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Redican, E., Vang, M. L., Shevlin, M., Elklit, A., & Raudzah Ghazali, S. (2023). The co-occurrence of potentially traumatic events (PTEs) and their associations with posttraumatic stress disorder (PTSD) in Indian and Malaysian adolescents. *Acta Psychologica*, *235*, Article 103896. https://doi.org/10.1016/j.actpsy.2023.103896

Link to publication record in Ulster University Research Portal

Published in:
Acta Psychologica

Publication Status:
Published (in print/issue): 31/05/2023

DOI:
https://doi.org/10.1016/j.actpsy.2023.103896

Document Version
Publisher's PDF, also known as Version of record

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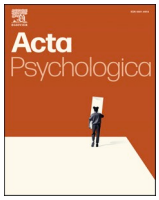
Download date: 09/04/2024

Acta Psychologica 235 (2023) 103896

Contents lists available at ScienceDirect

Acta Psychologica

journal homepage: www.elsevier.com/locate/actpsy



The co-occurrence of potentially traumatic events (PTEs) and their associations with posttraumatic stress disorder (PTSD) in Indian and Malaysian adolescents

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ARTICLE INFO

Keywords:
Potentially traumatic events (PTEs)
Posttraumatic stress disorder (PTSD)
Adolescents
Asia
Latent class analysis

ABSTRACT

Background: Although it is well-established that people can experience multiple traumatic events, there are few studies examining the co-occurrence of such experiences in non-Western nations. The current study sought to examine the occurrence of multiple potentially traumatic experiences (PTEs) and their associations with post-traumatic stress disorder (PTSD) among adolescents from two Asian nations.

Methods: Latent class analysis (LCA) was employed to model the co-occurrence of PTEs in two school samples of adolescents from India (n = 411) and Malaysia (n = 469). Demographic correlates (i.e., sex, age, household composition, parent education) of the latent classes and the association between latent class membership and probable diagnosis of posttraumatic stress disorder (PTSD) were examined.

Results: The LCA identified three latent classes for the Indian sample: 'Low Risk – moderate sexual trauma', 'Moderate Risk', and 'High Risk'. Similarly, three classes were also identified for the Malaysian sample: 'Low Risk', 'Moderate Risk', and 'High Risk'. Membership of 'Moderate Risk' was associated with male sex in both samples, and with older age and lower levels of parental education attainment in the Malaysian sample. No correlates of 'High Risk' class were identified in either sample. Membership of the 'High Risk' class was significantly associated with probable PTSD diagnosis in both samples, while membership of the 'Moderate Risk' class was associated with probable PTSD diagnosis in the Malaysian sample.

Conclusion: Findings from this study correspond with Western studies indicating co-occurrence of PTEs to be common and to represent a salient risk factor for the development of PTSD.

1. Introduction

Research has shown that likelihood of exposure to potentially traumatic events (PTEs) peaks during adolescence (e.g., Breslau et al., 1998) and that risk of developing posttraumatic stress disorder (PTSD) is highest among this demographic group (Kessler et al., 2017). It is estimated that one in six children and adolescents develop PTSD following exposure to a traumatic event (Alisic et al., 2014) while approximately one in ten adults are estimated to develop PTSD (Kilpatrick et al., 2013). Adolescents with PTSD are at increased risk of additional mental health problems including depression, conduct disorder, alcohol dependence, self-harm, suicide attempts, and functional impairment (Lewis et al., 2019). It is widely acknowledged that PTEs rarely occur as isolated events, and that adolescents are often victims of multiple co-occurring PTEs (e.g., Finkelhor et al., 2005, 2007; Turner et al., 2010; Ford et al., 2010; Pears et al., 2008). Research has consistently illustrated how adolescents exposed to poly-victimization (i.e., multiple co-occurring traumas) are at much greater risk of experiencing maladaptive psychological outcomes including PTSD (e.g., Karsberg et al., 2014; McChesney et al., 2015; Petersen et al., 2010; Shevlin & Elklit, 2008).

Consequently, in recent years, "person-centered" approaches to modeling PTEs have superseded more traditional "variable-centered" approaches due to their ability to explicitly capture the non-random distribution of exposure to traumatic events (O'Donnell et al., 2017). Commonly deployed variable-centered approaches have included examining the influence of trauma type, whether that be (1) a singular

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https://doi.org/10.1016/j.actpsy.2023.103896
Received 19 September 2022; Received in revised form 6 March 2023; Accepted 20 March 2023
Available online 28 March 2023
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trauma such as childhood sexual abuse (e.g., Hébert et al., 2014), (2) a narrow range of traumas such as focusing exclusively on maltreatment types (e.g., Yoon et al., 2019), or (3) assessing a broad range of traumas simultaneously (e.g., Copeland et al., 2007; McLaughlin et al., 2013). These approaches indicate the types of PTEs that are most predictive of maladaptive psychological outcomes, however, fail to capture the interrelatedness and heterogeneity of PTEs (McChesney et al., 2015). Another popular variable-centered approach involves examining the cumulative burden of PTEs where a summed score reflecting the total amount of different PTEs to which an adolescent has been exposed to is created (e.g., Layne et al., 2014; Suliman et al., 2009). A limitation of this approach includes the implicit assumption that all PTEs are equally weighted and interchangeable (Hagan et al., 2016; Houston et al., 2011). Conversely, person-centered approaches such as latent class analysis (LCA) recognize the heterogeneity in traumatic experiences and are better able to detect patterns across these experiences (Rivera et al., 2018). A systematic review of person-centered approaches to modeling traumatic experiences by O'Donnell et al. (2017) found that in all the seventeen studies which were reviewed that qualitatively distinct classes of individuals with similar patterns of exposure to PTEs were identified. Most studies identified a class typified by elevated levels of exposure to all PTE types and another typified by minimal levels of exposure to any PTE type, the latter of which was typically found to be the most populated class. Individuals in those classes reflecting elevated levels of exposure to multiple PTEs were consistently shown to be at greater risk of maladaptive psychological outcomes (O'Donnell et al., 2017). Notably, all studies included in this review were from Western nations such as the United States (US), the United Kingdom (UK), Australia, Denmark, and Greenland (O'Donnell et al., 2017). Examining latent classes of PTEs across countries with diverse social and cultural backgrounds is pivotal for the formation of prevention and intervention guidelines that are applicable at a global level (Charak et al., 2020).

Asian countries including India and Malaysia are poorly represented within the person-centered trauma literature. Located in South Asia, India is the world's second most populated country with every fifth person being aged between 10 to 19 years (UNICEF India, n.d.). Levels of poverty in India are among the highest worldwide, with approximately 176 million Indians living below the international poverty line (World Bank Group, 2022). Exposure to PTEs is the norm rather than the exception in India, with findings from the largest ever representative survey of the prevalence of child abuse and neglect (CAN) in India illustrating how two out of every three children and adolescents experience physical abuse, one in two experience sexual or emotional abuse, and two out of every three girls experience neglect (Kacker et al., 2007). There have been two studies (to the best of our knowledge) that have examined the co-occurrence of PTEs among adolescents in India. Both studies focused on experiences of CAN rather than a broader spectrum of PTEs (Charak & Koot, 2015; Sharatt et al., 2021), which is problematic given that research has shown how PTEs often occur across multiple trauma categories (Finkelhor et al., 2007). One study conducted by Rasmussen et al. (2013) investigated the prevalence of a wide spectrum of PTEs among Indian adolescents. This study illustrated how 78.1 % of adolescents from a small school sample ($n = 411$) encountered at least one PTE, with the most common PTEs being death of a close one, traffic accidents, serious illness, witnessing the injury or killing of others, and coming close to being injured or killed. Findings from this study illustrated how adolescents who had experienced threats of violence, attempted suicide, physical abuse, severe childhood neglect, and bullying were more likely to have a probable PTSD diagnosis (Rasmussen et al., 2013).

Malaysia is in Southeastern Asia and is home to over 32.78 million people (The World Bank, 2022). The socioeconomic landscape of Malaysia is markedly different to that of India with only 3100 individuals living below the international poverty line (World Bank Group, 2020). Nevertheless, rates of PTE exposure have also been shown to be particularly high among Malaysian adolescents. Ghazali et al. (2017) investigated the prevalence of PTE exposure among a large sample of Malaysian adolescents ($n = 1016$) and found that 83 % had experienced at least one PTE with more than half of these young people experiencing multiple PTEs. The most prevalent PTEs were death of someone close, near drowning, traffic accident, serious illness, and bullying. This study found that PTEs involving violent attack, threats of violence, attempted suicide, and bullying were strongly associated with probable PTSD diagnosis. Notably, no study (to the best of our knowledge) has examined patterns of co-occurrence among a broad range of PTEs in adolescents from either India or Malaysia.

Consequently, the current study had two primary aims. First, this study sought to examine patterns of co-occurrence among PTEs in two samples of school-aged adolescents from India and Malaysia. This study adds to a collection of studies examining latent classes of PTEs among school-aged adolescents from Denmark (Shevlin & Elklit, 2008), the Faroese Islands (Petersen et al., 2010), Greenland (Karsberg et al., 2014), and Uganda (Ferrajão et al., 2022). Consistent with these studies, it was anticipated that at least three classes would be identified including one characterized by low levels of exposure to any PTEs and another characterized by high levels of exposure to multiple PTEs. The second aim of the study was to examine demographic correlates of the latent classes. Although some studies identify no association between sex and trauma class membership, those that have identified such effects have found males to be highly represented within classes characterized by violence and females to be highly represented within classes characterized by exposure to multiple PTEs (O'Donnell et al., 2017). Hence, it was anticipated that similar patterns would be observed in the current study should sex effects emerge. It was also anticipated that adolescents who were members of classes characterized by exposure to multiple PTEs would be less likely to live with both parents (e.g., Shevlin & Elklit, 2008) and come from lower socioeconomic status (SES) families (e.g., Mossige & Huang, 2017). The final aim of the study was to examine the association between trauma class membership and PTSD, with it being anticipated that classes characterized by exposure to multiple PTEs would be more likely to have a probable diagnosis of PTSD (e.g., Karsberg et al., 2014; Petersen et al., 2010; Shevlin & Elklit, 2008).

2. Methods and materials

2.1. Study design

The current study utilized data from two convenience samples of adolescents from India and Malaysia. Indian participants were recruited from two private schools in Pune city (Rasmussen et al., 2013) and Malaysian participants were recruited from several schools districts in a state of Sarawak (Ghazali et al., 2017). Full details regarding sampling procedure and data collection for both countries are provided by Rasmussen et al. (2022). It should be noted that the Indian data used in the current study has previously been used in a study by Rasmussen et al. (2013) which examined the prevalence of PTEs and PTSD among Indian adolescents (findings from this study are discussed in the introduction). Moreover, data from both the Indian and Malaysian samples were recently utilized in a study examining the measurement invariance of the Harvard Trauma Questionnaire (HTQ) across nine countries (Rasmussen et al., 2022). Hence, the characteristics of the Indian and Malaysian samples have been extensively discussed elsewhere. Nevertheless, to briefly summarize, the Indian sample comprised of 411 participants. The average age of Indian participants was 14.15 (SD = 0.47, Range = 13–16 years) and the ratio of males to females was equivocal (males = 53.3 %, $n = 219$; females = 46.7 %, $n = 192$). Most participants lived with both parents (96.1 %) and reported the highest level of parent educational attainment to be college (32.8 %; $n = 135$) or university (59.4 %; $n = 244$). The Malaysian sample comprised of 469 participants, of which the average age of participants was 14.21 (SD = 1.18; Range = 11–17). There were more females (62.3 %; $n = 292$) than males (37.7 %; $n = 177$). Most pupils (83.2 %; $n = 390$) lived with both parents and

reported the highest level of parent educational attainment to be high school (30.9 %; $n = 145$), college (23.9 %; $n = 112$), or university (26.9 %; $n = 126$). Non-response rates for these samples ranged from 13 to 15 % due to participants being missing from school on the days that data was collected (Rasmussen et al., 2022). Prior to conducting the studies, institutional review and approval was sought from national and local governing bodies.

2.2. Measures

2.2.1. Trauma checklist

Trauma exposure was assessed using a 20-item checklist created by Elklit (2002). This checklist is comprised of both PTEs which align with the definition of a traumatic stressor as per DSM-IV (APA, 1994) and several potentially negative life events including bullying, parental divorce, absence of a parent, serious illness, and abortion/pregnancy (Elklit, 2002; Rasmussen et al., 2013). Using yes (1) or no (0) responses, respondents were required to indicate which PTEs they had been directly exposed to and those which they had witnessed or heard about someone else being exposed to (i.e., indirect exposure). Only direct PTEs were analysed in the current study. Given the small sample sizes of both countries, it was necessary that a smaller subset of PTEs were examined to retain power. Several similar PTEs were collapsed into single categories, while some PTEs (i.e., robbery/theft) and negative life events (i.e., absence of parent, parental divorce, abortion/pregnancy, serious illness) were removed. Robbery/theft was removed due to low endorsement in the Malaysian sample and was also removed in the Indian sample to maintain consistency when comparing findings across the samples. Negative life events were removed due to not meeting the criteria for what is considered a traumatic stressor however, bullying was retained due to a growing body of research indicating that bullying should be considered a form of interpersonal trauma (e.g., Idsoe et al., 2021). Consequently, nine PTEs were examined (see Table 1).

2.2.2. PTSD

PTSD was assessed using the Harvard Trauma Questionnaire, Part IV (HTQ; Mollica et al., 1992). The HTQ is comprised of thirty items, the first sixteen of which map onto the three symptom clusters of intrusion, avoidance and numbing, and hyperarousal as defined by DSM-IV. Respondents were instructed to consider the event most distressing to them from the list of PTEs included in the trauma checklist and to indicate the extent to which they had been affected by each of the listed symptoms during the preceding week. Responses were provided using a four-point Likert scale ranging from 'Not at all' (1) to 'Extremely' (4). Probable PTSD was inferred if participants reported ≥1 re-experiencing symptom, ≥3 avoidance symptoms, and ≥ 2 arousal symptoms (endorsement is Likert score ≥ 3 (i.e., "quite a bit") (Rasmussen et al., 2013; Shevlin & Elklit, 2008). For the Indian sample, each of the subscales had relatively low reliability (re-experiencing (α = 0.59), avoidance (α = 0.63), arousal (α = 0.63)), while the reliability of the subscales for the Malaysian sample were much better (re-experiencing (α = 0.74), avoidance (α = 0.78), arousal (α = 0.80)).

2.2.3. Demographic variables

Demographic variables included sex (0 = male, 1 = female), child age (measured in years), living arrangements (1 = lives with one parent, 2 = lives with both parents, 3 = other living arrangements such as living with grandparents), mother's educational level (0 = primary, 1 = high school, 2 = college, 3 = university) and father's educational level (0 = primary, 1 = high school, 2 = college, 3 = university). For the purposes of the current study, living arrangements was recoded into a binary variable (0 = does not live with both parents, 1 = lives with both parents), while a binary variable representing highest educational level achieved by either mother or father was created (0 = primary, 1 = high school, 2 = college, 3 = university).

2.3. Statistical analysis

First, rates of exposure to each PTE were estimated for the overall sample and then stratified by sex (and differences tested for using chi-square statistic). Second, latent class analysis (LCA) was employed to determine whether distinct subgroups of adolescents with the same patterns of PTE endorsement were identifiable for both the Indian and Malaysian samples. The fit of models from one class through to six classes were examined. Fit indices used to determine the optimal solution included: Bayesian Information Criterion (BIC; Sclove, 1987), sample size adjusted BIC (SSA-BIC; Sclove, 1987), and Akaike Information Criterion (AIC; Akaike, 1987). The LCA model with the lowest value on each of these fit indices was considered best-fitting. Other fit indices included the bootstrap likelihood ratio test (BLRT; McLachlan & Peel, 2000) and the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-A; Lo et al., 2001). Both the LMR-A and BLRT examine the improvement in model fit following the inclusion of an additional latent class, with a non-significant p-value ($p < .05$) indicating that the more parsimonious model (i.e., model without the additional class) should be retained (Nylund et al., 2007). Entropy values which indicate classification certainty were also examined with values >0.70 indicative of adequate classification of participants (Nagin, 2005). Finally, demographic correlates of the best fitting LCA solution were added using the R3STEP auxiliary command in MPlus, a method which ensures that the formation of the latent classes is not influenced by the demographic variables (Asparouhov & Muthén, 2014). The association between latent class membership and probable PTSD diagnosis was examined using the auxiliary DCAT command.

3. Results

3.1. Rates of PTE exposure and sex differences in PTEs

Rates of PTE exposure for the overall sample and stratified by sex are illustrated in Table 1. For the Indian sample, the most endorsed PTEs included serious accident (50.4 %; $n = 207$), exposure to a life-

Table 1
Frequency of exposure to PTEs.

	India				Malaysia			
	Total Sample ($N = 411$) (%)	Male ($N = 219$) (%)	Female ($n = 192$) (%)	χ^2	Total Sample ($N = 469$) (%)	Male ($N = 177$) (%)	Female ($n = 292$) (%)	χ^2
Serious accident	207 (50.4)	141 (64.4)	66 (34.4)	36.85, $p = .000$	188 (40.1)	88 (49.7)	100 (34.2)	10.98, p = .001
Physical assault	32 (7.8)	27 (12.3)	5 (2.6)	13.48, p = .000	24 (5.1)	15 (8.5)	9 (3.1 %)	6.60, $p = .010$
Life-threatening situation	120 (29.2)	77 (35.2)	43 (22.4)	8.06, $p = .005$	39 (8.3)	19 (10.7)	20 (6.8)	2.18, $p = .140$
Suicide attempt	10 (2.4)	8 (3.7)	2 (1.0)	2.94, $p = .086$	21 (4.5)	8 (4.5)	13 (4.5)	0.00, $p = .973$
Death of someone close	113 (27.5)	71 (32.4)	42 (21.9)	5.71, $p = .017$	143 (30.5)	6 (3.4)	7 (2.4)	0.40, $p = .526$
Physical abuse	25 (6.1)	16 (7.3)	9 (11.7)	1.23, $p = .268$	16 (3.4)	10 (5.6)	6 (2.1)	4.32, $p = .038$
Severe childhood neglect	18 (4.4)	12 (5.5)	6 (3.1)	1.35, $p = .245$	15 (3.2)	2 (1.1)	13 (4.5)	3.93, $p = .047$
Sexual trauma	13 (3.2)	11 (5.0)	2 (1.0)	5.29, $p = .021$	11 (2.3)	4 (2.3)	7 (2.4)	0.01, $p = .924$
Threats of violence/bullying	74 (18.0)	52 (23.7)	22 (11.5)	10.46, p = .001	85 (18.1)	46 (26.0)	39 (13.4)	11.85, $p = .001$

threatening situation (29.2 %; $n = 120$) and death of someone close (27.5 %; $n = 113$). The least commonly endorsed PTEs included suicide attempt (2.4 %; $n = 10$), sexual trauma (3.2 %; $n = 13$) and severe childhood neglect (3.2 %; n = 13). Almost three-quarters of the sample (74.2 %; $n = 305$) were exposed to at least one PTE (1 PTE = 28.7 %, 2 PTEs = 20.7 %, 3 PTEs = 14.4 %, 4 PTEs = 6.1 %, ≥5 PTEs = 4.4 %). Endorsement of several PTEs differed by sex, with males reporting higher levels of exposure to a serious accident, physical assault, life-threatening situation, death of a loved one, sexual trauma, and threats of violence/bullying.

For the Malaysian sample, the most common PTEs were serious accident (40.1 %; $n = 188$), death of someone close (30.5 %, $n = 143$), and threats violence/bullying (18.1 %; $n = 85$). The least common PTEs were sexual trauma (2.3 %; $n = 11$), physical abuse (3.4 %; $n = 16$), and severe childhood neglect (3.2 %; $n = 15$). Over two-thirds of the Malaysian sample (61.4 %; $n = 288$) were exposed to at least one PTE (1 PTE = 33.3 %, 2 PTEs = 16.0 %, 3 PTEs = 4.9 %, 4 PTEs = 4.5 %, ≥5 PTEs = 2.8 %). Endorsement of several PTEs also differed by sex for the Malaysian sample, with males reporting higher levels of physical assault, physical abuse, and threats of violence/bullying and females reporting higher levels of exposure to serious accident and severe childhood neglect.

Missing data on the HTQ items for the Indian sample ranged from 0.7 % to 3.9 %, with missing data imputed using the EM algorithm (Bunting et al., 2002; Shevlin & Elklit, 2008). The prevalence of PTSD for the Indian sample using the EM algorithm was 9.5 % ($n = 39$). There was no missing data on the HTQ items for the Malaysian sample, with the prevalence rate of PTSD being 6.4 % ($n = 30$).

3.2. LCA results

Fit statistics for the LCA models are shown in Table 2. For the Indian sample, LMR-A became non-significant for the three-class solution indicating that the two-class was best-fitting while BLRT became non-significant for the four-class solution indicating that the three-class solution was best-fitting. Moreover, BIC values were lowest for the two-class solution, SSA-BIC values were lowest for the three-class solution, and AIC values were lowest for the two-class solution. Given the ambiguity in the fit statistics, profile plots for each of the latent class solutions were thoroughly inspected. Inspection of profile plots illustrated how the three-class solution captured an additional meaningful trauma class compared to the two-class solution while the additional class in the four-class solution was a bisection of the smallest class of the three-class solution. Hence, the three-class solution was selected as the final model. The entropy value (0.72) for the three-class solution indicated acceptable classification of participants.

Similar patterns in the fit statistics were observed for the Malaysian sample. Specifically, LMR-A and BLRT became non-significant for the four-class solution suggesting that the three-class solution was best-fitting. BIC was lowest for the two-class solution, SSA-BIC was lowest for the three-class solution, and AIC was lowest for the four-class solution. Inspection of class compositions for each of the solutions illustrated how the three-class solution captured distinct subgroups of adolescents with the same patterns of PTE exposure whereas the four-class solution did not. Although the smallest class in the three-class solution comprised of <1 % of the sample, it captured an important subgroup of adolescents with elevated levels of exposure to multiple PTEs. Hence, the three-class solution was retained. Entropy for the three-class solution (0.85) indicated excellent classification of participants (Table 2).

The latent class profile plot for the Indian and Malaysian samples are shown in Figs. 1 and 2, respectively.

For the Indian sample (see Table 3), Class 3 (63 %; $n = 259$) was the largest class and was characterized by low endorsement of all PTEs, except for death of someone close and sexual trauma which were endorsed to a moderate extent. Consequently, this class was labelled 'Low Risk – moderate sexual trauma'. Class 1 (33.6 %; $n = 138$) was the second largest class and was characterized by high endorsement of the death of someone close, sexual trauma, and threats of violence/bullying. This class was also typified by moderate levels of exposure to a life-threatening situation. Consequently, this class was labelled 'Moderate Risk'. Class 2 (3.4 %; $n = 14$) was the smallest class and was characterized by high endorsement of severe childhood neglect, serious accident, a life-threatening situation, sexual trauma, and threats of violence/bullying. All other PTEs were endorsed to a moderate extent. Therefore, this class was labelled 'High Risk'.

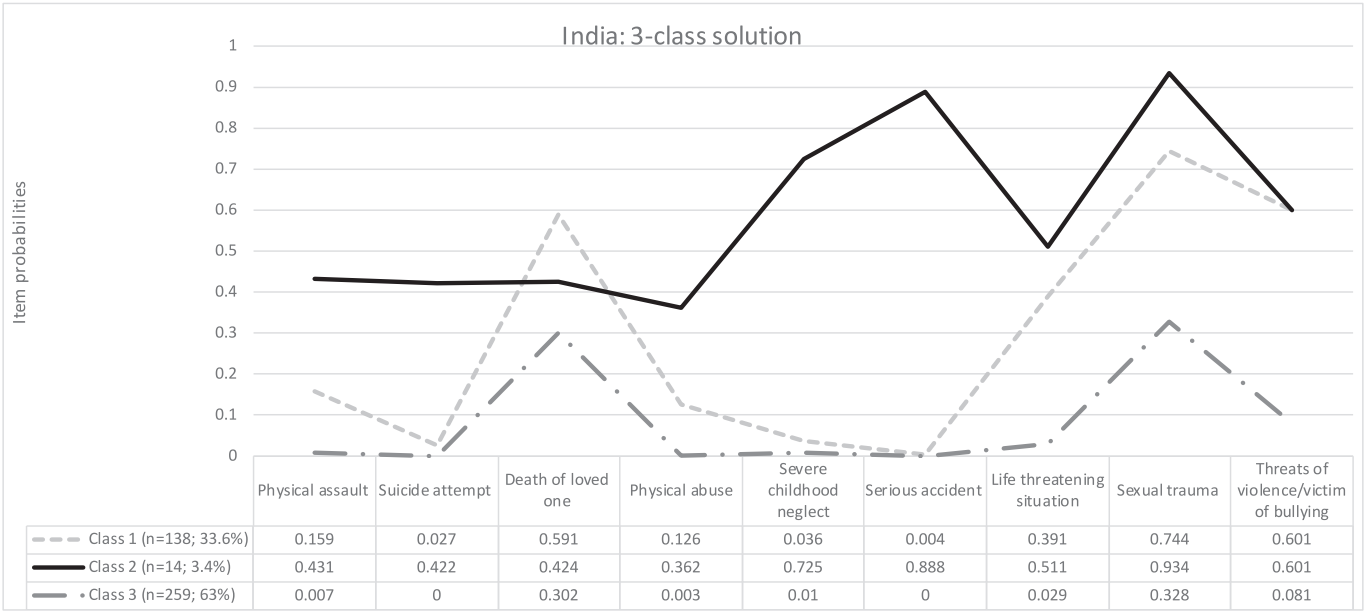
For the Malaysian sample (see Table 3), Class 3 (87.4 %; $n = 410$) was the largest class and was characterized by low endorsement of all PTEs, except for death of a loved one and serious accident which were moderately endorsed. This class was labelled 'Low Risk'. Class 2 (19.1 %; $n = 90$) was characterized by high endorsement of death of a loved one, serious accident and threats of violence/bullying. Consequently, this class was labelled as 'Moderate Risk'. Class 3 (<1 %; n = 4) was characterized by high endorsement of all PTEs and was labelled 'High Risk'.

3.3. Covariate analyses

For the Indian sample, findings from the bivariate analyses illustrated a significant association between male sex and membership of the 'Moderate Risk' (OR = 3.01) and 'High Risk' (OR = 9.08) classes. These associations strengthened in these multivariate analyses for both the 'Moderate Risk' (OR = 3.18) and 'High Risk' (OR = 12.48) classes. There were no significant associations between any of the demographic variables and membership of the 'High Risk' class at the bivariate or multivariate level. Regarding the Malaysian sample, findings from the bivariate analyses illustrated how male sex (OR = 0.41), not living with

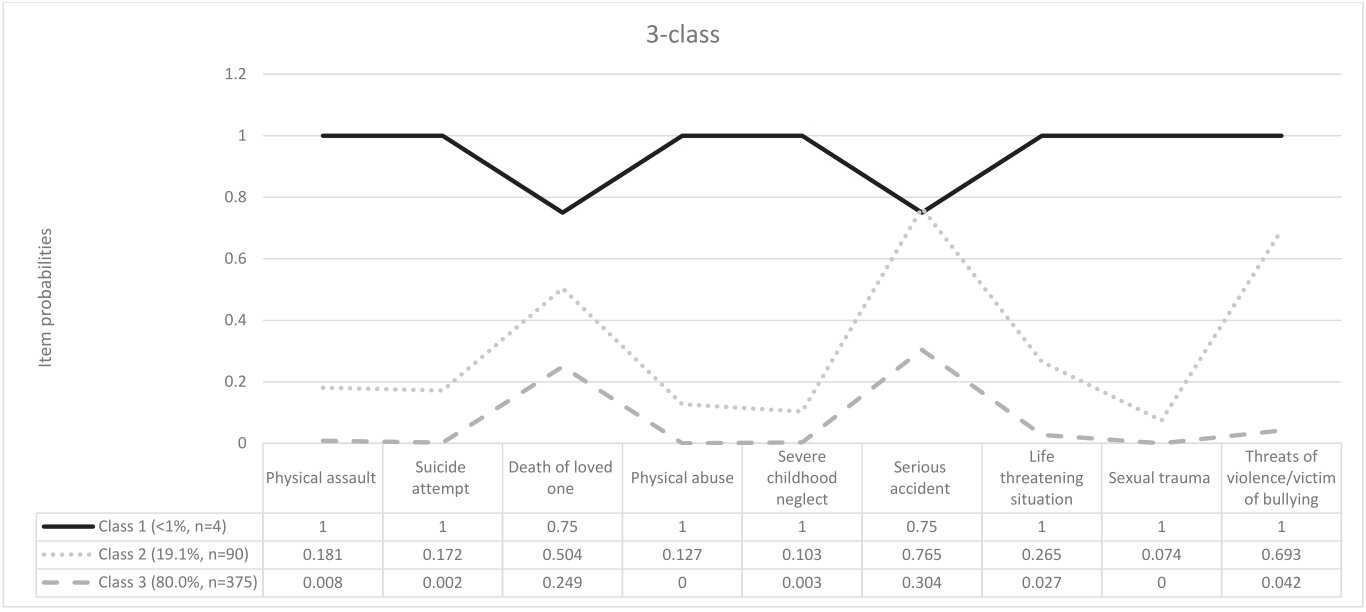
Table 2
Model fit statistics for LCA models.

Model	Log-likelihood	AIC	BIC	ssa-BIC	Entropy	LMR-A (p)	BLRT (p)
India							
1 class	−1390.835	2799.670	2835.837	2807.279	–	–	–
2 classes	−1297.246	2632.492	**2708.846**	2648.555	0.659	0.0022	0.0000
3 classes	**−1270.349**	2598.699	2715.238	**2623.215**	**0.717**	0.0634	**0.0000**
4 classes	−1260.049	**2598.098**	2754.823	2631.069	0.774	**0.0308**	0.2083
5 classes	−1250.835	2599.670	2796.581	2641.094	0.780	0.2315	0.6667
6 classes	−1242.022	2602.044	2839.141	2651.923	0.850	0.0482	1.000
Malaysia							
1 class	−1329.293	2676.585	2713.940	2685.376	–	–	–
2 classes	**−1196.183**	2430.366	**2509.228**	2448.925	**0.852**	0.0000	**0.0000**
3 classes	−1170.404	2398.807	2519.175	**2427.135**	0.847	0.0079	0.0000
4 classes	−1159.904	**2397.809**	2559.682	2535.904	0.846	**0.0347**	0.1500
5 classes	−1153.806	2405.612	2608.992	2453.476	0.852	0.7978	1.000
6 classes	−1146.832	2411.663	2656.549	2469.295	0.841	0.3947	1.000



	Physical assault	Suicide attempt	Death of loved one	Physical abuse	Severe childhood neglect	Serious accident	Life threatening situation	Sexual trauma	Threats of violence/victim of bullying
Class 1 (n=138; 33.6%)	0.159	0.027	0.591	0.126	0.036	0.004	0.391	0.744	0.601
Class 2 (n=14; 3.4%)	0.431	0.422	0.424	0.362	0.725	0.888	0.511	0.934	0.601
Class 3 (n=259; 63%)	0.007	0	0.302	0.003	0.01	0	0.029	0.328	0.081

Fig. 1. Latent class profile plot for Indian sample.



	Physical assault	Suicide attempt	Death of loved one	Physical abuse	Severe childhood neglect	Serious accident	Life threatening situation	Sexual trauma	Threats of violence/victim of bullying
Class 1 (<1%, n=4)	1	1	0.75	1	1	0.75	1	1	1
Class 2 (19.1%, n=90)	0.181	0.172	0.504	0.127	0.103	0.765	0.265	0.074	0.693
Class 3 (80.0%, n=375)	0.008	0.002	0.249	0	0.003	0.304	0.027	0	0.042

Fig. 2. Latent class profile plot for Malaysian sample.

both parents (OR = 0.53) and older age (OR = 1.30) were significantly associated with membership of 'Moderate Risk'. In the multivariate analysis, male sex (OR = 2.65), older age (OR = 1.36) and low levels of parental educational attainment (OR = 0.58) were significantly associated with membership of 'Moderate Risk'. Again, there were no significant associations between any of the demographic variables and membership of the 'High Risk' class at the bivariate or multivariate level in either sample.

3.4. Association of latent class membership with probable diagnosis of PTSD

For the Indian sample, there was a significant association between class membership and probable PTSD diagnosis ($\chi^2(2) = 13.23$, $p = .001$). Compared to 'Low risk – moderate sexual trauma', there was no significant association between membership of 'Moderate Risk' and probable PTSD diagnosis (OR = 2.671; 95 % C.I. = 0.91, 7.83) while there was a statistically significant association between membership of 'High Risk' class and probable PTSD diagnosis (OR = 23.22; 95 % C.I. = 5.46, 98.77). For the Malaysian sample, there was a significant association between class membership and probable PTSD diagnosis ($\chi^2(2) = 19.75$, $p = .001$). Compared to the 'Low Risk' class, there was a significant association between probable PTSD diagnosis and membership of both the 'High Risk' class (OR = 27.06; 95 % C.I. = 1.47, 498.19) and 'Moderate Risk' class (OR = 25.28; 95 % C.I. = 3.75, 170.44).

4. Discussion

The main objectives of the current study were to examine experiences of multiple traumatic events and identify demographic and mental

Table 3
The association between demographic variables and latent class membership.

India	Class 1: 'Moderate Risk'				Class 2: 'High Risk'			
	OR	CI	AOR	CI	OR	CI	AOR	CI
Age (years)	1.72	(0.31, 1.09)	1.67	(0.83, 3.38)	0.75	(0.06, 3.17)	0.59	(0.05, 2.70)
Sex (male)	**3.01***	(1.67, 5.44)	**3.02***	(1.64, 5.55)	**9.08***	(1.64, 50.38)	9.64	(0.52, 19.85)
Living arrangements (living with both parents)	6.17	(0.32, 119.51)	1.23	(0.88, 1.73)	0.04	(0.08, 5.74)	0.97	(0.32, 1.94)
Parent education	1.16	(0.84, 1.59)	11.92	(0.17, 1226.50)	0.96	(0.41, 2.21)	0.69	(0.00, 8.48)

Malaysia	Class 2: 'Moderate Risk'				Class 1: 'High Risk'			
	OR	CI	AOR	CI	OR	CI	AOR	CI
Age (years)	**1.30***	(1.05, 1.57)	**1.36***	(1.08, 1.73)	1.29	(0.52, 2.79)	1.29	(0.47, 3.55)
Sex (male)	**0.41***	(0.23, 0.63)	**2.65***	(0.06, 7.68)	1.51	(0.16, 10.19)	0.68	(0.06, 7.66)
Living arrangements (living with both parents)	**0.53***	(0.27, 0.93)	0.96	(0.57, 1.96)	0.52	(0.05, 3.54)	1.06	(0.60, 1.96)
Parent education	0.93	(0.75, 1.12)	**0.58***	(0.05, 4.42)	0.97	(0.54, 1.60)	0.50	(0.06, 4.42)

health-related factors associated with multiple traumatic exposure among two samples of adolescents from India and Malaysia. Consistent with existing research (Karsberg et al., 2014; McChesney et al., 2015; O'Donnell et al., 2017; Petersen et al., 2010), the largest class identified in both samples was characterized by low levels of exposure to most PTEs. The proportion of adolescents who were allocated membership of this class was much greater for the Malaysian sample (i.e., 80 %) compared to the Indian sample (i.e., 63 %). High levels of poverty, inadequate access to medical and educational facilities, homelessness, children- and adolescents engaging in begging, child marriage, sex-based discrimination, and child labour have been proposed to contribute to the high levels of PTE exposure among Indian adolescents (Kacker et al., 2007). It is possible that in Malaysia where the economic and social outlook is more favourable than India that a higher proportion of adolescents report minimal levels of PTE exposure. Although there was a class characterized by low levels of exposure to most PTEs in both samples, several PTEs emerged as being relevant to this class in each respective country. Death of a loved one was moderately endorsed by both samples in the present study, a finding consistent with prior research where death of a loved one has been found to infiltrate through all possible constellations of PTEs (Shevlin & Elklit, 2008). However, the moderate endorsement of sexual trauma for this class in the Indian sample was an unusual finding and suggests that sexual traumas can occur in isolation of other PTEs for a large proportion of Indian adolescents.

Consistent with prior studies (e.g., Karsberg et al., 2014; Petersen et al., 2010; Redican et al., 2022; Shevlin & Elklit, 2008), the second largest class was characterized by moderate levels of exposure to a small collection of PTEs. Events that were heavily endorsed in this class for both samples included death of someone close and threats of violence or bullying, baring semblance to the 'physical assault, threats of violence, and bullying class' identified by Petersen et al. (2010) in their sample of Faroese adolescents and the 'physical assault, threats of violence, neglect, and humiliation or persecution from others class' identified by Karsberg et al. (2014) in their sample of Greenlandic adolescents. Interestingly, sexual trauma also featured heavily in this class for the Indian sample. This was again perplexing given that this pattern failed to emerge for the Malaysian sample who reported similar levels of sexual trauma and that rates of sexual trauma were quite low in the present study when compared to global estimates which suggest that 18.0 % of girls and 7.6 % of boys experience sexual trauma (Stoltenborgh et al., 2015). It is possible that the sexual trauma prevalence estimates observed in the current study are not accurate representations of the true extent of sexual trauma in both countries as this study is based on convenience sampling. Asian countries are largely collective by nature whereby individual identities are deeply embedded within their collective (e.g., family, school, country) and individuals are conditioned to put the needs of their collective above their own (Triandis et al., 1988). Consequently, adolescents may be less willing to disclose sexual traumas to protect the integrity, harmony, and longevity of their collective (Futa et al., 2001). Alternatively, it may be that self-report surveys are not the most appropriate means of enquiring about adolescents' experiences of sexual trauma (Redican et al., 2022). Nevertheless, the high endorsement of sexual trauma within this class for the Indian sample suggests that sexual trauma permeates all potential constellations of PTEs for Indian adolescents and is likely to co-occur with other PTEs such as threats of violence or bullying. This pattern of co-occurrence aligns with prior research illustrating how adolescents with experiences of sexual abuse are at increased risk of being bullied at school (Xiao et al., 2021).

Consistent with prior studies conducted in Western nations (e.g., Karsberg et al., 2014; O'Donnell et al., 2017; Petersen et al., 2010; Redican et al., 2022; Shevlin & Elklit, 2008), the smallest class identified for both samples was characterized by high levels of exposure to many PTEs. These included severe childhood neglect, serious accident, life-threatening situations, sexual trauma, and exposure to threats of violence and bullying for the Indian sample and all PTEs for the Malaysian sample. The co-occurrence of neglect and sexual trauma for this class in the Indian sample but not for the other trauma classes identified in the Indian sample where sexual trauma also heavily featured was surprising. Prior research has shown how adolescents affected by sexual trauma are more likely to be exposed to multiple different forms of abuse and neglect (Dong et al., 2003), and hence it would appear intuitive that other forms of neglect and abuse would occur alongside sexual trauma in all trauma classes for the Indian sample. Indeed, this pattern emerged in the 'High Risk' class for the Malaysian sample where sexual trauma was found to co-occur with both physical abuse and severe childhood neglect in the most traumatized class. It may be that for some Indian adolescents' sexual trauma can occur in isolation of other instances of maltreatment, while for others, sexual trauma occurs concurrently with other types of maltreatment. This would be consistent with prior research where a class characterized by high endorsement of sexual abuse and low endorsement of other forms of maltreatment has also been identified (e.g., Armour et al., 2014; Witt et al., 2016). Overall, the detection of a 'High Risk' class in both samples adds to a growing body of research highlighting how a small proportion of adolescents are victims of multiple high impact traumatic events.

The current study also sought to explore the associations between a range of demographic variables and trauma class membership. Aligning with our initial hypothesis, and prior research (O'Donnell et al., 2017), findings from the current study highlighted how membership of 'Moderate Risk' class was strongly associated with male sex in both samples. Many of the PTEs endorsed in this class including physical assault, exposure to a life-threatening situation, and threats of violence/bullying are typically more prevalent among males (Tolin & Foa, 2008). This class was also characterized by sexual trauma in the Indian sample, with

research consistently illustrating sexual trauma-based classes to be predominantly comprised of females (O'Donnell et al., 2017). However, Indian males reported significantly higher levels of exposure to sexual trauma than their female counterparts in the current study, hence explaining why male sex was so strongly associated with membership of this trauma class. The higher prevalence of sexual trauma among Indian males is in keeping with other studies (e.g., Charak & Koot, 2014) with it being suggested that less stringent monitoring of young Indian males compared to their female counterparts may increase susceptibility to traumatic exposure (Charak, 2022; Rasmussen et al., 2013). Alternatively, it may be that sexual trauma is more common for Indian females but that various cultural and societal factors may preclude young females from disclosing such experiences. India is considered a patriarchal culture where preference for male children over female children is a pervasive issue (Das Gupta et al., 2003), and as a result, female children can experience high levels of discrimination (Priya et al., 2014). In countries such as India, it is also possible that females reporting sexual trauma may be disbelieved (Fontes & Plummer, 2010) or may fear being blamed for their trauma and tarnishing their family honour (Krishnakumar et al., 2014). Notably, male sex was not associated with membership of the 'High Risk' class in either sample at a multivariate level. This may be due to the small proportion of adolescents comprising these classes hindering the detection of any significant effects. Alternatively, several other studies have also found no association between sex and multiple trauma exposure (e.g., Karsberg et al., 2014; Shevlin & Elklit, 2008). Hence, it is possible that in some adolescent populations that the probability of experiencing multiple PTE types is relatively equivalent for males and females.

Consistent with prior research indicating older adolescents to be more likely to experience multiple PTEs (e.g., Finkelhor et al., 2007; Pereda et al., 2014), older age was found to be significantly associated with membership of 'Moderate Risk' in the Malaysian sample. This may be related to additional years providing greater opportunities for exposure to PTEs as well as the higher likelihood of engagement in high-risk activities in later adolescence (Nooner et al., 2012). The failure to identify an age effect in the Indian sample is likely linked to the lower variability in age in this sample compared to the Malaysian sample. Surprisingly, and inconsistent with the extant evidence base (e.g., Connell et al., 2018; Finkelhor et al., 2007; Ford et al., 2010), age was not identified as a correlate of the 'High Risk' class in either sample. Again, it is possible that the small class sizes may have impeded the detection of statistically significant effects. Alternatively, it is possible that some PTEs are more likely to occur during early adolescence and others during later adolescence, hence offsetting any age-related differences in exposure to multiple PTEs. Indeed, McLaughlin et al. (2013) found that vicarious PTEs, most violence-based PTEs, and automobile-related PTEs were more prevalent during later adolescence while physical abuse and life-threatening accidents were more prevalent during childhood or early adolescence. Future studies may benefit from exploring age-related differences in PTE exposure among Indian and Malaysian adolescents. Findings from the current study also highlighted how adolescents in the 'Moderate Risk' class in the Malaysian sample were more likely to have parents with lower levels of education. This concords with research indicating lower levels of parental educational attainment, an index of SES, among young people exposed to numerous traumatic events (e.g., Finkelhor et al., 2007; Mossige & Huang, 2017). It is likely that such an effect did not emerge for the Indian sample given that almost two thirds of this sample reported the highest level of parental educational attainment to be higher education compared to almost a third of the Malaysian sample.

Aligning with findings from existing research (e.g., Ford et al., 2010; Karsberg et al., 2014; McChesney et al., 2015; Shevlin & Elklit, 2008), membership of the 'High Risk' was significant associated with probable PTSD diagnosis in both samples. These findings emphasize how the identification of adolescents exposed to multiple PTEs is crucial to minimize the psychological consequences of early developmental trauma. Findings from the current study also revealed a strong link between membership of 'Moderate Risk' class and probable PTSD diagnosis in the Malaysian sample but not the Indian sample. This is perplexing given that the constellations of PTEs characterizing this class were almost identical in both samples, except for sexual trauma being heavily endorsed for the Indian sample and serious accident being heavily endorsed by the Malaysian sample. It is well-established that sexual trauma is a salient risk factor for the development of PTSD (e.g., Lewis et al., 2019), and hence, it would appear intuitive that given the high endorsement of sexual trauma in this class for the Indian sample that associated risk of probable PTSD would be considerable. As previously alluded to, rates of sexual trauma were low for the Indian sample, likely making it difficult to detect a statistically significant association between membership of 'Moderate Risk' class and probable PTSD diagnosis. It is likely that the PTEs endorsed within this class (i.e., death of a loved one, threats of violence or bullying) were the main drivers of the association between class membership and probable PTSD diagnosis. It may be that such events were experienced less often and intensely for the Indian sample as compared to the Malaysian sample, hence the null association. Future research may benefit from incorporating frequency and severity of PTEs into the estimation of trauma classes, adopting an approach similar to Zelviene et al. (2020) who investigated patterns of exposure to maltreatment among adolescents based on both type and severity of traumatic exposure.

Despite being the first study to examine patterns and correlates of PTEs among Indian and Malaysian adolescents, the present study has some limitations. First, participants were recruited using non-probability sampling strategies and hence, generalisability of our findings to the wider Indian and Malaysian adolescent context is limited. Second, the small sample sizes may have affected the ability to determine significant associations between the variables of interest, particularly for the 'High Risk' classes. Specifically, the 'High Risk' class contained <5 % of participants for the Indian sample and <1 % of participants for the Malaysian sample. This is a significant limitation given that unequal class sizes can increase the standard errors of regression coefficients and affect the significance of associations (Houston et al., 2011), while uneven class sizes can greatly undermine statistical power (Tekle et al., 2016). Third, the cross-sectional nature of the current study prohibits conclusions to be drawn regarding causality. Finally, this study did not include context specific PTEs such as natural disasters which are particularly relevant in Asia (Rasmussen et al., 2013). Nevertheless, the examination of PTEs that were consistent with studies of a similar nature conducted across different countries and cultural contexts, enabled comparisons across these various studies (e.g., Shevlin & Elklit, 2008; Karsberg et al., 2014; Petersen et al., 2010; Ferrajão et al., 2022).

In conclusion, our findings illustrate how trauma co-occurrence is common among adolescents from India and Malaysia, and that young victims of multiple co-occurring PTEs are more likely to experience adverse outcomes. These findings also emphasize the importance of country-level investigations of PTE co-occurrence, especially given the unique role of sexual trauma in the Indian sample. The association between male sex and exposure to multiple traumatic events highlights the need for greater awareness and prevention of trauma exposure in both males and females (Charak & Koot, 2014). Findings from this study may help facilitate the development of prevention and intervention guidelines aimed at minimizing the burden of childhood trauma at a multinational level.

Declaration of competing interest

Authors declare no conflict of interest.

Data availability

The data that has been used is confidential.

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