Latent Profile Analysis of School and Home Versions of the Adjustment Scales for Children and Adolescents among Primary School Children in Trinidad and Tobago

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Abstract

A latent profile analysis of the Adjustment Scales for Children and Adolescents and Adjustment Scales for Children and Adolescents-Home scores among a national sample of primary school students in Trinidad and Tobago identified three distinct profiles of behaviour across home and school settings that might be useful for personalized diagnosis and intervention. One profile, with 61% of the participants, was characterized by parent and teacher ratings that fell near the population average. A second profile, containing 19% of the participants, was marked by elevated teacher ratings of internalizing behaviours and a third profile, with 20% of the participants, was identified by elevated teacher and parent ratings of externalizing behaviours. These profiles were subsequently labeled Adjusted, Internalizing, and Externalizing, respectively. Membership in the Adjusted profile was related to more positive learning behaviours and better oral reading fluency than membership in the Internalizing and Externalizing profiles. Male students were more likely to be members of the Externalizing profile whereas students with more highly educated parents were less likely to be members of the Internalizing profile. Implications for intervention and assessment in Trinidad and Tobago are discussed.

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Given the many negative psychosocial outcomes associated with atypical development, identifying and treating socioemotional problems early in childhood is critical (Bevilacqua et al., 2018; Caspi et al., 2016; Pine & Fox, 2015). However, home and school expectations, attitudes toward child rearing, religion, race, economic conditions, and a host of other cultural factors complicate the assessment of childhood psychosocial problems (Causadias & Cicchetti, 2018). This is especially pertinent for Trinidad and Tobago, a developing Anglophone Caribbean nation, that has experienced difficult economic and political circumstances and is marked by home and school attitudes and practices influenced by its unique blend of British, East Indian, African, and French traditions (Cappa & Khan, 2011; De Lisle et al., 2010; Greenberg & Agozino, 2012; Maguire & Fishbein, 2016; Ramdass & Lewis, 2012; Roopnarine & Brown, 1997; Roopnarine & Jin, 2016; Williams, 2013).

Trinidad and Tobago is one of the most industrialized nations in the Caribbean and the literacy rate is estimated at 99% (Central Intelligence Agency, 2020). However, this figure does not represent the functional literacy rate in the country (Worrell, 2006). De Lisle (2019) reported that in the 2015 Programme for International Student Assessment, 42.5% of children in Trinidad and Tobago had scores "below the acceptable benchmark in reading" (p. 92). Underachievement was more prevalent in males and in the rural areas, and this pattern was also present in the Secondary Entrance Assessment scores. However, there are also substantial numbers of students in urban schools who cannot read at grade level (A. Yatali, personal communication, June 21, 2019) and a sizeable minority of schools in both rural and urban areas have students who are not doing well in both reading and mathematics (De Lisle et al., 2017).

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Alongside the academic concerns in Trinidad and Tobago's schools, there are substantial behavioural concerns (Williams, 2013, 2017). Consider the following excerpt from a local newspaper:

> Indiscipline among students is one of the issues on the front burner when the Ministry of Education holds two national consultations this month–one in Trinidad on February 15 and the other in Tobago on February 22….There are many issues plaguing schools in T&T–bullying, sexual misconduct, peer pressure, physical violence. The issue of indiscipline and violence has become a runaway horse, videos of students fighting in classrooms, on the streets and even with a police officer and MTS security guards have gone viral….In fact, authorities have been grappling with the problem of indiscipline in schools for decades… (Grappling with School Violence, 2016).

Over the past two decades, Trinidad and Tobago has become one of the more violent countries in the world, with a murder rate that is seven times higher than the murder rate in the United States (Williams, 2013), despite a population of less than 1.5 million people. The violence in the broader society is mirrored in the schools (Williams, 2017).

Identification of childhood socioemotional problems is often operationalized via standardized behaviour rating scales (Kamphaus & Frick, 2005; Konold & Pianta, 2007; Merrell, 2008), that is, instruments completed by informants, such as teachers and parents with culture-specific knowledge about child development and child rearing, that quantify a child's observed behaviour (Campbell & Hammond, 2014). Most behaviour rating scales were developed and standardized in developed countries and may not be applicable in other cultures unless properly adapted (Atilola, 2015; International Test Commission, 2016; Maguire & Fishbein, 2016; Mpofu et al., 2014). Fortunately, a collaboration between U.S. researchers and the Ministry of Education (Watkins et al., 2014) resulted in the development, adaption, and standardization of two behaviour rating scales for the measurement of childhood socioemotional problems in Trinidad and Tobago: the Adjustment Scales for Children and Adolescents (ASCA; McDermott et al., 1993) for teachers, and the Adjustment Scales for Children and Adolescents - Home (ASCA-H; Watkins & McDermott, 2002) for parents.

Normative studies of the ASCA and ASCA-H in Trinidad and Tobago found that each measured several broad syndromic dimensions (Chao, McDermott, Watkins, Rovine, et al., 2018; McDermott et al., 2015). For the ASCA, overactivity and underactivity dimen-

sions emerged that appear to correspond to the transdiagnostic externalizing and internalizing dimensions identified in modern taxonomies of psychopathology (Conway et al., 2019; Kotov et al., 2017; Lahey et al., 2011). Rather than assuming that psychopathology is categorical, these taxonomies utilize modern statistical methods to identify continuously distributed dimensions that are theorized to form the scaffolding for childhood psychopathology. These dimensions are structured hierarchically, with the broad externalizing (overactivity) dimension including the more narrow syndromes of aggressive, oppositional, and impulsive behaviours. Likewise, the broad internalizing (underactivity) dimension encompasses the narrower symptoms of shyness, anxiety, fear, and depression. In general, externalizing or overactivity involves causing distress to others whereas internalizing or underactivity involves self-distress. Alternatively, they can be thought of as behaviour problems versus emotional problems, respectively. Three broad dimensions were identified with the ASCA-H: Aggression, Irascible/Attention-Seeking, and Reticence/Withdrawal. The Aggression and Irascible/Attention-Seeking dimensions appear to map onto the externalizing syndrome whereas the Reticence/Withdrawal dimension seems to tap the distress component of the internalizing syndrome (Kim & Eaton, 2015).

Considerable research has supported the reliability and validity of ASCA and ASCA-H scores for youth in Trinidad and Tobago (Carrington-Blaides & Ramoutar, 2017; Chao, McDermott, Watkins, Rovine, et al., 2018; George et al., 2012; McDermott et al., 2015). However, this research has followed a variable-centered approach, that is, application of statistical methods such as multiple regression or factor analysis. In such approaches, relationships between scores on the ASCA and ASCA-H are compared to scores from other instruments, and it is assumed that the relationships between those scores apply equally well to all participants. That is, they assume that "all participants are drawn from a single population for which a single set of 'average' parameters can be estimated" (Morin et al., 2017, p. 400). In practice, that is an unrealistic assumption because individuals within groups always differ (Fisher et al., 2018).

Person-Centered Approaches

In contrast to a variable-centered approach, a person-centered approach studies the relationships among the participants rather than the relationships among the variables to identify subgroups of

participants who exhibit a similar profile on a set of variables (Morin, 2016; Morin et al., 2017; Woo et al., 2018). Person-centered methods assume that the data represent a mixture of subpopulations rather than a single population and "provide a classification system that helps categorize individuals into qualitatively and quantitatively distinct profiles" (Morin et al., 2018, p. 805). Given that both variable-centered and person-centered analyses utilize the same data from the same participants, they can be "considered as complementary approaches, as both provide alternative views of the same reality" (Morin et al., 2017, p. 400). However, variable-centered methods study the relationships among variables whereas person-centered methods examine the relationships among people.

Person-centered approaches are typically analyzed with latent variable mixture models, which are flexible statistical tools that allow researchers to focus on differences among people instead of differences among variables (Berlin et al., 2014; Morin et al., 2017). Commonly used mixture models include latent class analysis (LCA), latent profile analysis (LPA), and latent transition analysis (LTA). LCA analyzes categorical variables to identify unobserved, latent classes whereas LPA groups individuals into qualitatively and quantitatively distinct latent profiles based on their specific configuration on a set of continuous indicator variables (Ferguson et al., 2020; Peugh & Fan, 2013; Williams & Kibowski, 2016). In contrast, LTA uses categorical and continuous variables from longitudinal data to identify latent classes and how individuals transition between classes over time. (Tutorials in mixture models are available in the professional literature [e.g., Berlin et al., 2014; Ferguson et al., 2020; Masyn, 2013; Meyer & Morin, 2016; Morin et al., 2018; Morin & Wang, 2016; Nylund-Gibson & Choi, 2018]).

Current Study

Variable-centered approaches are necessary but not sufficient for clinicians who utilize tests to identify and treat socioemotional problems (Hunsley & Mash, 2007). By definition, clinicians make diagnostic and treatment decisions for individuals (Youngstrom et al., 2015). Individuals may behave differently in school and home, so a multi-informant approach that includes ratings from both teachers and parents has been recommended as best clinical practice (An et al., 2019; Campbell & Hammond, 2014). Given these considerations, a person-centered analysis of ASCA and ASCA-H scores might identify subgroups of individuals who exhibit distinct

profiles of behaviour across home and school settings that demonstrate unique relationships with other variables and which would be useful for personalized diagnosis and intervention in Trinidad and Tobago (Ng & Weisz, 2016). It was anticipated that the externalizing and internalizing constructs found in variable-centered research would also prove useful in a person-centered approach, that gender and parental education level would have a significant relationship with the latent profiles, and that profile membership would be associated with the academic performance of students (Arnett et al., 2015; Carrington-Blaides & Ramoutar, 2017; Conway et al., 2019; De Lisle et al., 2010; Korous et al., 2018; Patalaly et al., 2017).

Methods

Participants

Participants were 709 students enrolled in 79 government and assisted primary schools who were randomly selected via a multistage sampling strategy (Fowler, 2008) to be representative of the primary school population (Trinidad and Tobago Ministry of Education, 1999) (see De Lisle et al. [2010] as well as Ramdass and Lewis [2012] for detailed information about the Trinidad and Tobago education system).

Males and females were relatively equally distributed (49.2% vs. 50.8%, respectively) and were of similar ages (M = 7.9, SD = 2.1, and range of 4–13 years for both males and females). Students were of African (38.6%), East Indian (39.5%), and mixed (21.9%) ancestry, which is comparable to national ancestry distributions (34.2% African, 35.4% East Indian, and 30.4% mixed and unspecified; Central Intelligence Agency, 2020).

Instruments

Adjustment Scales for Children and Adolescents. The Adjustment Scales for Children and Adolescents (ASCA) (McDermott et al., 1993) is a behaviourally based teacher rating scale containing 156 behavioural indicators describing positive and problem behaviours in relation to 29 classroom contexts (e.g., team games, relationships with peers, seeking teacher help) in a dichotomous item format. Each context contains a mixture of positive and problem behaviours and the teacher may endorse multiple behaviour items within each context. For example, in the context of relationships with other students, behaviour options include: a good mixer; unkind to weaker students;

quarrels, provokes others; tells on others to gain teacher's attention; clowns around, plays silly tricks; and, tries to dominate. The 29 positive behaviours were included to reduce response bias and make it easier for teachers to respond but are not included in scoring. Thus, psychopathology is defined by pervasive expression of problem behaviours across multiple contexts and situations on the ASCA.

Considerable research has supported the reliability and validity of ASCA scores in North America (e.g., Canivez & Beran, 2009; McDermott, 1993; McDermott et al., 1995; Watkins & Canivez, 1997). An initial validation study in Trinidad and Tobago found the ASCA to be generalizable (George et al., 2012) and the ASCA was subsequently standardized and validated with a nationally representative sample of schoolchildren in Trinidad and Tobago (McDermott et al., 2015). Consistent with results of dimensional analyses of the ASCA among Hispanic, Native American, and Canadian youth (Canivez & Beran, 2009; Canivez & Bohan, 2006; Canivez & Sprouls, 2010), two broad syndromic dimensions emerged: overactivity (e.g., starts fights; inattentive to schoolwork; loses temper; steals) and underactivity (e.g., withdrawn; timid, rarely smiles; dejected look) with internal consistency reliability estimates of .92 and .74, respectively. Validity analyses indicated that ASCA overactivity and underactivity scores were related to other teacher rating measures and student reading achievement (McDermott et al., 2015). Alpha reliability for the current sample was .90, 95% CI [.89, .91] for the ASCA Overactivity scale and .79, 95% CI [.77, .81] for the ASCA Underactivity scale.

Adjustment Scales for Children and Adolescents - Home. The ASCA-H (Watkins & McDermott, 2002) assesses childhood behaviour across multiple situations in the home observable by a parent or guardian. It contains 182 behaviour descriptions (both positive and problem) presented in reference to 33 social, recreational, or daily living contexts in a dichotomous item format. Parents may endorse multiple behaviour items within each context. For instance, in the context of coping with household chores, behaviour options include: helps unless in a bad mood; willing; asks to be given jobs but often doesn't finish them; too withdrawn to offer help; refuses to do jobs or chores; and completes them hastily or without care. As with the ASCA, the positive behaviours were included to reduce response bias and make it easier for parents to respond but are not included in scoring. Likewise, psychopathology is defined by pervasive expression of problem behaviours across multiple contexts and situations on the ASCA-H.

Psychometric analysis of the ASCA-H among its Trinidad and Tobago normative sample (Chao, McDermott, Watkins, Rovine, et al., 2018) revealed three dimensions. Factor I was labeled Aggression and was loaded by items such as starts fights; disobedient; makes threats; etc. with reliability of .79. Factor II was called Reticence/Withdrawal and included behaviours like too timid to join in informal play; too shy to greet adults; prefers not to associate with other children; feelings easily hurt; etc. with reliability of .72. Factor III was called Irascible/Attention-Seeking and was marked by behaviours such as much too talkative; greets loudly; constantly restless at meals; etc. with reliability of .83. A subsequent analysis in the United States with a clinical sample essentially replicated these dimensions with small differences, probably due to analytic method and sample characteristics (Coffey, 2006). ASCA-H factor scores were found to be related to teacher rating scales and measures of student reading achievement (Chao, McDermott, Watkins, Rovine, et al., 2018) and an independent study subsequently used the ASCA-H to chart the prevalence of behaviour problems in Trinidad and Tobago (Carrington-Blaides & Ramoutar, 2017). Alpha reliability for the current sample was .79, 95% CI [.77, .81] for the ASCA-H Aggression scale, .71, 95% CI [.68, .74] for the ASCA-H Reticence/Withdrawal scale, and .82, 95% CI [.80, .84] for the ASCA-H Irascible/Attention-Seeking scale.

Learning Behaviours Scale. The Learning Behaviours Scale (LBS; McDermott, 1999) is a teacher rating scale that includes both negative and positive observable learning behaviours exhibited by students as they react to academic tasks. The instrument contains 29 items with responses on a 3-point Likert scale (2 = *Most often applies*, 1 = *Sometimes applies*, 0 = *Does not apply*) for teachers to describe the frequency with which a student manifests a given behaviour.

The LBS was standardized and normed in the United States and yields four factor scores: Competence Motivation (gives up easily, makes no attempt); Attitude Toward Learning (disinterest in learning, don't care attitude); Attention/Persistence (easily distracted, leaves seat); and Strategy/Flexibility (aggressive when corrected, performs tasks in unaccepted ways). Considerable reliability and validity evidence for LBS scores has accumulated in the US (e.g., Buchanan et al., 1998; Canivez et al., 2006; McDermott, 1999; Worrell et al., 2001) and the LBS has been successfully adapted for use in other cultures (Canivez & Beran, 2011; Hamlet et al., 2015).

The LBS has also been standardized in Trinidad and Tobago (Chao, McDermott, Watkins, Drogalis, et al., 2018) where two reliable

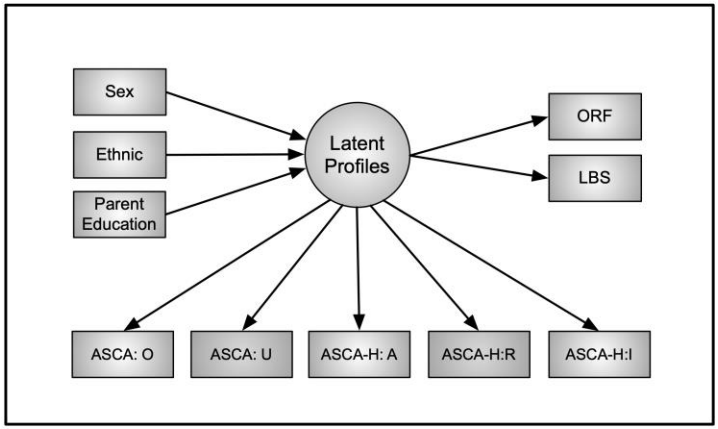
dimensions were found: Competence Motivation (gives up easily, interest in learning) and Strategy/Flexibility (easily distracted, aggressive when corrected) with alpha reliabilities of .89 and .80, respectively. Essentially, the first factor seems to tap motivation to learn while the second factor reflects strategy toward learning (Chao, McDermott, Watkins, Drogalis, et al., 2018). When the LBS is scored, negatively worded items are recoded so that higher scores on the LBS indicate the presence of positive learning behaviours. Analysis of the current sample found alpha reliability coefficients of .89, 95% CI [.88, .90] and .79, 95% CI [.77, .81] for Competence Motivation and Strategy/Flexibility dimensions, respectively.

Oral Reading Fluency. Oral reading fluency (ORF) is a type of curriculum-based measurement defined by the number of words accurately read aloud in one minute from grade-level texts. As described by Hasbrouck and Tindal (1992), ORF combines both reading rate and accuracy into one easily administered measure of overall reading achievement. In general, ORF scores have been found to be reliable and valid predictors of reading comprehension (Shin & McMaster, 2019; Yeo, 2011). In Trinidad and Tobago, three passages were selected from grade-level texts and administered in the spring semester in counterbalanced order to control for order effects (for details, see Hall et al., 2002). The average correlation among the three ORF probes was .88.

Procedure

ASCA, ASCA-H, LBS, and ORF data were collected as part of a multiyear collaboration between U.S. researchers, following university IRB approval, and the Ministry of Education in Trinidad and Tobago as described by Watkins et al. (2014). Data were collected in the 2001–2002 school years by Guidance and Special Education Officers from the Ministry of Education who were trained by U.S. researchers. Both teachers and parents received an honorarium for completing rating scales. Originally, ASCA forms were completed by 900 teachers and ASCA-H forms by 731 parents or guardians but data collection errors as well as the availability of teachers and parents left 709 students with complete ASCA and ASCA-H forms. Those 709 students with complete ASCA and ASCA-H protocols were the participants in this study.

Figure 1 *Latent Profile Model with Auxiliary Variables (Antecedents and Consequences)*



Note. ORF is Oral Reading Fluency measure; LBS is Learning Behaviour Scale measures; ASCA is the Adjustment Scales for Children and Adolescents with O indicating its Overactivity factor score and U its Underactivity factor score; ASCA-H is the Adjustment Scales for Children and Adolescents-Home with A indicating its Aggression factor score, R its Reticence/Withdrawal factor score, and I its Irascible/Attention-Seeking factor score.

Analyses

Indicator Variables. The LPA model applied in this study is presented in Figure 1. Prior research has revealed that the ASCA contains two dimensions (Overactivity and Underactivity) and the ASCA-H contains three dimensions (Aggression, Reticence/Withdrawal, and Irascible/Attention-Seeking) in their Trinidad and Tobago normative samples. The items associated with each dimension for the ASCA and ASCA-H were scaled through multiple-group item response theory (IRT) based on their respective normative sample and those parameters subsequently used to generate estimated factor scores using the Bayesian Expected a Posteriori (EAP) method with a population mean of 50 and standard deviation of 10 (Thissen et al., 1995). These ASCA and ASCA-H factor scores served as indicator variables because factor scores map onto the original measurement structure of the ASCA scales, incorporate global variable-centered constructs, are more reliable than categorical items, and are more parsimonious (Daljeet et al., 2017; Markon et al., 2011; Morin et al., 2017).

Latent Profile Analysis. LPA was conducted with Mplus version 8.4 (Muthén & Muthén, 1998-2019) using robust maximum likeli-

hood estimation. To ensure convergence on the global maximum, 3,000 sets of random start values were initially generated for each model. If the best loglikelihood value was not found by at least two different start values, then the number of random starts was increased until the best loglikelihood was replicated or more than 10,000 start values were exhausted (Morin & Wang, 2016).

Two constraints were imposed on LPA solutions to minimize the number of parameters to be estimated "to avoid unstable solutions and ensure a meaningful interpretation of classes" (Geiser et al., 2014, p. 11): specifically, the local independence assumption that latent profile membership explains covariance among and between the ASCA and ASCA-H indicators and the homogeneity assumption of equality of profile-specific variances (Peugh & Fan, 2013). As with the assumption of uncorrelated residuals in factor models, Morin and Wang (2016) argued that relaxation of these constraints "should be made with caution and based on strong theoretical assumptions of expected relations among the indicators that exist over and above the expected profiles" (p. 495). Similar cautions have been expressed by other researchers (Marsh et al., 2009; Nylund-Gibson & Choi, 2018). However, we also followed the post-hoc strategy detailed by Lubke and Luningham (2017) of assessing the effects of relaxing these constraints (Berlin et al., 2014).

LPA models were fit in a stepwise fashion, starting by estimating a one-profile solution and then successively adding profile classes until the model failed to converge or produced a statistically improper solution, indicating that a more parsimonious model might be necessary (Morin, 2016; Morin & Wang, 2016; Nylund-Gibson & Choi, 2018; Wang & Wang, 2020). Unfortunately, there is no universally accepted measure of statistical adequacy for LPA models (Nylund-Gibson & Choi, 2018). Statistical simulations have variously found the Bayesian information criterion (BIC; Schwarz, 1978), sample size adjusted BIC (aBIC; Sclove, 1987), Vuong-Lo-Mendell-Rubin likelihood ratio tests (LMR and aLMR; Lo et al., 2001), and Bootstrapped likelihood ratio test (BLRT; McLachlan & Peel, 2000) to be superior (Lubke & Muthén, 2007; McLachlan & Peel, 2000; Nylund et al., 2007).

The BIC and aBIC are information criteria that balance parsimony and goodness-of-fit. BIC adjusts for the number of free parameters and sample size whereas aBIC alters the adjustment for larger samples (McLachlan & Peel, 2000). With both criteria, the smallest value points to the preferred profile solution. In contrast, LMR, aLMR, and BLRT are inferential tests of the difference between the

current model and the model with one less profile. Statistical non-significance indicates that model fit is not statistically improved by the addition of the current profile. In all cases, convergence issues and statistically improper solutions were assumed to be indicative of overparameterization (Morin, 2016; Morin & Wang, 2016; Nylund-Gibson & Choi, 2018; Wang & Wang, 2020).

Measures of the overall precision of classification across all latent profiles (entropy) and the average posterior class probability within each profile were also consulted to determine whether overall (≥ .60) and profile-specific (≥ .70) precision were adequate (Wang & Wang, 2020). Additionally, the relative size of emergent profiles was reviewed to ensure sufficient power for generalization to the population and statistical testing of covariates (≥ 5% of the sample; Nylund-Gibson & Choi, 2018). Finally, each solution was evaluated for its theoretical coherence (Ferguson et al., 2020; Morin & Wang, 2016; Wang & Wang, 2020) based on evidence regarding psychopathology among children and adolescents, especially among youth from Trinidad and Tobago (Chao, McDermott, Watkins, Rovine, et al., 2018; McDermott et al., 2015).

Auxiliary Variables. Antecedents and consequences of profile membership were analyzed to gain a richer contextual description of the obtained profiles and to discover how other variables relate to the obtained profiles (Ferguson et al., 2020; Meyer & Morin, 2016; Nylund-Gibson & Choi, 2018). Antecedent variables included participant sex (male and female), ethnic background (African, East Indian, Mixed/Other), and highest parent education (less than Standard 5, Standard 5, Form 3, Form 5, Form 6, and University). Consequent variables included the average of the ORF passages and two LBS factor scores computed as per Chao, McDermott, Watkins, Drogalis, et al. (2018).

Following profile enumeration, the 3-step method (Asparouhov & Muthen, 2014) was applied to regress resultant latent profiles on antecedent child demographic and family factors while accounting for measurement error in posterior classifications (Nylund-Gibson et al., 2019). Each model held antecedent factors as simultaneous binary explanatory variables (child male vs. female gender, child African ethnicity vs. other, advanced parental education vs. not) in a multinomial logistic regression model using the general logit link function. The objective was to ascertain the relative risk of profile membership (estimated through the odds ratio) associated with each antecedent factor. The process was designed to inform relationships between known antecedent factors and derived profiles, whereas the

antecedent factors were not allowed to alter the results of foregoing latent profile analysis.

Results

Indicator Variables

Descriptive statistics for the ASCA and ASCA-H EAP scores for the total sample of 709 participants are provided in Table 1. Descriptive statistics for LBS scores and ORF rates for the total sample are also presented in Table 1. Although univariate measures of skew and kurtosis were relatively normal, multivariate kurtosis (Mardia, 1970) was elevated and statistically significant, 40.98, $\chi^2(1) = 90.6$, $p < .001$. Consequently, robust model estimation methods were employed (Savalei, 2014).

Latent Profile Analysis

The solutions for 1- through 4-profile models are displayed in Table 2. Solutions with more than 4 profiles and solutions that relaxed the homogeneity and local independence assumptions were

Table 1 *Descriptive Statistics on Factor Scores from the Adjustment Scales for Children and Adolescents, and Adjustment Scales for Children and Adolescents-Home*

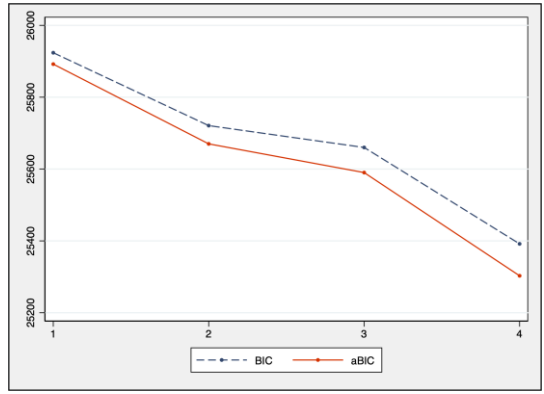
Scale	Mean	Standard Deviation	Skew	Kurtosis
ASCA Overactivity	50.9	9.3	0.69	0.62
ASCA Underactivity	50.3	7.4	1.04	0.22
ASCA-H Aggression	50.0	10.0	0.85	3.27
ASCA-H Reticence/ Withdrawal	50.1	10.0	–0.12	0.33
ASCA-H Irascible/Attention-Seeking	50.0	10.0	0.33	0.17
LBS Competence Motivation	51.0	9.8	–0.36	–0.38
LBS Strategy/Flexibility	50.6	10.0	–0.42	–0.26
Oral Reading Fluency	75.1	41.9	0.37	–0.43

Notes. Sample of 709 Youth from Trinidad and Tobago; ASCA = Adjustment Scales for Children and Adolescents; ASCA – H = Adjustment Scales for Children and Adolescents-Home

improper, producing non-positive definite matrices or failing to produce replicable loglikelihood values. The BIC and aBIC values continued to decrease as more profiles were added so none of the inferential tests were definitive. It is not uncommon that BIC and aBIC values continue to decrease so a "point of diminishing returns" in model fit was determined by the ΔBIC and ΔaBIC values, defined as "small decreases in the IC (Information Criteria) for each additional latent class" (Nylund-Gibson & Choi, 2018, p. 443). As displayed in Table 2 and illustrated in Figure 2, the 3-profile solution appeared to be the point of diminishing returns in this analysis.

Selection of the 3-profile solution was strengthened by consideration of classification precision and the relative size of the emergent profile classes. Both the 3- and 4-profile solutions exhibited moderate to good overall (.731 and .982, respectively) and adequate class specific (.704 to .935 vs. .960 to .999, respectively) precision of classification (Wang & Wang, 2020). However, the 4-profile solution was marked by one profile with only 27 members, which is smaller than the minimal 5% benchmark suggested by Nylund-Gibson and Choi (2018). Additionally, the 4-profile solution contained two profiles that differed only slightly in level (M = 51.0 vs. 48.3) but not in pattern. On balance, the 3-profile solution was accepted as optimal given its statistical fit, classification precision, and alignment with existing theory.

Figure 2 *'Elbow' Plot of BIC and aBIC value for the One to Four Profile Solutions for ASCA and ASCA-H Factor Scores*



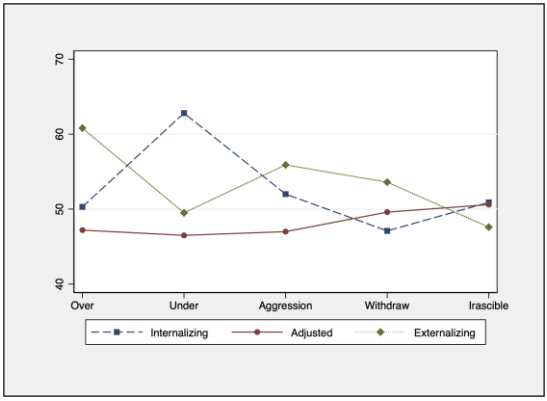
Note. BIC and aBIC values on vertical axis and number of profiles on horizontal axis.

Table 2 *Fit Statistics and Classification Accuracy for Latent Profile Analysis of Factor Scores from ASCA and ASCA-H*

Pro-file	Loglikeli-hood	BIC	aBIC	aLMR	*p*	BLMR *p*	Entropy	ΔBIC	ΔaBIC
1	–12929.1	25923.8	25892.1	–	–	–	1	–	–
2	–12807.9	25720.9	25670.1	236.3	.0001	.0001	.893	202.9	222.0
3	–12757.8	25660.1	25590.2	97.7	.0114	.0001	.731	60.8	79.9
4	–12604.0	25391.8	25302.9	244.8	.0013	.0001	.982	268.3	287.3

Notes. Sample of 709 Youth from Trinidad and Tobago; ASCA = Adjustment Scales for Children and Adolescents; ASCA-H = Adjustment Scales for Children and Adolescents-Home; BIC = Bayesian information criterion; aBIC = sample size adjusted BIC; aLMR = adjusted Vuong-Lo-Mendell-Rubin likelihood ratio test; BLMR = Bootstrapped likelihood ratio test. Models that extracted 5 and 6 profiles produced statistically improper solutions.

Figure 3 *Plot of Estimated Profile Means for the Three-profile Solution for ASCA and ASCA-H Factor Scores*



Notes. ASCA = Adjustment Scales for Children and Adolescents; ASCA-H = Adjustment Scales for Children and Adolescents-Home. Over is ASCA Overactivity factor; Under is ASCA Underactivity factor; Aggression is ASCA-H Aggression factor; Withdraw is ASCA-H Reticence/Withdrawal factor; and Irascible is the ASCA-H Irascible/Attention-Seeking factor.

Within educational systems, a three-tier system has been developed to characterize student support needs (Frey et al., 2010; Merrell, 2008). Within this system, the 5% of students who exhibit the most maladaptive behaviour need intensive individual support, the next 15% are at-risk and require targeted group interventions, and

the remaining 80% should be adequately served by typical educational methods. The means of ASCA and ASCA-H scores for the three-profile solution are presented in Table 3 and illustrated in Figure 3. The 429 (60.5%) members of Profile 1 appear to represent a group of well-adjusted children given that all their ASCA and ASCA-H scores were near the population mean of 50. Using the student support rubric enumerated above, their social and emotional needs should be fulfilled within the standard educational system. In contrast, Profiles 2 (19.3%) and 3 (20.3%) appear to represent at-risk students. Specifically, the 137 members of Profile 2 exhibited moderately elevated scores on the ASCA Underactivity factor (90th per

Table 3 *Estimated Profile Means for Factor Scores from the ASCA and ASCA-H (N = 709)*

Profile	ASCA Over	ASCA Under	ASCA-H Aggression	ASCA-H Withdraw	ASCA-H Irascible	*n*	Average Profile Probability
Adjusted	47.2	46.5	47.0	49.6	50.6	429	.927
Internalizing	50.3	62.8	52.0	47.0	51.0	137	.704
Externalizing	60.8	49.5	55.9	53.6	47.6	143	.935

Notes. ASCA = Adjustment Scales for Children and Adolescents; ASCA-H = Adjustment Scales for Children and Adolescents-Home. Over is ASCA Overactivity factor; Under is ASCA Underactivity factor; Aggression is ASCA-H Aggression factor; Withdraw is ASCA-H Reticence/Withdrawal factor; and Irascible is the ASCA-H Irascible/Attention-Seeking factor.

centile) whereas the 143 members of Profile 3 displayed moderately elevated scores on the ASCA Overactivity factor (86th percentile) and mildly elevated scores on the ASHA-H Aggression factor (72nd percentile). Thus, children in Trinidad and Tobago were conceptually grouped by the transdiagnostic externalizing and internalizing dimensions identified in modern taxonomies of psychopathology (Conway et al., 2019; Kotov et al., 2017). For descriptive purposes, these profiles are subsequently labeled as Adjusted, Internalizing, and Externalizing.

Auxiliary Variables

Although ethnic background had no statistically significant influence on profile membership, both gender and parent education

were influential. In comparison to the Adjusted profile, males were significantly more likely to be members of the Externalizing profile (χ^2 = 9.5[1], p = .002 with an odds ratio of 2.19 [1.16, 4.12]) whereas participants whose parents completed more education were significantly less likely to belong to the Internalizing profile (χ^2 = 11.1[5], p = .049 with an odds ratio of 0.66 [0.52. 0.84]).

As detailed in Table 4, LBS and ORF scores were dissimilar across the three profiles. The Adjusted profile was characterized by significantly more positive (a) LBS Competence Motivation scores than the Internalizing and Externalizing profiles (χ^2 = 495.2(1), p < .001 and χ^2 = 342.9(1), p < .001, respectively); (b) LBS Strategy/Flexibility scores than the Internalizing and Externalizing profiles (χ^2 = 71.5(1), p < .001 and χ^2 = 464.3(1), p < .001, respectively); and (c) ORF scores than the Internalizing and Externalizing profiles (χ^2 = 69.0(1), p < .001 and χ^2 = 114.4(1), p < .001, respectively). Further, LBS Competence Motivation scores were more positive for the Externalizing profile than the Internalizing profile (χ^2 = 22.9(1), p < .001) whereas the LBS Strategy/Flexibility scores were more positive for the Internalizing profile than the Externalizing profile (χ^2 = 464.3(1), p < .001).

Table 4 *Estimated Means (Standard Errors) for Consequent Variables by Profile Membership*

Profile	LBS Competence Motivation[a]	LBS Strategy-Flexibility[a]	Oral Reading Fluency[b]
Adjusted	56.7 (0.33)	55.5 (0.36)	89.5 (2.18)
Internalizing	40.8 (0.63)	48.6 (0.74)	55.7 (3.44)
Externalizing	44.8 (0.55)	40.8 (0.58)	51.0 (2.87)

Notes. [a] Statistically significant differences among all 3 profiles (p < .001). [b] Statistically significant differences between Adjusted profile and both Internalizing and Externalizing profiles (p < .001). Non-significant difference between Internalizing and Externalizing profiles, (χ^2 = 1.12(1), p = .29).

Discussion

A person-centered analysis of ASCA and ASCA-H scores among a national sample of primary school students in Trinidad and Tobago identified three distinct profiles of behaviour across home and school settings. Specifically, one profile (61% of participants) was characterized by parent and teacher ratings that fell near the popula-

tion average. A second profile, containing 19% of the participants, was marked by elevated teacher ratings of internalizing behaviours and a third profile (20%) was identified by elevated teacher and parent ratings of externalizing behaviours. These profiles were subsequently labeled Adjusted, Internalizing, and Externalizing, respectively, and are compatible with the transdiagnostic externalizing and internalizing dimensions identified in variable-centered taxonomies of psychopathology (Conway et al., 2019; Kotov et al., 2017; Lahey et al., 2011).

When auxiliary variables were analyzed, membership in the Adjusted profile was related to more positive learning behaviours and higher oral reading fluency than membership in the Internalizing and Externalizing profiles. Academic problems are often found to be associated with childhood psychopathology so these results are consistent with prior research (Kamphaus & Frick, 2005; Merrell, 2008; Patalay et al., 2017). Auxiliary variable analyses also revealed that males were more likely to be members of the Externalizing profile. Males have often been over-represented among externalizing groups (Kamphaus & Frick, 2005; Merrell, 2008; Patalay et al., 2017; Pine & Fox, 2015), including Caribbean samples (Carrington-Blaides & Ramoutar, 2017; Gentle-Genitty et al., 2017; Lambert et al., 1996; Maguire & Fishbein, 2016; Rowe et al., 2012).

Additionally, students with more highly educated parents were less likely to be members of the Internalizing profile. Parental education, as one aspect of socioeconomic status, has often been found to be a protective factor in child psychopathology research (Fantuzzo et al., 2005) and differentially associated with internalizing disorders (Korous et al., 2018; McDermott et al., 2017). Interestingly, participants' ethnic background had no statistically significant effect on profile membership even though prior research has shown that parents of African ancestry engaged in higher levels of harsh physical punishment than parents of East Indian ancestry in Trinidad and Tobago (Krishnakumar et al., 2014; Roopnarine & Jin, 2016; Roopnarine et al., 2014), which, in theory, should lead to increased behaviour problems among children of African ancestry (Krishnakumar et al., 2014).

Although both teacher (ASCA) and parent (ASCA-H) behaviour ratings were analyzed, teacher ratings were generally more discriminative than parent ratings with the exception of externalizing behaviours where heightened problems were reported by both parents and teachers. Some researchers have posited that teachers should be more accurate reporters than parents because they observe in a

structured setting and have a ready comparison group, but insufficient research exists to confirm this supposition (Kamphaus & Frick, 2005). In fact, variability between raters appears to be the norm due to situational specificity, respondent perspective, context, bias, etc. (An et al., 2019; Campbell & Hammond, 2014; Dirks et al., 2012).

Studies that partition variance among child, occasion, and rater sources have found that parent and teacher ratings are complexly determined and may be differentially sensitive to the gender of the child and the type of behaviour disorder (An et al., 2019; Konold & Pianta, 2007; Low et al., 2015). Genetic studies have also indicated that parent and teacher reports are differentially predictive of psychopathology with teacher ratings more predictive in primary school and parent ratings more predictive thereafter (Allegrini et al., 2020). As illustrated by the average profile probabilities reported in Table 3, the precision of classification was > .92 for the Adjusted and Externalizing profiles but .70 for the Internalizing profile. Parents and teachers have often been found to be good informants about externalizing problem behaviours whereas children were better able to report on internalizing problems (Kamphaus & Frick, 2005). In total, these results reinforce the best-practice recommendation for a multi-informant approach (An et al., 2019; Campbell & Hammond, 2014).

Most of the research on behaviour ratings has been variable-centered but there have been some person-centered studies. Unfortunately, many of these studies produced profiles that differed quantitatively but not qualitatively (Gomez & Vance, 2014; Mezulis et al., 2011; Mindrila, 2016). That is, the profiles were separated by elevation level but not type of behaviour. Some person-centered studies found qualitatively different profiles but did not include ratings from both parents and teachers (e.g., Bianchi et al., 2017; Patalay et al., 2017; Tetzner et al., 2017), or did not consider multiple types of maladaptive behaviour (e.g., Eaton et al., 2013; Fergusson et al., 2009). To this point, there have been no person-centered analyses of socioemotional behaviour in Trinidad and Tobago.

Given the academic and behavioural concerns of students in Trinidad and Tobago reported in other studies (e.g., De Lisle, 2019; De Lisle et al., 2017; Williams, 2013, 2017), these results provide convergent validity evidence in support of the previous research and also hint at directions for interventions. First, 60% of the participants in this study are well-adjusted behaviourally with concomitantly higher academic achievement, which provides a group that can be tapped for interventions involving peers. Indeed, universal or

Tier 1 interventions aimed at major social emotional well-being (e.g., perspective taking, self-awareness) may prove useful addressing some proportion of the 40% of students with internalizing and externalizing concerns. Second, the profiles of the internalizing and externalizing groups provide some guidance for specific approaches to responding to these groups. The internalizing group's biggest deficit was in the area of competence motivation, suggesting that interventions aimed at issues of anxiety and depression will be particularly useful coupled with Tier 2 interventions to address the reading deficits that this group also manifests. The combination of enhanced social emotional well-being and academic performance is likely to have positive effects for this group of students.

Third, the profile of the externalizing group suggests a different clinical approach. This group's academic and behavioural deficits are related to aggression and hyperactivity, and they require behavioural interventions that involve replacing these types of behaviours with more socially appropriate ways to interact with peers and teachers. As with the internalizing profile, students with externalizing concerns also require intensive reading interventions, given their reading scores. The similarity of both of the problematic profiles with school-based problems found in the US and elsewhere indicates that interventions used in these other contexts are likely to work, of course with modifications for the context of Trinidad and Tobago. In the past two years, the Student Support Services Unit in the Trinidad and Tobago Ministry of Education has hired several school psychologists, clinical psychologists, and behavioural specialists, who alongside the special education officers and reading specialists, provide the Ministry of Education with personnel who can address the academic, behavioural, and mental health concerns that these results have highlighted.

Fourth, it is likely that concurrent early interventions in several environments will be needed to achieve maximal effectiveness, especially for the most maladjusted youth (Allegrini et al., 2020; Bevilacqua et al., 2018; Carrington-Blaides & Ramoutar, 2017; Caspi et al., 2016; Maguire & Fishbein, 2016; Pine & Fox, 2015; Roopnarine et al., 2014). For example, the simultaneous application of parent education programmes (Menting, de Castro, & Matthys, 2013; Michelson et al., 2013), school-wide behaviour support programmes (Frey et al., 2010), and classroom-level teacher practices (Sutherland et al., 2019). Given that teachers in Trinidad and Tobago now have to complete a Bachelor of Education degree, it will also be important to

include coursework on academic and behavioural interventions in the requirements for the degree.

Finally, researchers are encouraged to investigate the efficacy of personalized intervention (Dirks et al., 2012; Ng & Weisz, 2016). At present, evidence-based or empirically supported methods are the predominant paradigm (Sonuga-Barke, 2020), that is, using research findings from randomized controlled trials among diagnostic groups to identify interventions most likely to be efficacious for all members of that diagnostic group (Chambless et al., 1998). For example, Oswald and Mazefsky (2006) identified empirically supported interventions for children and adolescents with internalizing disorders. In contrast, personalized interventions are "evidence-based methods for tailoring treatments to individuals" (Ng & Weisz, 2016, p. 216), not diagnostic groups. The concept of personalized intervention is relatively new and has received little research attention to date but a research agenda has been delineated by Ng and Weisz (2016).

These findings also have implications for clinical and educational assessment in Trinidad and Tobago. First, clinicians should include both parent and teacher behaviour ratings in assessments to ensure that a descriptive profile of behaviour across both home and school environments is obtained (An et al., 2019; Campbell & Hammond, 2014; Gass, 2918; Kamphaus & Frick, 2005; Merrell, 2008). Second, clinicians will probably maximize the effectiveness of their diagnostic decisions if they employ evidence-based assessment methods (Chorpita et al., 2011; Singla et al., 2017; Youngstrom et al., 2015) with appropriate modifications for the national and cultural contexts. Finally, given that diagnostic tools that meet psychometric standards are lacking in most developing countries (Rowe et al., 2012), it will be important to appropriately update and re-norm these scales in Trinidad and Tobago to ensure the continued reliability of their scores and the validity of the inferences derived from those scores (Beaujean, 2015; Carrington-Blaides & Ramoutar, 2017).

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