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Preliminary Psychometric Evidence for Evaluating Bullying Behavior in School Environments

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Abstract: This work reports a preliminary psychometric evidence done through an exploratory factor analysis (EFA) whose main objective is to reveal the actual reasons underlying the bullying behavior in school environments. We define bullying as repeated aggressive behaviors of a person or a group to hurt, upset and cause stress to a victim who is usually physically, mentally or socially weaker than the bully. We also coin here a term "school-based bullying" to designate bullying by school staff (for instance, teachers and school administrators) towards students and by students towards the school staff. Even though school-based bullying might not seem as prominent as peer-bullying or cyber-bullying, its effect is twofold: 1) considering students, it has great effect on the development of their academic success, their mental health, and is undoubtedly the leading cause of educational disruption and early drop-outs from schools; 2) regarding the bullying effect of students on teachers (and other school staff members), it can also be devastating, given that these staff members frequently suffer from increased stress and depression, reduced motivation and expectations, and low self-esteem. Therefore, school-based bullying is an important problem that can not only have a great effect on our junior population (by suffering direct bullying from school staff members and indirectly, as a consequence of inability/lack of motivation of teachers to play the right educational role in their lives), but also on school staff members (such as verbal, psychological, physical, and even sexual violence), that unfortunately receives inadequate attention in our society. Hence, this work proposes an instrument to adequately study the school-based bullying problem. The construction validity of the developed instrument was examined via EFA for a sample of 456 participants. Results of this analysis supported a two-factor solution consisting of 20 items which accounted for 46.4% of the variance. The instrument exhibited an excellent overall internal consistency both for the entire instrument (McDonald's $\omega = 0.92$) and all sub-scales (Cronbach's $\alpha > 0.87$). The performed study adds to the evidence that the developed instrument is an appropriate evaluation tool allowing the rigorous assessment of school-based bullying.

Keywords: Exploratory factor analysis; preliminary psychometric evidence; scale development; school-based bullying; student-teacher bullying)

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1. Introduction

Bullying has increasingly become a well-known problem in recent years [1]-[6]. Although previous studies and prevention programs generally focus on peer and/or cyberbullying, bullying has many other forms. The type of bullying that we refer to as school-based bullying, that occurs between students and school staff members has not been adequately explored nor was it given enough attention in the literature; thus, it is the main focus of this work, since this type of bullying harms the school environment significantly. In terms of students, the project KA220-SCH-D362F8ED entitled Preventing School-Based Bullying by Creating Early Prevention Programme (PRotoTYPe) fights with bullying and aims to create a safe school environment, supports students throughout their education. To this end, the project aims to cover the first priority within the scope of the Erasmus+Programme Guide and create unique tools to cope with school absenteeism and early school drop outs. According to the 2017 OECD document based on 2015 PISA results, in Poland 10.7 of students provided that they have been regularly and frequently bullied in schools and 21% state that they have been bullied at least once. These rates were 8.8 and 18.8% in Turkey, 6.8 and 14.7 in Ireland, 7.2 and 18.5% in Belgium, and 5.7 and 11.8% in Portugal respectively. According to a new Organisation for Economic Co-operation and Development (OECD) report, on the other hand, these rates have an increase of approximately 4 points overall across Europe [7]. Furthermore, a study by the European Commission in Eurydice Reports shows the rate of absenteeism is 32.7% in high schools, 25% in secondary schools, and 18% in elementary schools. Considering the student population in partner countries (Italy, Poland and Turkey), these rates refer to enormous numbers of student absence in their schools.

Compared to figures from 2009, early leaving from education and training (ELET) rates have decreased in most countries. In more than half of European countries, ELET rates are currently below the Europe 2020 headline target of 10%. Nevertheless, in Croatia, Hungary, Poland, Romania, Slovakia, and Sweden, ELET rates have slightly increased since 2009; yet, in 2013, the rates in Croatia, Poland, Slovakia, and Sweden remained below 10%. Another 15 countries have ELET rates lower than 10%. Some countries, despite having rates above 10%, have made significant improvements since 2009. This is the case with Spain, Malta and Portugal where a decrease of more than 6 percentage points can be observed in terms of ELET rates [9]. These data show how vital is to tackle school absenteeism and early drop-outs and to create a safe school environment for students. Thus, the PRotoTYPe project has been created and develops tools to prevent bullying from happening.

In the late 2018s, several studies reported that bullying in schools is observed not just among students and that students sometimes target their teachers, although the teachers are adults. According to a questionnaire conducted in Turkey; 67.4% of the teachers were exposed to verbal violence, 19.6% were exposed to physical violence, 12.9% were exposed to psychological violence and 0.1% were exposed to sexual violence and bullying [8]. Moreover, according to the results of the needs analysis conducted on 104 students for the purposes of this project, it was determined that the students were bullied by their teachers. The needs analysis from our partner schools and cooperation on the stage of preparing the project (gathering and sharing data, exchanging opinions and ideas between partners) revealed that there is an urgent need to tackle the growing problem of bullying, which during the pandemic period remains crucial (cyber-bullying, peer aggression, bullying during online learning, etc.). Hence, the bullying problem has evolved to an online form, even during the phase of remote education due to Covid19.

This work reports a preliminary psychometric evidence carried out via an exploratory factor analysis (EFA) with the intention to study and better comprehend psychometric qualities underlying the bullying in school-based environments. The proposed tool is developed such that it incorporates different types of bullying, such as physical-, verbal- and cyber-bullying, and was applied to the students of four secondary schools in three European countries: Italy, Poland and Turkey (two schools). Hence, intuitively, the items of the proposed scale were expected to load on a four factors, due to their strong interrelationship.

Even though there are some existing works on the topic of interest, most of them are related to peer bullying, and the new scale is introduced due to the necessity to further understand the actual reasons underlying the bullying behavior by students to school staff and vice versa. In total, 456 responses to the questionnaire were obtained and served as catalyst for the performed EFA.

2. Materials and Method

2.1. Study Design

The applied instrument consisted of 26 items, answered using a 5-point Likert scale, a format considered appropriate for this age group; we refer the reader to see Table 1. The answer format in the questionnaire ranged from 0 (never) to 4 (four or more times) and it consisted of four distinct parts. The first part was dedicated to student victimization, comprising 9 items that measured respondents' direct victimization suffered from teachers. The second part contained 9 items and it sought to evaluate student aggression towards teachers. The last two parts were designed to study cyber-bullying in school environments. Both parts were composed of 4 items whose aim was to analyze victimization and aggression towards/from students from/towards teachers, respectively.

2.2. Study Implementation

Participants in this study included 456 students ranging from the 1st up to 5th grades of secondary schools, in mixed schools located in three European countries: Italy, Poland, and Turkey. The students' age group was between 14 to 19 years. Students were inquired about bullying from teachers towards students and from students towards teachers.

The designed instrument was applied during the 2022/2023 school year in four schools: Istituto Tecnico Trasporti e Logistica "Euclide Caracciolo", Bari, Italy, Liceum Ogólnokształcące im. Wojska, Nowy Dwór Mazowiecki, Poland, Hasan Ali Yücel Anatolian School, Bursa, Turkey, and Bursa hürriyet Anadolu lisesi, Bursa, Turkey. The application was made through an online form, previously approved by the school administrations, with the support of teachers in each school. Before applying it, the form was first translated into the respective native language of each country. Moreover, questionnaire items were randomized before application, to control possible biases arising from sequential responses to items of the same competence.

2.3. Data Preparation and Statistical Analysis

Firstly, descriptive statistics of the 26 items of the developed school-based bullying scale were performed: mean, standard deviation, minimum, maximum, skewness and kurtosis. Prior to the EFA the number of extracted factors was based on the parallel analysis (PA) method with data permutation [11]. Afterwards, the EFA was performed with the minimum residual (MinRes) estimation method using a bivariate Pearson correlation matrix. The MinRes estimation method was chosen because it is suited best for slight multivariate normality violation, since it minimizes the entire residual matrix via an ordinary least squares (OLS) procedure (the only difference from OLS is that employs the empirical first derivative, which is produces slight latency) [12]. The applied rotation method was oblique "geominQ", given our initial assumption that two or more factors (latent variables) are correlated [13]. EFA factor loadings < 0.4 were considered non-substantive and loadings ≥ 0.4 were considered substantive [14]. Items with low commonalities ($h^2 < 0.3$), non-substantive factor loadings or item ambiguity (factor loadings > 0.4 on at least two factors) were eliminated [15].

Regarding reliability, the internal consistency was analyzed based on Cronbach's alpha (α) and McDonald's omega (ω). Cronbach's alpha and McDonald's omega values > 0.7 are indicators of adequate consistency. In all statistical procedures, a significance level of 5% was established. The analysis was conducted via JASP version 0.17.1.

Table 1. Composition of the instrument administered at the international level

	Item
Victimization	1. A teacher has hit, kicked, or pushed me.
	2. A teacher has verbally insulted me.
	3. A teacher has threatened me.
	4. A teacher called me mean names, made fun of me or teased me in a hurtful way.
	5. A teacher told lies or spread rumors about me and tried to make others dislike me
	6. I had money or other personal belongings taken away from me or damaged by a teacher.
	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.
	8. I was bullied with mean names, comments, or gestures with a sexual intent by a teacher
	9. I was bullied in other forms, by a teacher, that were not mentioned here.
Aggression	10. I have hit, kicked, or pushed a teacher.
	11. I have verbally insulted or said words to a teacher because I wanted to hurt him/her.
	12. I have threatened a teacher.
	13. I called another teacher(s) mean names, made fun of, or teased him/her in a hurtful way.
	14. I spread false rumors about a teacher and tried to make others dislike him/her.
	15. I took money or other personal belongings from a teacher or damaged his/her belongings.
	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).
	17. I bullied a teacher with mean names, comments, or gestures with sexual intent.
	18. I bullied teacher(s) using other forms that were not mentioned here.
Cybervictimization	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.
	20. A teacher has said bad words about me to others using the internet or instant messenger.
	21. A teacher has threatened me through Internet messages or instant messenger.
	22. A teacher has spread false rumors and lies about me on social networks.
Cyberaggression	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.
	24. I have said bad words about a teacher to other people through Internet messages or instant messenger.
	25. I have threatened a teacher through instant messenger or Internet messages.
	26. I have used a social network to spread false rumors and lies about a teacher.

3. Results

3.1. Descriptive Statistics

Table 2 provides the descriptive statistics (mean, standard deviation, minimum, maximum, skewness and kurtosis) of the 26 items regarding school-based bullying for students from 1st to 5th year of Secondary Education in the considered three countries.

Table 2. Descriptive Statistics of the Considered Items ($N = 456$).

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

One can observe that the answers to items 2, 3, 4 and 24 presented an average value above 0.3, being item 2 ("A teacher has verbally insulted me.") and 4 ("A teacher called me mean names, made fun of me or teased me in a hurtful way.") those with the highest average response (M = 0.519 and M = 0.363, respectively). The lowest average response value was verified for item 25 ("I have threatened a teacher through instant messenger or Internet messages."). Items 2 and 24 were the two that showed the greatest dispersion in responses (respectively SD = 0.894 and SD = 0.853), while items 25 and 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.") presented the lowest dispersion (SD = 0.364 and SD = 0.380, respectively). All items presented responses with similar range of values.

Regarding skewness and kurtosis, the values of the items vary significantly, showing results between 2.035 and 9.416 for skewness, and 3.972 and 94.824 for kurtosis, indicating that the data set has heavy tails and outliers [15].

3.2. Construction Validity

Following the recommendations of [20], the participant-item ratio was close to 20:1, hence EFA performance analysis was guaranteed. No multicollinearity problems arouse, with all scale items having a variance inflation factor (VIF) < 10.

The Kaiser-Meyer-Olkin (KMO) test returned a value of 0.89, which supports the sample adequacy. The significance of Bartlett's sphericity test ($\chi^2(192) = 4950.97$ and $p < 0.001$) revealed that correlations between items were adequate to conduct an EFA.

The preliminary results of the Parallel Analysis (PA) pointed to a three-factor solution, as shown in Fig. 1. Only three eigenvalues were above the threshold, $\tau = 1$, which is the measure of importance [22]. Therefore, a three-factor solution was initially adopted, forcing the EFA to restructure the solution to three factors, as illustrated in the figure.

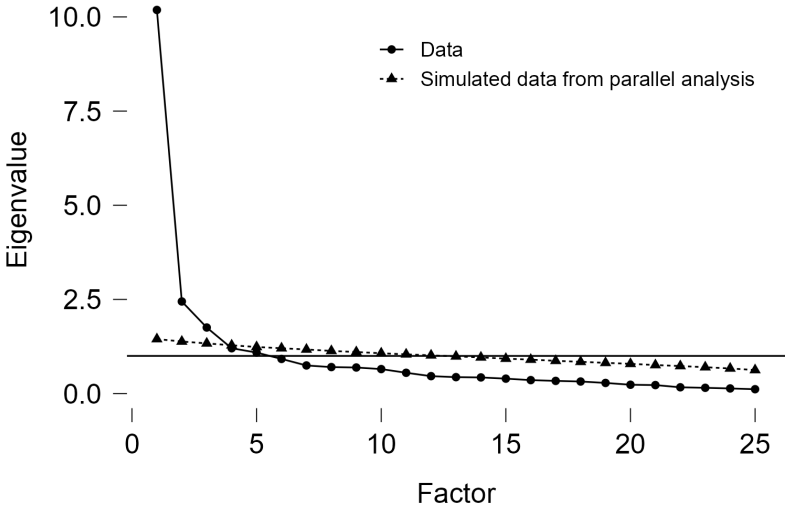

Figure 1. Initially obtained scree plot for parallel analysis.

The initial EFA revealed the presence of a cross-loading item (item 19 and therefore excluded from scale and a new EFA was performed, resulting in a stable three-factor structure. Furthermore, even though the resulting three-factor solution was stable, the third resulting factor withheld a mixture of the remaining two and was therefore considered inappropriate for further theoretical analysis. This resulted in the elimination of items 10, 11, 15, 20 and 21 that led to a final two-factor solution, as illustrated in Fig. 2. Table 3 summarizes the final two-factor structure with 20 items.

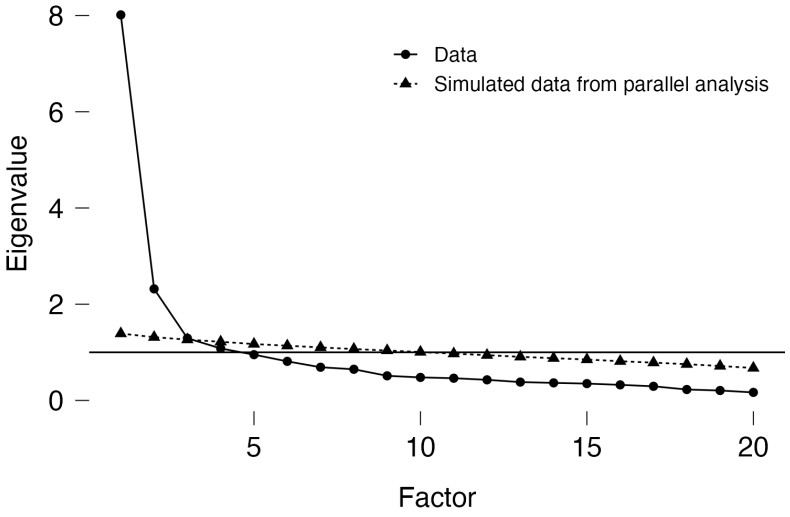

Figure 2. Final scree plot for parallel analysis.

Focused on the student/teacher bullying, the names of the factors were assigned and validated by a panel of 2 bullying experts. Factor 1 was entitled "Teacher bullying towards the student" and is composed of items 5, 7, 8, 9, 4, 1, 3, 6, 22, 2, explaining 24.2% of the scale variance. Factor 2 was designated "Student bullying towards the teacher" and comprises items 24, 25, 18, 23, 16, 17, 26, 13, 14, 12 that explained 22.2% of the scale variance. The values of the commonalities were high (all $h^2 > 0.3$) indicating that the variance of the items is properly explained by the factors; we refer the reader to see Table 3.

As shown in Table 4, the inter-factor correlation was positive and high, reinforcing our choice of the rotation method (oblique-geominQ). More detailed, the table shows that the Factor 1 has a correlation of 53.7% with the Factor 2.

Table 3. Factor Loadings

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 4. Factor Correlations

	Factor 1	Factor 2
Factor 1	–	0.537
Factor 2	0.537	–

In terms of reliability, the internal consistency of the "Teacher bullying towards the student" factor was good (Cronbach's $\alpha = 0.892$, McDonald's omega $\omega = 0.894$) and the "Student bullying towards the teacher" factor presented a Cronbach's $\alpha = 0.863$ and McDonald's omega $\omega = 0.861$, being equally good, as shown in Table 5. Lastly, the consistency of the entire scale was excellent ($\omega = 0.911$) [24].

Table 5. Frequentist Scale Reliability Statistics

Estimate	McDonald's ω	Cronbach's α
Teacher bullying toward the student	0.870	0.871
Student bullying toward the teacher	0.894	0.892
Total Scale:	0.927	-

3.3. Discussion

The primary objective of this work aimed at the construction and validation of an instrument that would enable us to better comprehend and prevent bullying behavior in school environments in different European countries, with a sample of students from 1st to 5th year of Secondary Education in Italy, Poland, and Turkey.

Based on the results of the EFA and on the analysis of specialists, we were able to sustain a factorial structure constituted by three factors: Verbal/Cyber abuse, Physical/Verbal

insults and Physical abuse/Rumor spreading. The Verbal/Cyber abuse sub-scale concerns student aggression in the context of verbal and online abuse. The Physical/Verbal insults, on the other hand, refers to student victimization in the context of name calling and physical molesting, while the Physical abuse/Rumor spreading sub-scale is related with physical aggression exercised by students towards teachers and rumor spreading about students by the teachers, in the school environment.

Based on the developed instrument and from the acquired data sample, the following findings can be extracted:

- The average scores of Factors 1 and 2 were 0.22% and 0.13, respectively;
- The scores per factor in different intervals with unit increment are summarized in Table 6 that reveals that the majority of students ($\approx$ 95%) do not participate or participate lightly in bullying events, while a small portion of them (0.88% act as victims and 0.44% act as aggressors) experience extreme bullying behavior;
- The average scores per item in Factor 1 indicate that most students were verbally insulted by a teacher (Item 2) or were called mean names, made fun of or were teased in a hurtful way (Item 4);
- The average scores per item in Factor 2 suggest that most students said bad words about a teacher to other people through the Internet messages or instant messenger (Item 24) or called mean names, made fun of or teased a teacher in a hurtful way (Item 13).

Table 6. Average scores per factor.

	Factor 1	Factor 2
$[0,1[$	95.61%	96.27%
$[1,2[$	3.29%	2.85%
$[2,3[$	0.22%	0.44%
$[3,4]$	0.88%	0.44%

4. Conclusions

This work presented a preliminary exploratory factor analysis with the intention to study and better comprehend psychometric qualities that lead to bullying in school-based environments. The inquiry was built in such a way that it incorporates different types of bullying, such as physical, verbal and cyber, and was applied to the students from 1st to 5th year of secondary school in three European countries: Italy, Poland and Turkey. In total, 456 responses to the questionnaire was obtain and served as a fuel for the performed exploratory factor analysis. The study was focused on the student's perspective in the relation student-teacher both in the context of student victimization and aggression. The results supported a two-factor solution consisting of 20 items which accounted for 46.4% of the variance. The instrument is also reliable, showing an excellent internal consistency. This study adds to the evidence that the developed instrument is an appropriate evaluation tool allowing rigorous assessment of school-based bullying.

Even though these preliminary results show promise, they should be confirmed in a subsequent confirmatory factorial analysis, which is left for future work. Moreover, in order to explore the stability of the scale, it should be validated on large samples from other countries with different characteristics.

5. Patents

This section is not mandatory, but may be added if there are patents resulting from the work reported in this manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee of ILIND on June 1, 2023.

Informed Consent Statement: Participant consent was waived due to the opinion of the Ethics Committee that the study does not deprive the participants of their protection in the eyes of the community, given that the questionnaire is answered voluntarily and anonymously, and that the study does not contain any information that jeopardizes any physical nor intimate integrity of the participants.

Conflicts of Interest: The authors declare no conflict of interest.

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