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Article

An examination of the psychometric properties and dimensionality of the Aggression-Problem Behavior Frequency Scale in a sample of Black South African adolescents

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Abstract

Advancing research into aggressive behaviour in South Africa necessitates a range of suitable measuring instruments. The Aggression-Problem Behavior Frequency Scale is one such instrument that has been extensively used in diverse settings. The authors of the Aggression-Problem Behavior Frequency Scale present it as a multidimensional scale that purports to measure physical, non-physical, and relational aggression. Despite the widespread use of the scale as a three-factor scale, the psychometric properties, specifically the factor structure of the instrument, have not been examined either globally or in South Africa. This article reports on the reliability, factor structure, and dimensionality of the Aggression-Problem Behavior Frequency Scale among a sample of Black South African adolescents. The scale demonstrated a high level of reliability both in terms of coefficient alpha and coefficient omega. Confirmatory factor analysis indicated that a second-order factor model and a bifactor model demonstrated a better fit than a one-factor model. Despite the superiority of fit of the two models, bifactor indices demonstrated that the Aggression-Problem Behavior Frequency Scale is essentially unidimensional. First, Omega Hierarchical Subscale indicated a significant reduction in the reliability of the subscales after partitioning out the variance attributable to the general factor (total aggression). Second, the percentage of common variance explained by the total scale was 75% with only 25% attributable to the three subscales. While the findings of the study tentatively confirmed the suitability of the Aggression-Problem Behavior Frequency Scale for use in South Africa, the results indicate that there is no empirical basis for the use of subscale scores and that the Aggression-Problem Behavior Frequency Scale is essentially unidimensional.

Keywords

Aggression-Problem Behavior Frequency Scale, factor structure, psychometric properties, South Africa

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Violent and aggressive behaviour in adolescence is a widely acknowledged social problem. Existing studies have confirmed that adolescents are more likely to be the perpetrators of various forms of violent and aggressive behaviour including bullying, cyberbullying, dating violence, physical assault, and rape (Babore, Carlucci, Cataldi, Phares, & Trumello, 2017; Burton, 2008 Malcolm-Smith, Woolley, & Ward, 2015). Although aggressive behaviour among adolescents is common globally, several studies have indicated that the prevalence of aggression among adolescents in developing contexts is higher than in developed countries (e.g., Akiba, LeTendre, Baker, & Goesling, 2002; Dahamat, Novin, Oosterveld, & Rieffe, 2017).

In South Africa, aggressive and violent acts perpetrated by adolescents have become a major cause for concern. Surveys conducted in school settings have found that violence in the form of school stabbings, physical assault, dating violence, and rape on school premises are increasingly common occurrences, particularly in low-income communities (South African Council of Educators [SACE], 2011; Swart, Seedat, Stevens, & Ricardo, 2002). In the Western Cape Province where gang activity is endemic in particular communities, there has also been an increase in gang-related incidences of violence on school grounds involving both adolescent boys and girls (Cooper &Ward, 2012). Violent and aggressive behaviours during adolescence is predictive of later maladjustment and is a risk factor for a range of negative outcomes including school dropout, suicidality, depression, conduct disorders, substance abuse, and criminal activity (Babore et al., 2017).

Given the prevalence of aggressive and violent behaviours among adolescents in South Africa and its long-ranging negative outcomes, there is a serious need for basic and applied research in this area particularly among non-clinical samples. Many investigations of aggressive behaviour have focused on clinically aggressive (e.g., conduct disordered or substance abusing adolescents) and incarcerated samples of adolescents (e.g., Plüddemann, Flisher, McKetin, Parry, & Lombard, 2010; Souverein, Ward, Visser, & Burton, 2016; Van Rensburg et al., 2016). As such, the knowledge base concerning aggression and violence in non-clinical samples is comparatively limited and requires further investigation. Despite this need, the approach to the assessment of aggression and violence among adolescents in South Africa demonstrates some shortcomings. First, many studies (e.g., Malcolm-Smith et al., 2015; Pileggi, 2017) have relied on peer report or parent/teacher report methods. These methods of assessment may not produce reliable information due to the influence of social desirability bias among the peer group. In addition, adolescence is a period where young people tend to distance themselves from parents and teachers and, as a consequence, aggressive acts may go unnoticed by significant others. This is particularly true for indirect forms of aggression such as cyberbullying and relationally aggressive behaviours (Hinduja & Patchin, 2008). Second, studies that have used adolescent self-report methods have merely reported the internal consistency of the instrument (e.g., Plüddemann et al., 2010). Internal consistency only speaks to measurement precision and not to the validity of the instrument. Third, many researchers tend to unduly rely on the psychometric properties of instruments developed in Western contexts and assume that, because the instrument has sound psychometric properties in the original application, it can be reliably used in a developing country (e.g., Van Rensburg et al., 2016). However, such assumptions of universality are problematic (Byrne & Van de Vijver, 2010; Harachi, Choi, Abbott, Catalano, & Bliesner, 2006; Tran, Ngo, & Conway, 2003) and assessing the psychometric properties of an instrument prior to its application is a prerequisite for reliable and valid results.

The Aggression-Problem Behavior Frequency Scale (A-PBFS: Henry & Farrell, 2004) is an extensively used measure of aggression among children and adolescents (e.g., Bilič, 2013; Mrug et al., 2014 Mrug et al., 2008; Zapolski, Garcia, Jarjoura, Lau, & Aalsma, 2016). The A-PBFS is a self-report measure of the frequency of aggressive behaviours and is presented by the developers as consisting of three subscales, namely physical aggression, non-physical aggression, and relational aggression, as well as a total aggression score. Physical aggression refers to the use of

physical force (e.g., punching someone), non-physical aggression entails verbally aggressive behaviour (e.g., insulting someone), and relational aggression involves the manipulation of social relationships (e.g., through malicious gossip, social exclusion, and threats to withdraw friendship; Farrell, Kung, White, & Valois, 2000; Werner & Hill, 2010).

With reference to developing countries like South Africa, the A-PBFS has certain advantages over other scales. First, it differentiates between direct aggression (i.e., physical and non-physical) and indirect forms of aggressive behaviour (i.e., relational aggression). The vast majority of South African studies, for example, have focused on direct forms of aggression (e.g., physical assault, rape, intimate partner violence, and verbal abuse; Dlamini et al., 2007; Jewkes, Penn-Kekana, Levin, Ratsaka, & Schrieber, 2001; Russell et al., 2014). An important extension to this literature is the focus on relational aggression. This form of aggression represents a distinct construct in that it entails behaviours specifically aimed at inflicting harm by damaging or manipulating the victim's relationships with peers (e.g., threatening to withdraw friendship unless the victim acquiesces to demands, spreading false rumours). A range of international studies have documented the prevalence and negative effects of this form of aggression among adolescents (Nixon, Linkie, Coleman, & Fitch, 2011; Orpinas, McNicholas, & Nahapetyan, 2015; Werner & Hill, 2010). Relational aggression is particularly harmful for youth because it inhibits the formation of social networks, which in turn leads to deficits in social-problem solving and emotional regulation (Leff, Waasdorp, & Crick, 2010; Sullivan, Farrell, & Kliewer, 2006). As such, investigating relational aggression among adolescents in developing societies represents an important extension of existing research.

Second, by differentiating between direct and indirect aggression, the A-PBFS can provide important directions for prevention and intervention work. Intervention programmes typically focus on direct forms of aggression (Ostrov et al., 2009; Werner & Hill, 2010). However, given that different aetiological factors may be involved in physical, non-physical, and relational aggression, programmes that are developed to address one form of aggression may not be appropriate or effective for others (Ostrov et al., 2009; Van Schoiack-Edstrom, Frey, & Beland, 2002). The A-PBFS provides a measure of the frequency of different forms of aggression allowing for the development of targeted interventions.

Given the above-mentioned advantages of the A-PBFS, it seems appropriate to investigate its suitability for the South African context. The purpose of this study was therefore to examine the psychometric properties, specifically the factor structure and dimensionality, of the A-PBFS when used in South Africa. The A-PBFS is a subset of the larger Problem Behaviour Frequency Scale (PBFS; Farrell et al., 2000; Farrell, Sullivan, Gomcy, & Le, 2016; Miller-Johnson, Sullivan, Simon, & Multisite Violence Prevention Project, 2004) that originally consisted of four subscales, namely, drug use, delinquency, physical aggression, and non-physical aggression. The PBFS went through several iterations and the current version (Henry & Farrell, 2004), which drew on the works of Farrell et al. (2000), Crick and Bigbee (1998), and Orpinas and Frankowski (2001), consists of 47 items that form seven subscales, namely, physical aggression, non-physical aggression, relational aggression, drug use, delinquency, overt victimization, and relational victimization.

The A-PBFS has been used in a number of ways including as part of the larger PBFS (Farrell et al., 2016; Miller-Johnson et al., 2004) and as a distinct scale measuring the three forms of aggression (Mrug et al., 2014; Mrug et al., 2008; Zapolski et al., 2016). In addition, the scale has been adapted to assess for aggressive behaviour on social networking platforms (Bilić, 2013) and select items from the measure have been used to assess violence perpetration among youth (Ybarra, Espelage, & Mitchell, 2014; Ybarra, Langhinrichsen-Rohling, Friend, & Diener-West, 2009). Subscales of the A-PBFS have also been used independently (Physical subscale only: Coker et al.,

2015; Ehrenreich, Nahapetyan, Orpinas, & Song, 2014; Physical and Non-physical subscales only: Pugh & Farrell, 2012; Physical and Relational subscales only: Sullivan et al., 2006).

Despite the extensive use of the scale and the subscales and its use in diverse cultural settings (e.g., Bulgaria; Bilič, 2013; United States of America: Zapolski et al., 2016), to the author's knowledge, no studies have focused on the psychometric properties of the A-PBFS specifically. Apart from reliability coefficients, only two studies (Farrell et al., 2016; Multisite Violence Prevention Project, 2004) have reported on a confirmatory factor analyses (CFA) of the full PBFS. The A-PBFS differs from the full PBFS and therefore these studies cannot be regarded as evidence of the factor structure of the A-PBFS. In addition, since there is no published research on the use of the A-PBFS in developing countries, a need exists to determine its suitability for use within these contexts. Accordingly, this study focused on examining the proposed structure of the A-PBFS when used with a South African sample. In particular, the study reports on the normative data, reliability, factor structure, and dimensionality of the A-PBFS when used with a sample of Black South African adolescents.

Method

Participants

Adolescents ($n = 229$) from secondary schools located in the Mitchells Plain area of Cape Town, South Africa, participated in the study. Mitchells Plain was created by the apartheid government as a township for the Black population in terms of the official policy of segregation. Currently, it is one of South Africa's largest townships and many parts of Mitchells Plain have deteriorated into urban ghettos characterized by high rates of poverty, gang violence, substance abuse, and unemployment. The majority of participants in this study were female (61.1%) and in Grade 10 (47.6%). Participants were selected from Grades 10 to 12. The age of the participants ranged from 13 to 19 years ($M = 15.68$, $SD = 1.22$).

Instruments

The A-PBFS is an 18-item measure of the frequency of aggressive behaviours on three dimensions: physical, non-physical, and relational. Respondents are required to indicate on a 6-point scale (1 = never, 6 = 20 or more times) how frequently they engaged in a range of aggressive behaviours in the last 30 days, for example, 'shoved or push another kid' (physical), 'picked on someone' (non-physical), and 'spread a false rumour about someone' (relational). The reliabilities of the subscales have generally ranged between .70 and .87 in studies in the United States (e.g., Miller-Johnson et al., 2004). Similarly, a Bulgarian study reported Cronbach's alphas ranging between .83 and .87 (Bilič, 2013). However, there have been no reported studies on the structure of the A-PBFS.

Procedure

The nature and aims of the study was explained to the participants and questionnaires were distributed after one of their regular classes.

Ethical considerations

Ethical consent for the study was obtained from the University of the Western Cape and the South African Department of Education. Subsequently, informed consent was obtained from the

parents of learners, school principals, and those learners whose parents had consented to their participation.

Data analyses

Apart from descriptive statistics and reliability analysis, CFA was used to examine the factor structure of the A-PBFS. In such confirmatory factor models, the items of the scale are regarded as the observed measurements while the hypothesized factors are regarded as the latent variables represented by the items (Bentler, 1995).

In the CFA, three different models of the possible structure were examined, a one-factor model (representing a total aggression score), a second-order factor model, and a bifactor model. In the second-order factor model, the total aggression scale is conceptualized as a higher-order factor and the three subscales as lower-order factors, while the bifactor model examines aggression as a single general factor with the three subscales as orthogonal factors reflecting the variance among clusters of items (Allan, Albanese, Short, Raines, & Schmidt, 2015; Mansolf & Reise, 2017). In addition, using the Bifactor Indices Calculator (Dueber, 2017), ancillary bifactor measures were calculated to clarify the dimensionality of the A-PBFS. These measures include explained common variance (ECV) which is the proportion of reliable variance explained by the specific factor, Omega which is a model-based estimate of reliability, and Omega Hierarchical (OmegaH) which indicates the proportion of systematic variance in total scores that can be attributed to individual differences on the general factor. In general, if OmegaH is high ($>.80$), it is an indication that the scale is essentially unidimensional. For subscales, Omega Hierarchical Subscale represents the proportion of reliable systematic variance of a subscale score after partitioning out variability attributed to the general factor (Rodriguez, Reise, & Haviland, 2016).

The extent to which the hypothesized model fits the observed data is measured by the chi-square statistic (χ^2) which tests the null hypothesis of a perfect fit. Joreskog (1969), however, pointed out that the χ^2 test is very sensitive to sample size and also to violations of distributional assumptions. Kline (2005) suggests that, in addition to the model χ^2, at a minimum, the following indices should be reported: root mean square error of approximation (RMSEA: best if close to 0.08 or less), comparative fit index (CFI: best if close to 0.90 or greater), and the standardized root mean square residual (SRMR: best if close to 0.08 or less). Additional indices reported on include goodness-of-fit index (GFI: best if close to 0.95 or greater) and Tucker–Lewis index (TLI: best if close to 0.90 or greater) (Byrne, 1994; Hu & Bentler, 1999; Schumacker & Lomax, 2004). Arbuckle (2012) suggests the inclusion of fit indices, such as Akaike's information criterion (AIC), which is used specifically for model comparisons. In general, lower levels of AIC are associated with better model fit.

With the exception of the bifactor indices, all analyses were carried out using IBM SPSS Statistics for Windows, version 25 (IBM Corporation, 2017) with AMOS (maximum likelihood estimation) used for the CFA.

Results

The descriptive statistics (scaled in terms of the 6-point response format of the A-PBFS) and reliabilities for the A-PBFS are reported in Table 1.

The descriptive statistics indicate a higher level of reported use of non-physical aggression as opposed to physical and relational aggression. The alpha coefficients demonstrate a high level of internal consistency for all the subscales as well as the total scale and these reliabilities are

Table 1. Descriptive statistics and reliabilities for A-PBFS.

Scale	Alpha [CI_{95}]	Mean	*SE*	*SD*	Median	Kurtosis	Skewness
Total Aggression	.90 [0.88–0.92]	2.02	0.06	0.84	1.72	1.38	1.34
Physical Aggression	.81 [0.77–0.85]	1.95	0.06	0.89	1.71	0.99	1.29
Non-physical Aggression	.77 [0.72–0.82]	2.38	0.07	1.11	2.00	0.63	1.09
Relational Aggression	.80 [0.75–0.84]	1.81	0.06	0.91	1.50	3.94	1.91

A-PBFS: Aggression-Problem Behavior Frequency Scale.

Table 2. Intercorrelations among subscales of the A-PBFS.

	TA	PA	NPA	RA
Total Aggression (TA)	–	.87**	.84**	.86**
Physical Aggression (PA)		–	.67**	.60**
Non-physical Aggression (NPA)			–	.66**
Relational Aggression (RA)				–

A-PBFS: Aggression-Problem Behavior Frequency Scale.
**$p < .001$.

consistent with those reported previously (Miller-Johnson et al., 2004). Confidence intervals were obtained using the intra-class correlation.

The inter-correlations among the subscales of the A-PBFS are reported in Table 2.

The inter-correlations among the subscales and the total scale ranged between 0.60 and 0.88 which indicates the factors are highly related as expected.

The three models tested with CFA are presented in Figure 1. The one general factor model presumes that a single factor (Total Aggression) is the best representation of the factor structure of the A-PBFS. The second-order model defines three first-order factors representing the three subscales and the correlations among those first-order factors are used to define a second-order factor representing the total aggression scale. The bifactor model specifies that a single general factor, namely, total aggression accounts for some of the variance and a set of three subfactors account for additional common variance.

The goodness-of-fit indices for the three models are presented in Table 3. These indices indicate that the one-factor model does not fit the data to an acceptable degree and represented the worst fit of the three models ($\chi^2 < 0.05$, GFI, TLI, CFI < 0.95, CFI < 0.90 and RMSEA > 0.08). The second-order factor and bifactor models on the other hand demonstrated a better fit with some of the fit indices at acceptable levels (RMSEA and SRMR < 0.08). Comparing the second-order and bifactor models, the model comparison index, namely AIC, indicates that the bifactor model (AIC = 363.14) is a marginally better model than the second-order factor model (AIC = 369.89).

In summary, the results of the CFA provide tentative support for the conceptualization of A-PBFS as being represented by either a hierarchical model with one general factor (aggression) as a higher-order factor and three lower-order factors (the three aggression subscales) or a bifactor model with a general factor (aggression) reflecting common variance among all the items of the A-PBFS, as well as three specific factors (the presumed subscales) reflecting the variance among clusters of items (Allan et al., 2015).

Despite this tentative support for the factor structure of the A-PBFS, the CFA provides little evidence for a viable multidimensional structure for the A-PBFS and some authors have

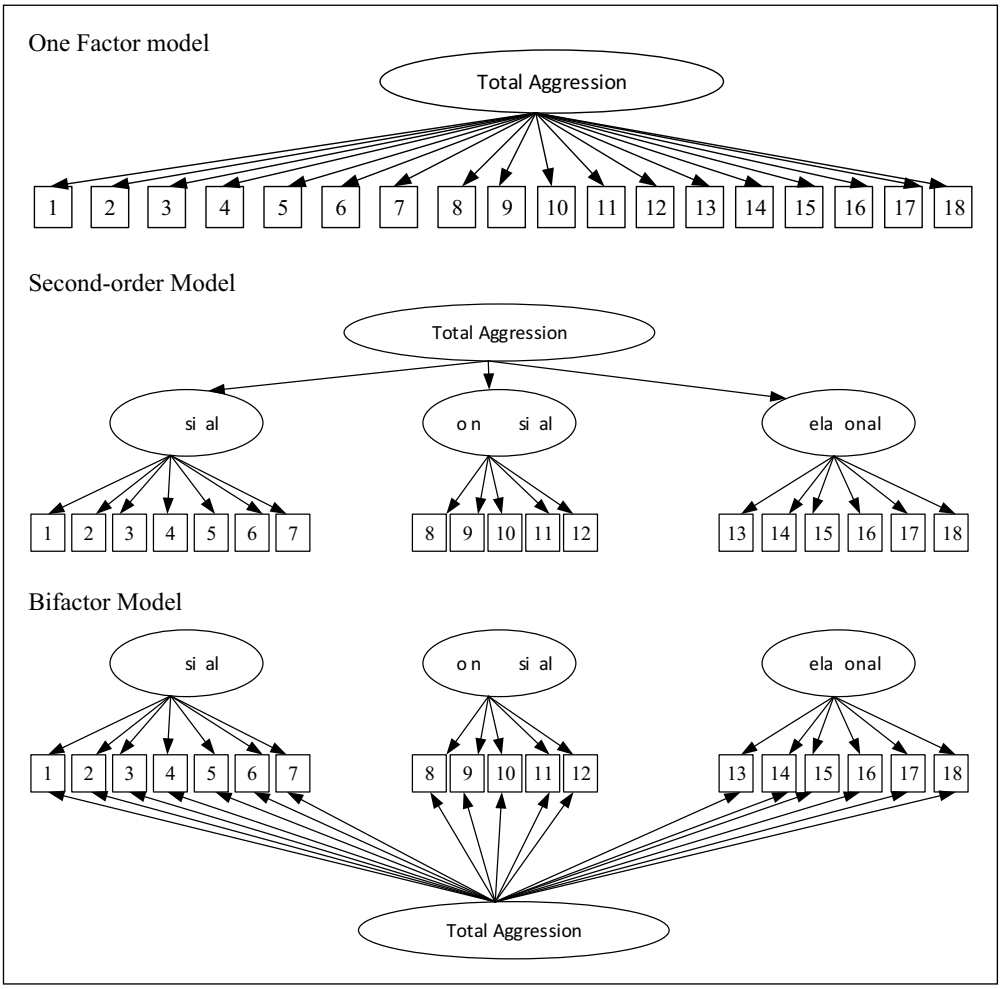

Figure 1. One-factor, second-order, and bifactor models of A-PBFS. Rectangles are observed variables (18 items) while ellipses are latent constructs.

encouraged the use of bifactor indices to examine dimensionality (Jovanović, 2015; Rodriguez et al., 2016). These indices for the A-PBFS as well as the factor loadings are reported in Table 4.

Omega is the model-based analogue of coefficient alpha (Rodriguez et al., 2016), and Table 4 shows similar omegas as obtained with coefficient alpha where the highest reliability obtained was for the total score and the lowest for the non-physical subscale. However, the ECV indices indicated that the percentage of common variance explained by the total scale was 75%, with 25% attributable to the three subscales. This indicates that the A-PBFS is essentially unidimensional with some group variance (25%) remaining and this is confirmed by the OmegaH with a value of .83, which suggests that the 18 items are indicators of a strong general factor. Omega Hierarchical Subscale, which indicates the variance accounted for by each subscale after removing the reliable variance attributable to the general factor (total aggression), further confirms this since the Omega Hierarchical Subscale coefficients for the physical, non-physical, and relational aggression subscales were .20, .10, and .24, respectively. The unstandardized loadings on the general factor were

Table 3. Fit indices for three models of the structure of the A-PBFS.

Goodness-of-fit indices	Best fit indicator (Parry, n.d.)	One-factor model	Second-order factor model	Bifactor model
χ^2 (df)		390.98 (135)	291.58 (132)	255.14 (117)
p-value	Non-significant	<.001	<.001	<.001
GFI	<0.95	0.84	0.88	0.89
TLI	<0.90	0.81	0.88	0.88
CFI	<0.90	0.83	0.89	0.91
RMSEA	>0.08	0.09 [CI_{90}: 0.08–0.10]	0.07 [CI_{90}: 0.06–0.08]	0.07 [CI_{90}: 0.06–0.08]
SRMR	>0.08	0.07	0.06	0.05
AIC	Lower levels	462.98	369.89	363.14

χ^2: chi-square; GFI: goodness-of-fit index; TLI: Tucker–Lewis index; CFI: comparative fit index; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual; AIC: Akaike's information criterion.

all statistically significant ($p < .05$) except for one item all the loadings for the physical subscale were significant. The same applied to the relational subscale where only one loading was non-significant. None of the unstandardized loadings for the non-physical scales were significant, indicating that this scale did not form a meaningful group factor.

Discussion

This study aimed to assess the reliability, factor structure, and dimensionality of the A-PBFS. The A-PBFS was found to be highly reliable both in terms of coefficient alpha (alphas ranging between .77 and .90) and coefficient omega (omegas ranging between .78 and .92). These results are similar to previously reported reliabilities of the A-PBFS (Mrug et al., 2014; Mrug et al., 2008; Zapolski et al., 2016). CFA indicated that the second-order factor model and bifactor model fit the observed data better than a one-factor model. While this would suggest support for the proposed structure of the A-PBFS as consisting of both a total aggression scale and three subscales, the bifactor indices indicated that the A-PBFS is essentially unidimensional. First, Omega Hierarchical Subscale reliability estimates for the subscales substantially reduced compared to the original omega coefficients after controlling for a general factor. Second, the general factor explained 75% of the common variance with only 25% attributable to the three subscales. These results seem to suggest that calculating separate subscale scores needs to be undertaken with more caution since there is insufficient variance to support well-defined group factors. The total score on the A-PBFS can be regarded as an essentially unidimensional reflection of aggression. This means that relational aggression could, for example, be considered a form of physical aggression.

To the best of the author's knowledge, this is the first study to examine the dimensionality of the A-PBFS and evaluate the viability of the subscales. Whereas CFA is generally limited to demonstrations of fit of various conceptualizations of measures, this study went further and focused on the dimensionality of the measure using bifactor indices such as Omega, Omega Hierarchical Subscales, and ECV (Rodriguez et al., 2016). This study provides an important foundation for future research using the A-PBFS. It is recommended that future studies replicate this study, specifically the dimensionality of the A-PBFS in different samples of South African adolescents as well as in clinical samples (i.e., high-risk adolescents).

Table 4. Factor loadings and bifactor indices for the bifactor model of the A-PBFS.

	Aggression total	Physical	Non-physical	Relational
Throw something at someone	.44	.54		
Been in a fight	.63	.32		
Threatened to hurt a teacher	.18	.33		
Shoved/pushed another kid	.55	.44		
Threatened someone with a weapon	.54	.23		
Hit/slapped another kid	.73	.17		
Threatened to hit another kid	.67	.08		
Insulted someone's family	.61		.13	
Teased someone	.54		.26	
Put someone down	.59		.23	
Gave mean looks to another student	.61		.37	
Picked on someone	.65		.12	
Didn't let another student be in your group	.64			.21
Told another student you wouldn't like them	.48			.30
Tried to keep others from liking another kid	.55			.41
Spread false rumour	.54			.44
Left another kid out on purpose	.55			.57
Said things about another student to make others laugh	.52			.18
ECV	75%	10%	4%	11%
Omega/OmegaS*	.92	.82	.78	.82
OmegaH/OmegaHS**	.83	.20	.10	.24

A-PBFS: Aggression-Problem Behavior Frequency Scale; ECV: explained common variance.
The A-PBFS is in the public domain and permission to use the scale was obtained from the developer.
*For Total Scale Omega and OmegaS for subscales.
**For Total Scale OmegaH and OmegaHS for subscales.

In sum, the A-PBFS is a reliable, unidimensional measure of aggression and this study provides the pre-requisite initial step for the use of the scale in developing contexts like South Africa and for cross-cultural research. However, given the small percentage of variance attributable to the group factors, it is probably not recommended to use the subscales in future research. For example, it would not seem feasible to treat the three scales as independent variables in a regression or structural equation model (Wiernik, Wilmot, & Kostal, 2015).

The A-PBFS also holds potential for assessing the efficacy of intervention programmes. The instrument specifies the time frame (i.e., past 30 days) for the perpetration of aggressive acts which means that the scale can be used to examine changes in the perpetration of aggression over time. This is of particular relevance for the evaluation of intervention programmes and determining which components of the intervention produced change.

This study has certain limitations. First, the sample involved adolescent learners from low-income communities in South Africa and therefore the extent to which findings can be generalized remains unclear. Further research is needed to determine the robustness of the findings for other adolescents from differing backgrounds. Second, the A-PBFS is a self-report measure and is therefore susceptible to social desirability bias. Nevertheless, several studies have demonstrated the reliability of self-report data for aggression (e.g., Crick & Bigbee, 1998). Third, the observed

distributions were skewed (see Table 1) and future research should consider using robust indicators (e.g., bootstrapping).

Conclusion

To the author's knowledge, this is the first study to provide information on the psychometric properties, particularly the factor structure and dimensionality of the A-PBFS. It tentatively confirms that the scale is a reliable, essentially unidimensional instrument when used in South Africa and provides a foundation for future research.

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