Exploratory Factor Analysis

PRotoTYPe – PR2

European Union's Erasmus+ Ka220-SCH-2021-1-PL01-KA220-SCH-000032708 - Cooperation partnerships in school education

September 2023

Study Design

- 26 items
- 5-point Likert scale (from 0 to 4)
- Student perspective
- Four parts:
  - Victimization (9 items)
  - Aggression (9 items)
  - Cybervictimization (4 items)
  - Cyberaggression (4 items)

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Study Implementation

- 456 students ranging from the 1st up to 5th grades of secondary schools
- Applied during the 2022/2023 school year
- Online form was used
- Translated into the respective native language

Data Preparation and Statistical Analysis

- PA (with data permutation) performed to extract factors
- EFA performed with MinRes estimation
- The applied rotation method was oblique "geominQ"
- EFA factor loadings < 0.4 considered non-substantive
- Eliminating criterions
  - low commonalities (h2 < 0.3)
  - factor loadings < 0.4
  - factor loadings > 0.4 on at least two factors
  - variance approximately 0

Descriptive Statistics

Nº	Item	Mean	SD	Min-Max	Sk	Kurt
1	A teacher has hit, kicked, or pushed me.	0.128	0.589	0-4	5.591	32.513
2	A teacher has verbally insulted me.	0.519	0.894	0-4	2.035	3.972
3	A teacher has threatened me.	0.314	0.758	0-4	3.051	10.071
4	A teacher called me mean names, made fun of me or teased me in a hurtful way.	0.363	0.774	0-4	2.864	9.249
5	A teacher told lies or spread rumors about me and tried to make others dislike me	0.188	0.623	0-4	4.213	19.382
6	I had money or other personal belongings taken away from me or damaged by a teacher.	0.194	0.633	0-4	4.189	19.339
7	I was bullied with mean names or comments about my race or color or any other diversity aspect (nationality, sexual orientation, etc.) by a teacher.	0.123	0.546	0-4	5.625	34.350
8	I was bullied with mean names, comments, or gestures with a sexual intent by a teacher	0.155	0.619	0-4	5.004	26.437
9	I was bullied in other forms, by a teacher, that were not mentioned here.	0.200	0.596	0-4	3.867	17.014
10	I have hit, kicked, or pushed a teacher.	0.049	0.396	0-4	8.780	78.849
11	I have verbally insulted or said words to a teacher because I wanted to hurt him/her.	0.144	0.617	0-4	5.023	26.000
12	I have threatened a teacher.	0.075	0.460	0-4	7.418	58.250
13	I called another teacher(s) mean names, made fun of, or teased him/her in a hurtful way.	0.247	0.782	0-4	3.665	13.235
14	I spread false rumors about a teacher and tried to make others dislike him/her.	0.179	0.663	0-4	4.504	21.022
15	I took money or other personal belongings from a teacher or damaged his/her belongings.	0.055	0.404	0-4	8.737	80.335
16	I bullied a teacher with mean names or comments about his/her race or color or any other diversity aspect (nationality, sexual orientation, etc).	0.075	0.435	0-4	7.369	59.667
17	I bullied a teacher with mean names, comments, or gestures with sexual intent.	0.064	0.402	0-4	7.675	65.097
18	I bullied teacher(s) using other forms that were not mentioned here.	0.106	0.535	0-4	5.683	33.408
19	A teacher has said bad words to me or has insulted me using email or instant messenger (such as WhatsApp) or other electronic platforms.	0.059	0.380	0-4	7.893	68.595
20	A teacher has said bad words about me to others using the internet or instant messenger.	0.060	0.397	0-4	8.147	71.807
21	A teacher has threatened me through Internet messages or instant messenger.	0.066	0.415	0-4	7.520	61.376
22	A teacher has spread false rumors and lies about me on social networks.	0.059	0.380	0-4	7.893	68.595
23	I have said bad words to a teacher or have insulted him/her using instant messenger (such as WhatsApp) or Internet messages or other electronic platforms.	0.126	0.571	0-4	5.285	29.022
24	I have said bad words about a teacher to other people through Internet messages or instant messenger.	0.315	0.853	0-4	3.007	8.566
25	I have threatened a teacher through instant messenger or Internet messages.	0.046	0.364	0-4	9.416	94.824
26	I have used a social network to spread false rumors and lies about a teacher.	0.066	0.436	0-4	7.739	63.078

Table 1. Descriptive Statistics of the Considered Items (N = 456)

Descriptive Statistics

- Items 2, 3, 4 and 24 presented an average value above 0.3

- The lowest average response value was verified for item 25

- Items 2 and 24 were the two that showed the greatest dispersion in responses

- All items presented responses with similar range of values

Construction Validity

- The participant-to-item ratio was close to 20:1
- $\chi^2(192) = 4950.97$ and $p < 0.001$ indicate that correlations between items were adequate to conduct an EFA
- Preliminary Parallel Analysis (PA) pointed to a three-factor solution
  - only three eigenvalues were above the threshold, $\tau = 1$
  - a three-factor solution was initially adopted

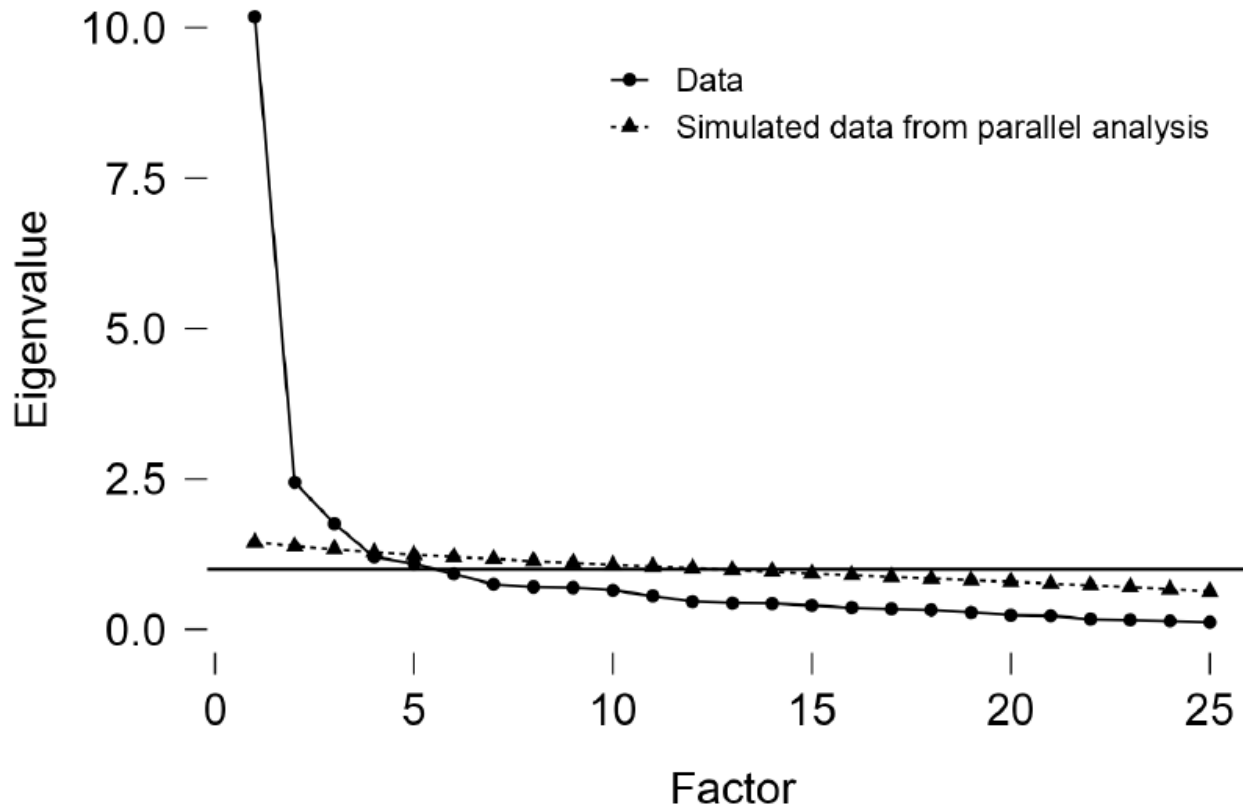Erasmus+

Construction Validity

Figure 1. Initially obtained scree plot for parallel analysis
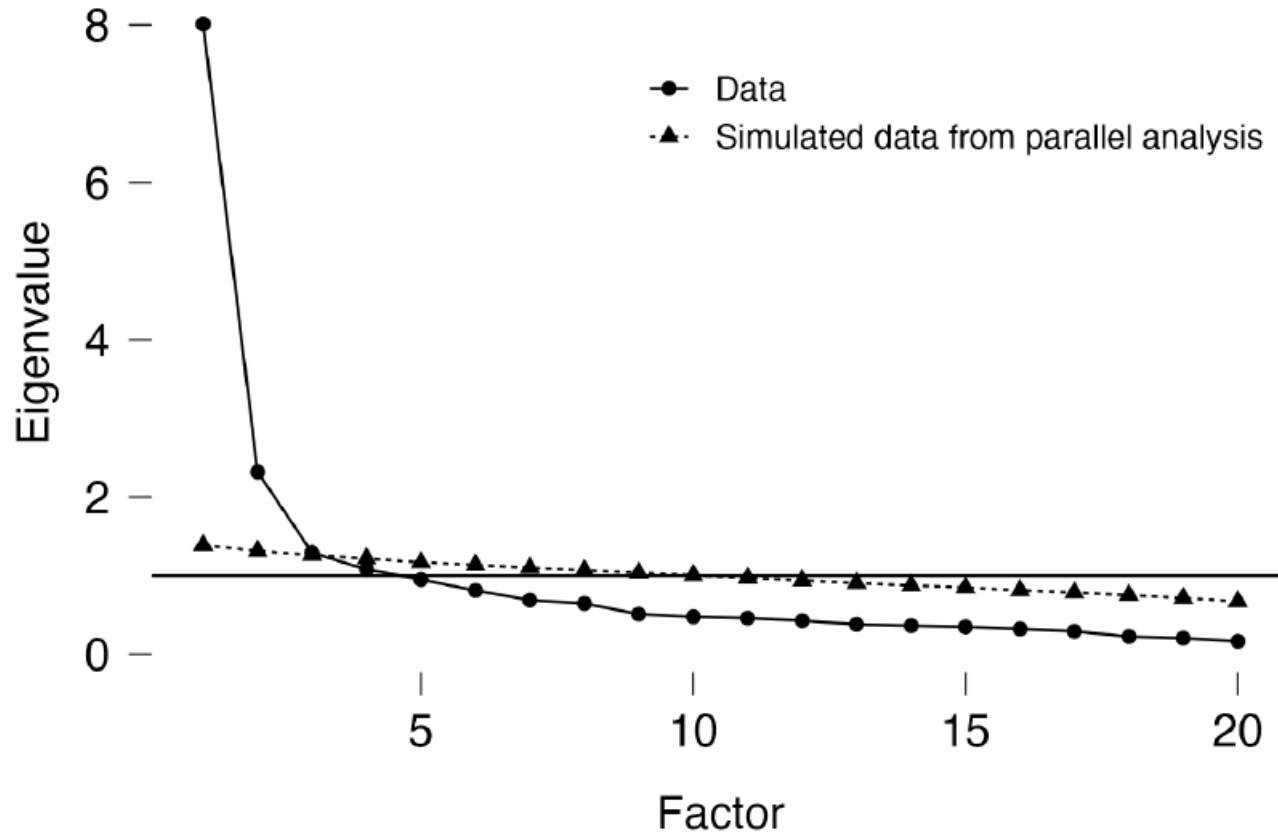
Construction Validity

Figure 2. Final scree plot for parallel analysis

Construction Validity

Item		Factor 1	Factor 2	h^2
05	A teacher told lies or spread rumors about me and tried to make others dislike me	0.803		0.589
07	I was bullied with mean names or comments about my race or color or any other diversity aspect (nationality, sexual orientation, etc.) by a teacher.	0.740		0.522
08	I was bullied with mean names, comments, or gestures with a sexual intent by a teacher	0.733		0.502
09	I was bullied in other forms, by a teacher, that were not mentioned here.	0.713		0.561
04	A teacher called me mean names, made fun of me or teased me in a hurtful way.	0.690		0.489
01	A teacher has hit, kicked, or pushed me.	0.687		0.521
03	A teacher has threatened me.	0.586		0.475
06	I had money or other personal belongings taken away from me or damaged by a teacher.	0.564		0.317
22	A teacher has spread false rumors and lies about me on social networks.	0.556		0.468
02	A teacher has verbally insulted me.	0.504		0.354
24	I have said bad words about a teacher to other people through Internet messages or instant messenger.		0.715	0.412
25	I have threatened a teacher through instant messenger or Internet messages.		0.706	0.491
18	I bullied teacher(s) using other forms that were not mentioned here.		0.691	0.508
23	I have said bad words to a teacher or have insulted him/her using instant messenger (such as WhatsApp) or Internet messages or other electronic platforms.		0.681	0410
16	I bullied a teacher with mean names or comments about his/her race or color or any other diversity aspect (nationality, sexual orientation, etc).		0.672	0.526
17	I bullied a teacher with mean names, comments, or gestures with sexual intent.		0.647	0.601
26	I have used a social network to spread false rumors and lies about a teacher.		0.642	0.407
13	I called another teacher(s) mean names, made fun of, or teased him/her in a hurtful way.		0.567	0.351
14	I spread false rumors about a teacher and tried to make others dislike him/her.		0.546	0.361
12	I have threatened a teacher.		0.463	0.416

Table 2. Factor Loadings

Construction Validity

- Item 19 was cross-loaded in two factors
  - resulted in a stable three-factor structure
  - the third resulting factor contained a mixture of the other two
  - inappropriate for further theoretical analysis
- Elimination of items 10, 11, 15, 20 and 21
  - leading to a final two-factor solution
  - from 26 to 20 items

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Construction Validity

- The names of the proposed factors were validated by a panel of 2 bullying experts
  - Prof. Ruchan Uz and Prof. Diogo Morais
- Factor 1 was entitled "Teacher bullying towards the student"
- Factor 2 was designated "Student bullying towards the teacher"

Construction Validity

Item		Factor 1	Factor 2
05	A teacher told lies or spread rumors about me and tried to make others dislike me	0.803	
07	I was bullied with mean names or comments about my race or color or any other diversity aspect (nationality, sexual orientation, etc.) by a teacher.	0.740	
08	I was bullied with mean names, comments, or gestures with a sexual intent by a teacher	0.733	
09	I was bullied in other forms, by a teacher, that were not mentioned here.	0.713	
04	A teacher called me mean names, made fun of me or teased me in a hurtful way.	0.690	
01	A teacher has hit, kicked, or pushed me.	0.687	
03	A teacher has threatened me.	0.586	
06	I had money or other personal belongings taken away from me or damaged by a teacher.	0.564	
22	A teacher has spread false rumors and lies about me on social networks.	0.556	
02	A teacher has verbally insulted me.	0.504	
24	I have said bad words about a teacher to other people through Internet messages or instant messenger.		0.715
25	I have threatened a teacher through instant messenger or Internet messages.		0.706
18	I bullied teacher(s) using other forms that were not mentioned here.		0.691
23	I have said bad words to a teacher or have insulted him/her using instant messenger (such as WhatsApp) or Internet messages or other electronic platforms.		0.681
16	I bullied a teacher with mean names or comments about his/her race or color or any other diversity aspect (nationality, sexual orientation, etc).		0.672
17	I bullied a teacher with mean names, comments, or gestures with sexual intent.		0.647
26	I have used a social network to spread false rumors and lies about a teacher.		0.642
13	I called another teacher(s) mean names, made fun of, or teased him/her in a hurtful way.		0.567
14	I spread false rumors about a teacher and tried to make others dislike him/her.		0.546
12	I have threatened a teacher.		0.463

Teacher bullying towards the student

Student bullying towards the teacher

Figure 3. Final factors with the corresponding names

Discussion

	Factor 1 Vit	Factor 2 Agree				
Maximo	4.00	4.00		0	95.61	96.27
Média	22%	13%		1	3.29	2.85
				2	0.22	0.44
0	436	439		3	0.44	0.22
1	15	13		4	0.44	0.22
2	1	2				
3	2	1				
4	2	1				
5						

Figure 4. Scores obtained from the whole acquired data sample

Discussion

	Factor 1 Vit	Factor 2 Agree				
Maximo	4.00	4.00	0	98.25	98.68
Média	7%	4%	1	1.10	1.10
			2	0.00	0.00
0	448	450	3	0.22	0.00
1	5	5	4	0.44	0.22
2	0	0			
3	1	0			
4	2	1			
5					

Figure 4. Scores obtained from the acquired data sample from Italy (116)

Discussion

	Factor 1 Vit	Factor 2 Agree			
Maximo	3.90	3.00			
Média	10%	5%			
			0	98.25	99.12
0	448	452	1	1.32	0.22
1	6	1	2	0.22	0.44
2	1	2	3	0.22	0.22
3	1	1	4	0.00	0.00
4	0	0			
5					

Figure 4. Scores obtained from the acquired data sample from Turkey (220)

Discussion

	Factor 1 Vit	Factor 2 Agree
Maximo	1.40	1.30
Média	5%	4%
0	452	449
1	4	7
2	0	0
3	0	0
4	0	0
5		

0	99.12	98.46
1	0.88	1.54
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00

Figure 4. Scores obtained from the acquired data sample from Poland (119)

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Conclusion

- EFA was performed to study and better comprehend psychometric qualities that lead to bullying in school-based environments

- The developed instrument is an appropriate evaluation tool allowing rigorous assessment of school-based bullying

- Items with the highest scores within a factor should be considered for future game developments