Bullying & Cyberbullying scale for Adolescents (BCS-A): Validation and Psychometric Properties in an Egyptian Sample

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ABSTRACT:

Even though youth bullying is a significant public health and educational issue, both healthcare providers and educational policymakers and practitioners have been limited in their ability to identify bullied adolescents due to a lack of a reliable and valid instrument for use in clinical and educational settings. The researcher conducted a multisite study to assess the psychometric properties of the Bullying & Cyberbullying scale for Adolescents (BCS-A), a new 26-item instrument for assessing youths' experiences of being bullied and cyberbullied.

The sample consists of 929 youths from various geographic backgrounds (433 females (46.6%), 496 males (53.4%), the sample mean age 14.8 years). The BCS-A and BFI abbreviated measures were completed by the participants. Analyses based on Classical Test Theory (CTT) were conducted, including reliability and validity assessments, item analyses, and principal component analyses. The BCS-A's diagnostic performance and test characteristics were also assessed. One component makes up the BCS-A, which accounts for 57.07 percent of the observed variance. Internal consistency reliability (Cronbach's = 0.93), construct, and convergent validity were all found in the analyses. The AUROC curve was 0.70 (95 percent CI: 0.65–0.76), with a sensitivity of 90 percent and a specificity of 87 percent. The BCS-A appears to be a reliable and valid tool for healthcare providers to use in screening for bullying exposure in the clinical and educational setting, according to the findings.

Keywords:

Bullying & Cyberbullying scale for Adolescents (BCS-A) - Validation - Psychometric properties.

1 | INTRODUCTION

Since the 1980s, there has been a steady increase in research into issues of aggressive behavior among children and adolescents at school, reflecting the growing severity of these issues around the world (Olweus, 2001; Skiba, 2000; Smith, 2003). Aggression varies based on its target; aggression against school property and that of other classmates, as well as aggression against teachers and peers, are examples of these behaviors (Astor, Pitner, Benbenishty, & Meyer, 2002; Herrero, Estevez, & Musitu, 2006). Therefore, researchers distinguish between *overt aggression*, which involves direct and manifest violence against others (e.g., hitting, pushing), *relational aggression*, which involves harming others by manipulating interpersonal relationships (e.g., spreading rumors, excluding a peer from a group), and *instrumental aggression*, which is used by aggressors to achieve their immediate goals (e.g., spreading rumors, excluding a peer from a group, hitting a peer to get money). (Estévez, Pérez, Ochoa, & Ruiz, 2008).

Aggression is a type of behavior in which someone attacks you physically or verbally. It can be directed at others or oneself, leading to self-destructive or suicidal behavior. Aggression, according to Berkowitz (1993), is any behavior that is intended to cause physical or psychological harm to another person. Aggression is defined as hostile or violent behavior or attitudes in the dictionary. It's a disjointed emotional reaction. The emergence of aggressive and violent behavior coincides with adolescence, some teenagers expose aggressive and violent behaviors, especially in educational settings. According to Sidhu et al., (2019), adolescence, which spans the ages of ten to nineteen years, is a period of growth and development that occurs between childhood and adulthood. Around 1.2 billion adolescents live in the world, accounting for one-fourth of the country's total population (UNICEF). In light of the rising rate of adolescent violence, the prevalence of aggression among adolescents, and the risk factors associated with it.

Adolescent aggression relates to the specific individual and social factors, with the latter primarily relating to the family and school contexts, which are the most important social contexts for development and psychosocial adjustment during this stage of life (Musitu & Garca, 2004). Adolescence is regarded as the most important transition period in life, as adolescents go through significant cognitive, biological, and social changes during this time. This is also the psychological transition period from being a child who must live in a family to an adult who must live in a society (Kumari & and Kumar, 2018).

Bullying is a common adolescent experience marked by the intent to harm, repetition, and an imbalance of power (Gladden, Vivolo-Kantor, Hamburger, & Lumpkin, 2014; Olweus, 1993). Bullying has evolved into a form of violence that poses a threat to a young person's safety in both schools and neighborhoods. Individuals, families, schools, and society as a whole are affected by bullying, which can leave young people feeling powerless, intimidated, and humiliated as a result of their peers' aggressive behavior. This vice can be found in a variety of places, including schools, after-school programs, and a young person's neighborhood. (Pepler, Craig, Ziegler & Charach, 1994, Pepler & Craig, 2000; Pepler, Smith & Rigby, 2004; Pepler & Craig, 2007; Ma, Stewin & Mah, 2001; Limo, 2015)

At the individual level, the psychosocial correlates of bullying have been well-documented (e.g., Arseneault, Bowes & Shakoor, 2010; Due et al., 2005, 2009a, 2009b; Fekkes, Pijpers, Fredriks, Vogels, & Verloove-Vanhorick, 2006; Hawker & Boulton, 2000). In terms of gender, boys are more likely to bully and be bullied, with physical attacks and aggressive behavior being the most common forms of bullying. Girls, on the other hand, appear to be more vulnerable to indirect bullying, such as social isolation, slander, and the spread of rumors (Van der Wal, et al., 2003). According to Juvonen and Graham (2014), roughly 20–25% of youth are directly involved in bullying as perpetrators, victims, or both in a recent review. Large-scale studies conducted in Western countries revealed that 4–9% of youths engage in bullying regularly, and 9–25% of school-aged children are bullied. A smaller subgroup of youth (bully/victims) whom both bully and are bullied have also been identified.

According to Nansel, et al. (2001), bullying is a type of aggression in which: 1) the behavior is intended to harm or disturb, 2) the behavior occurs repeatedly over time, and 3) there is a power imbalance, with a more powerful person or group attacking a less powerful one. This power imbalance could be physical or mental, and the aggressive behavior could be verbal, physical, or psychological. Erika, Pertiwi, & Seniwati (2017) view that bullying is a multidimensional problem as it affects individuals' mental health in their family life, educational institutions and is reflected in social contexts. Hence, bullying is viewed as a social problem that is a form of violent behavior done aggressively with discrete harm, either physically, verbally, or psychologically, through an intermediary or without an intermediary, which violates the rights of the perpetrator and victim and is repeated.

Bullying also involves a power imbalance (or an asymmetrical power relationship), which makes it difficult for students who are subjected to negative actions to defend themselves. It is often characterized by proactive aggression or aggressive behavior that occurs without apparent provocation or threat from the

victim (Olweus, 2003). With the increasingly widespread of technology, traditional bullying practices transformed to take place in the virtual horizons. Traditional relational aggression or bullying through spreading rumors among neighbors, classmates, or roommates now changed to happen in the social medial platforms and applications. Bullying has moved from the physical to the virtual due to technological advancements; the Internet has become a new arena for social interactions, allowing adolescents to say and do things with some anonymity and limited oversight by adult monitors (Ang, & Goh, 2010).

Bullying is twice as common as cyberbullying, even though they share some behavioral traits and frequently co-occur (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014). Olweus (1993) identified two key differences between bullying and non-bullying aggression: aggression can be a single act, whereas bullying involves multiple acts; additionally, bully-victim relationships are characterized by a power imbalance, making it difficult for the victim to defend himself or herself. In cyberbullying, the concept of a power imbalance is more complicated than in traditional forms of bullying (Dooley, Cross, & Pyzalski, 2009). As a result, proving that you are dealing with a case of cyberbullying rather than a case of general cyber aggression may be difficult. We will, however, use the term "cyberbullying" to describe the phenomenon in the following sections for the sake of clarity.

Cyberbullying has been studied extensively in recent years, but its definition has often differed between studies. This had a noticeable impact on results, and because consensus is difficult to achieve, cyberbullying definition is still being debated by researchers all over the world. However, following the most recent research in the field, Cyberbullying is defined as the intentional and repeated infliction of harm or discomfort on a specific person or group of people using the Internet as a technological medium (Patchin & Hinduja, 2006). According to Smith & Slonje, (2007, p. 249), cyberbullying refers to an aggressive, intentional act or behavior perpetrated repeatedly and over time by a group or an individual against a victim who cannot easily defend himself or herself.

Cyberbullying is the collective label used to define forms of bullying that use electronic means such as the internet and mobile phones to aggressively and intentionally harm someone," (Price and Dalgleish, 2010, p. 51). It can be measured separately from in-person bullying if it is thought of as an additional form of bullying. There have been numerous bullying scales developed, but their psychometric evaluation has been limited (Vessey, Strout, DiFazio, & Walker, 2014; Vivolo-Kantor, Martell, Holland, & Westby, 2014). In terms of the reference period, response categories, scale length, the inclusion of cyberbullying, and the creation

of victimization and perpetration subscales, instruments differ (Thomas et al., 2015).

Valid and reliable measurement is necessary for research into the emergence, course, and negative consequences of bullying, as well as for the evaluation of intervention programs. Victimization and perpetration experiences – being bullied and bullying others – should be captured by measurement tools (Thomas, Connor, & Scott, 2015). Effective measures for assessing bullying and cyberbullying include evaluating the prevalence of traditional forms of bullying including physical (e.g., hitting or kicking), verbal (e.g., name-calling, threats), and relational bullying (e.g., rumor spreading and social exclusion) (Gladden et al., 2014), also, it includes cyberbullying is a more recent issue (Thomas et al., 2015).

Among the widely used measures for assessing bullying and cyberbullying is the *Revised Olweus Bully/Victim Questionnaire (R-OBVQ)* (Olweus, 1993, 2006) which is a psychometrically sound instrument that assesses two distinct aspects of bullying and has been validated for use in international bullying studies. The R-OBVQ is split into two sections. Part I (Questions 5–24) refers to the initiation of a bullying act against the child who is filling out the survey, whereas Part II (Questions 25–40) refers to the child's bullying behavior directed at others. Another prominent measure of bullying is the California Bullying Victimization Scale (CBVS) (Felix et al., 2011) that mainly intends to measure the intention, repetition, and power imbalance elements of bullying victimization without using the term.

Also, the 20-items Child Adolescent Bullying Scale (CABS) (Strout, et al., 2018) was designed mainly to assess traditional bullying in childhood and adolescence. The CABS is the first known instrument created in response to the federal uniform definition of bullying among children and adolescents (Gladden, Vivolo-Kantor, Hamburger, & Lumpkin, 2014). Recognizing that bullying among children and adolescents has a significant public health impact, the Federal Partners in Bullying Prevention Steering Committee was formed to provide consistent bullying guidance (Strout, et al., 2017).

A team of researchers at Queensland University succeeded to design a scale to measure both traditional bullying and cyberbullying in adolescents. The Bullying and Cyberbullying Scale for Adolescents (BCS-A) is a multi-dimensional measurement model for bullying victimization and perpetration among adolescents. The findings show that two 13-item scales measuring victimization and perpetration experiences, each with four factors: physical, verbal, and relational, as well as cyber, were used (Thomas, et al., 2019). The literature reviewed revealed that only two studies were conducted to validate the scale, one of these studies has been conducted by the scale designers themselves (Thomas, et al., 2019) on a sample of Australian adolescents (Adolescents from 10 mainstream secondary schools completed a baseline and follow-up survey; N = 1,217; Mage = 14 years; 66.2% male). The study revealed that the BCS-A demonstrated acceptable concurrent and convergent validity (internalizing and externalizing problems school connectedness, social support, and personality), as well as predictive validity over 6 months.

The other study to validate the BCS-A scale is that of Özbey & Başdaş (2020) to stand on the psychometric properties of BCS-A on a sample of 600 Turkish adolescents, aged between 12 and 18 years. The study revealed that the BCS-A is a valid and reliable tool for determining bullying and cyberbullying among adolescents aged 12 to 18. The Content Validity Ratio (CVR) was greater than 0.733. All factor loads in the victimization subscale were above 0.630, and all factor loads in the bullying subscale were above 0.679. The victimization subscale had Cronbach's Alpha values ranging from 0.606 to 0.806, while the perpetration subscale had Cronbach's Alpha values ranging from 0.616 to 0.815. The pre-and post-test values were identical, and Intraclass Correlation Coefficients (ICC) of 0.559 and higher were found.

In the light of the scarcity of psychometric studies that validate the BCS-A worldwide in general and specifically in the Arab region, the current study has become essential. Therefore, this study is to look into the psychometric properties of the Bullying and Cyber-bullying Scale for Adolescents (BCS-A) in a sample of Egyptian adolescents.

2 | METHODS

2.1 | Design

A Classical test theory (CTT) measurement design was employed to determine the reliability of the computed BCS-A summary scores, the contribution of individual items to those scores, and validity assessments of the utility of those scores. Two existing instruments were used to evaluate convergent validity.

2.2 | Settings and participants

Secondary schools in five main Egyptian cities participated in this research. Between September 2019 and February 2020, youth treated at these facilities were enrolled in the study. The following were the inclusion criteria: 1) 13–17 years of age; 2) cognitively able to participate in the study; and 3) willingness to participate. Youths were not allowed to participate if they had any problem that made it difficult for them to comprehend instructions or provide assent. The researcher received institutional approval, and each youth participant and their parent or a legally authorized representative signed a written informed consent/assent form. The sample size of the study consists of 929 youths registered in the secondary schools in the five cities.

2.3 | Measures
2.3.1 | Bullying and cyberbullying Scale for Adolescents (BCS-A)

The initial Bullying and cyberbullying Scale for Adolescents (BCS-A) scale had a victimization scale of 20 items and a perpetration scale of 20 items. This version has been designed through the use of different previous bullying, cyberbullying and victimization scales to create the items; the revised version of the Olweus Bully-Victim Questionnaire (Olweus, 1996), the Peer Relations Questionnaire (Rigby, 1998), and the Forms of Bullying Scale (Shaw et al., 2013). Victimization and perpetration were divided into two subscales: 'offline/face-to-face' (11 items; traditional bullying subscales) and 'online/on the Internet or Mobile Phones' (11 items; traditional bullying subscales) (nine items; cyberbullying subscales).

The final scale had a victimization scale of 13 items and a perpetration scale of 13 items. It has been designed through the use of different previous bullying, cyberbullying, and victimization scales. The victimization and perpetration scale was divided into two subscales: 'offline/face-to-face' (13 items; traditional bullying subscales) and 'online/on the Internet or Mobile Phones' (13 items; traditional bullying subscales) (nine items; cyberbullying subscales). Figure 1 depicts a conceptual diagram of the four fixed subscales. The scale's reference period was the previous three months. Existing bullying measurement scales have traditionally used a reference period of 'past 30 days,' 'past couple of months,' or 'past Term.' This is generally thought to be a good timeframe for asking people about their most recent bullying experiences (Bovaird, 2010; Olweus, 1996; Shaw et al., 2013).
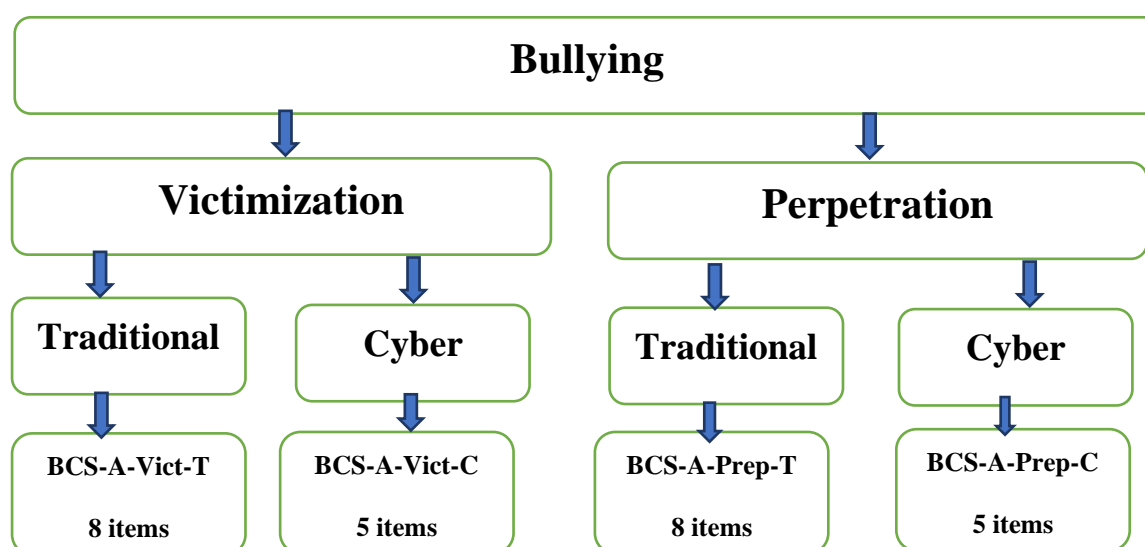
Figure 1. The Conceptual diagram of the BCS-A measurement model. Note. BCS-A = Bullying and cyberbullying Scale for Adolescents; C = cyber; Perp = perpetration; T = traditional; Vict = victimization. 1. Bullying as an overarching construct; 2. Bullying by the experience of victimization and perpetration; 3. Bullying as an experience within a traditional versus cyber domain; 4. Four fixed subscales were developed for the BCS-A.

2.3.2 | Olweus global bully Questionnaire:

To assess bullying experiences, the Olweus Bully-Victim Questionnaire (Olweus, 1996) was used to ask two global bullying victimization and perpetration questions (Solberg & Olweus, 2003). 'How often have you been bullied/taken part in bullying another student(s) at school in the last couple of months?' the participants were asked. 'Not bullied/did not bully,' 'once or twice,' 'two or three times a month,' 'about once a week,' and 'several times a week' were among the response options. Respondents were dichotomized based on their responses to these two items, with a cut-off of "every few weeks" or "more often."

2.3.4 | Forms of Bullying Scale

To assess bullying experiences using a unidimensional multi-item scale, the 2×10-item victimization and perpetration scales were included (Shaw et al., 2013). Prior to the scale, a definition with pictographs was presented. Responses measured on a 5-point scale ('this did not happen to me'/'I did not do this', 'once or twice', 'every few weeks', 'about once a week', 'every few weeks', 'about once a week', 'several times a week or more'. Each scale's items were added together and a mean score was calculated.

2.3.5 | Big Five Inventory Questionnaire (Adapted)

The Big Five Inventory Questionnaire (BFI) was designed by Chen (2013) based on interpretation of McCrae and Costa's research on the Big Five Inventory

(BFI)/Six Facets of personality traits (1995). This questionnaire should be used as a starting point for determining one's personality traits. It consists of some characteristics that may describe your personality, participants read each statement and circle the score that most accurately indicates the extent to which they agree or disagree with that statement. The scoring key is as follows: 1) Disagree strongly, 2) Disagree a little, 3) Neither agree nor disagree, 4) Agree a little, and 5) Agree strongly. A score of 5 means that a participant strongly agrees with the statement, while a score of 1 means that he/she strongly disagrees. If they don't agree or disagree with the statement that he/she is a person who "warms up quickly to others," for example, his/her score will be 3.

The Big Five Inventory Questionnaire (BFI) includes five subscales; extraversion (positive items; 1, 3, 4, 6, and 8; negative items; 2.5, 7, and 9), neuroticism (positive items; 10. 12, 13, 15, and 17; negative items; 11, 14, and 16), openness (positive items; 19, 20, 21, and 23; negative items; 18, 22, 24, and 25), agreeableness (positive items; 27, 29, 30, and 32; negative items; 26, 28, 31, and 33), and conscientiousness (positive items; 34, 36, 39, and 40; negative items; 35, 37, 38, and 41)

2.4 | Procedures

Human ethical clearance from the schools was obtained, as well as approval from the appropriate educational authorities. Participation in the study required parental informed consent. An information sheet and consent form were given to the secondary school students who had parental consent. Participants were reminded that the survey was voluntary, that they could withdraw at any time, and that their responses were anonymous by a researcher who explained these documents.

Participants filled out a pencil-and-paper survey in five different Egyptian cities about bullying and mental health. The study took place during a 40-minute class period at school. Participants were asked to fill out the survey booklet on their own, and teachers were on hand to answer any questions they had. The surveys were given out during the first semester in the academic year 2019-2020 specifically in the last month of the first school term.

The researcher in addition to study investigators identified youths who met the enrollment criteria. Both the researcher and investigators met the youths and their parents to assess their interest in participating in the study. After that, the study was explained in detail, and informed consent and assent were obtained. After that, in a pencil and paper format, youths completed the following instruments: 1) demographics worksheet; 2) BCS-A; and 3) BFI- adapted measure.

2.5 | Statistical analyses

Data were tabulated and were analyzed using SPSS for Windows v. 24.0 (Chicago, IL) statistical software as well as Amos 23.0 statistics. For each variable, data were systematically examined for normality and outliers. To assess the pattern of missing data and determine the most appropriate method for addressing missing values, a missing values analysis was conducted, including frequency of missing responses for each BCS-A item, the frequency of missing responses for each participant, and visual inspection of graphical displays to determine whether a monotonic pattern existed within the missing values. Following this analysis, missing values were replaced through multiple imputations, using an iterative Markov chain Monte Carlo imputation method (Cottrell, Cot, & Mary, 2009; Donders, van der Heijden, Stijen, & Moons, 2006). Descriptive statistics and confidence intervals were used to portray the sample demographics.

2.5.1 | Scale characteristics

A traditional classical test theory-based set of analyses were performed. This included an analysis of item difficulty, item discrimination (item-total point-biserial correlations), and the distribution of responses across the items' scoring categories. When an item in a scale is itself included in the computation of the total score and an item-total correlation is then computed, an inflated estimate of the item's discrimination value results. To address this, the correlation was recomputed without the item of interest included in the total score, resulting in a corrected item-to-total correlation. The internal consistency reliability of the BCS-A scores was evaluated through Cronbach's coefficient alpha. A Cronbach's alpha of .70 or above is typically considered acceptable (Nunnally, 1978).

2.5.2 | Scale components
- Construct validity
- Exploratory factor analysis

An exploratory principal component approach (PCA) was used to examine the dimensionality of the BCS-A instrument by identifying the smallest number of interpretable components required to explain observed correlations amongst BCS-A items. Assessment of the Kaiser-Meyer-Olkin statistic, the determinant of the R-matrix, and Bartlett's-Test of Sphericity was used to assess the appropriateness of the BCS-A correlation matrix for analysis (Bartlett, 1950; Kaiser, 1974).

Criteria for component extraction included the magnitude of component eigenvalues, proportion of variance accounted for by the components, clarity of the separation in the component loadings, and meaningfulness of the extracted components. To aid in component interpretation, the researcher planned to conduct PCA followed by an oblique rotation method (Promax) with the examination of the resulting component correlation matrix. The strength of the resulting correlations would guide the ultimate selection of either an oblique or orthogonal rotation method, with observed correlations ≥ 0.32 suggesting a correlation between underlying components (Brown, 2009; Tabachnick & Fidell, 2007).

The researcher assessed the fit of the resulting model by examining the residuals, the difference between the observed correlation coefficients and the ones reproduced in the model. If the model was to perfectly fit the data, the reproduced correlations would be the same as the observed correlations. In a very good model, the residual values are very small, less than 0.05 (Field, 2009).

- Confirmatory factor analysis

Factor determination. Because the EFA results ranged from one to five factors, CFA used maximum likelihood estimation on Data B to look at single and multi-factor solutions. Because deleting items before determining the final number of factors could reduce the number of factors retained, all items were kept (Worthington & Whittaker, 2006). All scale items should be kept, according to the results of CFA analyses.

- Concurrent Validity

The concurrent validity of the BCS-A compared to the Olweus global items and the Forms of Bullying Scale (FBS) in explaining the variance of two dependent variables previously shown to be associated with experiences of bullying victimization and perpetration: internalizing and externalizing problems, were investigated using hierarchical multiple regressions, controlling for gender and age/grade. Step 1 consisted of demographic variables, Step 2 consisted of the Olweus global item or the FBS, and Step 3 consisted of the four BCS-A factors. In comparison to unidimensional measurement, this was done to test the unique contribution of the multi-dimensional measurement structure, which allows individual factor associations to be examined (Olweus global and FBS). The BCS-A physical, verbal, relational, and cyber factors together explained significantly more variance in the dependent variables (SDQ internalizing and externalizing problems) than the Olweus global victimization and perpetration items, as well as the FBS-Victimization and FBS-Perpetration scales, for both victimization and perpetration.

3 | Results

3.1 | Characteristics of the study participants

The study sample consisted of 929 subjects recruited on a convenience basis over 2 months: 300 from secondary schools in Hurghada, 300 from Alexandria, 150 from Minia governorate, and 179 from secondary schools in Beheira city. The mean age of participants was 14.8 years, range 13–17 years old. Forty-six-point six percent ($n = 433$) of participants were female and fifty-three point four ($n = 496$) were males. Participants registered at governmental schools represent 85.1% ($n = 791$), and 14.9% ($n = 138$) were studying at language schools. The participation rate was 100%, and the estimated time to completion of the BCS-A tool was 15 min. Complete demographic information can be found in Table 1.

Table 1 demographic information

	N	%	N.	%
Gender				
Male	496	53.4%		
Female	433	46.6%		
Age/Grade				
10th grade			594	63.9%
11th grade			242	26.0%
12th grade			93	10.0%
School Type				
Government school	791	85.1%		
Language school	138	14.9%		
Residence				
Hurghada			300	32.3%

Alexandria	300	32.3%
Minia	150	16.1%
Beheira	179	19.3%

None of the continuous variables displayed extreme nonnormality requiring transformations. The item response scoring categories functioned as intended, in that none were ignored. No participant-generated outlier BCS-A scores might have occurred through deliberate misleading responses (such as responding strongly agree to every item). In addition, the quality of the inter-item correlation as assessed through the "appropriateness" checks mentioned above was considered sufficient for extracting stable and meaningful components in the data reduction process.

3.2 | Reliability analyses

The standardized Cronbach alpha coefficient for the BCS-A scale scores was 0.93. Corrected item-total correlations (item discrimination) ranged from 0.41–0.69, all falling well above the 0.30 threshold for deletion (Table 1). Inter-item correlation values ranged from .406 (for item 6 "Said mean or hurtful things to me" **offline - been bullied** and item 19 "Said mean or hurtful things to someone "online/ **Mobile- been bullied**) to 0.665 (for item 8 "Spread lies or rumors about me, to hurt me or make others not like me" **offline - bullied** and item 13 "Spread lies or rumors about me, to hurt me or make others not like me" **online/ Mobile-bullied**). Corrected item discrimination values for the BCS-A data ranged from .405 (for the "Punched, hit, kicked, pushed or shoved me, on purpose" item) to .691 (for the "Sent or posted, mean or hurtful pictures/videos about someone" item). Because summed BCS-A item responses are continuous, item difficulties were expressed as the arithmetic means for each item. Item difficulties for the BCS-A items ranged from 1.92 to 2.73 (out of 5.0). This range suggests that the participants tended to score relatively low on the BCS-A, suggesting a low level of bullying.

Table 2. Item discrimination values for the BCS-A instrument, 26 items (N = 929)

	Corrected item discriminations	Alpha if item deleted
"OFFLINE" / FACE TO- FACE? - Been Bullied		
1.Punched, hit, kicked, pushed, or shoved me, on purpose	.405	.929
2. Forced me to do something I did not want to do.	.496	.925
3. Told me others would not like me if I did not do what they said.	.664	.922
4. Damaged, hid, or stole my belongings, on purpose.	.593	.923
5. Called me mean or hurtful names.	.604	.923
6. Said mean or hurtful things to me.	.663	.922
7. Left me out of a group or an activity, or did not allow me to join in, on purpose.	.582	.924
8. Spread lies or rumors about me, to hurt me or make others, not like me.	.442	.926
"ONLINE" / ON THE INTERNET or MOBILE PHONES? - Been Bullied		
9. Called me mean or hurtful names.	.437	.926
10. Sent or posted, mean or hurtful pictures/videos about me.	.684	.922
11. Told me others would not like me if I did not do what they said.	.622	.923
12. Left me out of a group or an activity, or did not allow me to join in, on purpose.	.616	.923
13. Spread lies or rumors about me, to hurt me or make others, not like me.	.485	.925
"OFFLINE" / FACE- TO -FACE – Bullied		
14. Punched, hit, kicked, pushed, or shoved someone, on purpose.	.430	.932
15. Forced someone to do something they did not want to do.	.606	.923
16. Told someone that others would not like them if they did not do what I/we said.	.613	.923
17. Damaged, hid, or stole someone's belongings, on purpose.	.623	.923
18. Called someone mean or hurtful names.	.558	.924

19. Said mean or hurtful things to someone.	.614	.923
20. Left someone out of a group or an activity, or did not allow them to join in, on purpose.	.633	.923
21. Spread false rumors about a person, to hurt them or make others, not like them.	.635	.923
"ONLINE" / ON THE INTERNET or MOBILE PHONES – Bullied		
22. Called someone means or hurtful names.	.543	.924
23. Sent or posted, mean or hurtful pictures/videos about someone.	.691	.922
24. Told someone that others would not like them if they did not do what I/we said.	.643	.923
25. Left someone out of a group or an activity, or did not allow them to join in, on purpose.	.638	.923
26. Spread lies or rumors about someone, to hurt them or make others, not like them.	.516	.925

3.3 | Principal components analysis

Based on the previously described retention criteria, a single component solution accounting for 57.07% of the observed variance was accepted. All items loaded highly onto a single component (Table 3). Examination of the associated scree plot (Figure 2) also supported a single-component solution through demonstration of discontinuity in the plotted eigenvalues (Cattell, 1996).

In addition, communality values reflecting the common variance estimated for the sample are provided. The communality values represent the variance explained by the retained component following extraction. Values for the BCS-A items ranged from 0.363 to 0.795, accounting for a moderate to large proportion of the common variance.

Table 3. Descriptive statistics, loadings, and communalities of the BCS-A instrument, 26 items (N = 929)

	M.	**SD**	**loadings**	**communalities**
"OFFLINE" / FACE TO- FACE? - Been Bullied				
1.Punched, hit, kicked, pushed, or shoved me, on purpose	.85	1.070	.741	.741
2. Forced me to do something I did not want to do.	1.25	1.79	.521	.738
3. Told me others would not like me if I did not do what they said.	1.12	1.135	.704	.522
4. Damaged, hid, or stole my belongings, on purpose.	1.39	1.209	.626	.624
5. Called me mean or hurtful names.	1.46	1.415	.646	.569
6. Said mean or hurtful things to me.	1.44	1.278	.704	.628
7. Left me out of a group or an activity, or did not allow me to join in, on purpose.	1.05	1.130	.634	.501
8. Spread lies or rumors about me, to hurt me or make others, not like me.	1.56	1.332	.464	.795
"ONLINE" / ON THE INTERNET or MOBILE PHONES? - Been Bullied				
9. Called me mean or hurtful names.	.94	1.109	.577	.727
10. Sent or posted, mean or hurtful pictures/videos about me.	1.09	1.067	.724	.547
11. Told me others would not like me if I did not do what they said.	1.05	1.114	.677	.599
12. Left me out of a group or an activity, or did not allow me to join in, on purpose.	1.21	1.252	.669	.585
13. Spread lies or rumors about me, to hurt me or make others, not like me.	1.45	1.369	.553	.738
"OFFLINE" / FACE- TO -FACE – Bullied				
14. Punched, hit, kicked, pushed, or shoved someone, on purpose.	.99	1.271	.752	.707
15. Forced someone to do something they did not want to do.	1.12	1.034	.632	.548

16. Told someone that others would not like them if they did not do what I/we said.	1.09	1.060	.649	.557
17. Damaged, hid, or stole someone's belongings, on purpose.	1.11	1.188	.681	.582
18. Called someone mean or hurtful names.	1.28	1.375	.620	.542
19. Said mean or hurtful things to someone.	1.12	1.189	.669	.494
20. Left someone out of a group or an activity, or did not allow them to join in, on purpose.	.99	1.146	.696	.633
21. Spread false rumors about a person, to hurt them or make others, not like them.	1.13	1.243	.700	.605
"ONLINE" / ON THE INTERNET or MOBILE PHONES – Bullied				
22. Called someone mean or hurtful names.	.74	.953	.577	.720
23. Sent or posted, mean or hurtful pictures/videos about someone.	.98	.994	.748	.678
24. Told someone that others would not like them if they did not do what I/we said.	1.01	1.099	.705	.594
25. Left someone out of a group or an activity, or did not allow them to join in, on purpose.	1.10	1.217	.694	.531
26. Spread lies or rumors about someone, to hurt them or make others, not like them.	.80	1.010	.572	.363
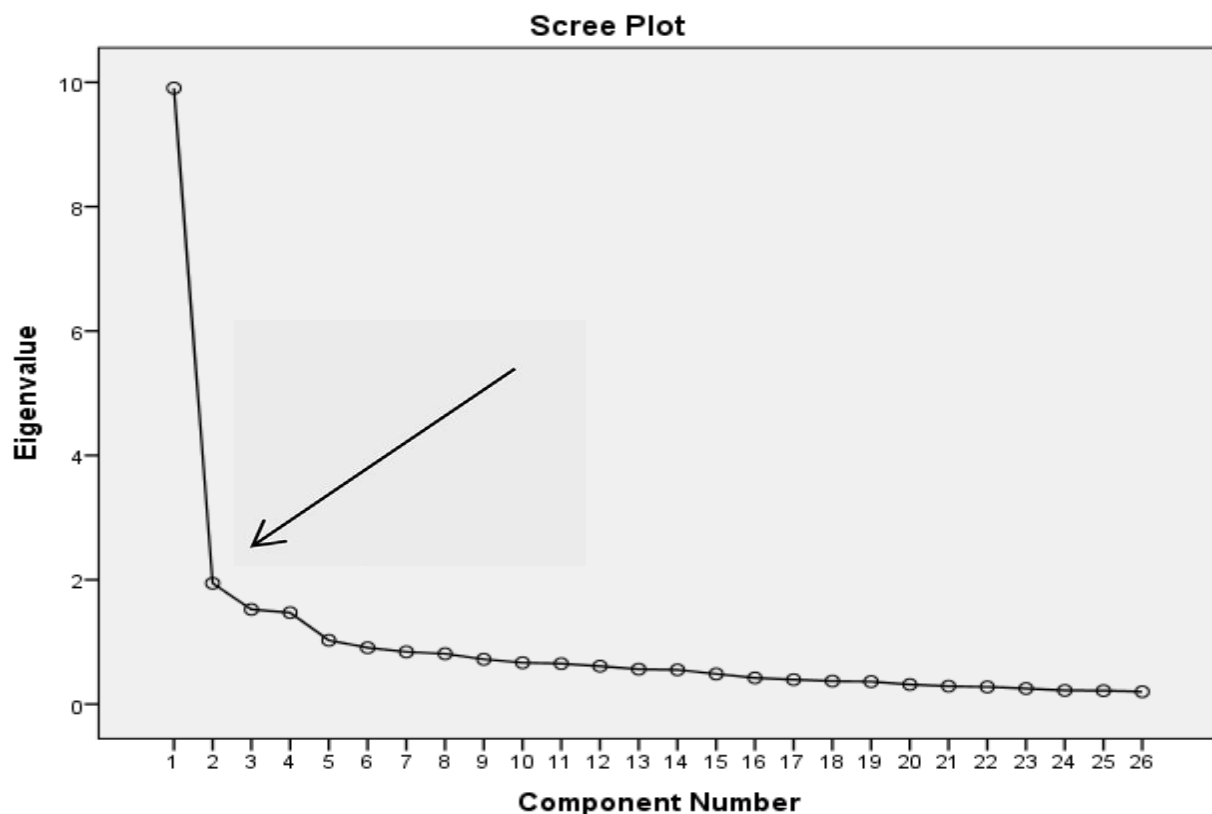
Fig. 2. Scree plot of eigenvalues for the BCS-A Items, *N* = 929. The scree plot displayed in Figure 1 depicts a sharp descent in the curve, or point of inflection, at the second component. The black arrow indicates the inflection point. Cattell's (1966) recommendation of retaining only components to the left of the inflection point supports a single-component solution

Residual analysis revealed that most of the BCS-A residual values were very small, but 82 (8.83%) were noted to be greater than 0.05. This proportion (8.83%), is well under the 50% that Field (2009) suggests is concerning. Therefore, it can be concluded that the model appears to be a reasonable fit for the data. Given the simple nature of the single-component solution, rotation was not required to aid in solution interpretation.
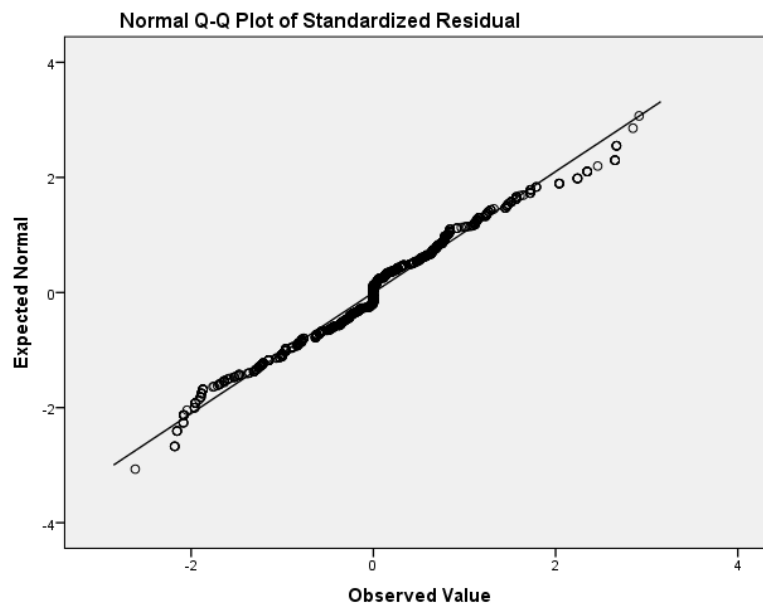
Fig 3. Residual analysis of the BCS-A

### 3.4 | Confirmatory factor analyses

A CFA was run to test whether or not the 26-items BCS-A scale dealing with bullying and cyberbullying cohered together into a four-dimensional, bullying and cyberbullying construct. The results supported the PCA findings (see Figure 4) by demonstrating that the four-factor model [$X2(26)$ 612.06, p.0.01] yielded excellent fit for all of indices [df/ratio 0.56; CFI .88; TLI .83; SRMR 0.067; RMSEA 0.106 (0.00, 0.00; 90% CI)] and was also highly reliable (alpha= 0.93).
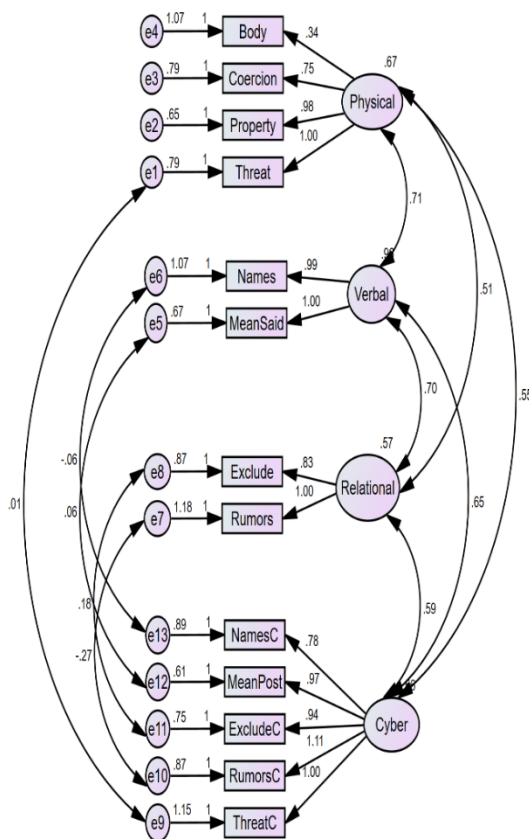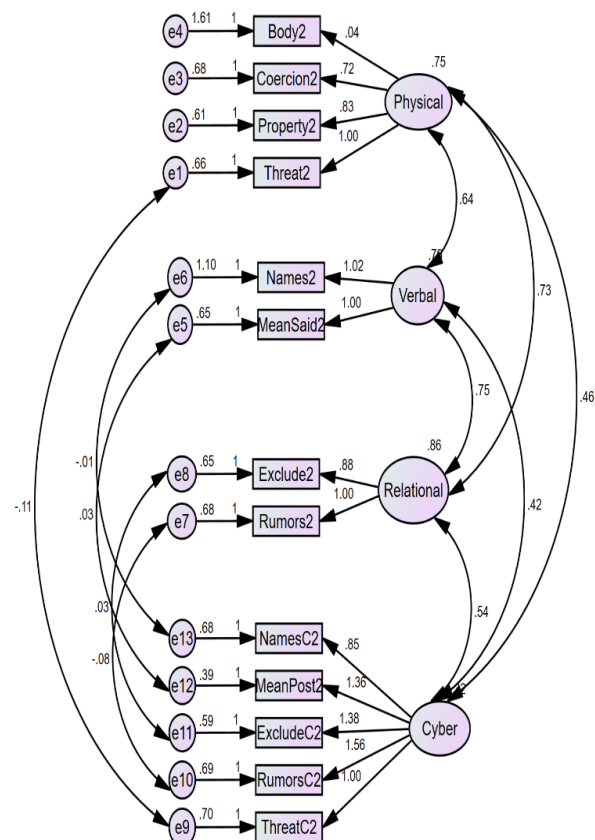
Figure 2. Final four-factor victimization and perpetration models. Note. Ellipses represent latent constructs; rectangles indicate measured variables; circles signify residuals. Standardized maximum likelihood parameters are presented. All parameters are statistically significant at p < .001.

3.5 | Analyses of variance and correlation analyses

BCS-A scale total scores were correlated with subscales of offline victimization, offline victimization, offline perpetration, and online perpetration, to examine the construct's validity and explore its relationship with relevant attitudes and demographic factors (see Table 4). BCS-A scale scores were positively correlated with gender, age/gender, education sector, personality traits questionnaire scores. It supports the instrument's construct validity as a measure of victimization and perpetration. Crucially higher scores were associated with a better diagnosis of bullying and cyberbullying.

Table 4 Inter-item Pearson's correlation matrix and corrected item-total correlation

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	-												
2	.300**	-											
3	.152**	.337**	-										
4	.258**	.375**		-									
5	.182**	.266**	.435**	.544**	-								
6	.068*	.418**	.499**	.400**	.526**	-							
7	.048	.206**	.447**	.323**	.385**	.429*	-						
8	.079*	.146*	.348**	.252**	.327**	.418**	.276**	-					
9	.056	.508**	.220**	.275**	.280**	.403**	183**	.322**	-				
10	.199**	.377**	.458**	.452**	.484**	.526**	.315**	.296**	.393**	-			
11	.049	.217**	.530**	.273**	.355**	.508**	.528**	.331**	.364**	.483**	-		
12	.115**	.540**	.398**	.414**	.361**	.422**	.494**	.212**	.392**	.463**	.391**	-	
13	.130**	.127**	.371**	.308**	.228**	.368**	.345**	.665**	.214**	.391**	.376**	.230**	-

Table 4. (con.) Inter-item Pearson's correlation matrix and corrected item-total correlation

	14	15	16	17	18	19	20	21	22	23	24	25	26
14	-												
15	.188**	-											
16	.147**	.399**	-										
17	.026	.488**	.490**	-									

18	.121**	.375**	.435**	.381**	-							
19	.051	.300**	.436**	.448**	.486**	-						
20	.058	.376**	.491**	.467**	.441**	.460**	-					
21	.054	.382**	.440**	.506**	.420**	.544**	.518**	-				
22	.086**	.359**	.229**	.306**	.274**	.377**	.286**	.400**	-			
23	.034	.487**	.485**	.563**	.345**	.500**	.496**	.619**	.511**	-		
24	.059	.376**	.481**	.535**	.499**	.408**	.546**	.508**	.337**	.564**	-	
25	.025	.414**	.412**	.433**	.408**	.474**	.631**	.497**	.295**	.583**	.505**	-
26	.071*	.292**	.369**	.287**	.286**	.404**	.455**	.438**	.356**	.415**	.397**	.397**	-

Corrected item to total correlations ranged from .043 (item 14) to .69 (item 23). Cronbach alphas if an item were deleted ranged from .922 (items 3, 6, 10, 23), .925 (items 2, 13, 26) to .929 (item 1). A *t*-test showed statistically significant differences between males and females in their bullying and cyberbullying behaviors; males (*M*=34.52, *SD*= 18.12), females (*M*=23.36, *SD*=16.13) *t*= 9.84, *p*<.001. Similarly, there was a statistically significant difference in BCS-A score differences between adolescents registered in governmental schools and language schools in their victimization and perpetration bullying and cyberbullying levels; governmental schools (*M*= 39.65, *SD*=18.13), language schools (*M*=27.52, *SD*=17.48), *t*= 7.48, *p*<.001. An analysis of variance (ANOVA) showed that there were statistically significant differences in BCS-A scores in terms of age/grade, *F*(16.64), *p* < .001. Post hoc analyses using the Scheffe criterion for significance indicated that 12th graders (*M*=37.34; *SD*= 18.49) had significantly higher BCS-A scores than the other lower grades, whereas 11th graders were the lowest BCS-A scorers (*M*=25.04; *SD*= 17.80) had the lowest BCS-A scores.

Also, ANOVA showed that there were statistically significant differences in BCS-A scores in terms of the city of residence, *F*(3.26), *p* < .02. Post hoc analyses using the Scheffe criterion for significance indicated that participants residing in Beheira City (*M*=31.85; *SD*= 17.89) had significantly higher BCS-A scores than participants residing in the other cities, whereas youths residing in Hurghada city were the lowest BCS-A scorers (*M*=27.35; *SD*= 18.41) had the lowest BCS-A scores.

Table 5. Correlation coefficients between the BCS-A and the total scale and subscales of Personality traits.

Variables Correlation	**Variables Correlation**
Victimization (Traditional)	.907**
Victimization (Cyber)	.869**
Perpetration (Traditional)	.907**
Perpetration (Cyber)	.870**
Extraversion	-.172**

Neuroticism	.229**
Openness	-.105**
Agreeableness	-.110**
Conscientiousness	-.127**
PFI Questionnaire	.195**

Table 6. Zero-order correlations

| Variables	BCS-A
Gender	-.308
Age/Grade	-.239
School Type	.041
Residence	.068

Note. N=929, BCS-A: Bullying and Cyberbullying Scale total score, Gender: (1=male, 2= female); Age/ grade; (1=10th grade, 2= 11th grade, 3=12th grade); school type: (1=governmental schools, 2=language schools); residence: (1= Hurghada, 2=Alexandria, 3=Minia; 4= Beheira).

Correlation analysis showed that males initiate bullying and cyberbullying behaviors than their female counterparts. In terms of school type, youths in governmental schools show more victimization and perpetration whether offline or online compared with their peers in language (private) school. In terms of the city, youths reside, it is clear that youths living in Beheira were the highest in exposing bullying and cyberbullying behaviors with the youths residing in Hurghada the lowest.

3.6 | Receiver operating characteristic analyses
Receiver operating characteristic (ROC) analyses were used to evaluate the BCS-A's diagnostic viability as a mental health assessment tool. Additionally, it is used to determine a cut score that best distinguishes individuals who experience signs of victimization and perpetration because of bullying and cyberbullying (individuals with high levels of BCS-A scored >20).
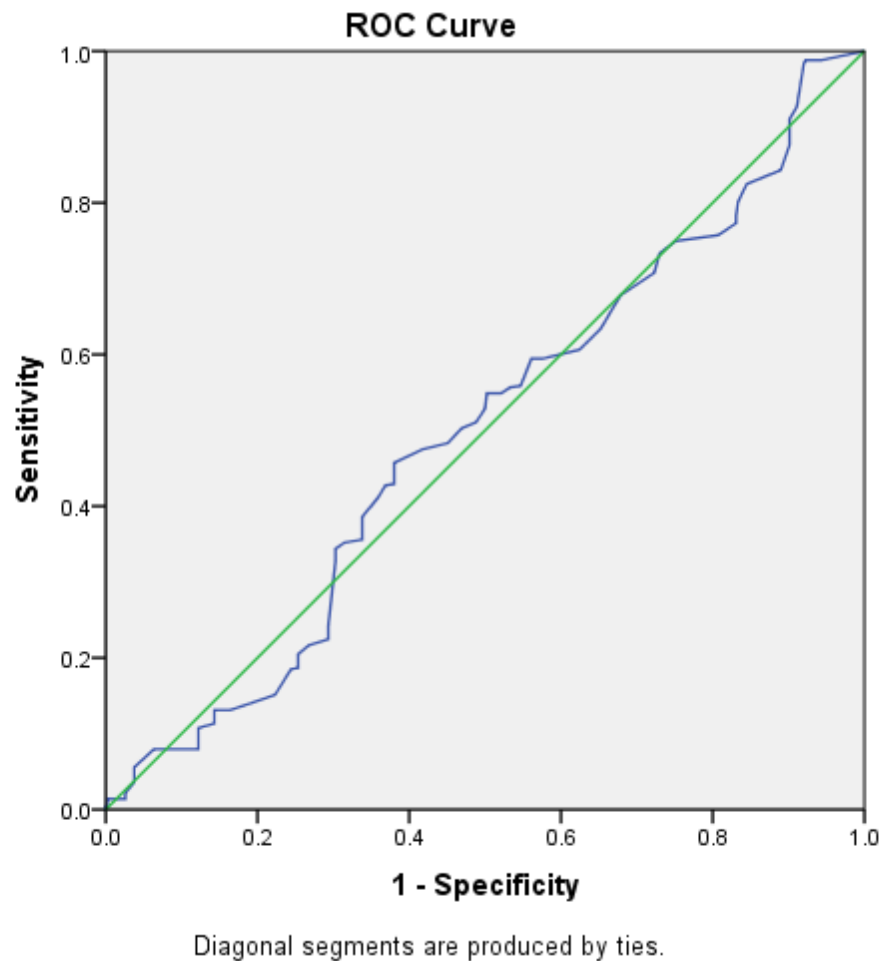
Figure 2. Area under the ROC curve. Note. AUC: 0.71, *p* < .001

The ROC graph displayed the convex pattern that is indicative of good discrimination ability (see Figure 2), while the Area Under the Curve (AUC) demonstrated solid diagnostic and assessment accuracy for the BCS-A (AUC= 0.71, *p* < .001). A BCS-A score >20 optimally classified adults as having (95% sensitivity) or not having (90% specificity) victimization and perpetration symptoms (Youden's index of 70) with a false positive rate of 20%. Thus, these results support the BCS-A as an accurate psychological assessment tool with robust classification features.

3.3 | Discussion

The study's main aim is to validate the psychometric properties of the BCS-A scale that researchers, teachers, and health professionals can quickly and confidently use to identify probable causes and symptoms of victimization and perpetration of bullying and cyberbullying among adolescents. The Bullying and Cyberbullying Scale for Adolescents (BCS-A) was developed as a multi-dimensional measurement model of bullying victimization and perpetration. The findings revealed two 13-item scales measuring victimization and perpetration experiences, each with four factors: physical, verbal, and relational, as well as cyber. The

BCS-A is one of the leading psychological/mental health measures of related psychopathology validated on a large sample of youth/adults who may suffer from victimization and perpetration of bullying and cyberbullying.

BCS-A is characterized by its ability to identify unique independent associations between bullying involvement and other outcomes using a multi-dimensional measurement approach. This has significant implications for the ability to tailor interventions to subscale profiles. In terms of response shift biases and, more specifically, recalibration, or a shift in internal measurement standards, Shaw, Cross, and Zubrick (2015) found no evidence of response shift in BCS-A, this is an important psychometric property that should be investigated further with the BCS-A. It stems from the fact that measurement scales must not only be accurate and dependable, but also sensitive to change (Vessey et al., 2014).

The BCS-A includes two 13-item measures for victimization and perpetration that are interchangeable. Specific actions were assessed using a continuous scale that represented the experience of a specific type of

bullying. While a continuous measure adds more variance to measurement models and has the potential for greater sensitivity to change, it could be argued that an ordinal type response is more straightforward and requires less effort from participants. The BCS-A, on the other hand, has the flexibility to be reduced to ordinal level data to suit the analytic goals of a study because it captures these data as a continuous measure (Thomas, et al., 2019). In future research, measurement flexibility will be useful for developing more complex structural models of bullying antecedents and consequences.

3.4 | Limitations

Because the sample was not representative, it is suggested that the models be tested on other adolescent populations. It is acknowledged that only 3% of the population was represented in the current sample. Given the active consent procedures used in this study, it's possible that students who were victims or perpetrators of bullying were under-represented (Shaw, Cross, Thomas, & Zubrick, 2014). It's also possible that the sample at follow-up included adolescents with higher functioning levels than those who dropped out. This would result in a slight underestimation of reported effects (Wolke et al., 2009). Although self-report is a widely accepted measurement method, it is recognized that by operationalizing bullying in this way, the measurement method becomes part of the construct being studied. The construct being measured in this manner was the subjective experience of being bullied and bullying others (Salmivalli & Peets, 2011)

In addition, it should be noted that even though the model demonstrates acceptable fit by most conventions, in some instances it was only marginal. Although the majority of indicators produced strong factor loadings, some indicators resulted in lower factor loadings in the final model. These lower loadings were most likely due to a greater conceptual distinction between indicators for some factors than for others. This is because there is more variation in the way specific indicators behave. Finally, this study depends upon the relations between bullying/ Cyberbullying behaviors concerning personality traits, further researches should assess concordance rates with existing measures of bullying especially the multidimensional measures.

Disclosure statement
The author reported no potential conflict of interest.

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