Everyone was happy with the decisions that were made	101	4	0	4.3	4.0	1.0	4.0 ~ 5.0
i_anom1	The group decisions at the decision points were unanimous	100	3	1	4.0	4.0	1.1	4.0 ~ 5.0
i_anom2	Someone tried to impress others.	101	1	0	2.0	2.0	1.0	1.0 ~ 2.0
i_anom3	Love stories were going on in the group	101	6	0	2.3	1.0	1.6	1.0 ~ 4.0
i_anom4	The presence of other groups impacted my group's decision making	101	2	0	2.0	1.0	1.3	1.0 ~ 3.0

* number of cases minus number of NA

† IDN: Don't know

Table 2: Descriptive statistics for without-leader group (long)

					Central tendency		Dispersion tendency	
var	Question	n*	n of IDN†	n of NA	Mean	Median	SD	Q1~Q3
i_skill2	There was no large gap in avalanche assessment skills between the group members	114	0	0	3.2	3.0	1.3	2.0 ~ 4.0
i_skill3	There was no important difference in skiing skill level between group members, given the terrain	114	0	0	3.6	4.0	1.3	2.0 ~ 5.0
i_skill4	All group members were equipped with standard avalanche safety equipment (beacon, shovel, probe) and trained in the use of it	114	1	0	4.5	5.0	1.0	4.0 ~ 5.0
i_orga1	The group members knew each other well	113	0	1	4.2	5.0	1.0	4.0 ~ 5.0
i_orga2	The group size was appropriate for the trip (time, difficulty)	113	1	1	4.6	5.0	0.8	4.0 ~ 5.0
i_orga3	The roles of the group members were clearly defined	113	5	1	3.2	3.0	1.4	2.0 ~ 5.0
i_orga4	Some or all group members met each other for the first time on this trip	113	1	1	1.7	1.0	1.3	1.0 ~ 2.0
i_comm1	Decisions concerning avalanche hazard were well discussed in the group	114	0	0	4.0	4.0	1.0	4.0 ~ 5.0
i_comm2	Everyone in the group understood the decisions that were made	114	1	0	4.3	5.0	0.9	4.0 ~ 5.0
i_comm3	Everyone voiced their concerns whenever they felt necessary	114	6	0	4.3	4.0	1.0	4.0 ~ 5.0
i_iden1	There were clear expectations of each group member	114	0	0	3.6	4.0	1.0	3.0 ~ 4.0
i_iden2	Everyone was happy with the decisions that were made	114	1	0	4.4	5.0	0.8	4.0 ~ 5.0
i_anom1	The group decisions at the decision points were unanimous	114	7	0	4.2	4.0	1.1	4.0 ~ 5.0
i_anom2	Someone tried to impress others.	114	2	0	1.9	2.0	1.2	1.0 ~ 2.0
i_anom3	Love stories were going on in the group	114	2	0	1.8	1.0	1.3	1.0 ~ 2.0
i_anom4	The presence of other groups impacted my group's decision making	114	1	0	2.3	2.0	1.5	1.0 ~ 4.0

* number of cases minus number of NA

† IDN: Don't know

Table 3: Descriptive statistics for with-leader group (short)

					Central tendency		Dispersion tendency	
var	Question	n*	n of IDN†	n of NA	Mean	Median	SD	Q1~Q3
i_skill0	The level of avalanche assessment and rescue skills differed greatly across the group.	101	2	0	3.4	4.0	1.4	2.0 ~ 4.0
i_orga0	The group was well-set up and organized for this trip	101	0	0	3.9	4.0	0.9	3.0 ~ 4.0
i_comm0	The communication in the group was good	101	1	0	4.4	4.0	0.7	4.0 ~ 5.0
i_iden0	The group was cohesive and had a shared vision	100	1	1	4.2	4.0	0.8	4.0 ~ 5.0
i_anom0	Social interactions in the group negatively impacted decision	101	3	0	1.8	1.0	1.2	1.0 ~ 2.0

* number of cases minus number of NA

† IDN: Don't know

Table 4: Descriptive statistics for without-leader group (short)

					Central tendency		Dispersion tendency	
var	Question	n*	n of IDN†	n of NA	Mean	Median	SD	Q1~Q3
i_orga0	The group was well-set up and organized for this trip	114	0	0	4.1	4.0	0.9	4.0 ~ 5.0
i_comm0	The communication in the group was good	114	0	0	4.3	5.0	1.0	4.0 ~ 5.0
i_iden0	The group was cohesive and had a shared vision	114	0	0	4.2	4.0	0.8	4.0 ~ 5.0
i_anom0	Social interactions in the group negatively impacted decision	113	3	1	1.9	2.0	1.1	1.0 ~ 2.0

* number of cases minus number of NA

† IDN: Don't know

2.2 Adress NA and IDN casewise

The number of NAs and IDNs were few in number comparing with the sample size for each data set. Hence, the NAs and IDNs were checked case-wise, and decisions for each case were made accordingly. Please go to file "NA_and_IDN.md" for full description. A quck summary here: case #82 (in without group) were removed due to high proportion of IDNs, while other cases with NAs/IDNs does not show much logical issue. These NAs/IDNs will be imputed by within-subgroup median.

2.3 sumarize data clensing

The full processes of data cleansing were summarized in the following flowchart.

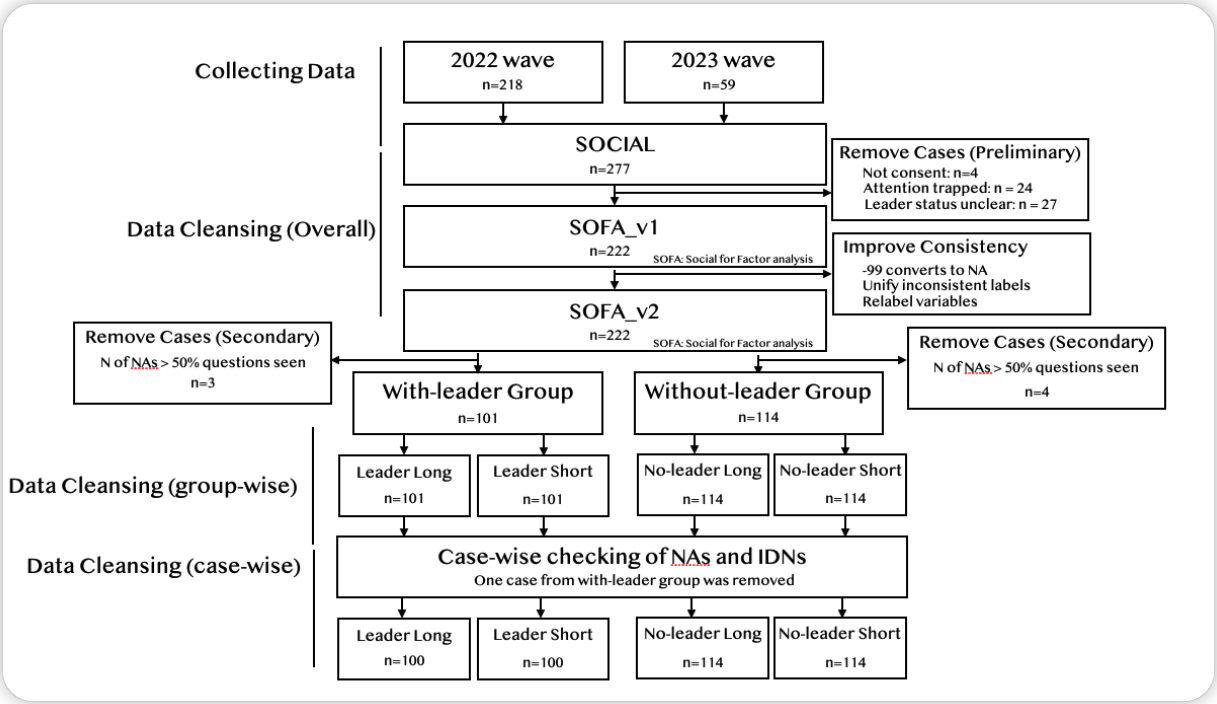


Figure 1: Figure 1. Flowchart for data cleansing

3 Visualization

3.1 Distribution

Since the data were collected from Likert scale, which usually skewed towards an end, I do not seek normality from these graphs. Instead, I scanned through the distributions to get a sense of the features of each item, such as left skewness (e.g. i_anom3), right skewness (e.g. i_skill4), kurtosis (e.g. i_orga4), polarization (e.g. i_skill3). These shed light on skiers' overall performance pattern in these aspects. Of course, I hope for a normal distribution from the factor scores obtained by the following factor analysis.

Figure 2 Distributions of the item for with−leader group (long

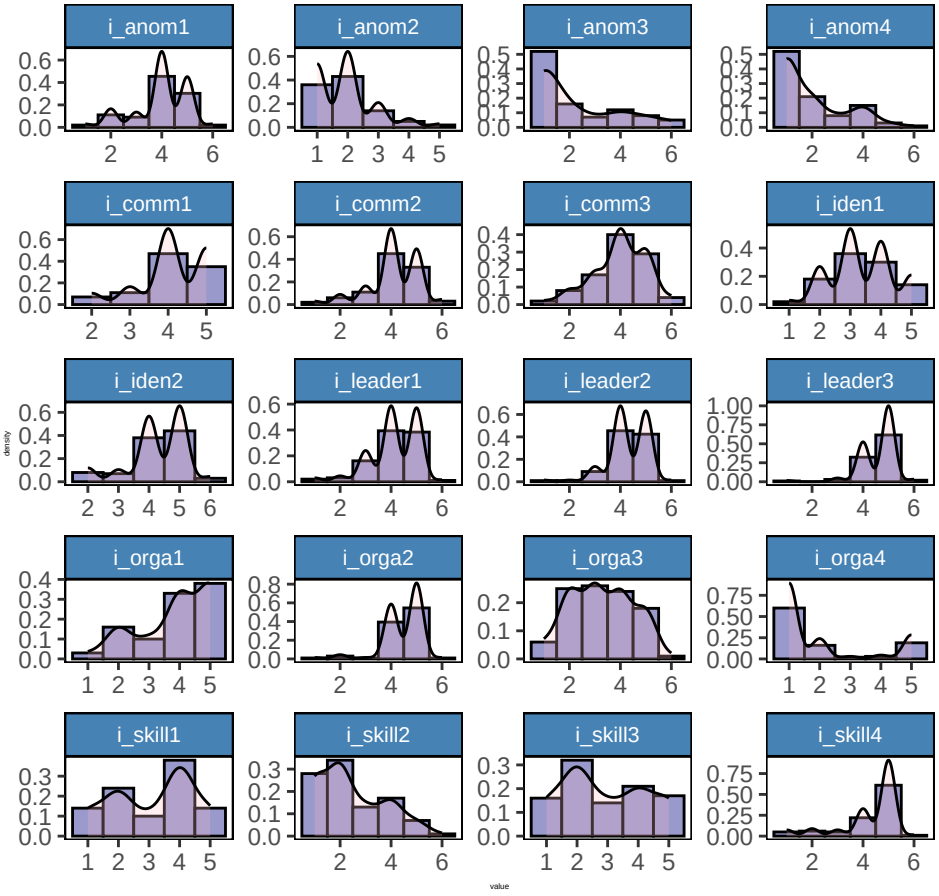


Figure 3 Distribtuions of the item for without−leader group (lo

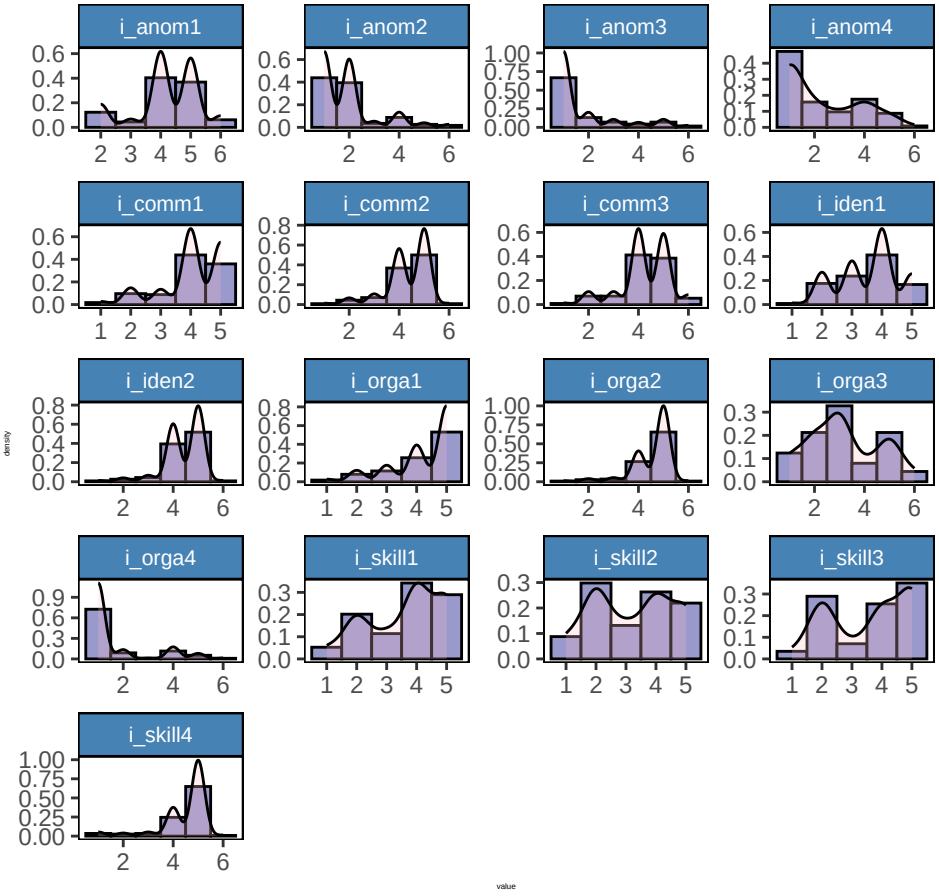


Figure 4 Distributions of the item for with−leader group (short)

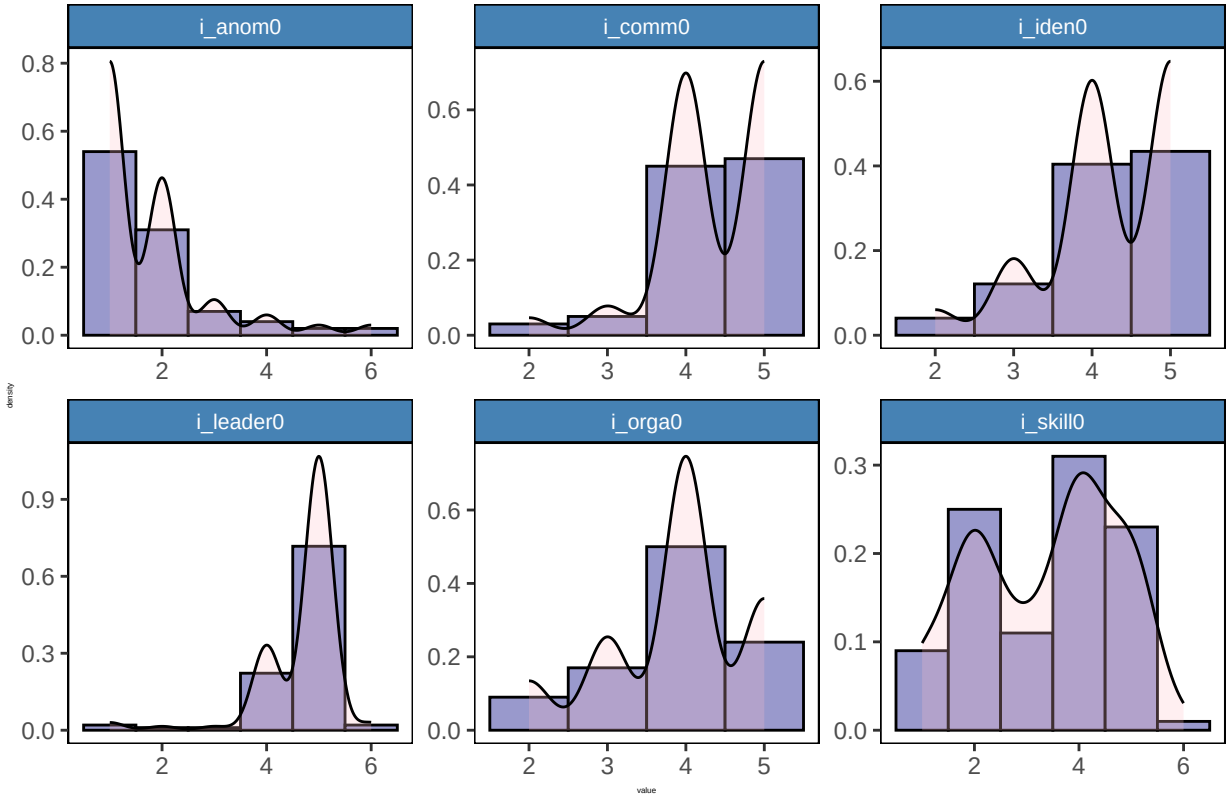
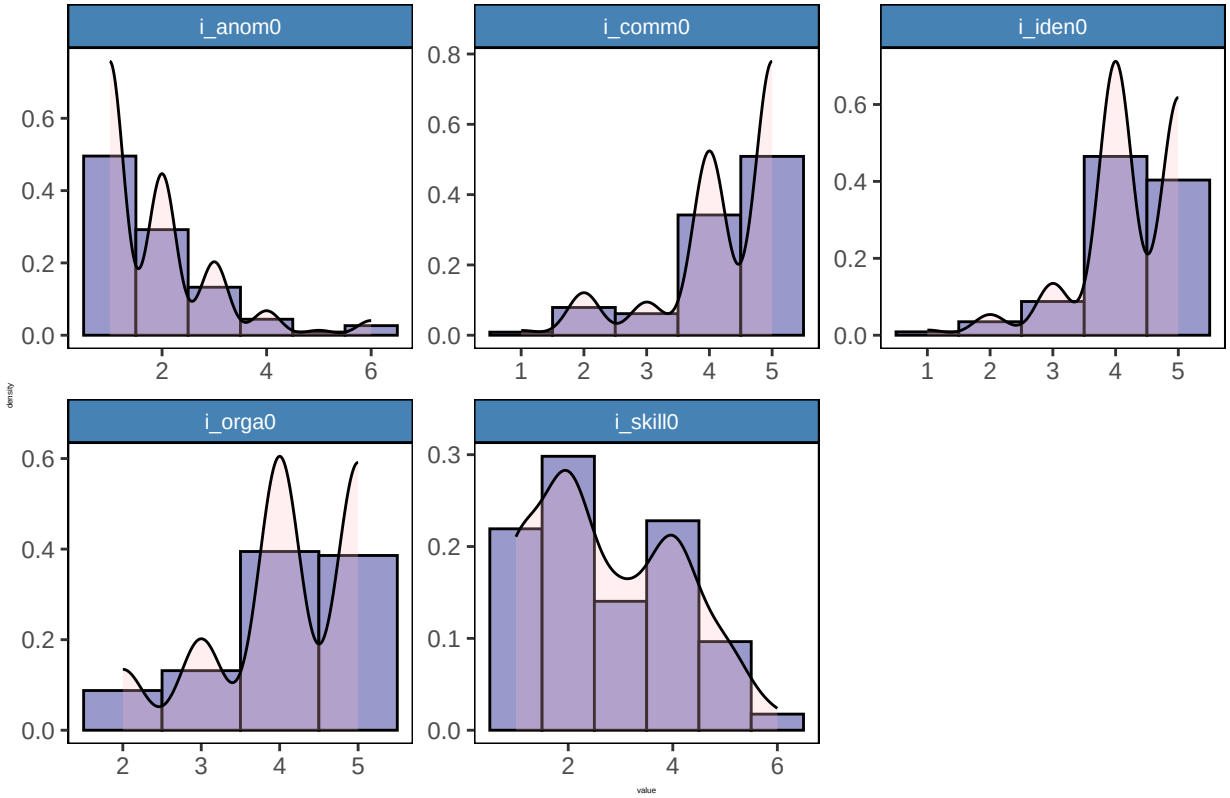


Figure 5 Distributions of the item for without−leader group (short)



3.2 Correlation matrix

Figure 6 Correlation matrix of the item for with−leader group (long)

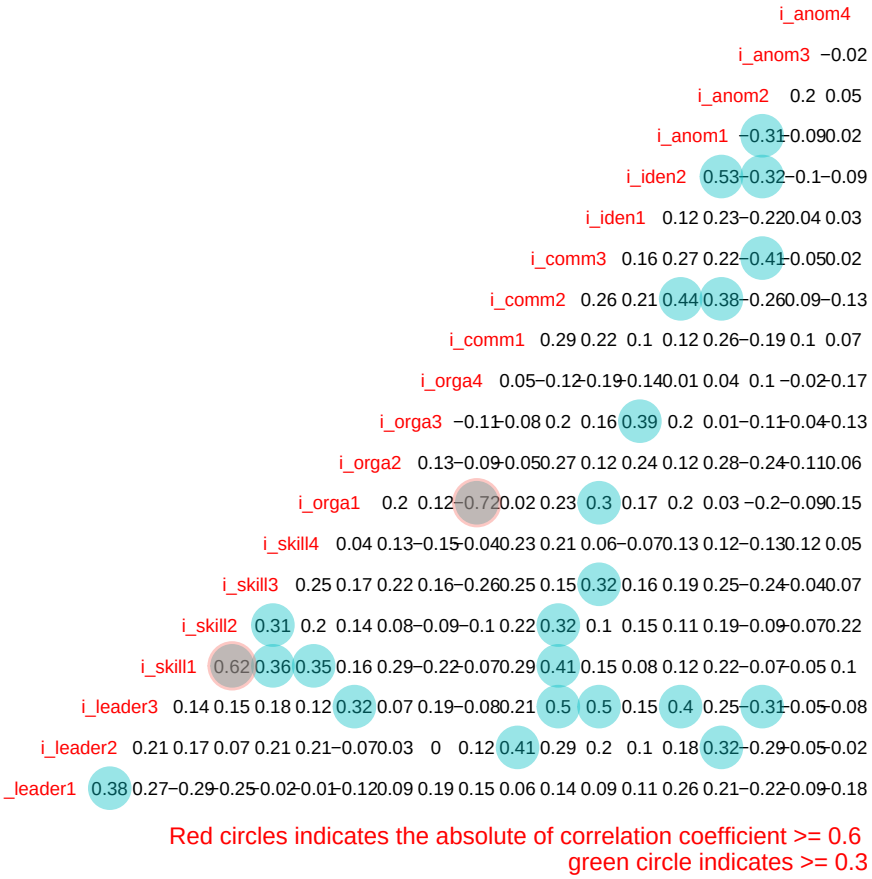


Figure 7 Correlation matrix of the item for without−leader group (long)

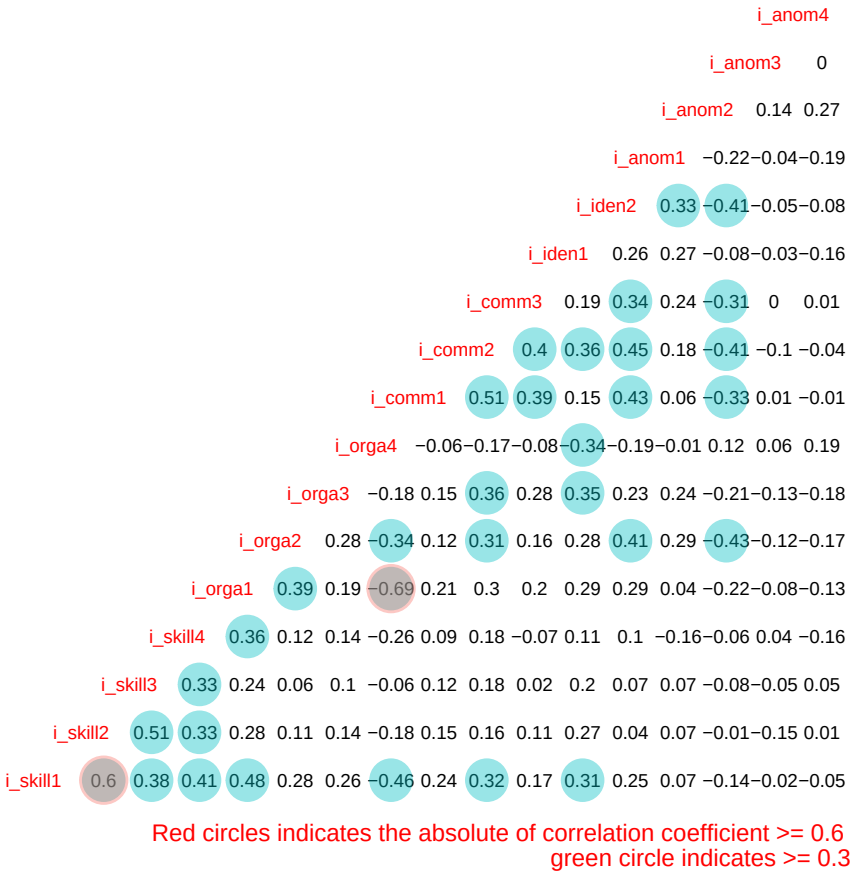


Figure 8 Correlation matrix of the item for with−leader group (short)

Red circles indicates the absolute of correlation coefficient >= 0.6
green circle indicates >= 0.3

Figure 9 Correlation matrix of the item for without−leader group (short)

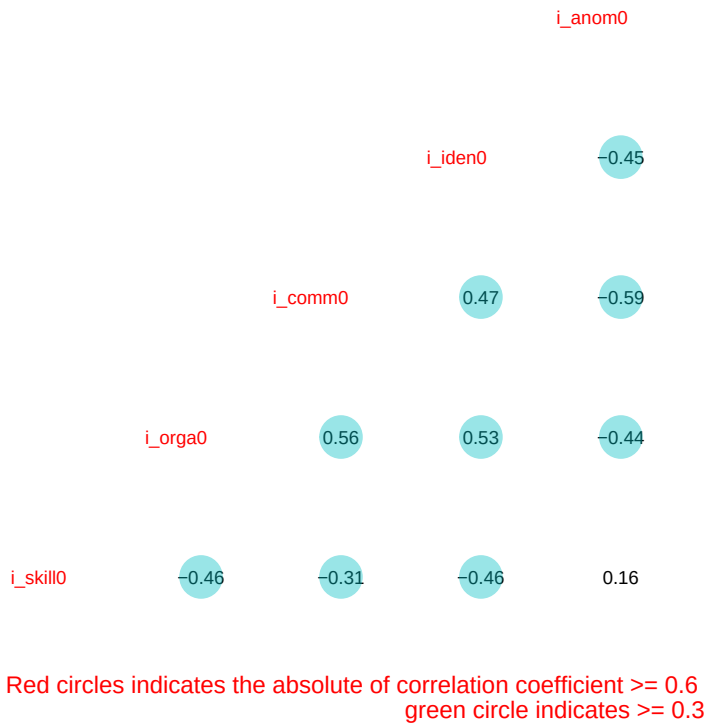


Table 5: Results of KMO test of sampling adequacy for with-leader group (long)

	KMO.ldr20
i_leader1	0.635
i_leader2	0.700
i_leader3	0.731
i_skill1	0.641
i_skill2	0.712
i_skill3	0.661
i_skill4	0.764
i_orga1	0.555
i_orga2	0.491
i_orga3	0.505
i_orga4	0.480
i_comm1	0.762
i_comm2	0.697
i_comm3	0.811
i_iden1	0.639
i_iden2	0.662
i_anom1	0.711
i_anom2	0.794
i_anom3	0.347
i_anom4	0.568
Overall	0.654

Table 6: Results of bartlett test for with-leader group (long)

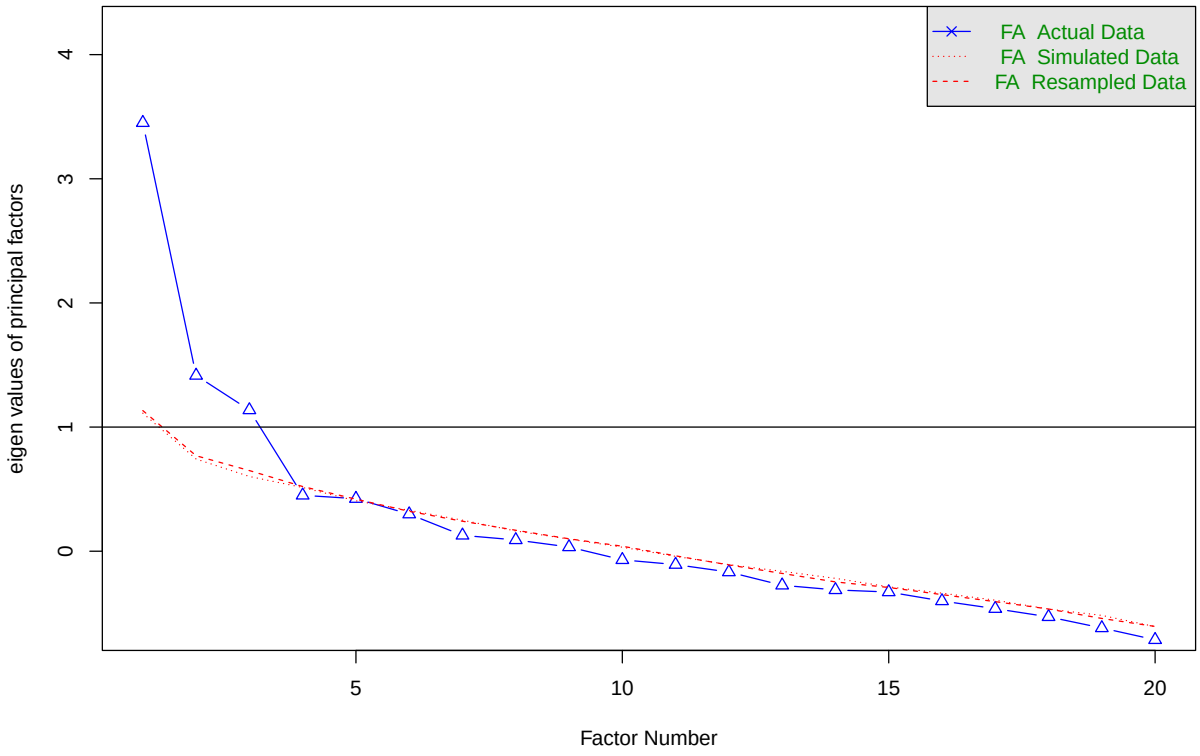
Chi-square	p-value	DF
576.907	<0.001	190

4 Factor analysis for with-leader group (long)

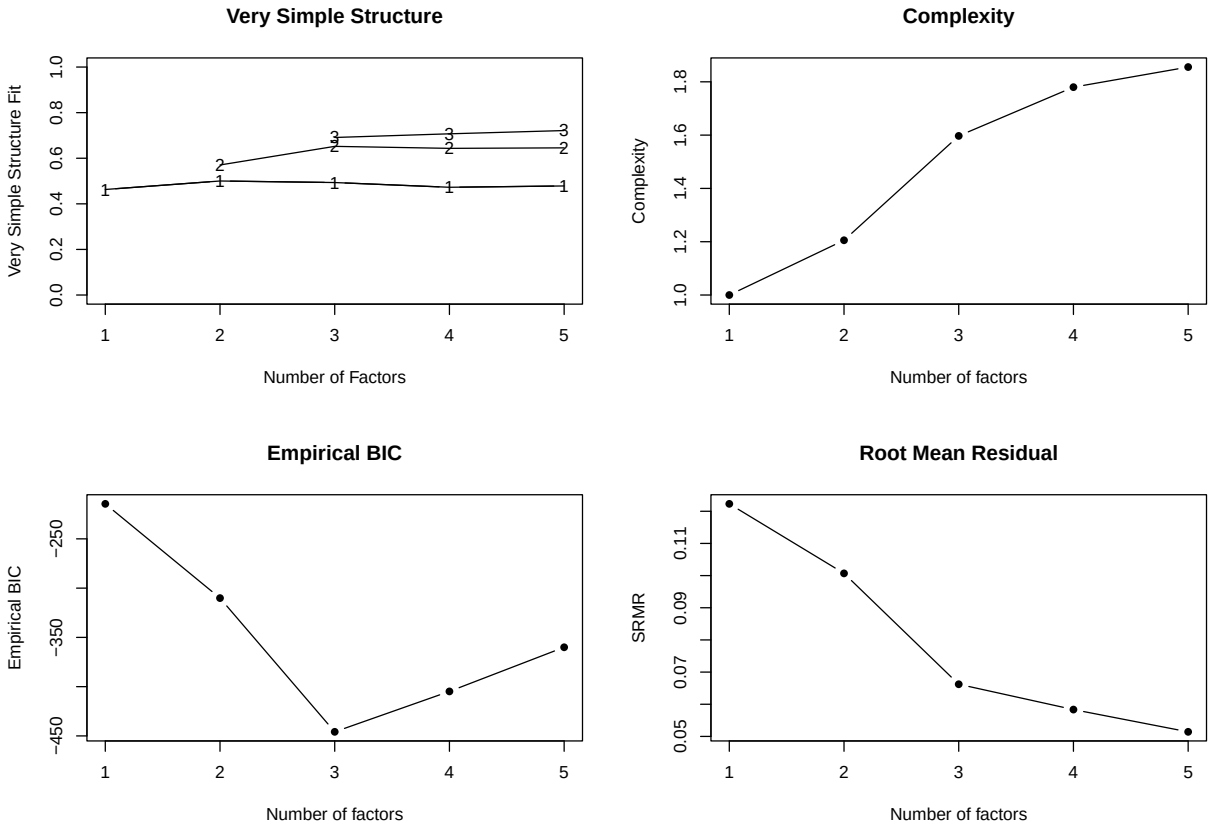
4.1 Check factoribility

4.2 Explore number of factors

Figure 9. Scree plot for with−leader group (long)




```
## Parallel analysis suggests that the number of factors =  3  and the number of components =  NA
```




```
##
## Number of factors
## Call: vss(x = x, n = n, rotate = rotate, diagonal = diagonal, fm = fm,
##     n.obs = n.obs, plot = FALSE, title = title, use = use, cor = cor)
## VSS complexity 1 achieves a maximimum of 0.5  with  2  factors
## VSS complexity 2 achieves a maximimum of 0.65  with  3  factors
## The Velicer MAP achieves a minimum of 0.02  with  3  factors
## Empirical BIC achieves a minimum of  -445.86  with  3  factors
## Sample Size adjusted BIC achieves a minimum of  -31.86  with  5  factors
##
## Statistics by number of factors
##   vss1 vss2   map dof chisq    prob sqresid  fit RMSEA  BIC SABIC complex
## 1 0.46 0.00 0.026 170   366 1.8e-16    19.7 0.46 0.107 -416   120     1.0
## 2 0.50 0.57 0.025 151   271 6.9e-09    15.8 0.57 0.089 -424    53     1.2
## 3 0.49 0.65 0.024 133   167 2.3e-02    11.3 0.69 0.050 -445   -25     1.6
## 4 0.47 0.64 0.027 116   141 5.6e-02    10.0 0.73 0.045 -393   -27     1.8
## 5 0.48 0.65 0.032 100   113 1.8e-01     8.8 0.76 0.034 -348   -32     1.9
##   eChisq  SRMR eCRMS eBIC
## 1    568 0.122 0.129 -214
## 2    385 0.101 0.113 -310
## 3    167 0.066 0.079 -446
## 4    129 0.058 0.075 -405
## 5    100 0.051 0.071 -360
```

4.3 Explore factor solutions

4.3.1 Explore 5-factor solution

Figure 10. Five−factor solution, with−leader group (long)

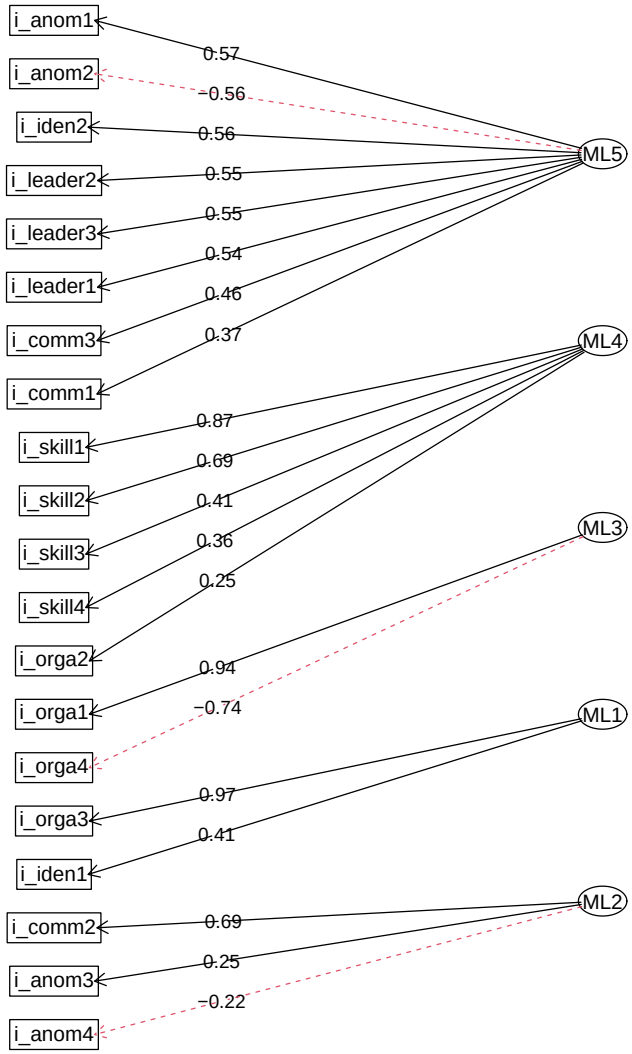


Table 7: Factor loadings of the 5-factor solution for with-leader group (long)

Item	ML5	ML4	ML3	ML1	ML2
i_leader1	0.535	-0.367			
i_leader2	0.55				
i_leader3	0.55				
i_skill1		0.873			
i_skill2		0.691			
i_skill3		0.415			-0.309
i_skill4		0.357			
i_orga1			0.939		
i_orga2					
i_orga3				0.971	
i_orga4			-0.744		
i_comm1	0.365	0.315			
i_comm2	0.533	0.391			0.694
i_comm3	0.456				
i_iden1				0.411	
i_iden2	0.559				
i_anom1	0.569				
i_anom2	-0.56				
i_anom3					
i_anom4					

4.3.2 Explore 4-factor solution

Figure 11. Four−factor solution, with−leader group (long)

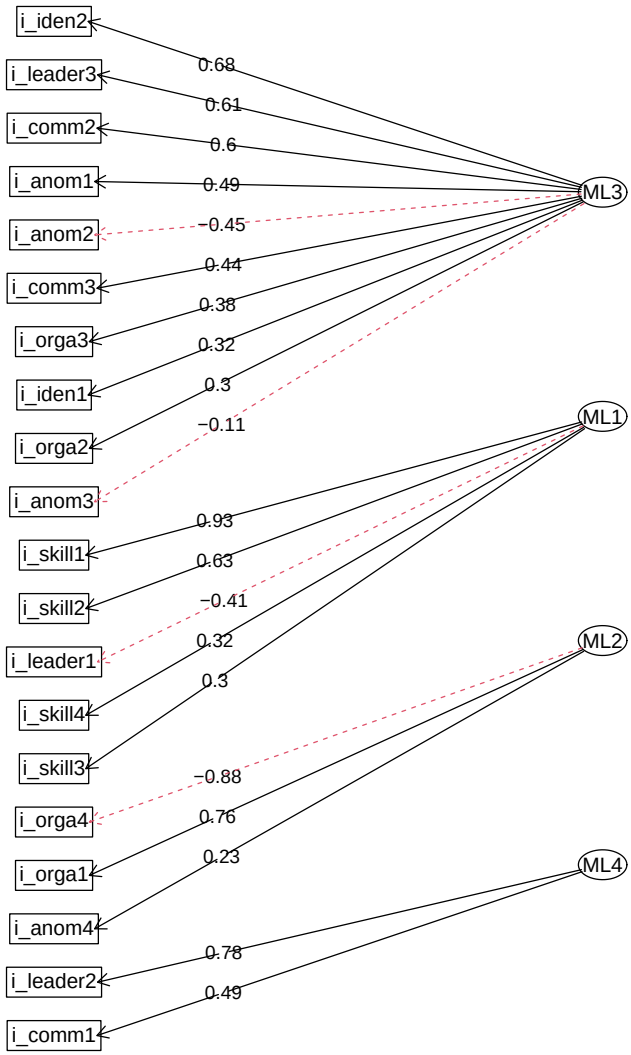


Table 8: Factor loadings of the 4-factor solution for with-leader group (long)

Item	ML3	ML1	ML2	ML4
i_leader1	0.329	-0.41		0.373
i_leader2				0.785
i_leader3	0.611			
i_skill1		0.931		
i_skill2		0.633		
i_skill3				
i_skill4		0.319		
i_orga1	0.335		0.759	
i_orga2	0.305			
i_orga3	0.384			
i_orga4			-0.883	
i_comm1				0.494
i_comm2	0.597	0.326		
i_comm3	0.44			
i_iden1	0.324			
i_iden2	0.676			
i_anom1	0.487			
i_anom2	-0.447			-0.305
i_anom3				
i_anom4				

4.3.3 Explore 3-factor solution

Figure 12. Three−factor solution, with−leader group (long)

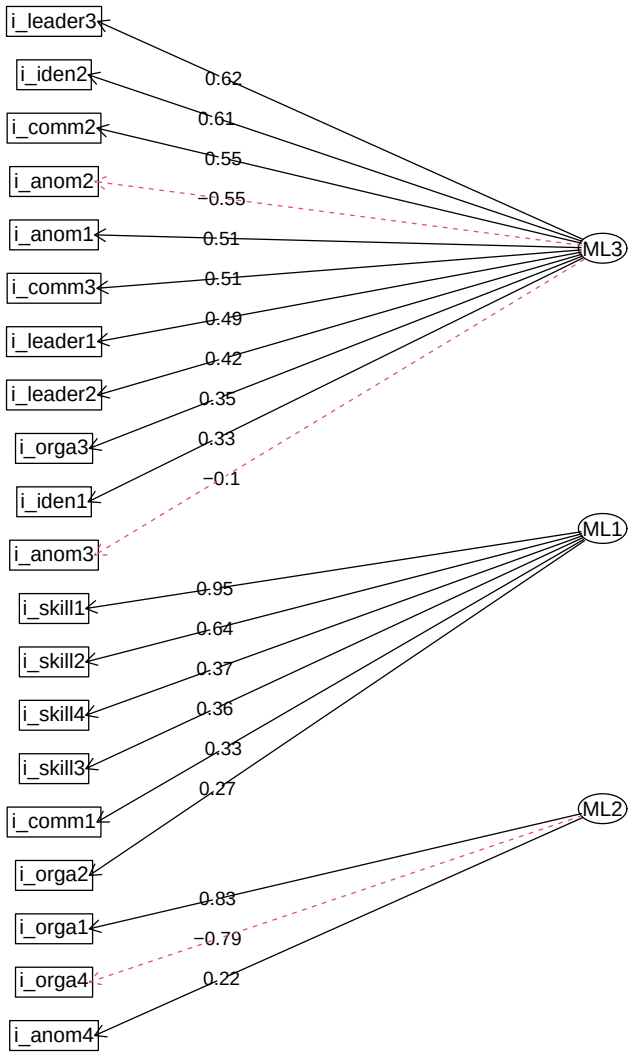


Table 9: Factor loadings of the 3-factor solution for with-leader group (long)

Item	ML3	ML1	ML2
i_leader1	0.49		-0.332
i_leader2	0.422		
i_leader3	0.624		
i_skill1		0.951	
i_skill2		0.635	
i_skill3		0.36	
i_skill4		0.368	
i_orga1	0.348		0.829
i_orga2			
i_orga3	0.353		
i_orga4			-0.788
i_comm1		0.329	
i_comm2	0.551	0.419	
i_comm3	0.51		
i_iden1	0.326		
i_iden2	0.611		
i_anom1	0.512		
i_anom2	-0.549		
i_anom3			
i_anom4			

4.3.4 Finetune 3-factor solution

Figure 13. Fine−tuned three−factor solution, with−leader group (long)

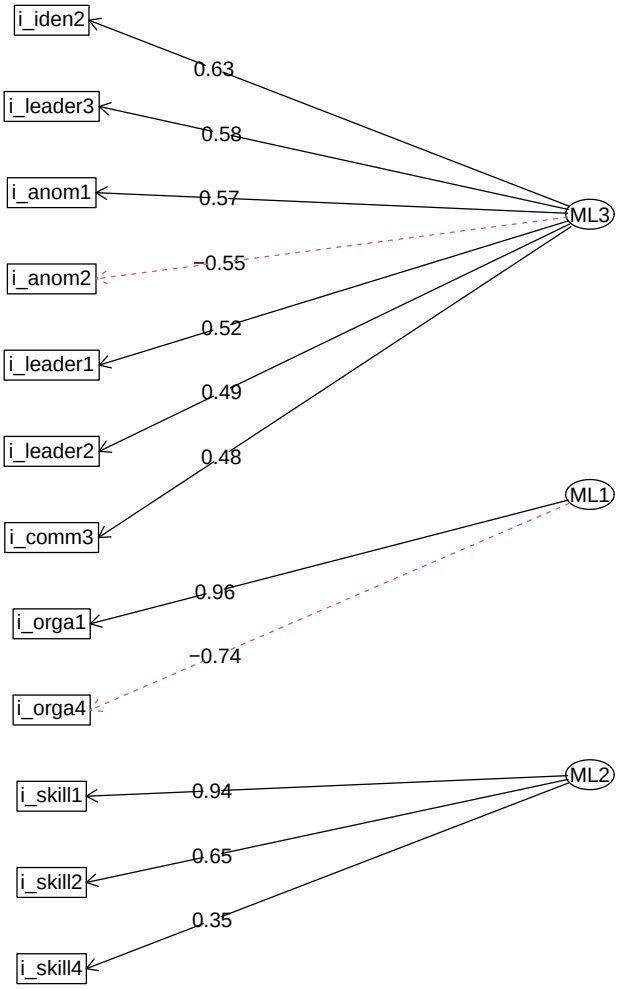


Table 10: Factor loadings of the 3-factor solution for with-leader group (long)

Item	ML3	ML1	ML2
i_leader1	0.523		-0.34
i_leader2	0.492		
i_leader3	0.581		
i_skill1			0.94
i_skill2			0.647
i_skill4			0.35
i_orga1		0.965	
i_orga4		-0.742	
i_comm3	0.48		
i_iden2	0.626		
i_anom1	0.567		
i_anom2	-0.546		

4.3.5 Explore 2-factor solution

Figure 14. Two−factor solution, with−leader group (long)

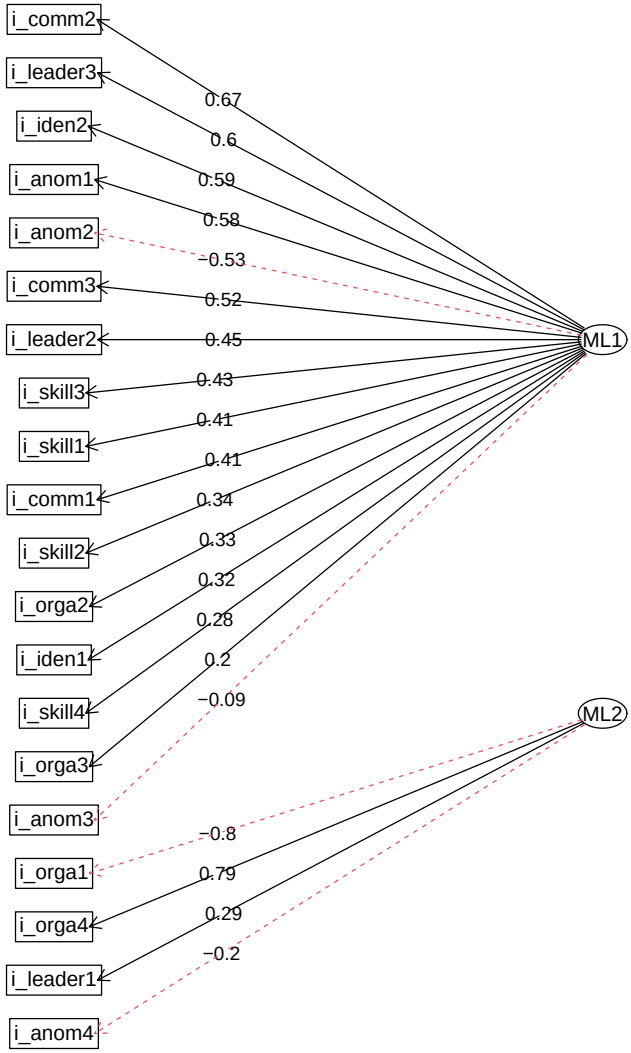


Table 11: Factor loadings of the 2-factor solution for with-leader group (long)

Item	ML1	ML2
i_leader1		
i_leader2	0.447	0.309
i_leader3	0.601	
i_skill1	0.413	
i_skill2	0.339	
i_skill3	0.432	
i_skill4		
i_orga1	0.393	-0.797
i_orga2	0.333	
i_orga3		
i_orga4		0.79
i_comm1	0.406	
i_comm2	0.672	
i_comm3	0.524	
i_iden1	0.32	
i_iden2	0.589	
i_anom1	0.578	
i_anom2	-0.527	
i_anom3		
i_anom4		

4.3.6 Finetune 2-factor solution

Figure 15. Fine−tuned two−factor solution, with−leader group (long)

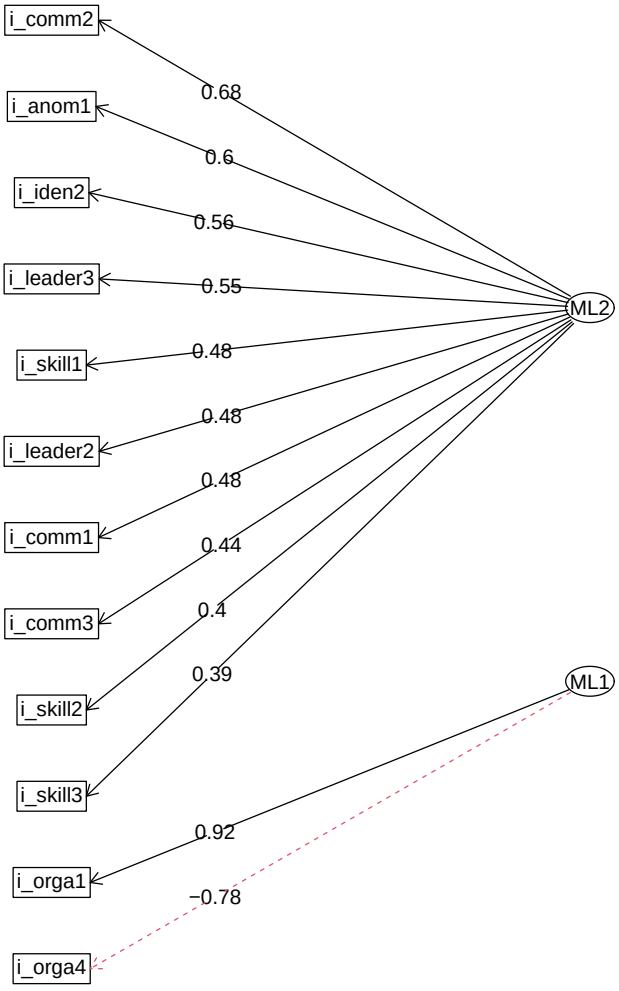


Table 12: Factor loadings of the 3-factor solution for with-leader group (long)

Item	ML2	ML1
i_leader2	0.481	
i_leader3	0.549	
i_skill1	0.485	
i_skill2	0.405	
i_skill3	0.39	
i_orga1		0.915
i_orga4		-0.784
i_comm1	0.479	
i_comm2	0.68	
i_comm3	0.439	
i_iden2	0.559	
i_anom1	0.597	

Table 13: Comparison between factor solutions, with-leader (long)

	CumulativeVariance
2-factor(tuned)	0.362
2-factor	0.255
3-factor(tuned)	0.457
3-factor	0.344
4-factor	0.383
5-factor	0.439

Table 14: Final items for 3 factor solution, with-leader group (long)

	Item
ML2: Leadership Quality	
i_iden2	Everyone was happy with the decisions that were made
i_leader3	Everyone could voice their concerns to the leader (formal or informal)
i_anom1	The group decisions at the decision points were unanimous
i_leader1	The leader (formal or informal) was the best suited person in the group to make the decisions.
i_leader2	The leader (formal or informal) communicated openly and clearly
i_comm3	Everyone voiced their concerns whenever they felt necessary
i_comm2	Someone tried to impress others.
ML3: Planning	
i_orga1	The group members knew each other well
i_orga4	Some or all group members met each other for the first time on this trip
ML1: Skill	
i_skill1	The least knowledgeable group member could conduct satisfactory avalanche assessments for this trip
i_skill2	There was no large gap in avalanche assessment skills between the group members
i_skill4	All group members were equipped with standard avalanche safety equipment (beacon, shovel, probe) and trained in the use of it

Table 15: Results of KMO test of sampling adequacy for with-leader group (short)

	KMO
i_leader0	0.778
i_skill0	0.635
i_orga0	0.696
i_comm0	0.780
i_iden0	0.711
i_anom0	0.806
Overall	0.732

Table 16: Results of bartlett test for with-leader group (short)

Chi-square	p-value	DF
96.656	<0.001	15

4.4 Comparison between factor solutions, with-leader (long)

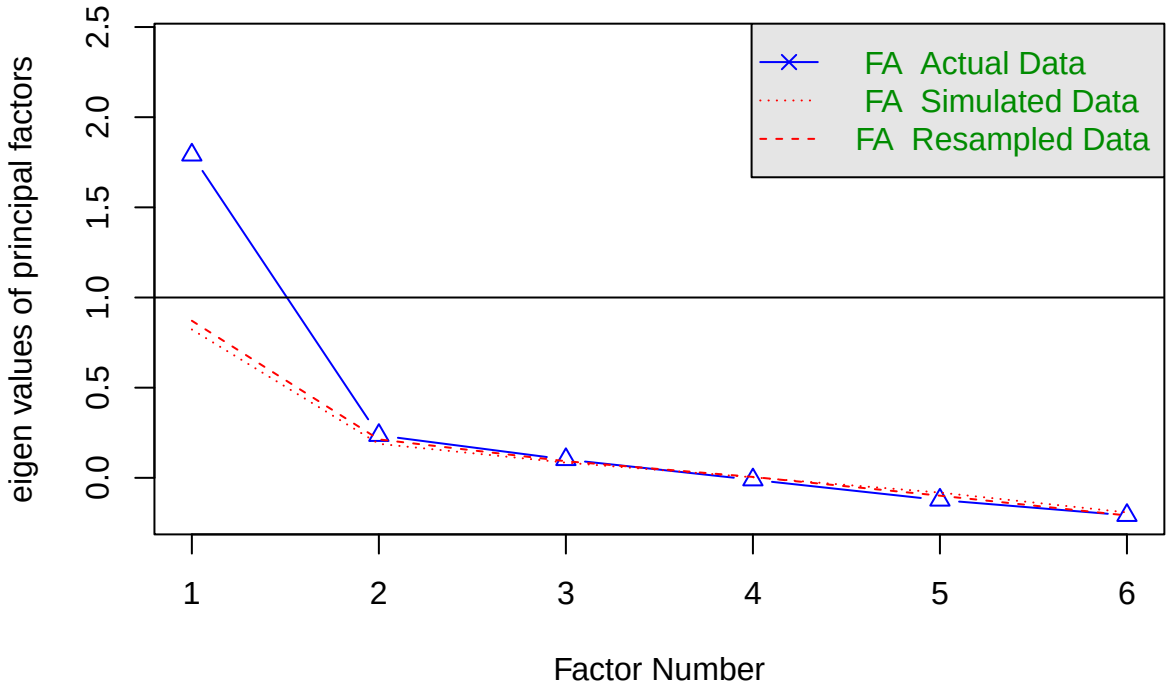
4.4.1 Check the factor connotation for 3-factor solution (fine-tuned)

5 Factor analysis for with-leader group (short)

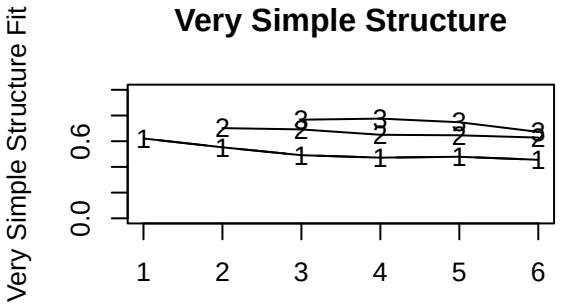
5.1 Check factoribility

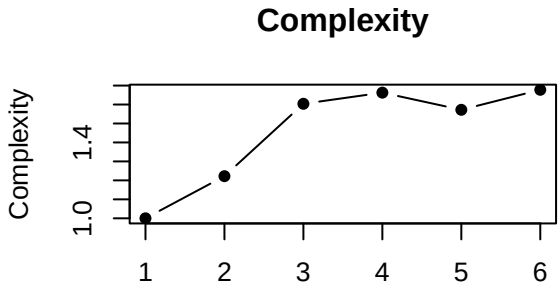
5.2 Explore number of factors

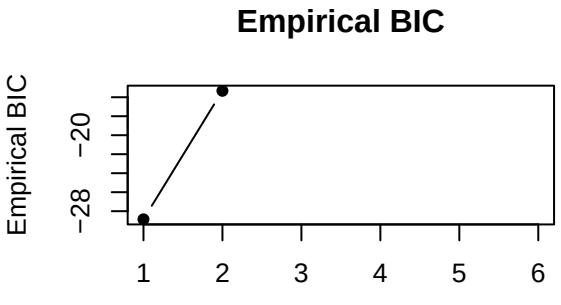
figure 14. Scree plot, wiht−leader group (short)

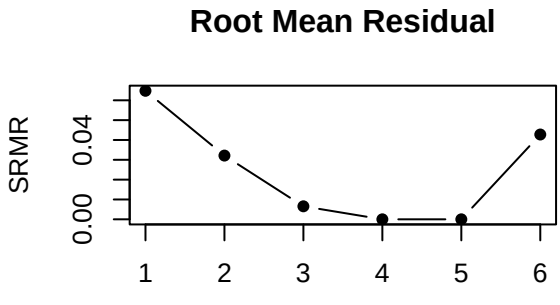



```
## Parallel analysis suggests that the number of factors =  1  and the number of components =  NA
```










```
##
## Number of factors
## Call: vss(x = x, n = n, rotate = rotate, diagonal = diagonal, fm = fm,
##     n.obs = n.obs, plot = FALSE, title = title, use = use, cor = cor)
## VSS complexity 1 achieves a maximimum of 0.62  with  1  factors
## VSS complexity 2 achieves a maximimum of 0.7  with  2  factors
## The Velicer MAP achieves a minimum of 0.05  with  1  factors
## Empirical BIC achieves a minimum of  -28.86  with  1  factors
## Sample Size adjusted BIC achieves a minimum of  -3.05  with  2  factors
##
## Statistics by number of factors
##   vss1 vss2   map dof   chisq prob sqresid  fit RMSEA BIC SABIC complex  eChisq
## 1 0.62 0.00 0.052   9 1.1e+01 0.27     3.3 0.62 0.046 -30    -2     1.0 1.3e+01
## 2 0.55 0.70 0.123   4 2.7e+00 0.60     2.6 0.70 0.000 -16    -3     1.2 3.1e+00
## 3 0.49 0.69 0.219   0 1.0e-01   NA     2.0 0.77    NA  NA    NA     1.6 1.3e-01
## 4 0.47 0.65 0.465  -3 2.7e-12   NA     1.8 0.80    NA  NA    NA     1.7 3.1e-12
## 5 0.48 0.65 1.000  -5 0.0e+00   NA     1.5 0.83    NA  NA    NA     1.6 2.8e-19
## 6 0.46 0.63    NA  -6 5.3e+00   NA     2.8 0.67    NA  NA    NA     1.7 5.5e+00
##      SRMR eCRMS eBIC
## 1 6.5e-02 0.084  -29
## 2 3.2e-02 0.062  -15
## 3 6.6e-03    NA   NA
## 4 3.2e-08    NA   NA
## 5 9.7e-12    NA   NA
## 6 4.3e-02    NA   NA
```

5.2.1 Explore 2-factor solution

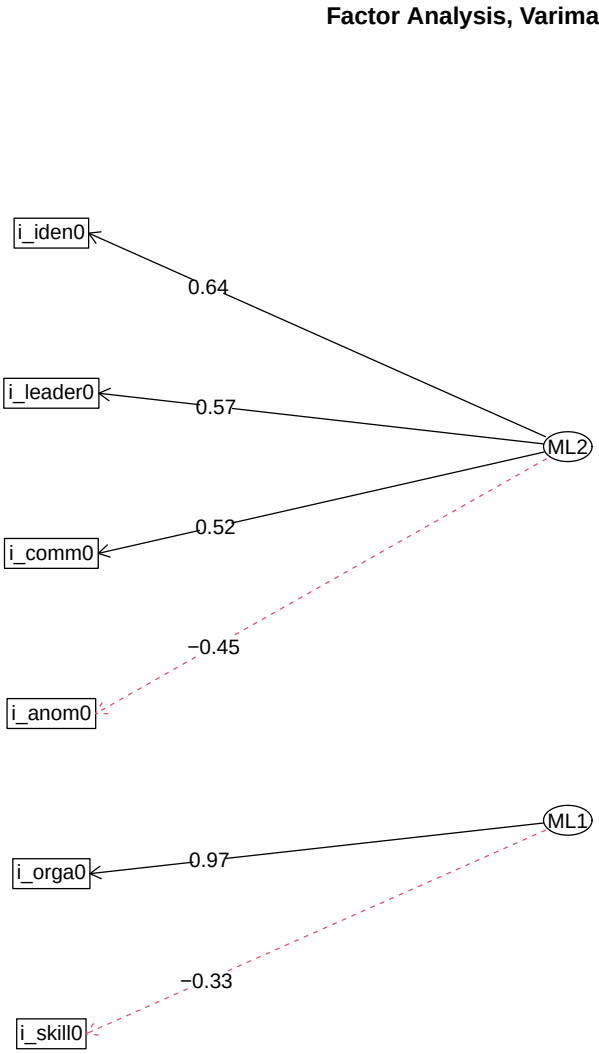


Table 17: Figure 16. Factor loadings of the 5-factor solution for with-leader group (short)

Item	ML2	ML1
i_leader0	0.567	
i_skill0		-0.329
i_orga0		0.968
i_comm0	0.516	
i_iden0	0.643	0.361
i_anom0	-0.446	

5.2.2 fine-tune 2-factor solution

Figure 17. Fine−tuned two−factor solution, with−leader group (short)

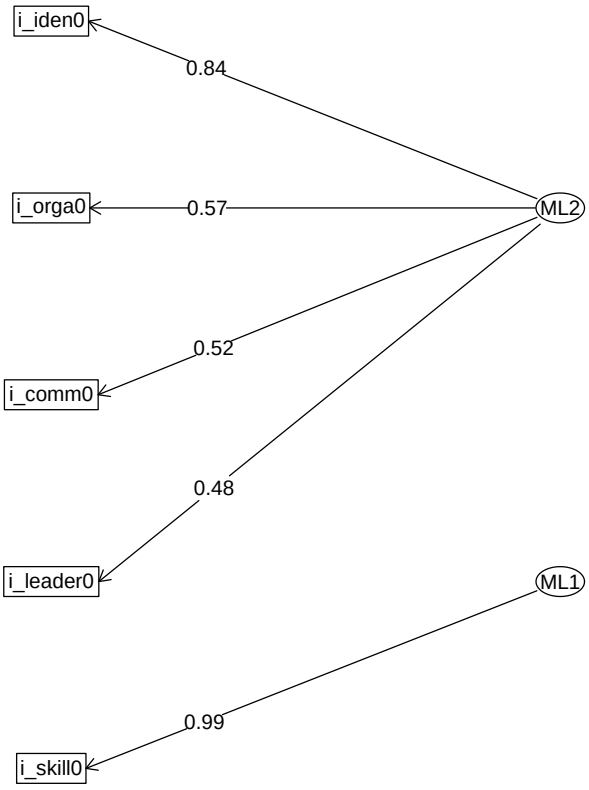


Table 18: Factor loadings of the 3-factor solution for with-leader group (long)

Item	ML2	ML1
i_iden0	0.842	
i_comm0	0.52	
i_leader0	0.476	
i_orga0	0.566	
i_skill0		0.992

5.2.3 Explore 3-factor solution

Figure 18. Three−factor solution, with−leader group (short)

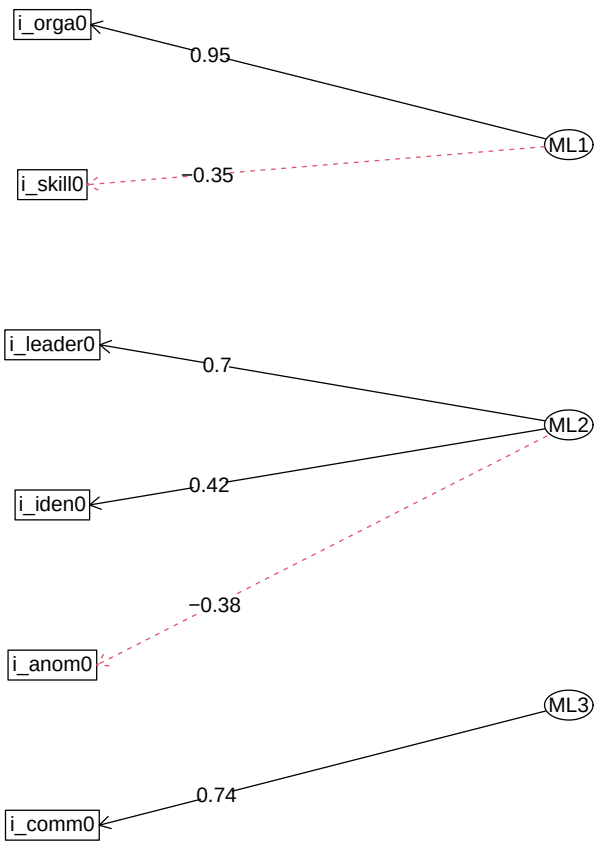


Table 19: Factor loadings of the 5-factor solution for with-leader group (long)

Item	ML1	ML2	ML3
i_leader0		0.704	
i_skill0	-0.352		
i_orga0	0.949		
i_comm0			0.742
i_iden0	0.362	0.421	0.413
i_anom0		-0.382	

Table 20: Results of KMO test of sampling adequacy for without-leader group (short)

	KMO
i_skill0	0.733
i_orga0	0.808
i_comm0	0.772
i_iden0	0.812
i_anom0	0.738
Overall	0.777

Table 21: Results of bartlett test for with-leader group (short)

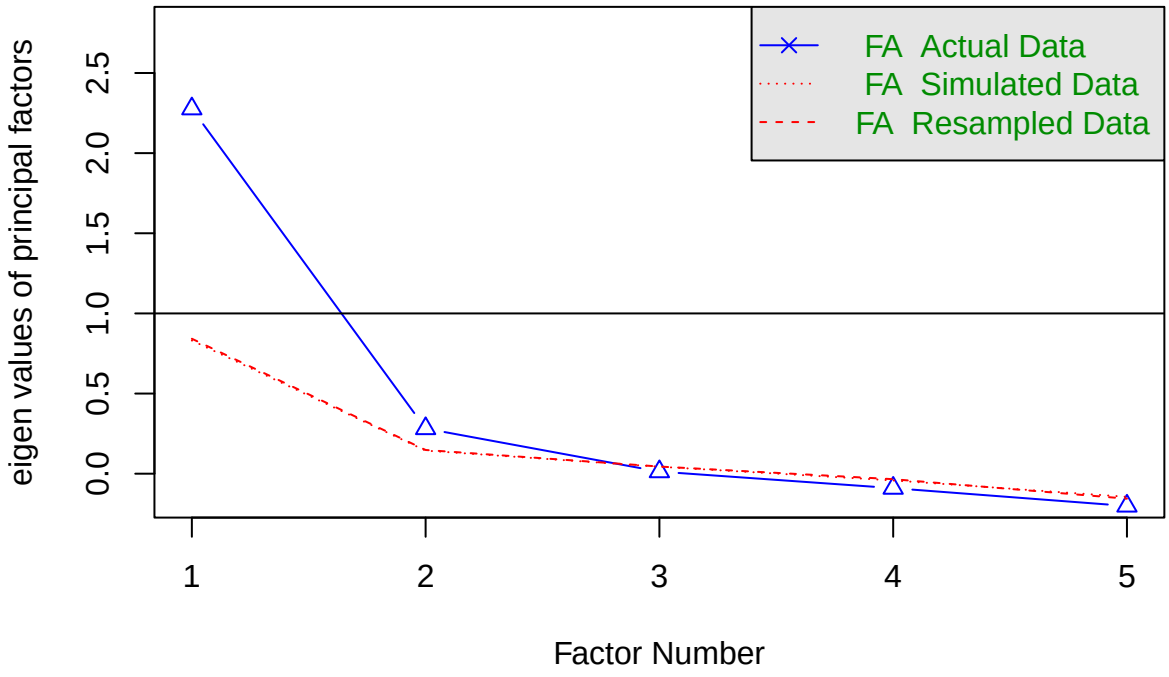
Chi-square	p-value	DF
177.887	<0.001	10

6 Factor analysis for without-leader group (short)

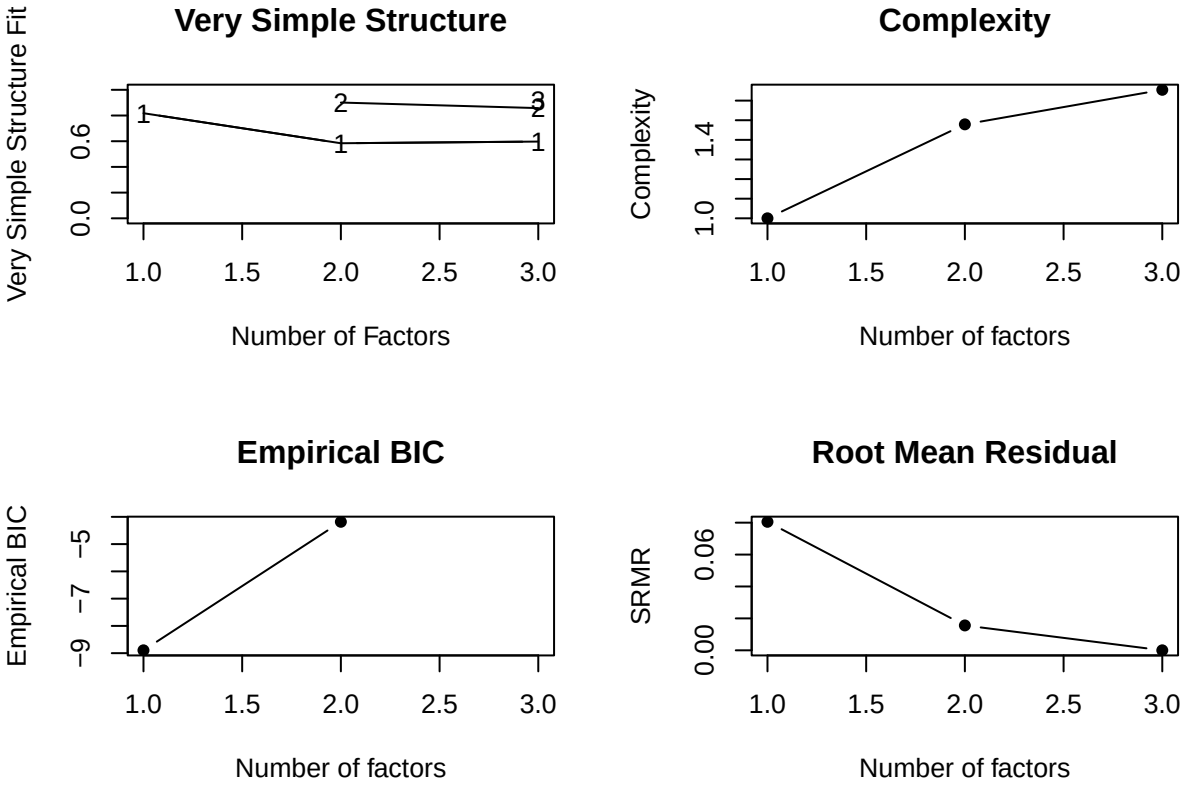
6.1 Check factoribility

6.2 Explore number of factors

figure 14. Scree plot, wiht−leader group (short)




```
## Parallel analysis suggests that the number of factors =  2  and the number of components =  NA
```

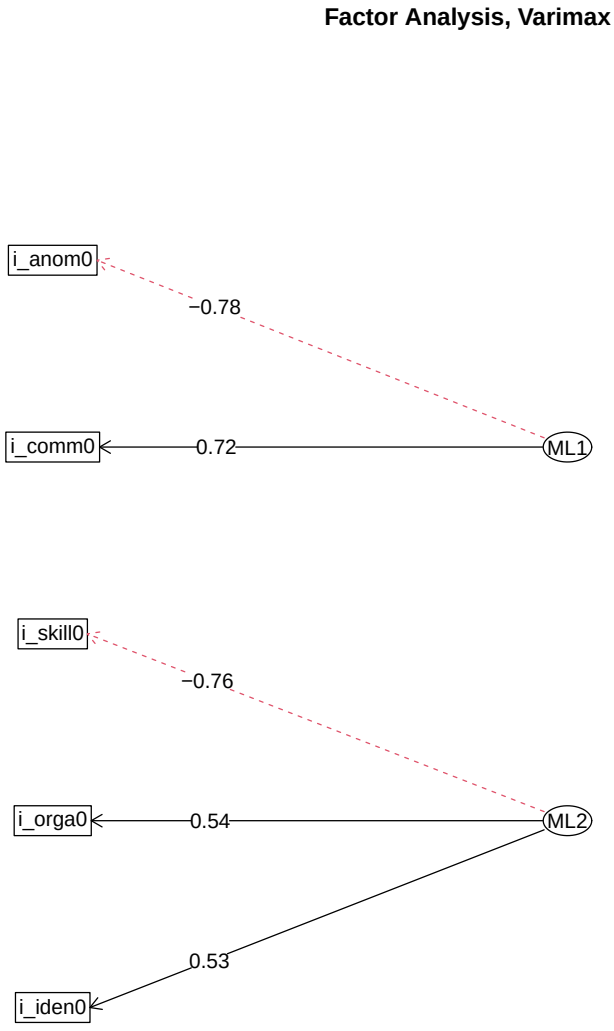



```
##
## Number of factors
## Call: vss(x = x, n = n, rotate = rotate, diagonal = diagonal, fm = fm,
##     n.obs = n.obs, plot = FALSE, title = title, use = use, cor = cor)
## VSS complexity 1 achieves a maximimum of 0.82  with  1  factors
## VSS complexity 2 achieves a maximimum of 0.9  with  2  factors
## The Velicer MAP achieves a minimum of 0.09  with  1  factors
## Empirical BIC achieves a minimum of  -8.89  with  1  factors
## Sample Size adjusted BIC achieves a minimum of  -0.12  with  2  factors
##
## Statistics by number of factors
##   vss1 vss2  map dof   chisq   prob sqresid  fit RMSEA  BIC SABIC complex
## 1 0.82 0.00 0.09   5 2.0e+01 0.0015    1.68 0.82 0.160 -4.1 11.75     1.0
## 2 0.58 0.90 0.18   1 1.5e+00 0.2281    0.91 0.90 0.062 -3.3 -0.12     1.5
## 3 0.60 0.86 0.41  -2 5.6e-12     NA    0.81 0.91    NA   NA    NA     1.7
##    eChisq    SRMR eCRMS eBIC
## 1 1.5e+01 8.1e-02 0.114 -8.9
## 2 5.5e-01 1.6e-02 0.049 -4.2
## 3 2.4e-12 3.2e-08    NA   NA
```

Table 22: Figure Factor loadings of the 5-factor solution for without-leader group (short)

Item	ML1	ML2
i_skill0		-0.762
i_orga0	0.518	0.541
i_comm0	0.715	0.3
i_iden0	0.479	0.528
i_anom0	-0.777	

6.2.1 Explore 2-factor solution



s ### Explore 3-factor solution

Figure Three−factor solution, without−leader group (short)

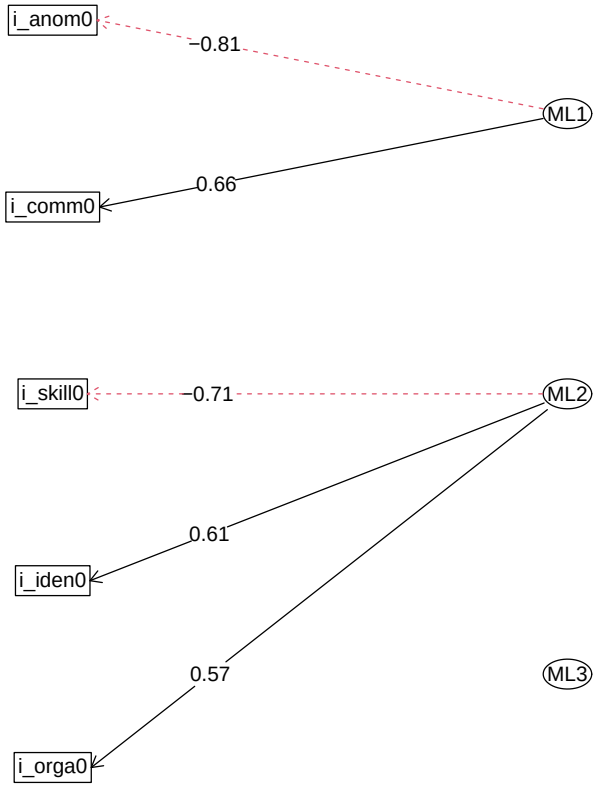


Table 23: Factor loadings of the 5-factor solution for with-leader group (long)

Item	ML1	ML2	ML3
i_skill0		-0.705	
i_orga0	0.435	0.572	
i_comm0	0.662	0.313	0.362
i_iden0	0.448	0.613	
i_anom0	-0.809		